

Technical Description

APCLe-1711 and CPCIs-1711

Multifunction counter board, optically isolated



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, limit values, 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 7, 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

Warning!	3
Chapter overview	7
1 Definition of application, user, handling	8
1.1 Definition of application	8
1.1.1 Intended use	8
1.1.2 Usage restrictions	8
1.1.3 Limits of use	8
1.2 User	9
1.2.1 Qualification	9
1.2.2 Country-specific regulations	9
1.3 Handling of the board	9
1.4 Questions and updates	10
2 Brief description	11
2.1 Comparison between the APCLe-1711 and APCI-1710	13
2.2 Block diagram	13
3 Insertion and installation of the board	15
3.1 Insertion of the APCLe board	15
3.1.1 Opening the PC	15
3.1.2 Selecting a slot	15
3.1.3 Inserting the board	16
3.1.4 Closing the PC	16
3.2 Insertion of the CPCIs board	17
3.2.1 Opening the system	17
3.2.2 Selecting a slot	17
3.2.3 Inserting the board	18
3.3 Connecting the accessories	19
3.3.1 Connection of the screw terminal panels	19
3.3.2 Connection cables	20
3.4 Pin assignment	21
3.4.1 78-pin D-Sub female connector	21
3.4.2 50-pin D-Sub male connector on the cable ST1711-50	21
3.4.3 50-pin and 37-pin D-Sub male connectors on the cable ST1711-50-37	22
3.4.4 24 V supply voltage of the 24 V outputs (channels Hx)	24
3.4.5 24 V inputs (channels Ax, Bx, Cx and Dx)	24
3.4.6 Pin header ST3 (50-pin)	24
3.5 Connection examples of the inputs/outputs	28
3.5.1 RS422 input A0 with RS422 signal	28
3.5.2 RS422 input A0 with TTL signal	28
3.5.3 RS422 output A0 to RS422 driver	29
3.5.4 RS422 output A0 to TTL (3.3 V)	29
3.5.5 24 V input E0	30
3.5.6 24 V output H0	30
3.5.7 24 V input A0 (APCLe-1711-24V or CPCIs-1711-24V)	31
3.5.8 TTL inputs/outputs	32
3.6 Driver installation	32
3.7 Software tool "ConfigTools"	33
3.7.1 First steps	33
3.7.2 Main window structure	34
4 Function description	37
5 Standard software	38
6 Return or disposal	39
6.1 Return	39

6.2	Disposal of ADDI-DATA waste equipment.....	40
7	Technical data and limit values.....	41
7.1	Electromagnetic compatibility (EMC)	41
7.2	Mechanical structure	41
7.3	Versions	42
7.4	Option.....	42
7.5	Limit values.....	43
7.5.1	Digital inputs (RS422)	43
7.5.2	Digital inputs (24 V)	44
7.5.3	Digital inputs (5 V)	44
7.5.4	Digital outputs (RS422).....	44
7.5.5	Digital outputs (24 V)	45
7.5.6	Digital outputs (3.3 V)	45
7.5.7	Reference clock source	45
7.5.8	LVC MOS / LV TTL: Digital inputs and outputs (ST3 header).....	45
8	Appendix.....	46
8.1	Glossary.....	46
8.2	Index	48
9	Contact and support.....	49

Figures

Fig. 1-1:	APCLe-1711: Correct handling	9
Fig. 1-2:	CPCIs-1711: Correct handling	10
Fig. 2-1:	APCLe-1711: Block diagram	13
Fig. 2-2:	CPCIs-1711: Block diagram	14
Fig. 3-1:	PCI Express slot types	15
Fig. 3-2:	Slot: Insert the board	16
Fig. 3-3:	PC housing: Fasten the board	16
Fig. 3-4:	CPCIs slot types.....	17
Fig. 3-5:	Slot: Insert the board	18
Fig. 3-6:	APCLe-1711: Connection of the screw terminal panels	19
Fig. 3-7:	CPCIs-1711: Connection of the screw terminal panels	20
Fig. 3-8:	78-pin D-Sub female connector (digital I/O)	21
Fig. 3-9:	50-pin D-Sub male connector (digital I/O)	22
Fig. 3-10:	APCLe-1711: Connection of the cable ST1711-50-37.....	23
Fig. 3-11:	CPCIs-1711: Connection of the cable ST1711-50-37.....	23
Fig. 3-12:	ST1711-50-37 cable: 50-pin and 37-pin D-Sub male connector ("Sin/Cos" function).....	24
Fig. 3-13:	Pin header ST3: Position on the board APCLe-1711	25
Fig. 3-14:	Pin header ST3: Position on the board CPCIs-1711	25
Fig. 3-15:	50-pin header ST3 ("TTL I/O" function).....	25
Fig. 3-16:	Input A0 with RS422 signal	28
Fig. 3-17:	Input A0 with TTL signal	28
Fig. 3-18:	Output A0 to RS422 driver	29
Fig. 3-19:	Output A0 to TTL (3.3 V)	29
Fig. 3-20:	Input E0	30
Fig. 3-21:	Output H0.....	30
Fig. 3-22:	Input A0 (APCLe-1711-24V or CPCIs-1711-24V)	31
Fig. 3-23:	TTL inputs/outputs	32
Fig. 3-24:	ConfigTools: Scan boards	33
Fig. 3-25:	ConfigTools: Main window	34
Fig. 3-26:	ConfigTools: SET1711	35

Fig. 3-27: "TTL I/O" function: ST3 configuration	36
Fig. 6-1: Serial number	39
Fig. 6-2: Disposal: Label.....	40
Fig. 7-1: APCLe-1711: Dimensions	41
Fig. 7-2: CPCIs-1711: Dimensions	41

Tables

Table 2-1: Board versions: Number and type of inputs/outputs	11
Table 2-2: Board versions: Available functions	12
Table 2-3: Overview of signal generators or functions	12
Table 2-4: Comparison: APCLe-1711 and APCI-1710.....	13
Table 3-1: Pin description ("TTL I/O" function)	26
Table 7-1: Versions	42
Table 7-2: Option.....	42

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 **APCLe-1711** must be inserted in a personal computer (PC) with PCI Express slots which is used as electrical equipment for measurement, control and laboratory pursuant to the standard DIN EN IEC 61010-1.

The board **CPCIs-1711** must be inserted in a CompactPCI Serial computer or in a corresponding hybrid system with CompactPCI Serial slots which is used as electrical equipment for measurement, control and laboratory pursuant to the standard DIN EN IEC 61010-1.

The used personal computer (PC) or CompactPCI Serial computer must fulfil the requirements of DIN EN IEC 62368-1 and DIN EN 55032 or IEC/CISPR 32 and DIN EN 55024 or IEC/CISPR 24.

The use of the boards **APCLe-1711** and **CPCIs-1711** in combination with external screw terminal panels requires correct installation according to the standard DIN EN IEC 61439-1 (Low-voltage switchgear and controlgear assemblies).

1.1.2 Usage restrictions

The boards **APCLe-1711** and **CPCIs-1711** must not be used as safety-related parts (SRP).

The boards **APCLe-1711** and **CPCIs-1711** must not be used for safety-related functions, such as emergency stop functions.

The boards **APCLe-1711** and **CPCIs-1711** must not be used in potentially explosive atmospheres.

The boards **APCLe-1711** and **CPCIs-1711** 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.

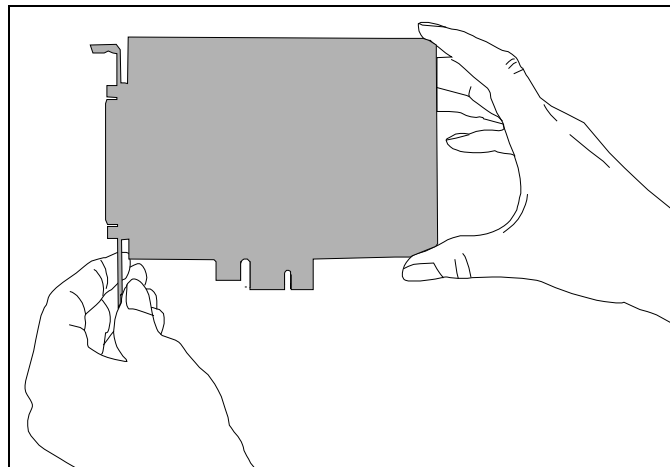
1.2.2 Country-specific regulations

Do observe the country-specific regulations regarding

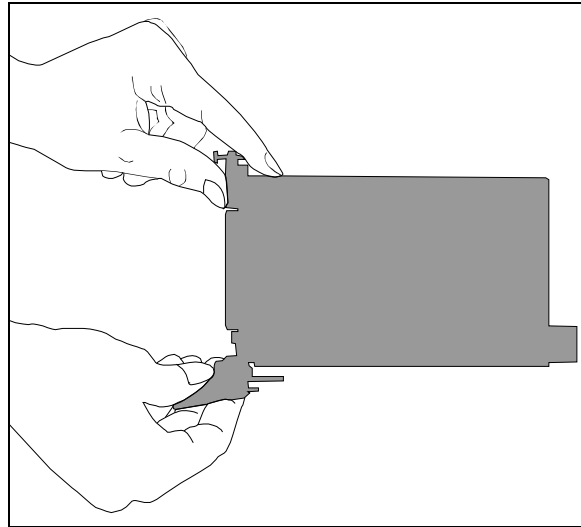
- the prevention of accidents
- electrical and mechanical installations
- Electromagnetic compatibility (EMC).

1.3 Handling of the board

Fig. 1-1: APCLe-1711: 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: CPC1s-1711: 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 **APC1e-1711** or **CPC1s-1711** can be downloaded for free at: <https://drivers.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 **APCLe-1711** or **CPCIs-1711** is a fast multifunction and multi-channel counter board for the PCI Express or CompactPCI Serial bus. It is equipped with four function modules that are assembled with four reprogrammable FPGAs.

