

CPCI-ASIO4

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



Hardware Manual

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Changes in the chapters

The changes in the manual below affect changes in the hardware as well as changes in the description of facts only.

| Chapter | Changes from previous version |
|---------|--------------------------------------|
| 1.3.4 | Notes on software support corrected. |

Technical details are subject to change without further notice.

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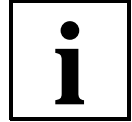
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| | |
|--|----|
| 1. Overview | 3 |
| 1.1 The CPCI-ASIO4 Board | 3 |
| 1.2 PCB View with Connector Designation | 4 |
| 1.3 Summary of Technical Data | 5 |
| 1.3.1 General Technical Data | 5 |
| 1.3.2 CompactPCI Bus | 6 |
| 1.3.3 Microcontroller Circuits | 6 |
| 1.3.4 Serial Interfaces | 7 |
| 1.3.5 Software Support | 7 |
| 1.4 Order Information | 8 |
| 2. Description of Units | 9 |
| 2.1 Front Panel and LED-Display | 9 |
| 2.2 Serial Interfaces | 10 |
| 2.2.1 Configuration | 10 |
| 2.2.1.1 Piggybacks | 10 |
| 2.2.1.2 Jumpers | 11 |
| 2.2.1.3 Solder Bridges for TTY-Active Mode | 12 |
| 2.2.2 Connection of the Serial Interfaces to the RJ45-Female Connector | 13 |
| 2.2.2.1 The RS-232 Interface | 13 |
| 2.2.2.2 The RS-422 Interface | 14 |
| 2.2.2.3 The RS-485 Interface | 14 |
| 2.2.2.4 The TTY(20 mA) Interface | 15 |
| 3. Connector Pin Assignment | 16 |
| 3.1 Serial Interfaces at RJ45-Female Connectors | 16 |
| 3.2 Pin Assignment of the RS-232 Interface at a DSUB9 Connector | 17 |
| 3.3 Assignment of RS-422, RS-484 and TTY-Interfaces at DSUB9 | 18 |

