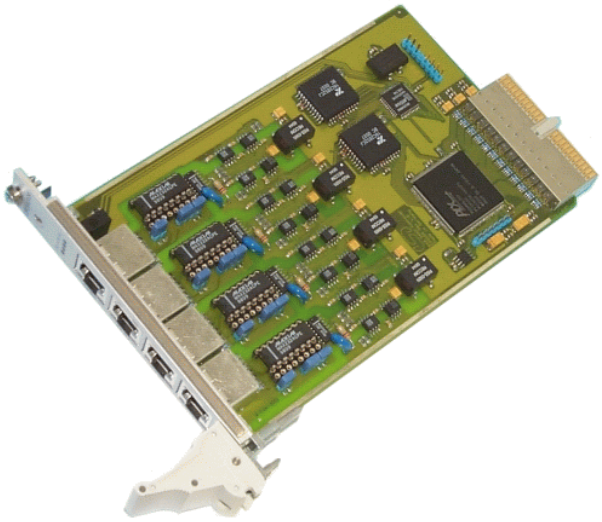
CPCI-ASIO4

CAN - RS-232, RS-422, RS-485 or TTY-Interface



Manual

to Product I.2307.02

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N O T E

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Changes in the chapters

The changes in the document listed below affect changes in the hardware and firmware as well as changes in the description of facts only.

Version	Chapter	Changes versus previous version
1.2	-	Safety instructions inserted
	2.2.2, 3.1, 3.3	Note concerning usage of shielded cables inserted
	4.	Declaration of Conformity inserted
	5.	Chapter: “Order Information” moved
1.3	-	Safety instructions revised
	1.3.5	Software support for Windows XP and QNX6 available.
	4.	Declaration of Conformity updated
	5.	Chapter “Order Information” revised

Technical details are subject to change without further notice.

Safety Instructions

- When working with CPCI-ASIO4 modules follow the instructions below and read the manual carefully to protect yourself and the CPCI-ASIO4 module from damage.
- The device is a built-in component. It is essential to ensure that the device is mounted in a way that cannot lead to endangering or injury of persons or damage to objects.
- The device has to be securely installed in the control cabinet before commissioning.
- Protect the CPCI-ASIO4 module from dust, moisture and steam.
- Protect the CPCI-ASIO4 module from shocks and vibrations.
- The CPCI-ASIO4 module may become warm during normal use. Always allow adequate ventilation around the CPCI-ASIO4 and use care when handling.
- Do not operate the CPCI-ASIO4 module adjacent to heat sources and do not expose it to unnecessary thermal radiation. Ensure an ambient temperature as specified in the technical data.
- Do not use damaged or defective cables to connect the CPCI-ASIO4 module.
- In case of damages to the device, which might affect safety, appropriate and immediate measures must be taken, that exclude an endangerment of persons and domestic animals, or property.
- Current circuits which are connected to the device have to be sufficiently protected against hazardous voltage (SELV according to EN 60950-1).
- The CPCI-ASIO4 may only be driven by power supply current circuits, that are contact protected. A power supply, that provides a safety extra-low voltage (SELV or PELV) according to EN 60950-1, complies with this conditions.

Attention !
Electrostatic discharges may cause damage to electronic components.
To avoid this, please discharge the static electricity from your body before you touch the CPCI-ASIO4.

Qualified Personal
This documentation is directed exclusively towards qualified personal in control and automation engineering.
The installation and commissioning of the product may only be carried out by qualified personal, which is authorized to put devices, systems and electric circuits into operation according to the applicable national standards of safety engineering.

Conformity
The CPCI-ASIO4 module is an industrial product and meets the demands of the EU regulations and EMC standards printed in the conformity declaration at the end of this manual.

Warning:	In a residential, commercial or light industrial environment the CBX-module may cause radio interferences in which case the user may be required to take adequate measures.
Note:	CE-conformity is only warranted if shielded cables are used.

Intended Use
The intended use of the CPCI-ASIO4 module is the operation as a serial interface in a CompactPCI-system.
The esd guarantee does not cover damages which result from improper use, usage not in accordance with regulations or disregard of safety instructions and warnings.

- The CPCI-ASIO4 is intended for installation in a CompactPCI-system only.
- The operation of the CPCI-ASIO4 in hazardous areas, or areas exposed to potentially explosive materials is not permitted.
- The operation of the CPCI-ASIO4 for medical purposes is prohibited.

Service Note
The CPCI-ASIO4 does not contain any parts that require maintenance by the user. The CPCI-ASIO4 does not require any manual configuration of the hardware. Unauthorized intervention in the device voids warranty claims.

Disposal
Devices which have become defective in the long run have to be disposed in an appropriate way or have to be returned to the manufacturer for proper disposal. Please, make a contribution to environmental protection.