The function modules are connected to each other through an internal bus. They allow digital input and output signals to be connected to each other and processed on a hardware basis, i.e. in real time, before they are passed on to the PC.

The digital signals are lead via the 78-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.

The board **CPCIs-1711** has an extended operating temperature range from -40 °C to +85 °C.

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

Pin name	APCLe-1711 CPCIs-1711	APCLe-1711-24V CPCIs-1711-24V	APCLe-1711-5V-I CPCIs-1711-5V-I
A0-A3 B0-B3 C0-C3 D0-D3	16 RS422/TTL inputs/outputs	28 24 V inputs	16 RS422/TTL inputs/outputs
E0-E3 F0-F3 G0-G3	12 24 V inputs		12 5 V inputs
H0-H3	4 24 V outputs	4 24 V outputs	4 24 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 versions, 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 boards **APCLe-1711-24V** and **CPCIs-1711-24V**.

Table 2-2: Board versions: Available functions

Function	APCLe-1711 CPCIs-1711	APCLe-1711-24V CPCIs-1711-24V	APCLe-1711-5V-I CPCIs-1711-5V-I
BiSS-Master	x	-	x
Digital I/O	x	x ¹	x
EnDat 2.2	x	-	-
ETM	x	x	x
Incremental counter	x	x	x
PWM	x	x ²	x
Sin/Cos	x	x	x
SSI	x	-	x
TTL I/O	x	x	x
Counter/Timer	x	x ³	x

¹ Pin Ax or Bx: Only the 24 V input can be used and not the 24 V output.

² Only the 24 V digital output PWM0 (signal: DIG_OUT_H_x) is available. The maximum output frequency is load-dependent and limited by the 24 V output to 100 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.



NOTICE!

To avoid the destruction of the board, the external switching must be done 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
BiSS-Master*	6	4	24
Digital I/O*	8	4	32
EnDat 2.2*	2	4	8
ETM	2	4	8
Incremental counter	1 (32-bit) / 2 (16-bit)	4	4 or 8
PWM*	2	4	8
Sin/Cos	2	2	4
SSI*	3	4	12
TTL I/O	24	1	24
Counter/Timer*	3	4	12

FM = Function module; "Sin/Cos" function: EM = Extension module

* see Table 2-2

2.1 Comparison between the APCLe-1711 and APCI-1710

Table 2-4: Comparison: APCLe-1711 and APCI-1710

Features	APCLe-1711	APCI-1710
Required PC slot	PCI Express (1-/4-lane)	PCI
Selectable bus clock	40 MHz	30 MHz, 33 MHz and 40 MHz
Front connector	78-pin (with the cable ST1711-50 compatible to the APCI-1710)	50-pin
Switching 50-pin D-Sub connector / pin 34	Automatic switching (see Chapter 3.4.2)	Via jumper
24 V supply for outputs	78-pin D-Sub connector (see Chapter 3.4.1)	50-pin D-Sub connector or via terminal on the board
Software tool for module configuration	ConfigTools	ConfigTools

2.2 Block diagram

Fig. 2-1: APCLe-1711: Block diagram

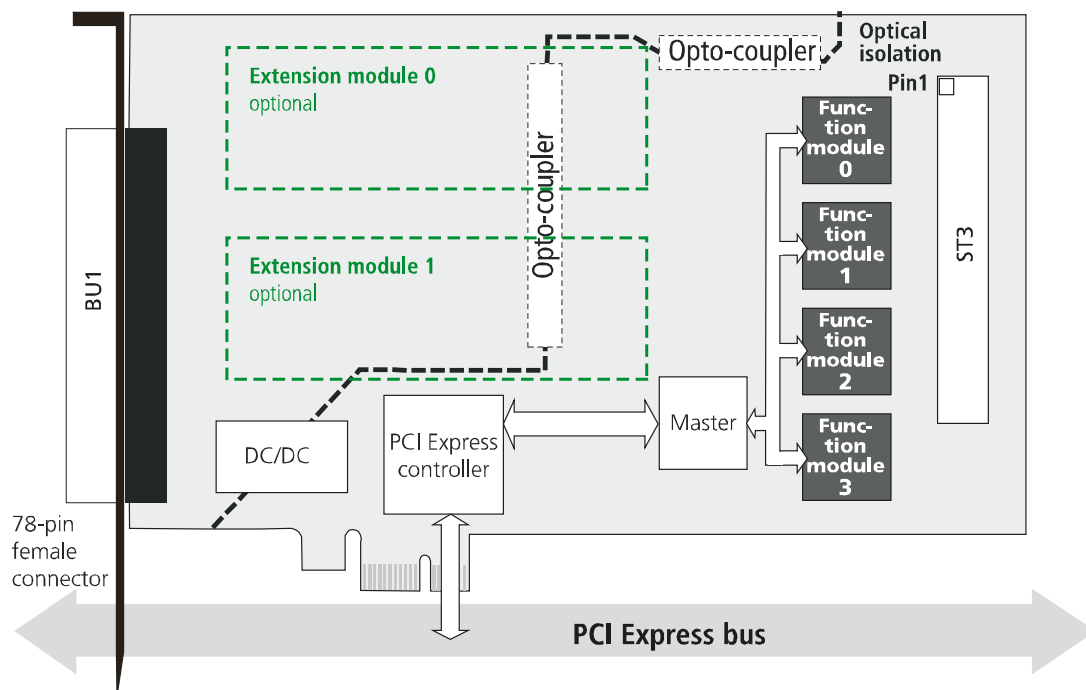
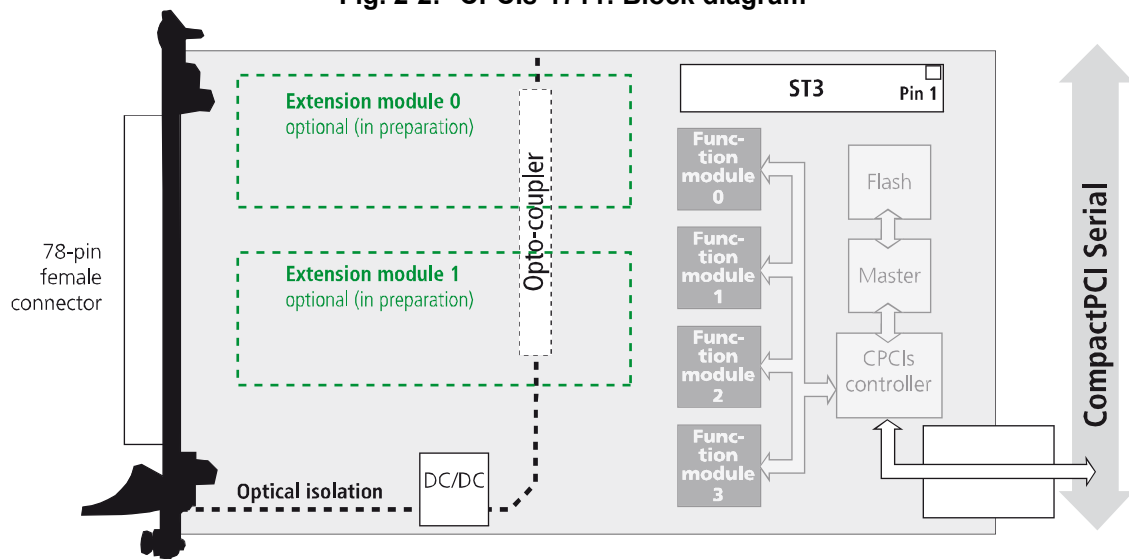


Fig. 2-2: CPCIs-1711: Block diagram



3 Insertion and installation of the board

3.1 Insertion of the APCLe board

**Risk of injury!**

Be sure to follow the safety precautions!
Improper use of the board may lead to property damage and personal injury.

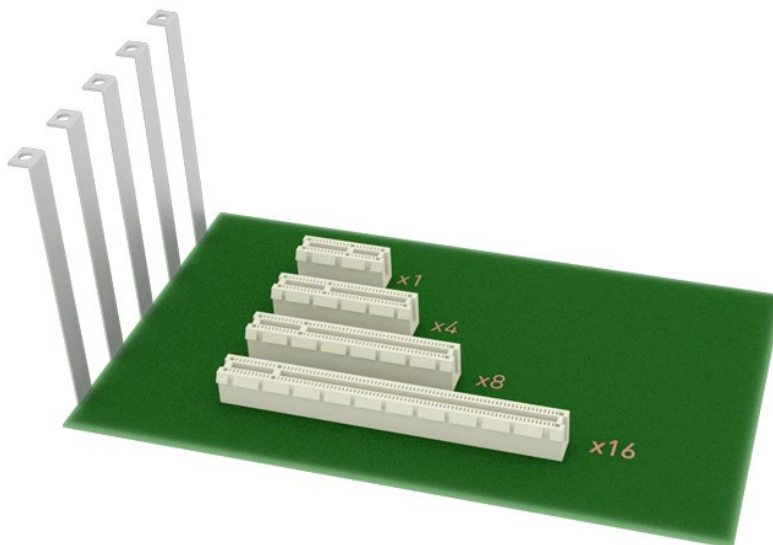
3.1.1 Opening the PC

- 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 1-lane (x1), 4-lane (x4), 8-lane (x8) or 16-lane (x16) PCI-Express slot for the board.