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1. Overview

1.1 The CPCI-ASIO4 Board

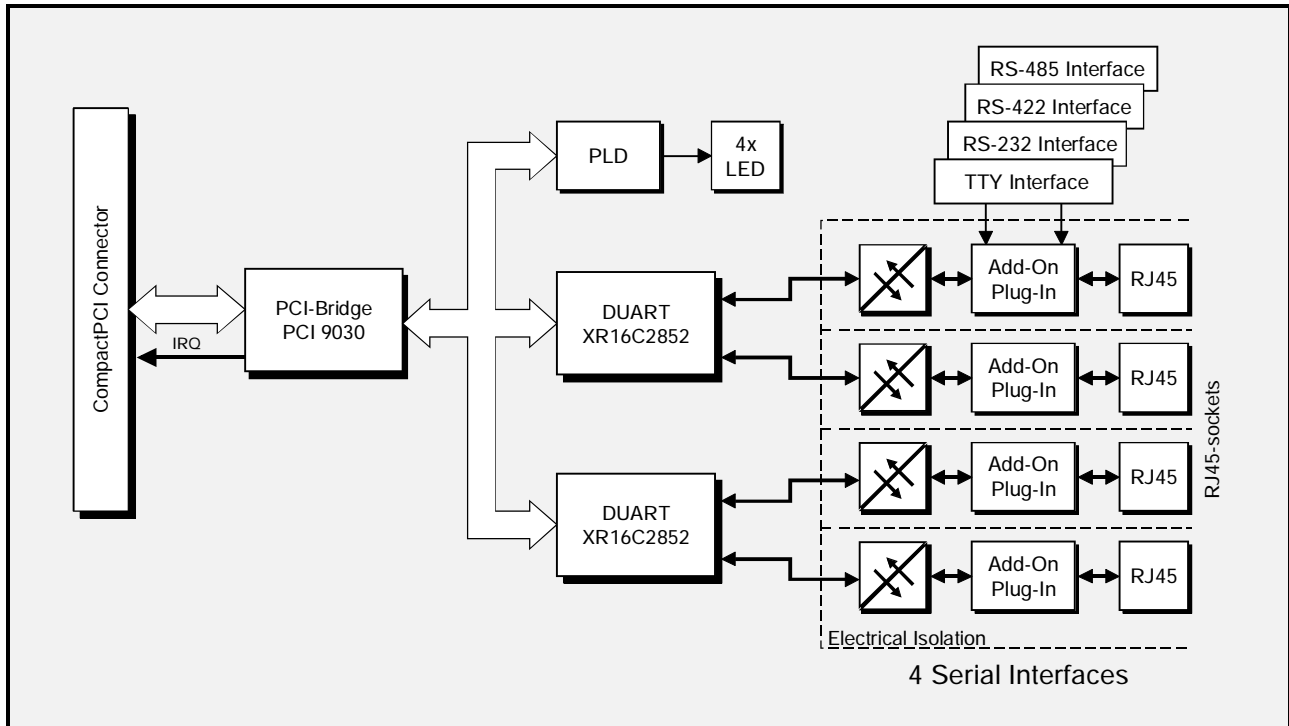


Fig. 1.1.1: Block circuit diagram

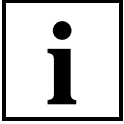
The module CPCI-ASIO4 is a CompactPCI board in Euro format. It has got four serial interfaces which are electrically isolated against the CPCI bus and against each other.