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1. Overview

1.1 Description of the CPCI-ASIO4 Board

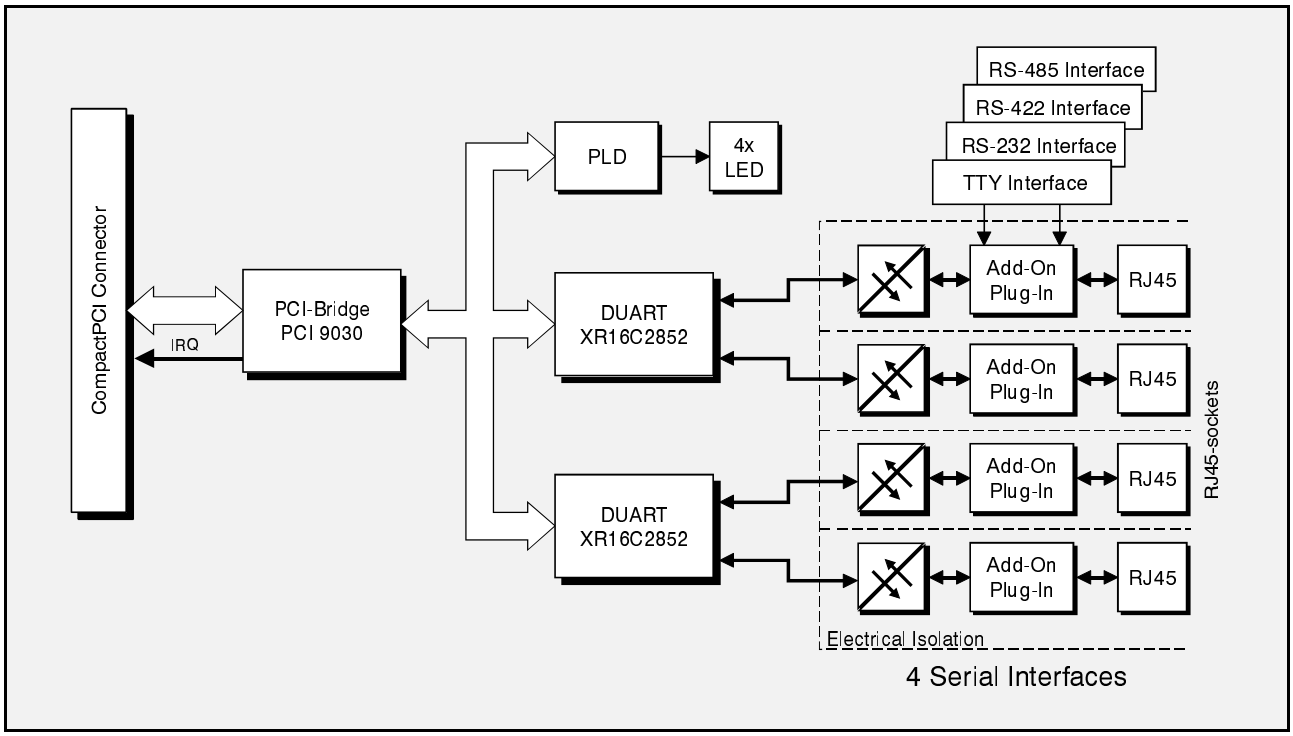


Fig. 1.1.1: Block circuit diagram

The module CPCI-ASIO4 is a CompactPCI® board in Euro format. It has got four serial interfaces which are electrically isolated against the CompactPCI bus and against each other.

The board is equipped with two DUARTs XR16C2852 that are compatible to the popular DUART ST16C2552 and can therefore be controlled by standard operating system drivers for serial interfaces.

The four interfaces can be equipped with several piggybacks to realize your application-specific requirements for a serial interface. You can choose between RS-232 (with hardware handshake), RS-422, RS-482 or TTY. TTY can be run in passive or active mode. Only if the TTY active mode is used, the four interfaces loose their electrical isolation because of the shared power supply for the interfaces. The different interface types can be combined at one CPCI-ASIO4.

The connection of the interfaces is done at the front panel by RJ45 connectors.

LEDs display the actual state of each interface.