Fig. 3-1: PCI Express slot types

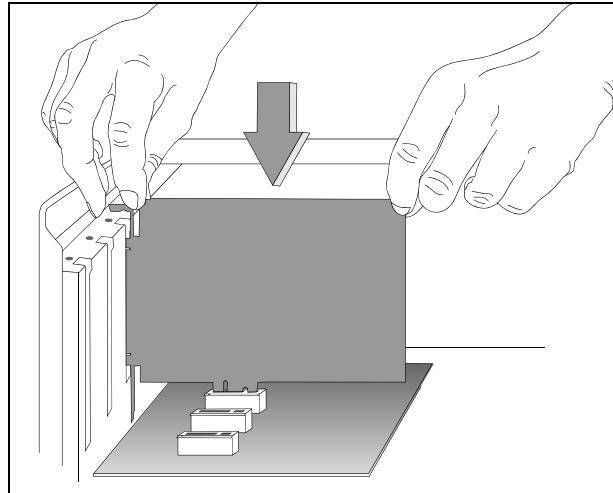


- Unscrew the back cover from the selected slot. For this, follow the operating instructions provided by the PC manufacturer!
Keep the back cover in a safe place. You will need it if you remove the board.
- Provide for potential equalisation.
- Take the board out of its protective packaging.

3.1.3 Inserting the board

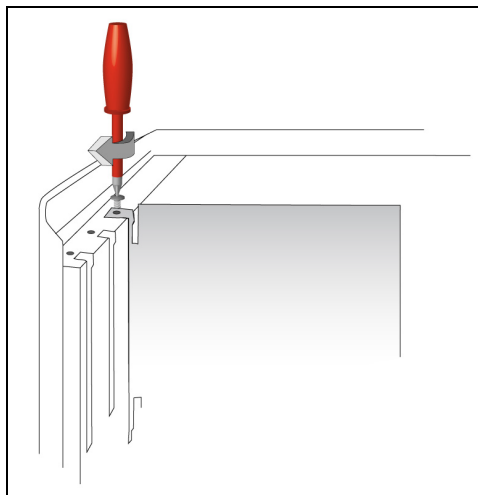
- Insert the board vertically from above into the selected slot.

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 CPCIs board



Risk of injury!

Be sure to follow the safety precautions!
Improper use of the board may lead to property damage and personal injury.

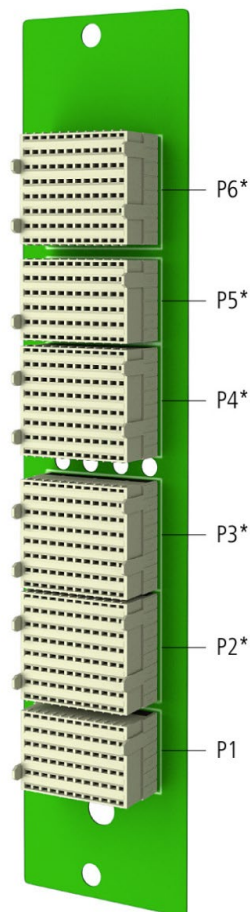
3.2.1 Opening the system

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

3.2.2 Selecting a slot

- Select a free CPCIs slot for the board (* P2-P6 = optional).

Fig. 3-4: CPCIs slot types

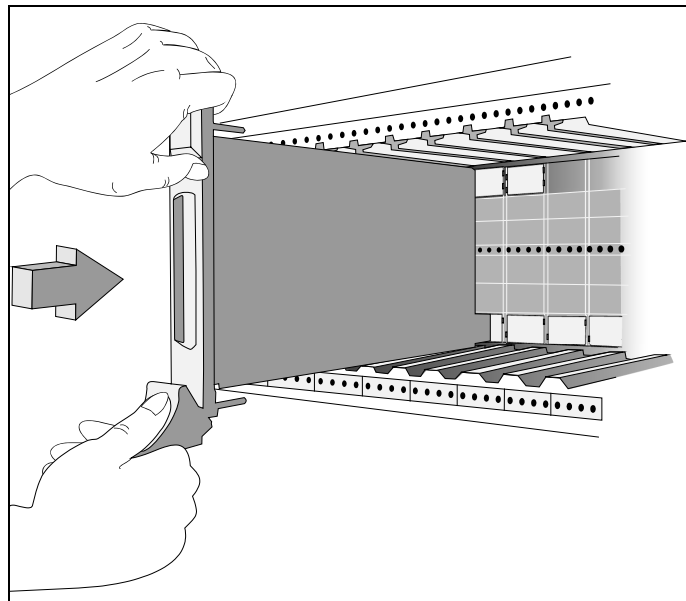


- Provide for potential equalisation.
- Take the board out of its protective packaging.

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

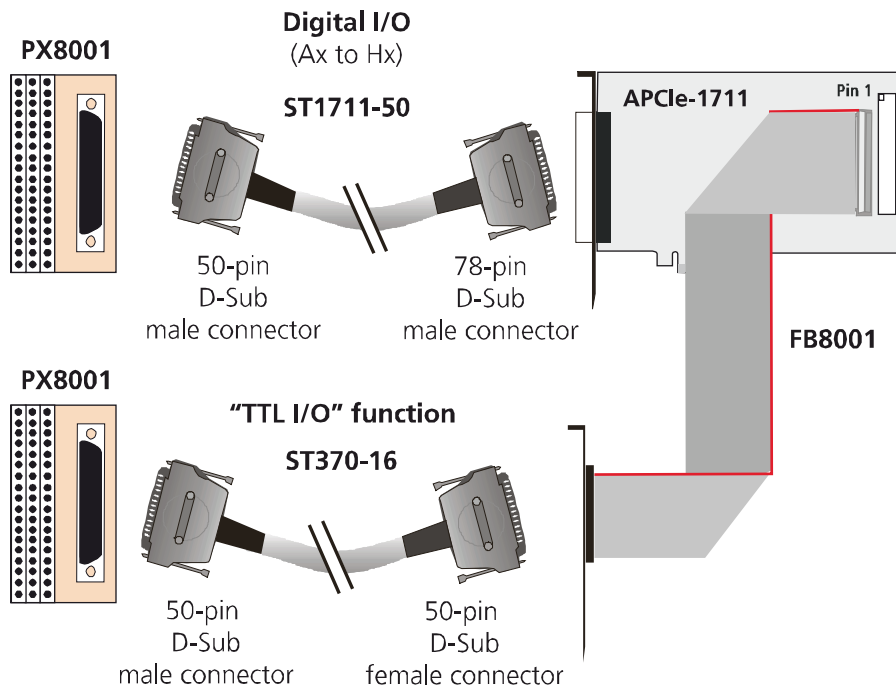
3.3.1 Connection of the screw terminal panels

Between the board **APCLe-1711** or **CPCIs-1711** and the peripherals, digital signals are exchanged via the screw terminal panel **PX8001** and the cable **ST1711-50**, which needs to be connected to the 78-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.

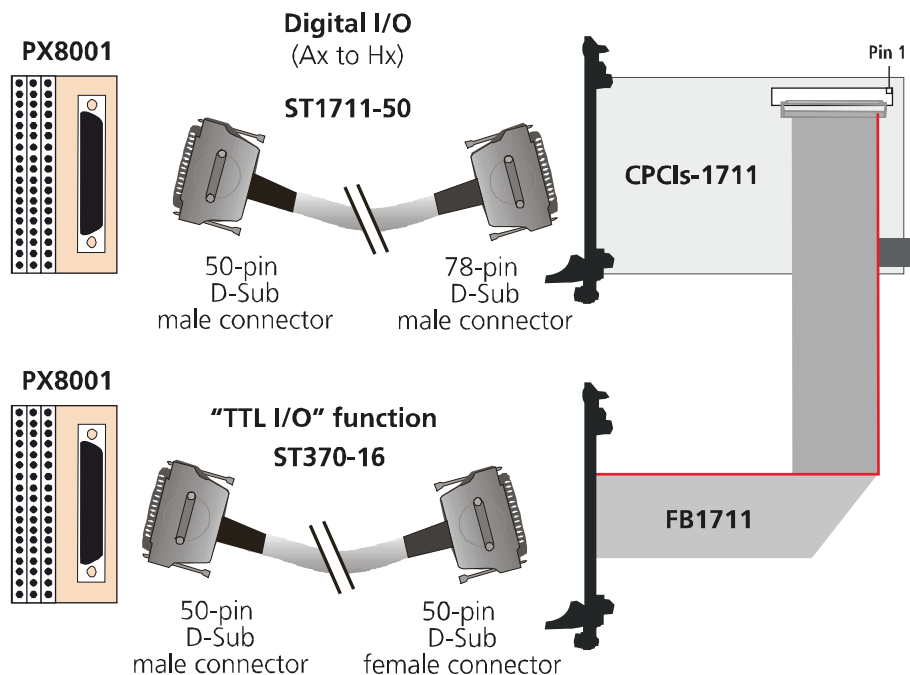
For the TTL inputs and outputs ("TTL I/O" function) of the **APCLe-1711** or **CPCIs-1711**, the ribbon cable **FB8001** or **FB1711** is connected to the 50-pin header of the board. This ribbon cable has a 50-pin D-Sub male connector for the connection of the cable **ST370-16**, i.e. a second slot is required.

Fig. 3-6: APCLe-1711: 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: CPCIs-1711: Connection of the screw terminal panels**NOTICE!**

Plug the **FB1711** cable into the connector by inserting the red (or blue or black) cable line into pin 1.