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

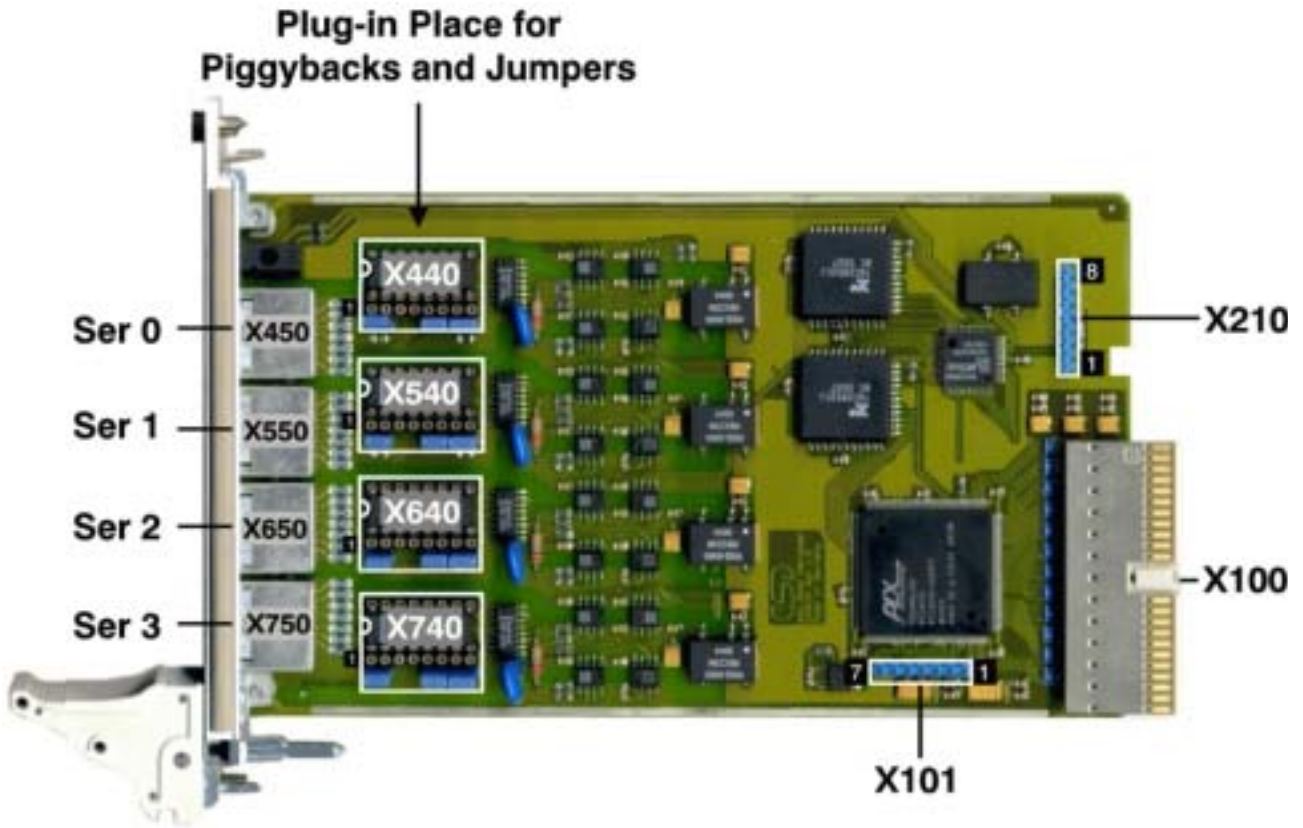


Fig. 1.2.1: PCB view

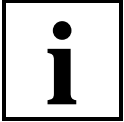


1.3 Summary of Technical Data

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

The board runs with the standard serial interface system drivers of Linux and VxWorks. Support for Windows NT, Windows XP and QNX6 on request.



1.4 Order Information

| Type | Properties | Order No. |
|----------------|---|--|
| CPCI-ASIO4 | 4 serial interfaces, RS-232 | 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 |
| CPCI-ASIO4-ME | User manual in English ^{1*)} (this manual) | I.2307.21 |
| CPCI-ASIO4-ENG | Engineering manual in English ^{2*)} contents: circuit diagrams, PCB top overlay drawing, data sheets of significant components | I.2307.25 |

1*) If module and manual are ordered together, the manual is free of charge.

2*) This manual is liable for costs, please contact our support.

Table 1.4.1: Order information



2. Description of Units

2.1 Front Panel and LED-Display

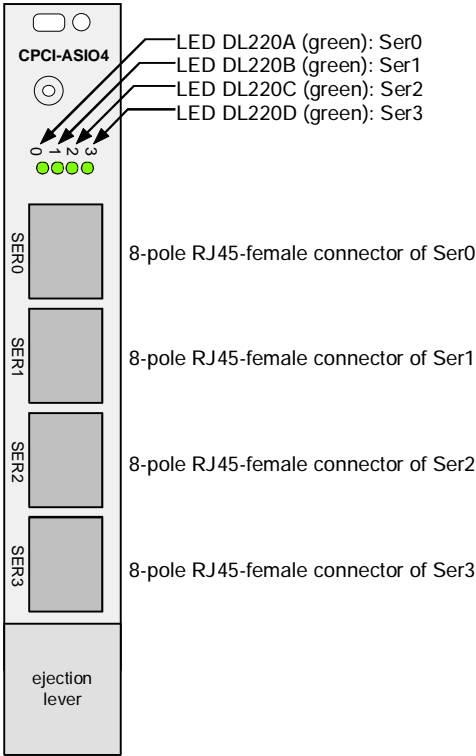


Fig. 2.2.1: Front panel view with LEDs

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.



Description of Units

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 11)!

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**

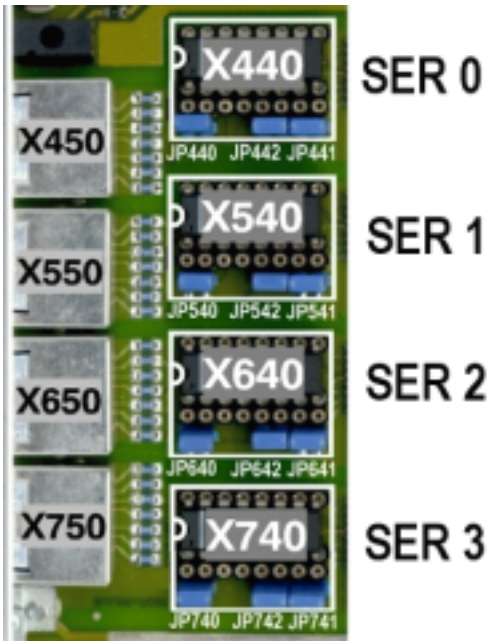


Fig. 2.2.3: Assignment of the plug-in places to the serial channels (shown example: RS-232 mode)

| 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



Description of Units

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 loses its electrical isolation. The signal lines of the TTY-active interfaces are routed via optocouplers independently from the solder bridge settings.