1.2 PCB View with Connector Designation

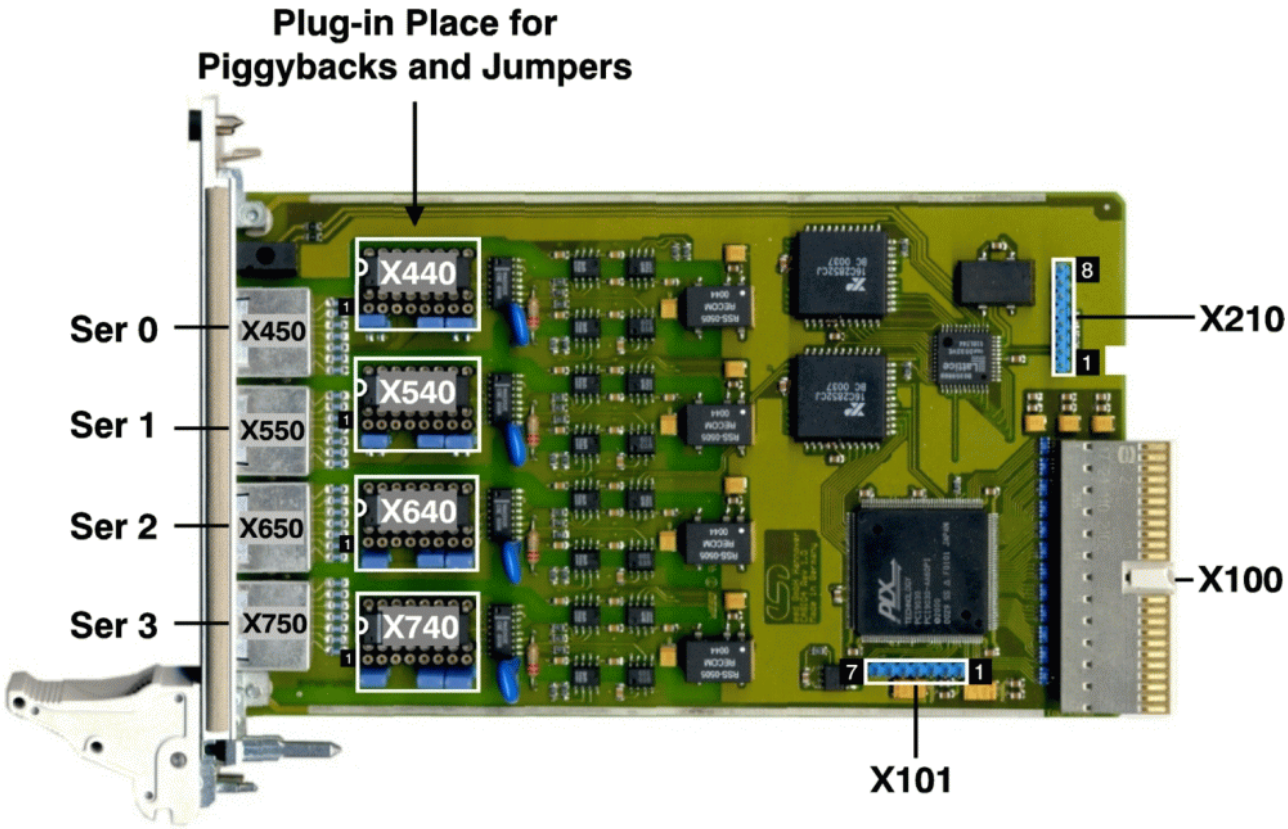


Fig. 1.2.1: PCB view

Note:
The connector pin assignments can be found on page 18 and following.

1.3 Summary of Technical Data

1.3.1 General Technical Data

Ambient temperature	0...50 ˚C
Humidity	max. 90 %, non-condensing
Power supply	nominal voltages: 5 V/DC, 3.3 V/DC, ±12 V (only for TTY-active-mode necessary) current consumption (at 20 ˚C): typ. 350 mA at 5 V/DC, typ. 150 mA at 3.3 V/DC
Connectors	X100 (132-pol. post connector) - CompactPCI connector X101 (7-pol. post connector) - JTAG-port X210 (8-pol. post connector) - ISP-port X450 (RJ45-female) - serial interface Ser0 X550 (RJ45-female) - serial interface Ser1 X650 (RJ45-female) - serial interface Ser2 X750 (RJ45-female) - serial interface Ser3 X440 (DIP16-socket + 1x 8-pin socket) - plug-in place of driver IC or piggybacks of Ser0 X540 (DIP16-socket + 1x 8-pin socket) - plug-in place of driver IC or piggybacks of Ser1 X640 (DIP16-socket + 1x 8-pin socket) - plug-in place of driver IC or piggybacks of Ser2 X740 (DIP16-socket + 1x 8-pin socket) - plug-in place of driver IC or piggybacks of Ser3
Dimensions	160 mm x 100 mm
Weight	approx. 180 g incl. front panel, piggybacks and jumpers

Table 1.3.1: General data of the module

1.3.2 CompactPCI Bus

Host bus	PCI-bus in accordance with PCI Local Bus Specification 2.1
PCI-data/address bus	32 bits
Controller	PCI9030 by PLX Technology
Interrupt	interrupt signal A
Board dimension	in accordance with CompactPCI-Specification, Rev. 2.0
Connectors	
Connector coding	Universal Board, not keyed (3.3 V or 5 V signalling voltage)

Table 1.3.2: CompactPCI-bus data

1.3.3 Microcontroller Circuits

Microcontroller	DUART XR16C2852
Memory	128 k x 16 bit SRAM
Debug Interface	for service and programming only

Table 1.3.3: Microcontroller circuit

1.3.4 Serial Interfaces

Number of serial interfaces	4 independently configurable serial interfaces
Controller	2x DUART XR16C2852
Electrical isolation of the interfaces against each other and against other circuits	via optocouplers and DC/DC-converters (If the TTY-active mode is used, the electrical isolation of the serial channels against each other is dropped, because of the shared power supply.)
Interface	standard: RS-232 (hardware handshake) options: RS-422, RS-485, TTY-active/passive
Bit rates	RS-232: up to 115.2 kbit/s RS-422: up to 115.2 kbit/s RS-485: up to 115.2 kbit/s TTY: up to 38.4 kbit/s
Connection	8-pole RJ45-female connector in front panel

Table 1.3.4: Technical data of serial interfaces

1.3.5 Software Support

Software drivers are available for Windows XP, VxWorks and QNX 6. Additionally, the board runs with the standard serial interface system drivers of Linux.
See “Order Information“ on page 22 for further information.