3.3.2 Connection cables

**NOTICE!**

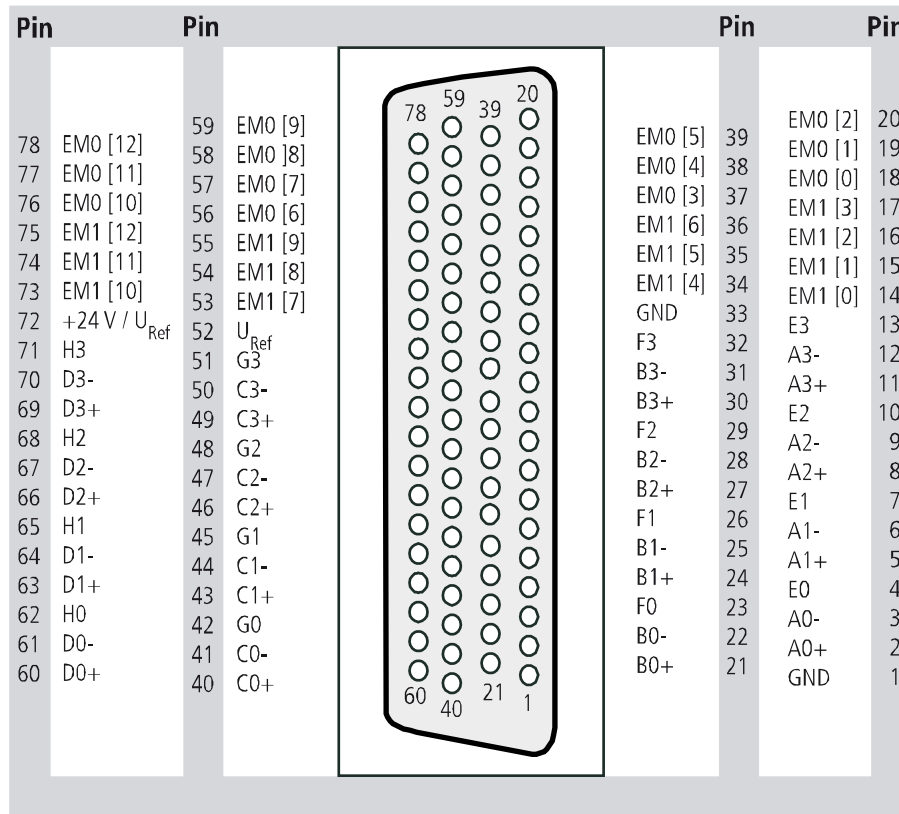
Interferences are emitted and spread through the connection cables. Therefore, a wrong cable might endanger the operation and function safety of your system.

- 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 78-pin D-Sub female connector

Fig. 3-8: 78-pin D-Sub female connector (digital I/O)



EM = Extension module

U_{Ref} = Reference voltage

Pin 52 and pin 72 can be used for the supply of a reference voltage of 1.4 V. This voltage is needed to connect a TTL signal to a differential RS422 input (see Chapter 3.5).

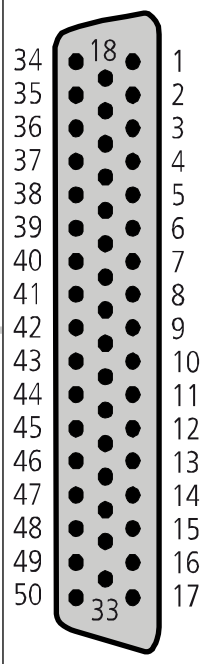
In addition, over pin 72, +24 V can be supplied for the outputs Hx. As this pin is protected through a protective circuit, +24 V or 1.4 V can be supplied as required.

3.4.2 50-pin D-Sub male connector on the cable ST1711-50

With the cable **ST1711-50**, the 78-pin D-Sub female connector of the board is adapted to a 50-pin D-Sub male connector, which can be directly used for the screw terminal panel **PX8001**. Because of this adaptation, one GND PIN, one PIN for the reference voltage and the connections of the extension modules EM0 and EM1 are not available anymore.

The pin assignment of the 50-pin D-Sub male connector is compatible with that of the 50-pin D-Sub male connector of the **APCI-1710** board.

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

Pin			Pin			Pin			Pin		
34	+24 V / U _{Ref}	Function module 2 (FM2)	18	A2+		1	GND	1	Function module 0 (FM0)		
35	H0		19	A2-		2	A0+	2			
36	H1		20	B2+		3	A0-	3			
37	H2		21	B2-		4	B0+	4			
38	H3		22	C2+		5	B0-	5			
39	E0		23	C2-		6	C0+	6			
40	E1		24	D2+		7	C0-	7			
41	E2		25	D2-		8	D0+	8			
42	E3		26	A3+		9	D0-	9			
43	F0	Function module 3 (FM3)	27	A3-		10	A1+	10	Function module 1 (FM1)		
44	F1		28	B3+		11	A1-	11			
45	F2		29	B3-		12	B1+	12			
46	F3		30	C3+		13	B1-	13			
47	G0		31	C3-		14	C1+	14			
48	G1		32	D3+		15	C1-	15			
49	G2		33	D3-		16	D1+	16			
50	G3					17	D1-	17			

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. Pin 34 is protected through a protective circuit.

The reference voltage of 1.4 V is required to connect a TTL signal to a differential RS422 input (see Chapter 3.5). In order to use the 24 V supply voltage for the outputs Hx at the same time, a Y-cable is required (see the following chapter).

3.4.3 50-pin and 37-pin D-Sub male connectors on the cable ST1711-50-37

As already mentioned in Chapter 3.4.2, pin 34 of the 50-pin D-Sub male connector on the **ST1711-50** cable is dual-wired.

If both the 24 V supply voltage and the 1.4 V reference voltage are required, the Y-cable **ST1711-50-37** can be connected to the 78-pin D-Sub female connector of the board. Besides the 50-pin D-Sub male connector, this cable has a 37-pin D-Sub male connector. On pin 34 of the 50-pin connector, the 24 V supply voltage is available; on pin 19 of the 37-pin connector, the reference voltage of 1.4 V. The other pins of the 37-pin connector are used for the extension modules, like e.g. with the "Sin/Cos" function.