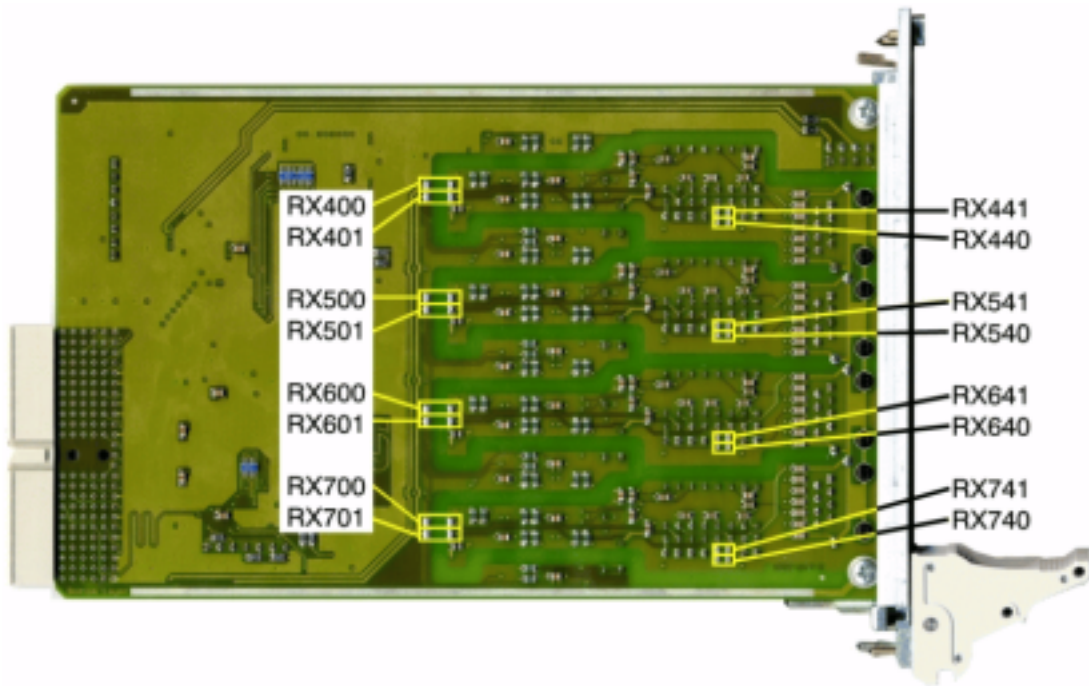


Fig. 2.2.4: Position of the solder bridges at the bottom layer of the PCB

| 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).

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 Windows 95/98, Windows NT/2000, Linux, VxWorks or QNX4, you have to route the signals as described in the example figure below.