2. Description of Units

2.1 Front Panel and LED-Display

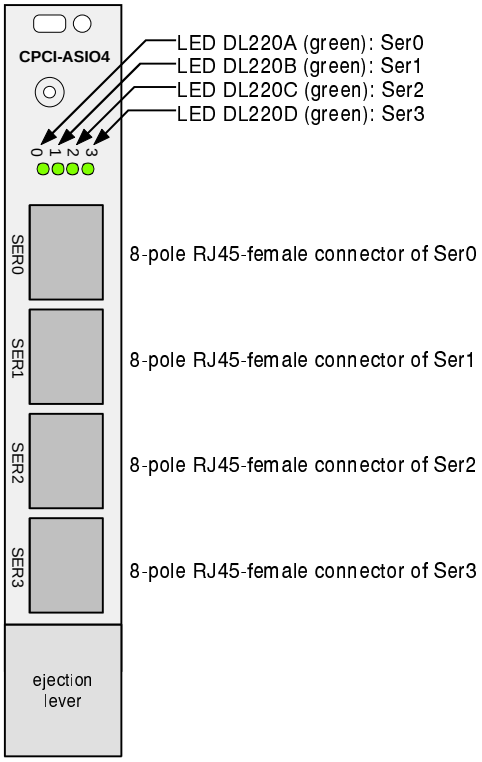


Fig. 2.2.1: Front panel view with LEDs

The LED of the corresponding channel Ser0...Ser3 lights, if the controller of the channel triggers an interrupt. This occurs if data are received or send or if the controller has a timeout or an error state.

2.2 Serial Interfaces

2.2.1 Configuration

2.2.1.1 Piggybacks

The physical layer of the serial channels can be configured as a RS-232-, RS-422-, RS-485-, TTY-active- or TTY-passive interface. The RS-232-mode is realized by a RS-232A driver circuit, the other interfaces are realized by piggybacks (add-on adapter boards).

Additionally the jumpers of the RS-232 signals have to be removed, if a RS-422-, RS-485- or TTY-piggyback is equipped (see page 13)!

The interfaces of the serial channels can be configured independently from each other.

The position of the RS-232 driver at the plug-in place is shown in the following figure. The piggybacks are wider than the RS-232 driver circuit and have to be plugged into the pins X1...X8 and 9...16. Pin 1 of the piggybacks has to be plugged into the pin X1. The assignment of the plug-in places X440...X740 to the serial channels is shown on the following page.

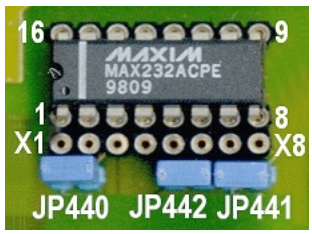


Fig. 2.2.2: Position of the RS-232 driver and the piggybacks at the plug-in place

2.2.1.2 Jumpers

Via the jumpers the RS-232 control signals DTR, DCD and DSR are connected to the RJ45-connector. The pins of the RJ45 connector used for the control signals are also used for signals of the RS-422, RS-485 and TTY piggybacks. Therefore the RS-232 signals have to be disconnected, if the piggybacks are used. This is done by removing the jumpers.

There are three jumpers for each serial channel:
- if the channel shall be used as a **RS-232 interface**, the jumpers have to be **inserted**
- if the channel shall be used as **RS-422, RS-485 or TTY interface**, the jumpers have to be **removed**

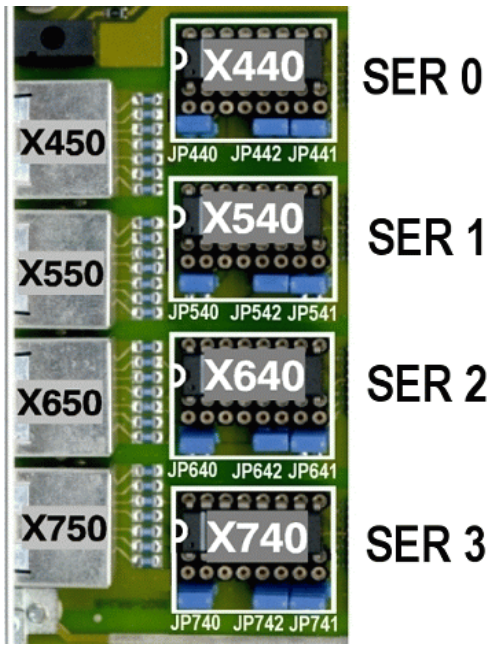


Fig. 2.2.3: Assignment of the plug-in places to the serial channels (shown example: RS-232 mode)

Serial Channel	Interface	
	RS-232	**RS-422, RS-485, TTY-active, TTY-passive**
Ser0	JP440, JP441, JP442 inserted	JP440, JP441, JP442 removed
Ser1	JP540, JP541, JP542 inserted	JP540, JP541, JP542 removed
Ser2	JP640, JP641, JP642 inserted	JP640, JP641, JP642 removed
Ser3	JP740, JP741, JP742 inserted	JP740, JP741, JP742 removed

Table 2.2.1: Assignment of the plug-in places to the serial channels

2.2.1.3 Solder Bridges for TTY-Active Mode

The interfaces have to be supported with +12 V and -12 V power supply via the CompactPCI bus, if they should work in TTY-active mode.

At the bottom layer of the CPCI-ASIO4 four solder bridges are placed for each serial channel to connect the supply voltage of the piggybacks to the CompactPCI connector. To connect the supply voltages the two contacts of each according solder bridge has to be connected.