Fig. 3-10: APCLe-1711: Connection of the cable ST1711-50-37

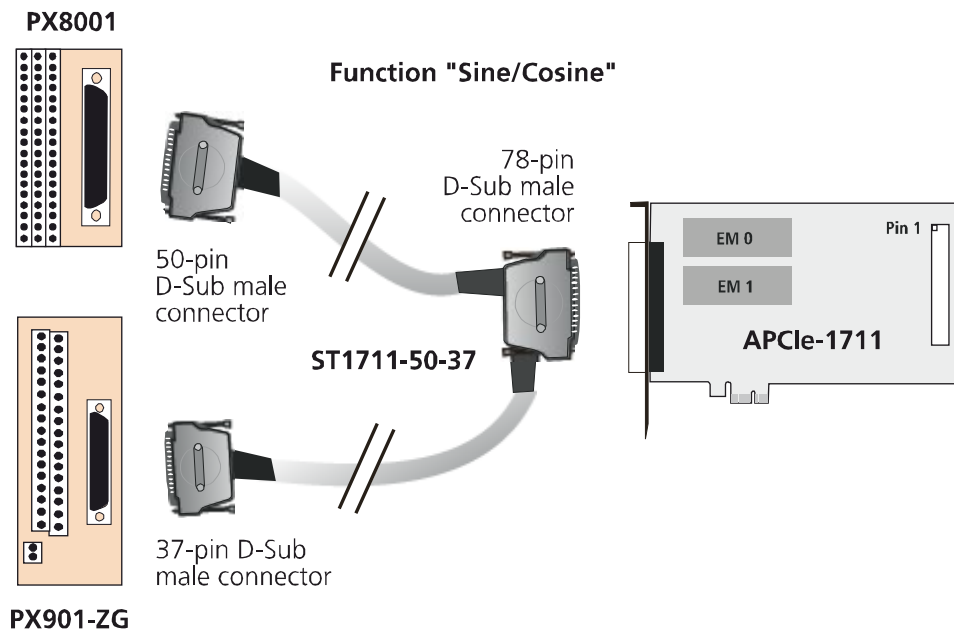


Fig. 3-11: CPCIs-1711: Connection of the cable ST1711-50-37

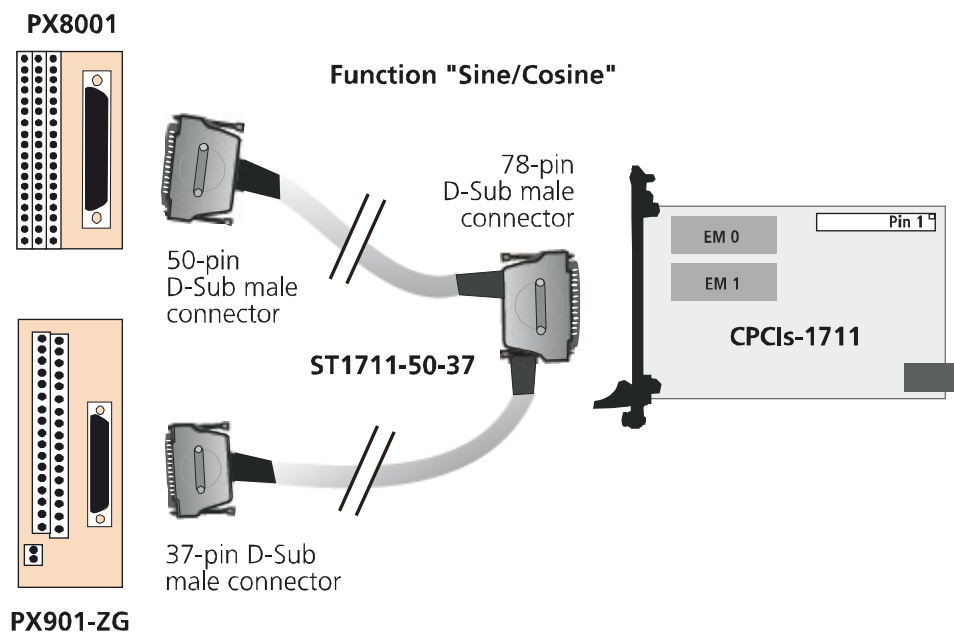
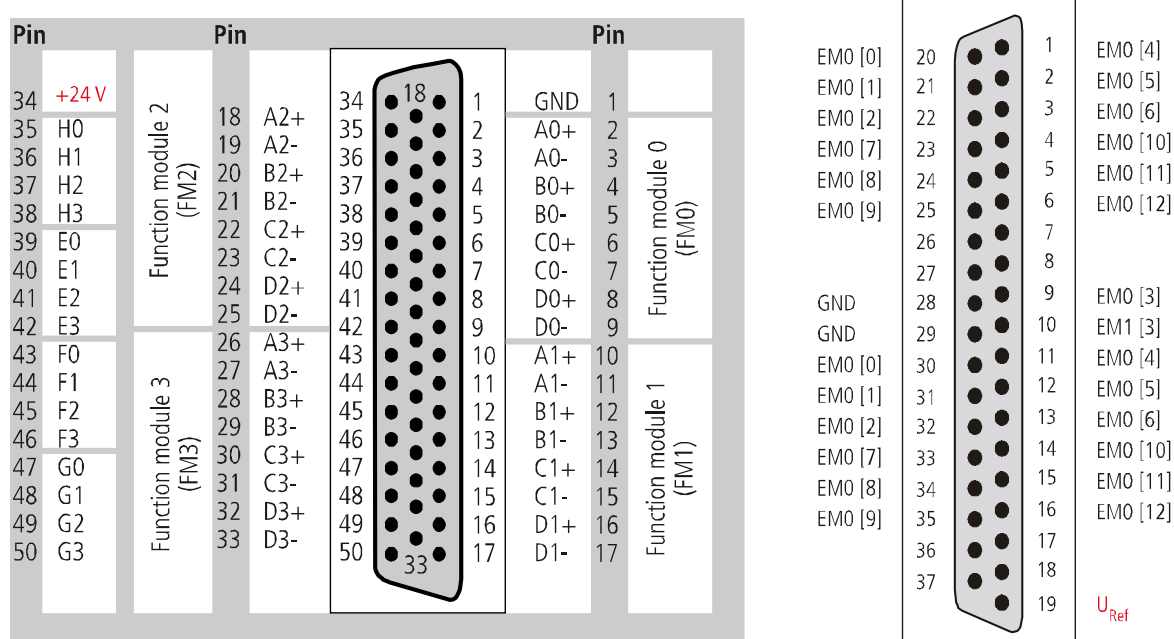


Fig. 3-12: ST1711-50-37 cable: 50-pin and 37-pin D-Sub male connector (“Sin/Cos” function)

EM = Extension module

U_{Ref} = Reference voltage

3.4.4 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 (see pin assignments).

3.4.5 24 V inputs (channels Ax, Bx, Cx and Dx)

With the board versions **APC1e-1711-24V** and **CPC1s-1711-24V**, Ax-, Bx-, Cx- and Dx- are not connected. The 24 V signals must be connected to Ax+, Bx+, Cx+ Dx+ relating to GND.

3.4.6 Pin header ST3 (50-pin)

The TTL ports of the 50-pin header ST3 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. 3-13: Pin header ST3: Position on the board APCle-1711

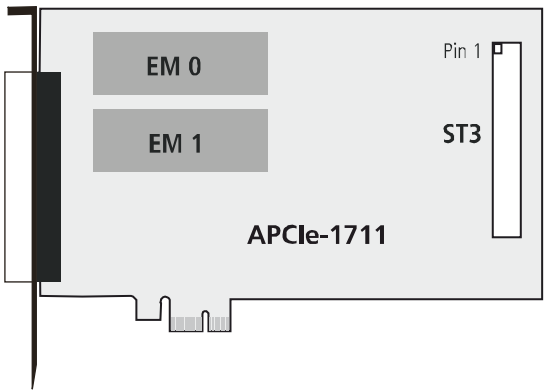


Fig. 3-14: Pin header ST3: Position on the board CPCIs-1711

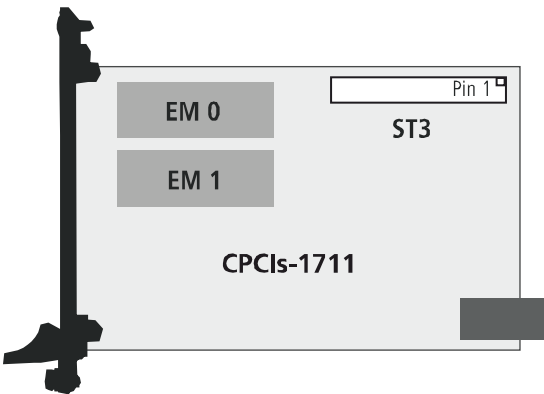


Fig. 3-15: 50-pin header ST3 (“TTL I/O” function)

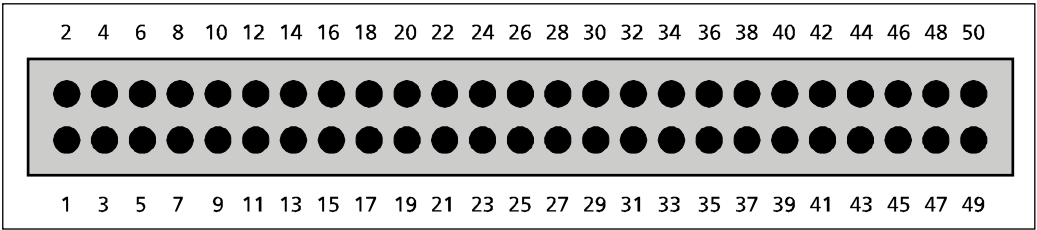


Table 3-1: Pin description ("TTL I/O" function)

	FB8001	Board	
Pin name	Pin No. (50-pin D-Sub male connector)	Pin No. (50-pin header)	Pin function
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

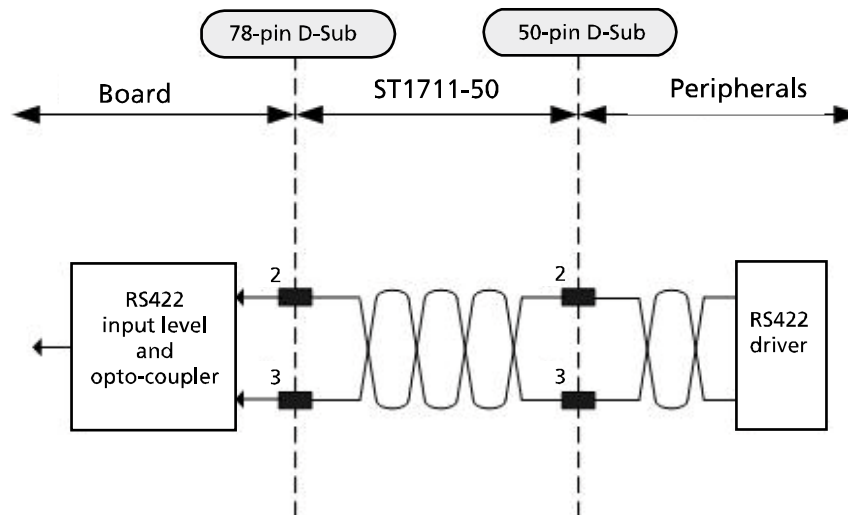
	FB8001	Board	
Pin name	Pin No. (50-pin D-Sub male connector)	Pin No. (50-pin header)	Pin function
PA5	41	23	TTL, input or output; after reset: input
PA6	25	24	TTL, input or output; after reset: input
PA7	9	25	TTL, input or output; after reset: input
PB0	26	27	TTL, input or output; after reset: input
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 V² PD: Serial resistor 100 Ω