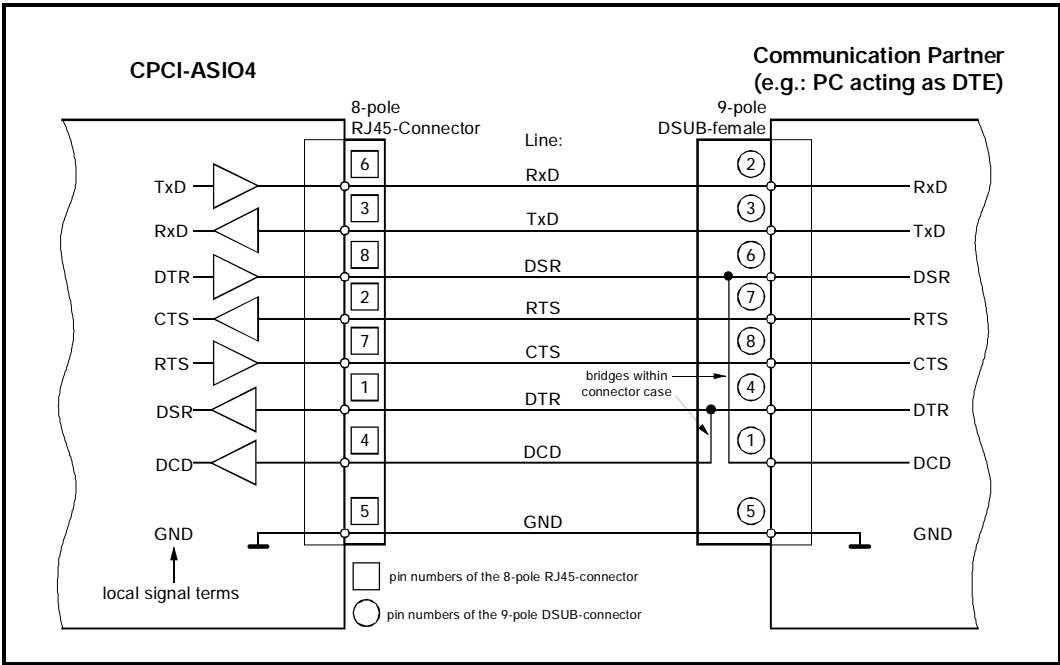


Fig. 2.2.5: Connection scheme for RS-232 operation (example: CPCI-ASIO4 <-> PC)