The power supply of the TTY-active interfaces has no electrical isolation against the CompactPCI bus. Only one voltage supply for all four channels exists.
If the TTY-active mode is selected for a channel, this channel looses its electrical isolation. The signal lines of the TTY-active interfaces are rooted via optocouplers independently from the solder bridge settings.

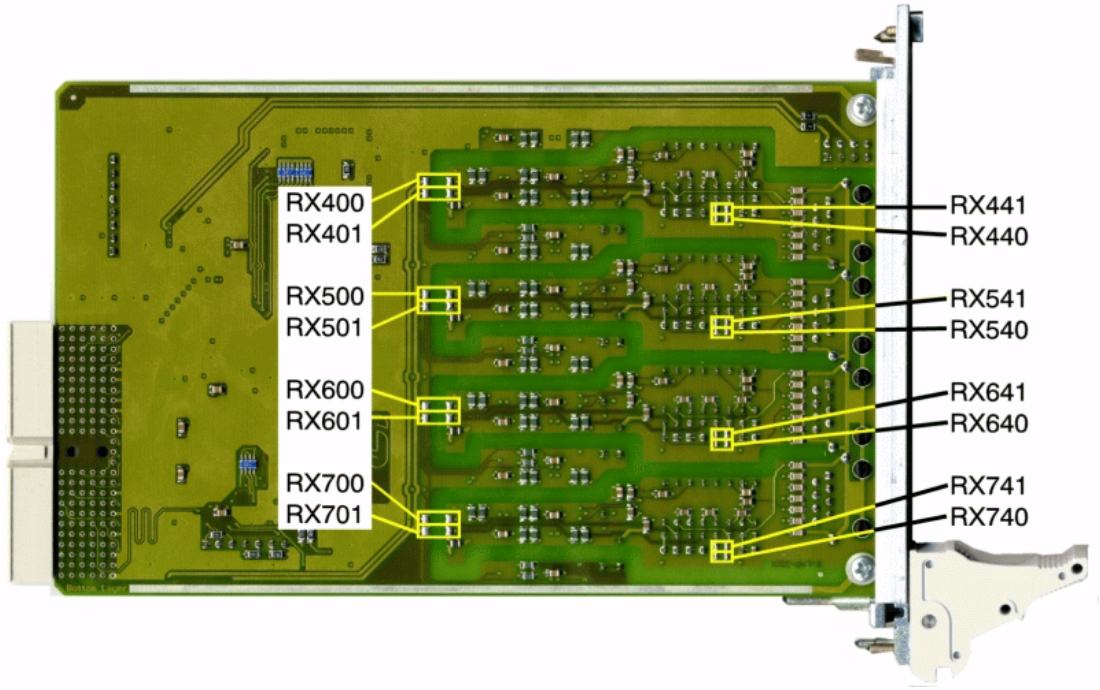


Fig. 2.2.4: Position of the solder bridges at the bottom layer of the PCB

Serial Channel	Solder Bridges for TTY-active Mode
Ser0	RX400, RX401, RX441, RX440
Ser1	RX500, RX501, RX541, RX540
Ser2	RX600, RX601, RX641, RX640
Ser3	RX700, RX701, RX741, RX740

Table 2.2.2: Assignment of the solder bridges to the serial channels

2.2.2 Connection of the Serial Interfaces to the RJ45-Female Connector

Below the wiring of the serial interface in relation to the data direction is shown. The figures explain the short terms of the signals used in the appendix (connector assignment). Furthermore the circuit layouts of the various available piggybacks can be found in the appendix (circuit diagrams).

Note:
It is strongly recommended to use shielded cables for the connection of the serial interface! CE-conformity is only warranted if shielded cables are used!

2.2.2.1 The RS-232 Interface

The example below shows an adapter cable from RJ45 to DSUB9/female. This cable is configured for the direct connection of the CPCI-ASIO4 to a PC without null modem.

For individual connector pin assignments we recommend adapter cables with DSUB-connectors with free insertable connector pins. Of course you can order customer-specific cables from **esd**.

Attention ! Please notice that the function of the control signals depends on the installed software drivers of the serial interfaces.
If you want to run the CPCI-ASIO4 with the standard drivers of the operating systems Linux or VxWorks, you have to route the signals as described in the example figure below.