3.5 Connection examples of the inputs/outputs

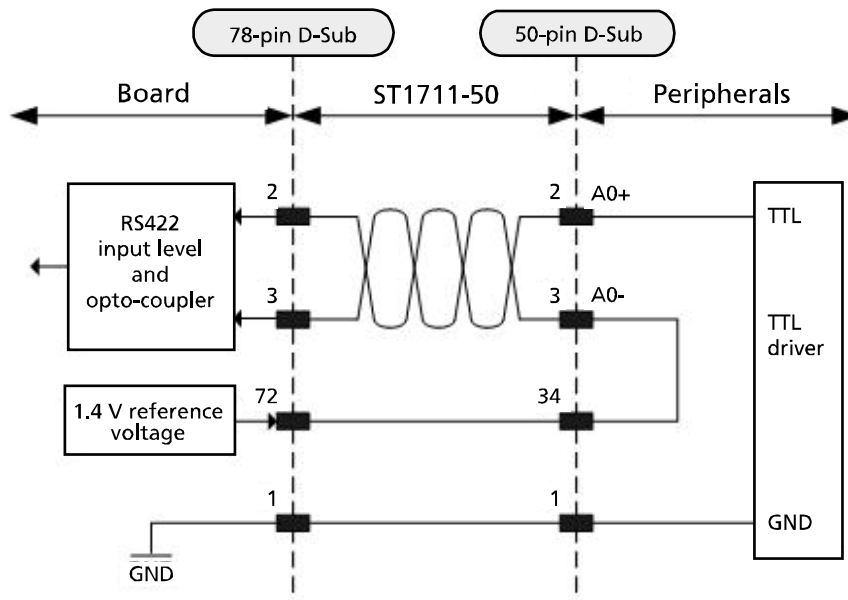
3.5.1 RS422 input A0 with RS422 signal

Fig. 3-16: Input A0 with RS422 signal



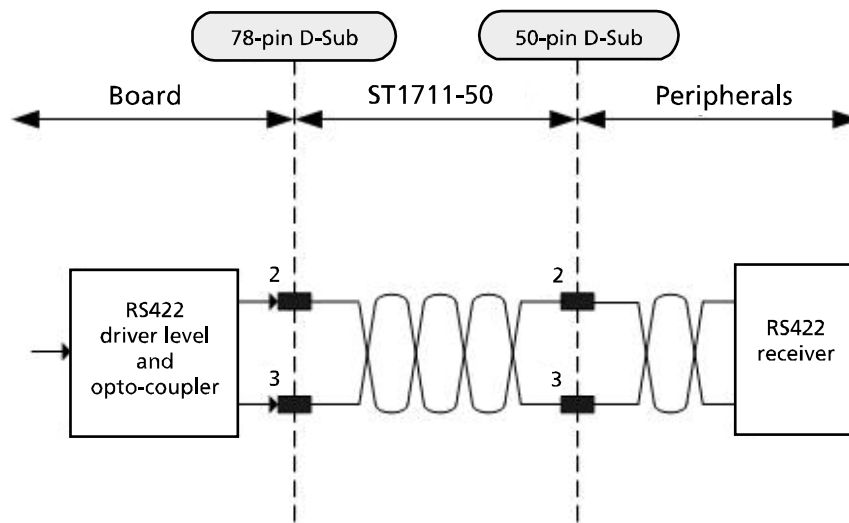
3.5.2 RS422 input A0 with TTL signal

Fig. 3-17: Input A0 with TTL signal



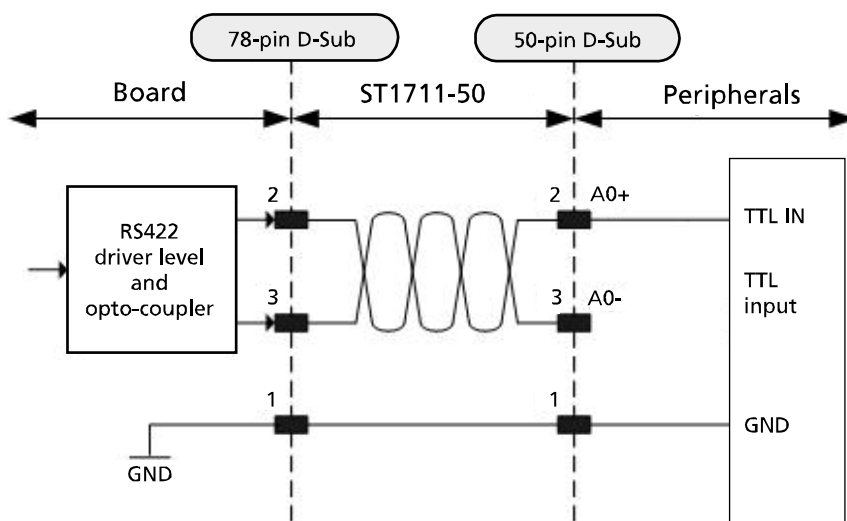
3.5.3 RS422 output A0 to RS422 driver

Fig. 3-18: Output A0 to RS422 driver



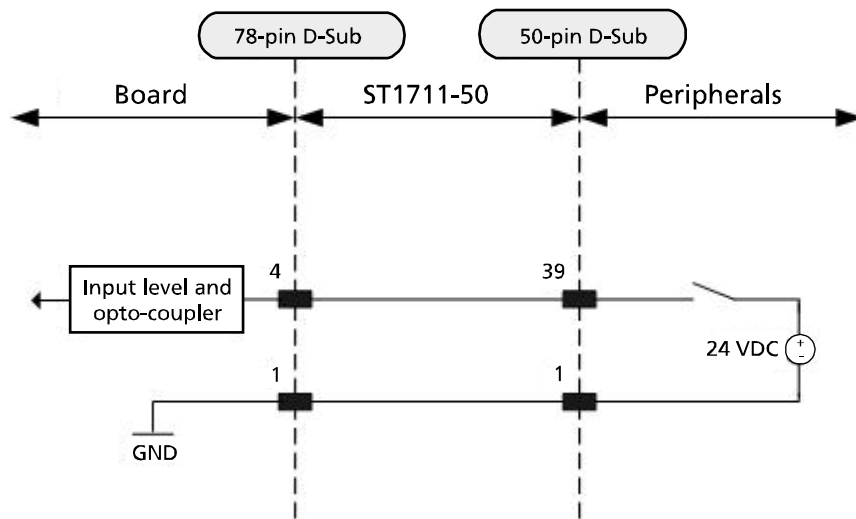
3.5.4 RS422 output A0 to TTL (3.3 V)

Fig. 3-19: Output A0 to TTL (3.3 V)