Description of Units

2.2.2.2 The RS-422 Interface

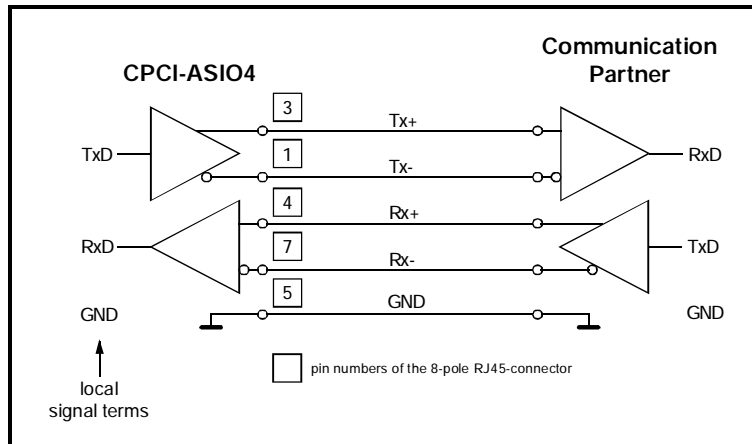


Fig. 2.2.6: Connection scheme for RS-422 operation

2.2.2.3 The RS-485 Interface

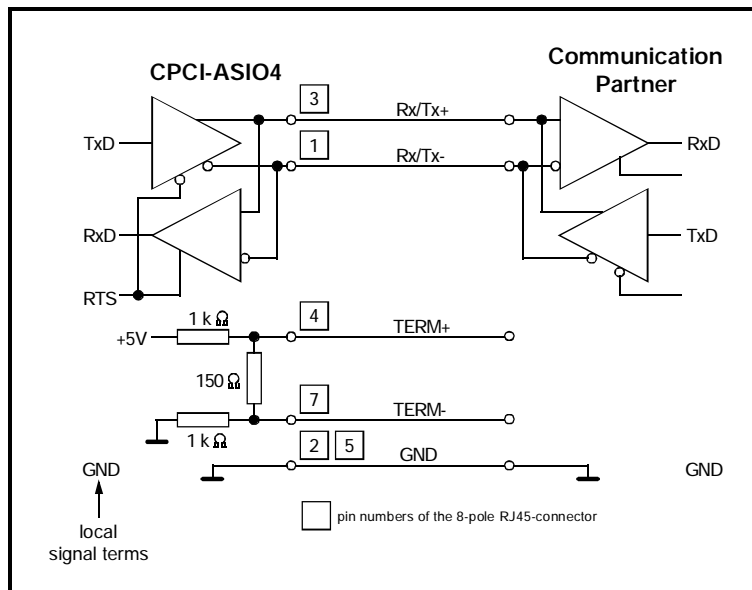


Fig. 2.2.7: Connection scheme for RS-485 operation

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

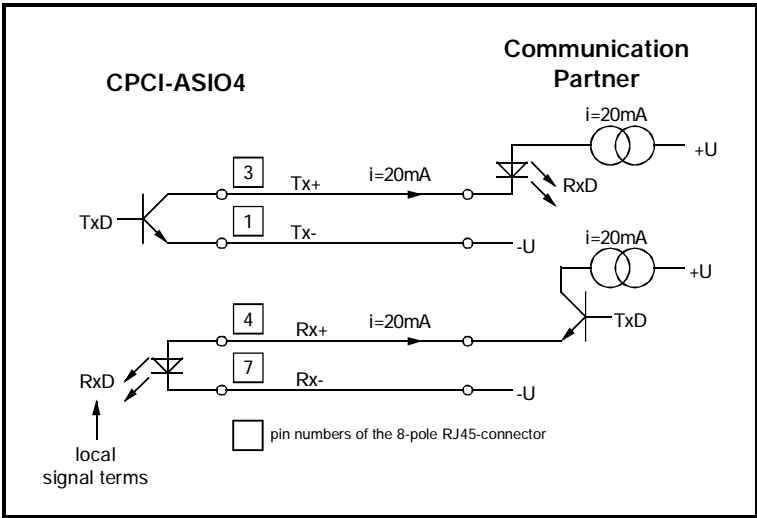


Fig. 2.2.8: Connection scheme for TTY operation (passive)

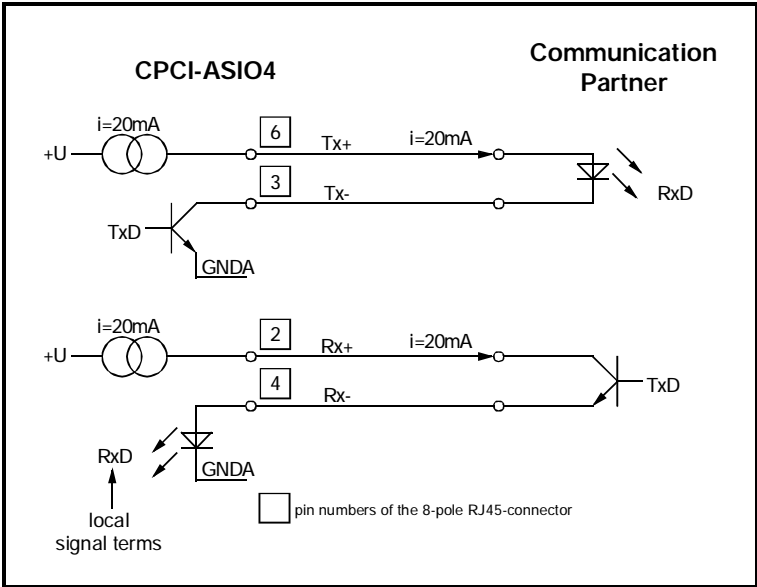
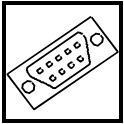


Fig. 2.2.9: Connection scheme for TTY operation (active)



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 13. From the principle circuit diagrams represented in that chapter, you will be able to clearly determine the signal direction (Rx <-> Tx).

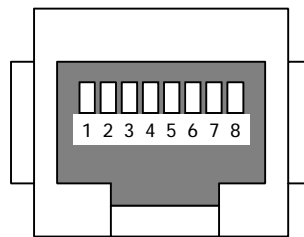
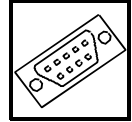


Fig. 3.1.1: Pin assignment at RJ45-female connector

| 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 not required for the corresponding operating mode.

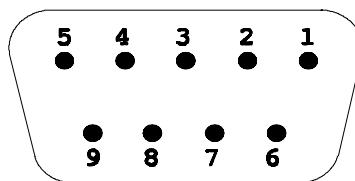


3.2 Pin Assignment of the RS-232 Interface at a DSUB9 Connector

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 13. From the principle circuit diagrams represented in that chapter, you will be able to clearly determine the signal direction (Rx <-> Tx).

Pin Assignment

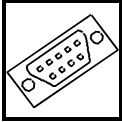


Signal Assignment:

| Signal | Pin | Signal |
|-----------------|-----|------------------|
| DCD *1) (Input) | 1 | DSR *1) (Output) |
| RxD (Output) | 2 | |
| TxD (Input) | 3 | RTS (Input) |
| DTR *1) (Input) | 4 | CTS (Output) |
| 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 13.



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 15.

| 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 not required for the corresponding operating mode.