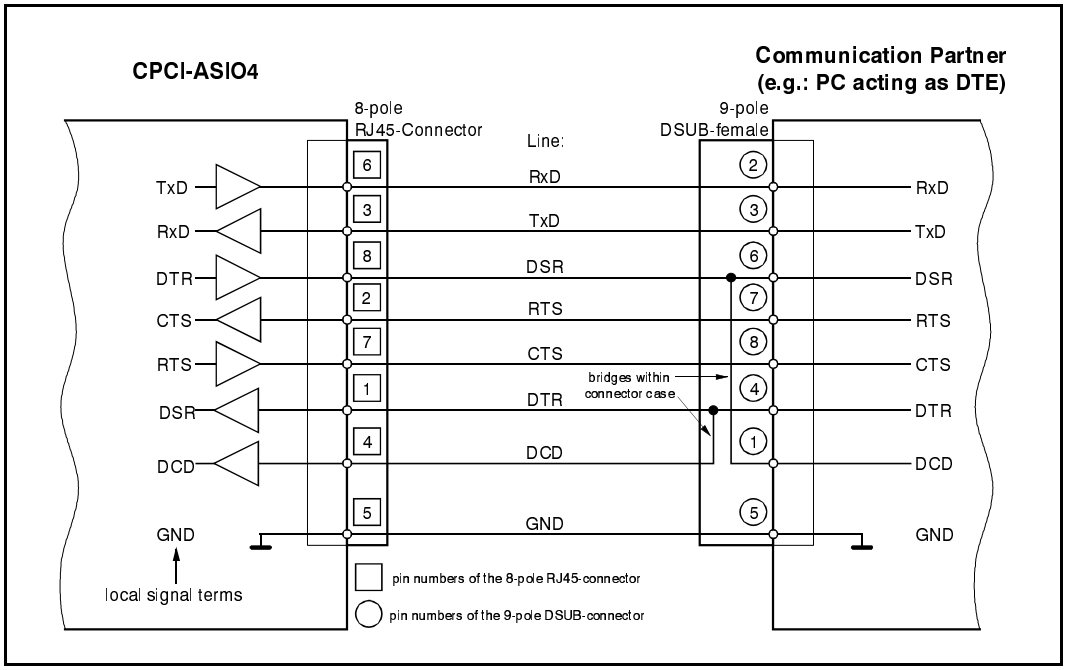


Fig. 2.2.5: Connection scheme for RS-232 operation (example: CPCI-ASIO4 <-> PC)

2.2.2.2 The RS-422 Interface

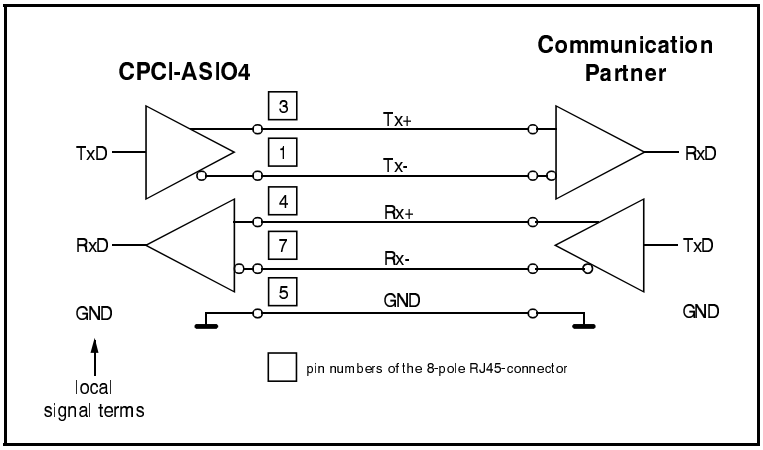


Fig. 2.2.6: Connection scheme for RS-422 operation

2.2.2.3 The RS-485 Interface

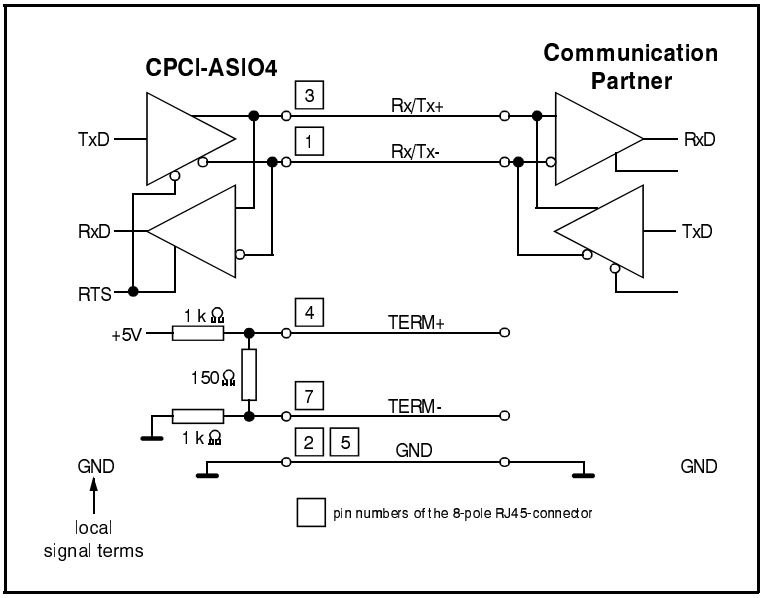


Fig. 2.2.7: Connection scheme for RS-485 operation

The pins 4 and 7 of the RJ45-connector are connected to a terminal-resistance network at the RS-485 piggyback. To activate the termination the signal Rx/Tx+ has to be connected to TERM+ and the signal Rx/Tx- has to be connected to TERM-.