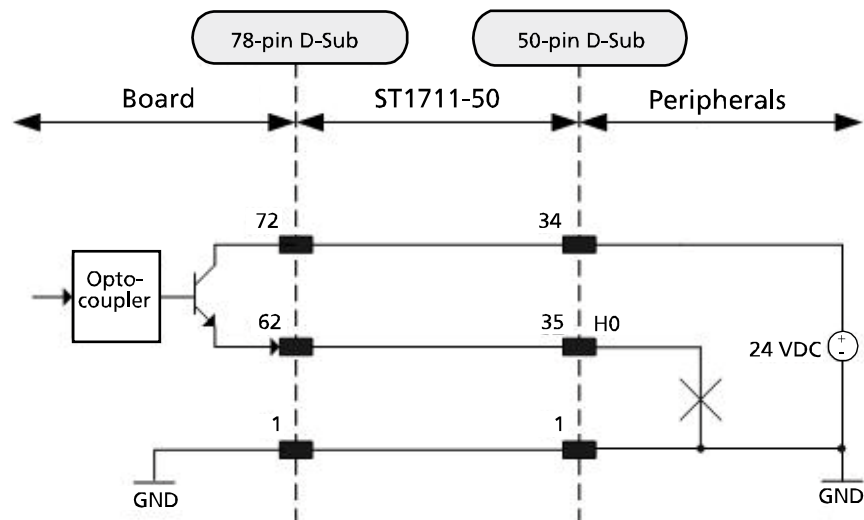
3.5.5 24 V input E0

Fig. 3-20: Input E0

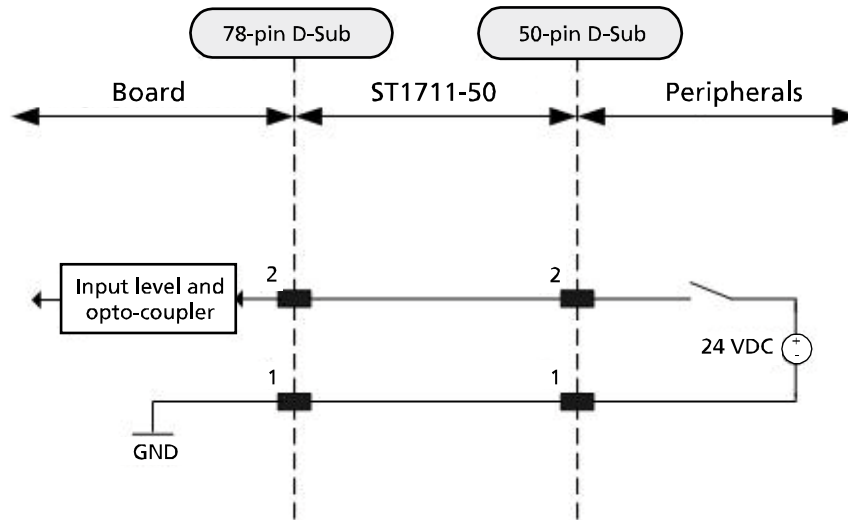


3.5.6 24 V output H0

Fig. 3-21: Output H0

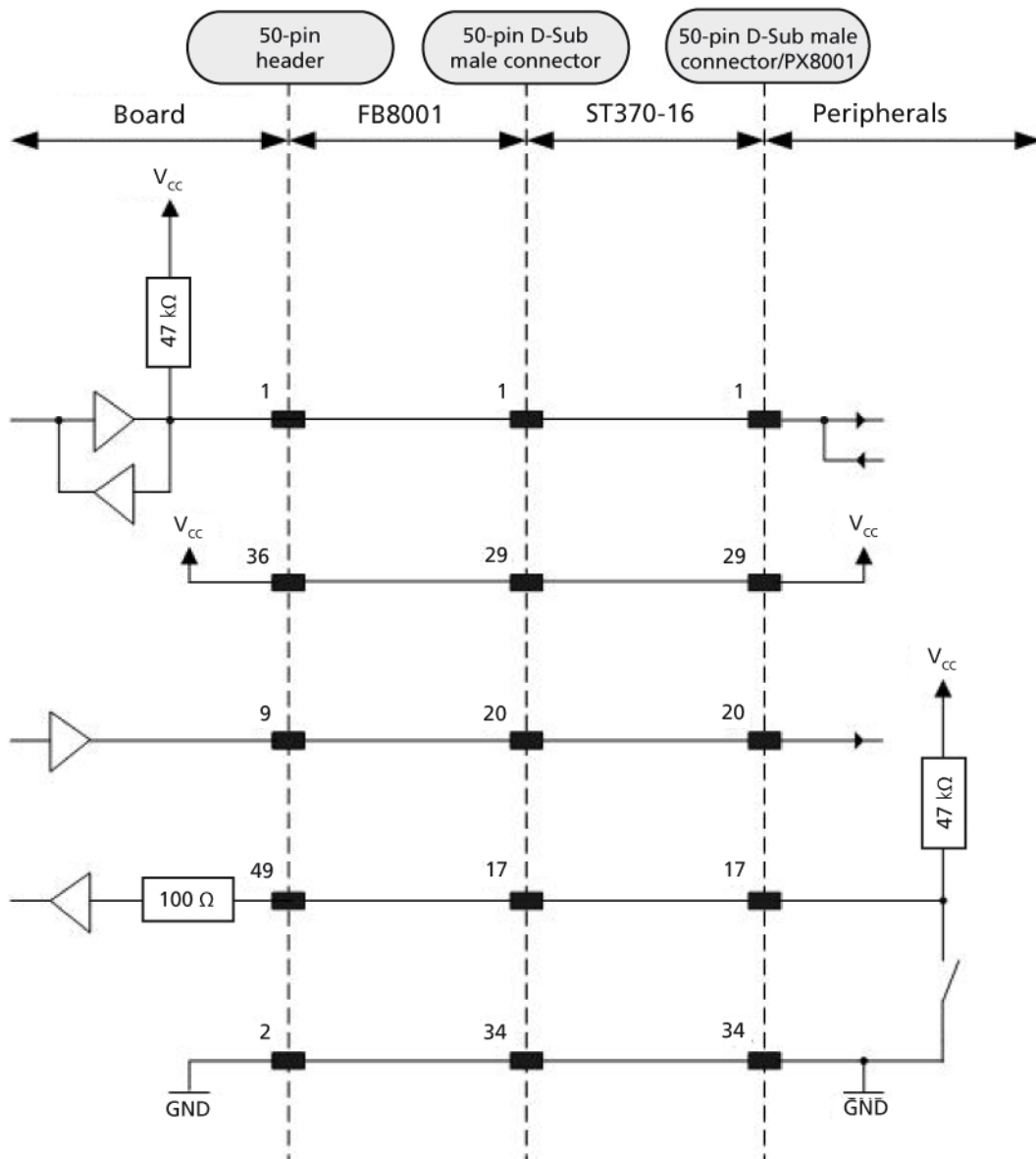


3.5.7 24 V input A0 (APCLe-1711-24V or CPCIs-1711-24V)

Fig. 3-22: Input A0 (APCLe-1711-24V or CPCIs-1711-24V)

3.5.8 TTL inputs/outputs

Fig. 3-23: TTL inputs/outputs



3.6 Driver installation

Information on how to select and download the appropriate driver can be found in the document "Quick installation PC boards" (see PDF link).

The installation of drivers of the type "ADDI-DATA Multiarchitecture Device Drivers 32-/64-Bit for x86/AMD64" as well as the installation of the corresponding samples is described in the installation instructions (see PDF link).

3.7 Software tool “ConfigTools”

The software tool **ConfigTools** supports you in working with your board. It allows you, for example, to configure the function modules and to carry out firmware updates.

3.7.1 First steps

ConfigTools is to be found on the ADDI-DATA website <https://drivers.addi-data.com>, under “Drivers / Tools (Windows)”. To install this software tool, proceed as follows:

- Save the downloaded .zip file in a directory of your choice and unpack it afterwards.
- Double-click on the “ConfigTools_setup.exe” file and follow the instructions of the installation program.

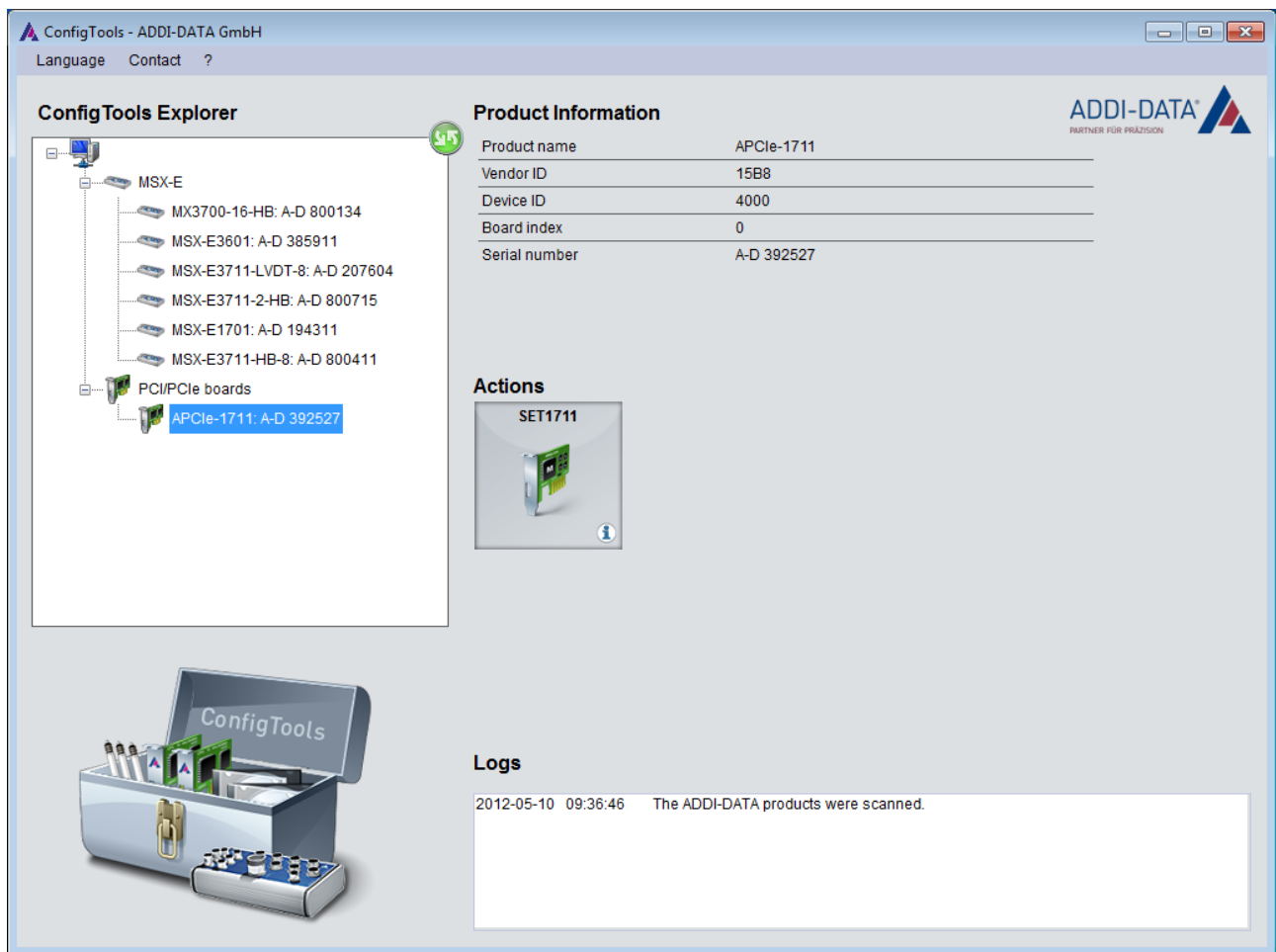
As soon as you have started the installed software tool on your computer, the inserted boards are scanned.

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 a board name, corresponding product information, such as the serial number of the board, 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 "SET1711" button that enables you to change the settings of your board.

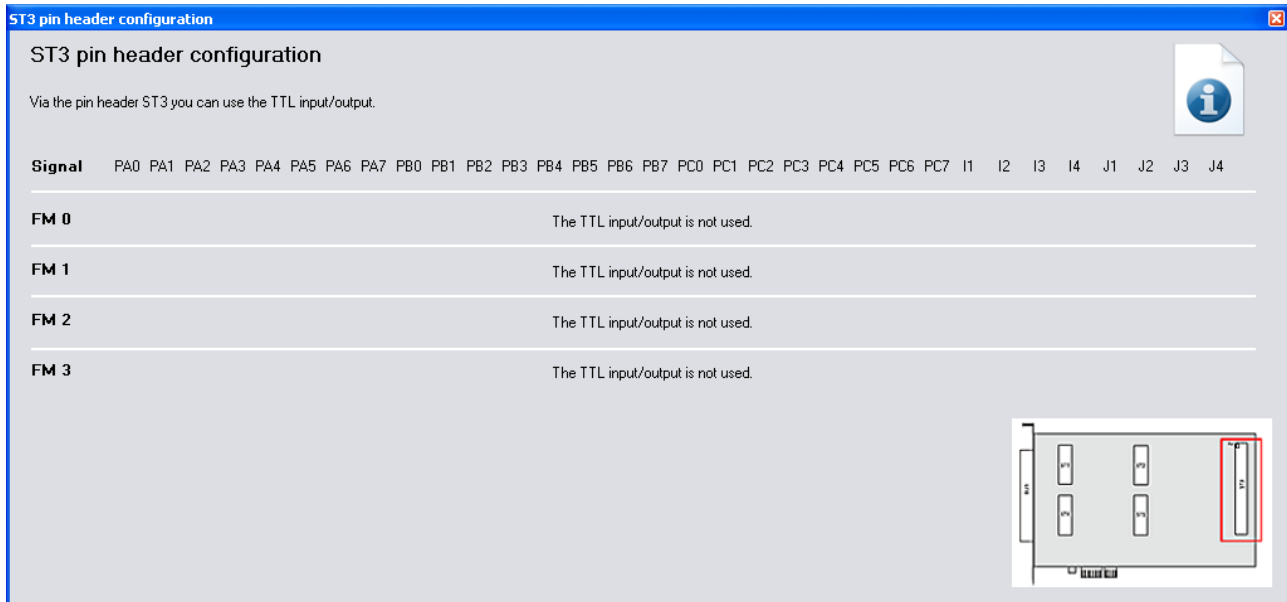
- Click on the "SET1711" button.

Fig. 3-26: ConfigTools: SET1711



In the "SET1711" window, the invariable hardware configuration of the board is displayed. Below that, the configuration of the function modules can be seen. It changes along with the function module selection in the upper part of the window. The configuration of the ST3 pin header of the "TTL I/O" function is shown via the "ST3/TTL" button.