2.2.2.4 The TTY(20 mA) Interface

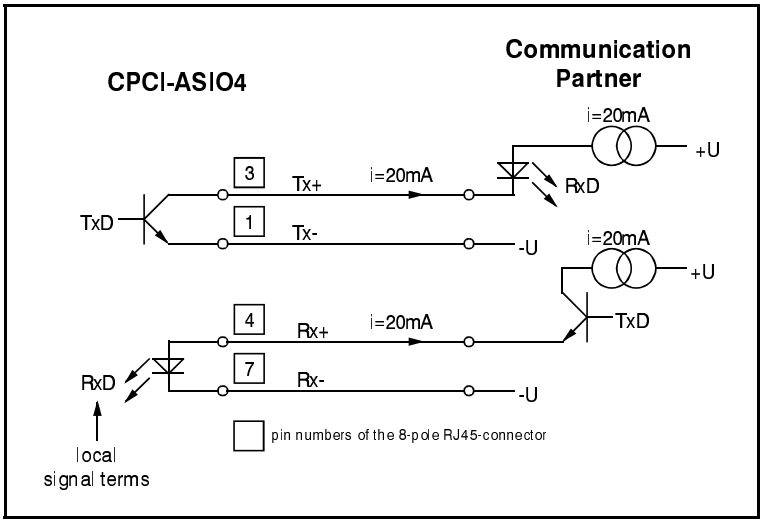


Fig. 2.2.8: Connection scheme for TTY operation (passive)

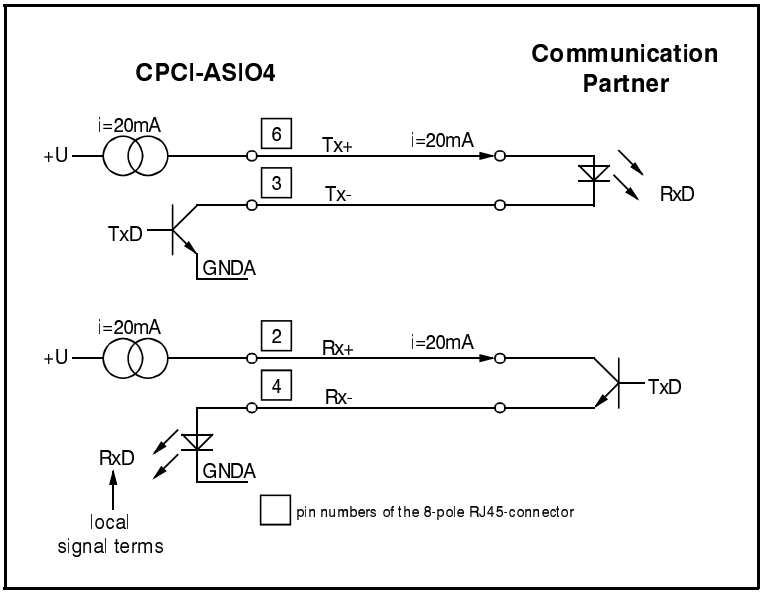


Fig. 2.2.9: Connection scheme for TTY operation (active)

3. Connector Pin Assignment

3.1 Serial Interfaces at RJ45-Female Connectors

For notes on the connection of serial interfaces please refer also to chapter *'Connection of the Serial Interfaces to the RJ45-Female Connector'* on page 15. From the principle circuit diagrams represented in that chapter, you will be able to clearly determine the signal direction (Rx <-> Tx).

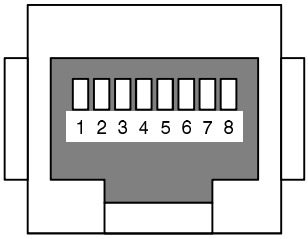


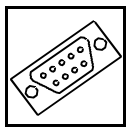
Fig. 3.1.1: Pin assignment at RJ45-female connector

Connector Pin RJ45	Signal				
	RS-232	**RS-422**	**RS-485**	**TTY-passive**	**TTY-active**
1	DSR (Input)	Tx-	Tx/Rx-	Tx-	[-12V]
2	CTS (Input)	GND	GND	[I2+]	Rx+
3	RxD (Input)	Tx+	Rx/Tx+	Tx+	Tx-
4	DCD (Input)	Rx+	TERM+ *1)	Rx+	Rx-
5	GND	GND	GND	GND	GND
6	TxD (Output)	-	-	[I1+]	Tx+
7	RTS (Output)	Rx-	TERM- *1)	Rx-	[-12V]
8	DTR (Output)	-	-	-	-

*1)... The pins 4 and 7 of the RJ45-connector are connected to a terminal-resistance network at the RS-485 piggyback. In order to activate the terminal resistor network of an interface, signal TERM+ has to be connected to R/Tx+ and TERM- to R/Tx-

[ ]... The signals given in brackets are connected to the RJ45 connector, but are nor required for the corresponding operating mode.

Note:
It is strongly recommended to use shielded cables for the connection of the serial interface! CE-conformity is only warranted if shielded cables are used!

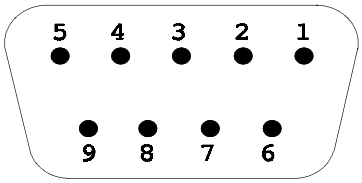


3.2 Pin Assignment of the RS-232 Interface at a DSUB9 Connector

The names of the signals in the table below are specified as seen from the terminal (here: PC). The signal direction specified in brackets is shown as seen from the CPCI-ASIO4 board.

For notes on the connection of serial interfaces please refer also to chapter *'Connection of the Serial Interfaces to the RJ45-Female Connector'* on page 15. From the principle circuit diagrams represented in that chapter, you will be able to clearly determine the signal direction (Rx <-> Tx).