Fig. 3-27: "TTL I/O" function: ST3 configuration



In the "Load new firmware" section, you can update the firmware of the board. The required firmware file is available on request. The file name corresponds to the firmware version.

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

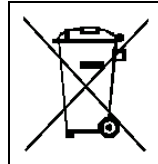
6.2 Disposal of ADDI-DATA waste equipment

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: info@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 **APCLe-1711** or **CPCIs-1711** is suited for installation in personal computers (PCs) or CompactPCI Serial computers which comply with the European EMC directive.

The boards **APCLe-1711** and **CPCIs-1711** comply with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the standard DIN EN IEC 61326-1. 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: APCLe-1711: Dimensions

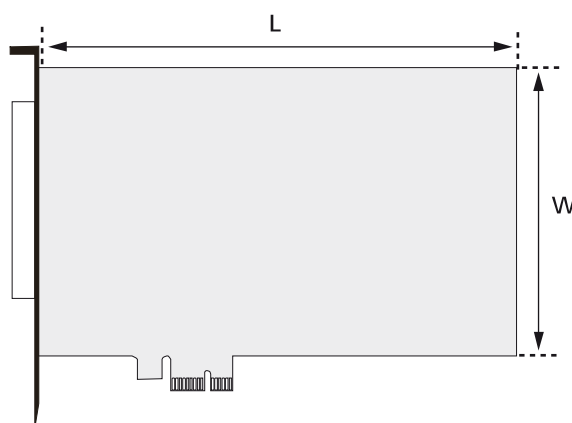


Fig. 7-2: CPCIs-1711: Dimensions



Dimensions (L x W):	APCLe-1711:	168 x 98 mm
	CPCIs-1711	160 x 100 mm
Weight:	APCLe-1711:	approx. 140 g
	CPCIs-1711	approx. 190 g
Insertion into:	APCLe-1711:	PCI Express slot
	CPCIs-1711	CompactPCI Serial slot

Connection to peripherals:		
Front connector:	78-pin D-Sub female connector (digital I/O)	
Additional connector:	pin header ST3 (50-pin, "TTL I/O" function)	
Accessories: ¹	see Chapter 3.3	
for digital I/O:	Cable:	ST1711-50
	Screw terminal panel:	PX8001
for "TTL I/O" function:	Cables:	FB8001 or FB1711, ST370-16
	Screw terminal panel:	PX8001
for "Sin/Cos" function:	Cable:	ST1711-50-37
	Screw terminal panels:	PX8001, PX901-ZG

**NOTICE!**

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

7.3 Versions

The boards **APCLe-1711** and **CPCIs-1711** are available in the following versions:

Table 7-1: Versions

Version	Features
APCLe-1711	Multifunction counter board, optically isolated
APCLe-1711-24V	24 V inputs instead of RS422/TTL inputs/outputs (A, B, C, D)
APCLe-1711-5V-I	5 V inputs instead of 24 V inputs (E, F, G)
CPCIs-1711	Multifunction counter board, optically isolated
CPCIs-1711-24V	24 V inputs instead of RS422/TTL inputs/outputs (A, B, C, D)
CPCIs-1711-5V-I	5 V inputs instead of 24 V inputs (E, F, G)

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

7.4 Option

Table 7-2: Option

Board	Option	Features
APCLe-1711	Opt. 5V	3.3 V outputs instead of 24 V outputs (H)
CPCIs-1711		

¹ Not included in standard delivery

7.5 Limit values

Height:	2000 m over NN
Operating temperature:	APCLe-1711: 0-60 °C (with forced ventilation) CPCIs-1711: -40 °C to +85 °C (with forced ventilation)
Storage temperature:	APCLe-1711: -25 °C to +70 °C CPCIs-1711: -40 °C to +85 °C
Relative air humidity at indoor installation:	50 % at +40 °C 80 % at +31 °C
Minimum PC requirements:	
System bus:	APCLe-1711: 1-/4-/8-/16-lane PCI Express according to PCI Express Base Specification, Revision 1.0a (PCI Express 1.0a) CPCIs-1711: PCI Express according to CompactPCI Serial Specification PICMG CPCI-S.0 R1.0
Link speed:	2.5 Gbit/s
Required space:	- digital I/O: 1 PCI Express slot or 1 CompactPCI Serial slot - "TTL I/O" function: 1 PCI Express slot (for FB8001 cable) or 1 CompactPCI Serial slot (for FB1711 cable)
Operating system:	Windows 10, Windows 7, Linux
Energy demand:	
Operating voltage from PC:	APCLe-1711: 3.3 V ± 9 % 12 V ± 8 % CPCIs-1711: 12 V ± 5 %
Current consumption (typ. in standby state)	APCLe-1711: at 3.3 V: 341 mA ± 10 % at 12 V: 76 mA ± 10 % CPCIs-1711: at 12 V: 230 mA ± 10 %

7.5.1 Digital inputs (RS422)

Number of inputs:	16 max. (differential: A, B, C, D)
Nominal voltage:	3.3 V
Optical isolation:	1000 V
Common mode range:	-7 V to +12 V
Max. diff. voltage:	-7 V to +12 V
Input sensitivity:	200 mV
Input hysteresis:	50 mV
Input impedance:	12 kΩ
Max. input frequency (at nominal voltage):	20 MHz (depending on the function)
Terminating resistance:	120 Ω (not fitted as standard)

7.5.2 Digital inputs (24 V)

Number of inputs:	12 max. (GND-related: E, F, G) APCLe-1711-24V, CPCIs-1711-24V: 28 max. (A, B, C, D, E, F, G)
Nominal voltage:	24 V
Filter/protective circuit:	TVS diodes
Optical isolation:	1000 V
Input voltage:	0-30 V
Input impedance:	1 M Ω typ.
Max. input frequency (at nominal voltage):	1 MHz (depending on the function)
Logic input levels:	U _{Hmax} : 30 V U _{Hmin} : 19 V U _{Lmax} : 14 V U _{Lmin} : 0 V APCLe-1711-24V, CPCIs-1711-24V: U _{Hmax} : 30 V U _{Hmin} : 18 V U _{Lmax} : 16 V U _{Lmin} : 0 V

7.5.3 Digital inputs (5 V)

Number of inputs:	12 max. (GND-related: E, F, G)
Nominal voltage:	5 V
Filter/protective circuit:	TVS diodes
Optical isolation:	1000 V
Input voltage:	0-7 V
Input impedance:	1 M Ω
Max. input frequency:	1 MHz (depending on the function)
Logic input levels:	U _{Hmax} : 7 V U _{Hmin} : 2 V U _{Lmax} : 0.8 V U _{Lmin} : 0 V

7.5.4 Digital outputs (RS422)

Number of outputs:	16 max. (differential: A, B, C, D)
Output type:	RS422
Nominal voltage:	3.3 V
Optical isolation:	1000 V
Max. output frequency:	20 MHz (depending on the function)

7.5.5 Digital outputs (24 V)

Number of outputs:	4 max. (H)
Output type:	24 V high-side (load to GND)
Nominal voltage:	24 V
Optical isolation:	1000 V
Max. output saturation voltage:	2 V
Supply voltage:	4.75 V to 30 V
Max. current per output:	90 mA
Total current limit (PTC):	270 mA
Max. output frequency:	100 kHz (load-dependent)
Protection against overtemperature:	165 °C
Saturation voltage (at 24 V, 90 mA)	1.8 V typ.

7.5.6 Digital outputs (3.3 V)

Number of outputs:	4 max. (H)
Output type:	3.3 V (LVTTTL)
Optical isolation:	1000 V
Max. current per output:	5 mA
Max. output frequency:	5 MHz

7.5.7 Reference clock source

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

7.5.8 LVCMOS / LVTTTL: Digital inputs and outputs (ST3 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 V (PC supply voltage = 3.3 V ± 5 %)
Max. output current:	40 mA (no short-circuit protection)
Signal thresholds:	
Input logic 1:	1.7 V min.
Input logic 0:	0.8 V max.
Output logic 1:	2.4 V min. (PC supply voltage ≥ 3 V)
Output logic 0:	0.45 V max. (PC supply voltage ≥ 3 V)

8 Appendix

8.1 Glossary

Direct current voltage

DC voltage means that the voltage remains constant over time. In practice, it will always exhibit small fluctuations. Particularly when switching a device on or off, the transitional behaviour may be of significance. Transient oscillations may occur, determined by the actual connection.

Driver

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

EMC

= Electromagnetic Compatibility

According to the European EMC Directive, electromagnetic compatibility is "the ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to other equipment in that environment."

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.

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) and 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.

PCI Express

This is a parallelisable serial process for switched point-to-point connections. Unlike PCI bus, PCIe is not a parallel bus but a serial point-to-point connection. Data transfer is via so-called lanes comprising a line pair for transmission and a second pair for receiving. Individual components are connected via switches.

PCIe is also hot-plug compatible, which allows (defective) expansion boards to be replaced in operation – a feature much in demand in the server area.

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.

Synchronous

Two time-dependent events, time slots, or signals are synchronous if their respective significant dates correspond with each other and are divided by requested time intervals that are nominally the same.

TVS

= Transient Voltage Suppression

8.2 Index

Accessories
 Connection 19
Block diagram 13
Board
 Insertion 15
ConfigTools 33
Connection examples 28
Country-specific regulations 9
Dimensions 41
Disposal 40
Driver installation 32
EMC 41
Function description 37
Glossary 46
Intended use 8
Limit values 43
Option 42
Repair 39
Return 39
Slot type 15, 17
Standard software 38
Technical data 41
Update
 Driver 10
 Manual 10
User
 Qualification 9
Versions 42

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:

<https://drivers.addi-data.com>