Pin Assignment

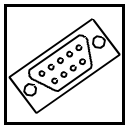


Signal Assignment:

Signal		Pin		Signal	
DCD *1)	(Input)	1	6	DSR *1)	(Output)
RxD	(Output)	2	7	RTS	(Input)
TxD	(Input)	3	8	CTS	(Output)
DTR *1)	(Input)	4	9	-	
GND		5			

9-pole DSUB-female

*1) It is necessary to connect some signals by bridges, if you want to use the hardware handshake function in connection with a PC. The signals that have to be connected by bridges are shown in the figure at page 15.



Connector Pin Assignment

3.3 Assignment of RS-422, RS-484 and TTY-Interfaces at DSUB9

There is no common definition for the pin assignment of these interfaces at a DSUB9 connector. In the systems and applications manufactured by **esd** the pin assignment given in the following table is used in most cases.

Attention:
Do not use an adapter with the pin assignment shown below for the RS-232 interface!

Note:
Please note for the connection of the TTY-signals: The names (out) and (in) are used for the data direction only, not for the direction of the current. Refer to the circuit diagram in the chapter *'Connection of the Serial Interfaces to the RJ45-Female Connector'* at page 17.

Connector Pin		Signal			
RJ45	**DSUB9**	**RS-422**	**RS-485**	**TTY-passive**	**TTY-active**
-	**1**	-	-	-	-
3	**2**	Tx+ (Output)	Rx/Tx+	Tx+ (Output)	Tx- (Output)
6	**3**	-	-	[I1+]	Tx+ (Output)
7	**4**	Rx- (Input)	TERM- *1)	Rx- (Input)	[-12V]
5	**5**	GND	GND	GND	GND
8	**6**	-	-	-	-
1	**7**	Tx- (Output)	Rx/Tx-	Tx- (Output)	[-12V]
2	**8**	GND	GND	[I2+]	Rx+ (Input)
4	**9**	Rx+ (Input)	TERM+ *1)	Rx+ (Input)	Rx- (Input)

*1)... The pins 4 and 7 of the RJ45-connector are connected to a terminal-resistance network at the RS-485 piggyback. In order to activate the terminal resistor network of an interface, signal TERM+ has to be connected to R/Tx+ and TERM- to R/Tx-.

[ ]... The signals given in brackets are connected to the RJ45 connector, but are nor required for the corresponding operating mode.

Note:
It is strongly recommended to use shielded cables for the connection of the serial interface! CE-conformity is only warranted if shielded cables are used!

4. EC Declaration of Conformity

EU-KONFORMITÄTSERKLÄRUNG
EU DECLARATION OF CONFORMITY

Adresse / *Address*
esd electronic system design gmbh
Vahrenwalder Str. 207
30165 Hannover
Germany

esd erklärt, dass das Produkt *esd declares, that the product*	Typ, Modell, Artikel-Nr. *Type, Model, Article No.*
CPCI-ASIO4	**I.2307.02**
die Anforderungen der Normen *fulfills the requirements of the standards*	**EN 61000-6-2:2005,** **EN 61000-6-4:2007+A1:2011**
gemäß folgendem Prüfbericht erfüllt. *according to test certificate.*	**H-K00-0406-10,** **H-K00-0359-09,** **H-Z01-0359-13**
Das Produkt entspricht damit der EU-Richtlinie „EMV" *Therefore the product conforms to the EU Directive 'EMC'*	**2014/30/EU**
Das Produkt entspricht der EU-Richtlinie „RoHS" *The product conforms to the EU Directive 'RoHS'*	**2011/65/EU**

Diese Erklärung verliert ihre Gültigkeit, wenn das Produkt nicht den Herstellerunterlagen entsprechend eingesetzt und betrieben wird, oder das Produkt abweichend modifiziert wird.
This declaration loses its validity if the product is not used or run according to the manufacturer's documentation or if non-compliant modifications are made.

Name / *Name*	T. Ramm
Funktion / *Title*	CE-Koordinator / *CE Coordinator*
Datum / *Date*	Hannover, 2015-02-12

Rechtsgültige Unterschrift / *authorized signature*

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5. Order Information

Type	Properties	Order No.
CPCI-ASIO4	CompactPCI 3U/4HP board with 4 asynchronous serial interfaces, basic version with 4 x RS-232 PCI Bridge PLX 9054, 2 x 16552 asynchronous controller, front panel with 4 RJ-45	I.2307.02
instead of RS-232 added with (specify in order): RS-422-piggyback RS-485-piggyback TTY-20mA passive-piggyback TTY-20mA active-piggyback		V.1930.02 V.1930.04 V.1930.06 V.1930.08
Software		
CPCI-ASIO4-WIN XP	CPCI-ASIO4-WIN Driver for Windows XP Windows XP as object	I.2307.12
CPCI-ASIO-VxWorks	VxWorks Source Code with instructions for connection to the hardware. Documentation in the source code	I.2307.55
CPCI-ASIO4-QNX 6	QNX driver as object	I.2307.15

Table 1.4.1: Order information

PDF Manuals
For availability of English manuals see the following table.
Please download the manuals as PDF documents from our esd website www.esd.eu for free.

Manual		Order No.
CPCI-ASIO4-ME	Manual in English	I.2307.21

Table 2: Available manuals

Printed Manuals
If you need a printout of the manual additionally, please contact our sales team: sales@esd.eu for a quotation. Printed manuals may be ordered for a fee.