CPCI-COM4

Multi I/O Serial Interface Board (RS-232/RS-422/RS-485/HDCL)

Hardware Manual

to Product I.2328.01

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Document History

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

Revision	Chapter	Changes versus previous version	Date
1.0	-	First English version	2011-11-09

Technical details are subject to change without further notice.

Safety Instructions

- When working with CPCI-COM4 follow the instructions below and read the manual carefully to protect yourself from injury and the CPCI-COM4 from damage.
- Protect the CPCI-COM4 from dust, moisture and steam.
- Protect the CPCI-COM4 from shocks and vibrations.
- The CPCI-COM4 may become warm during normal use. Always allow adequate ventilation around the CPCI-COM4 and use care when handling.
- Do not operate the CPCI-COM4 adjacent to heat sources and do not expose it to unnecessary thermal radiation. Ensure an ambient temperature as specified in the technical data.

Attention !
Electrostatic discharges may cause damage to electronic components.
To avoid this, please perform the steps described on page 8 *before* you touch the CPCI-COM4, in order to discharge the static electricity from your body.

Qualified Personal
This documentation is directed exclusively towards personal qualified 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.

Intended Use
The intended use of the CPCI-COM4 is the operation as serial interface in a CPCI system.
The guarantee given by esd does not cover damages which result from improper use, usage not in accordance with regulations or disregard of safety instructions and warnings.

- The CPCI-COM4 is intended for installation in a CPCI-system only.
- The operation of the CPCI-COM4 in hazardous areas, or areas exposed to potentially explosive materials is not permitted.
- The operation of the CPCI-COM4 for medical purposes is prohibited.

Service Note
The CPCI-COM4 does not contain any parts that require maintenance by the user. The CPCI-COM4 does not require any manual configuration of the hardware.

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

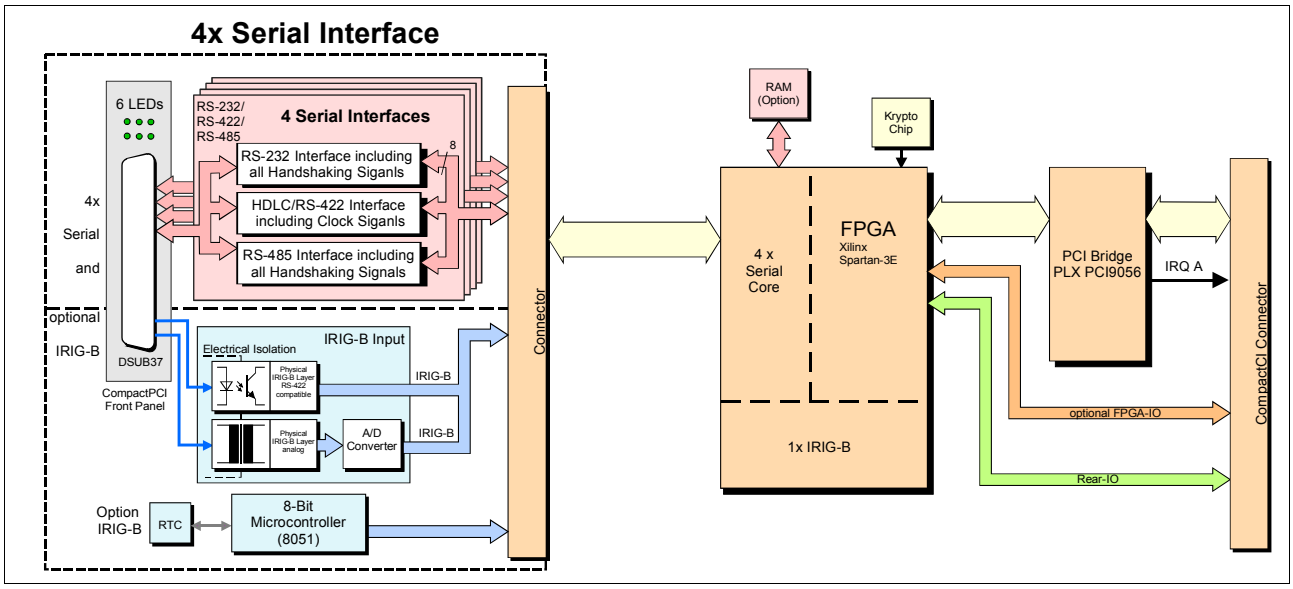


Figure 1: Block circuit diagram

The CPCI-COM4 is a CompactPCI board in 3U format. It features 4 serial interfaces (RS-232, RS-422 or RS-485). On request the board can be updated to up to 12 RS-232 or 8 RS-422/RS-485 interfaces (without handshake) via software update.
Local data control and management is controlled by an FPGA.

On request the CPCI-COM4 optionally features an IRIG-B interface and high resolution hardware timestamps.

All I/Os are connected to a 37-pin DSUB connector in the front panel.

The HDLC protocol is supported on the 4 serial interfaces as input or output.
Clock generation or -reception is configurable for each interface.

Fast adaption to customer-specific protocols and physical layers can easily be realised due to modular design: The protocol is implemented in the FPGA.
Physical layer connectors are located on a Piggy-back for easy design modifications.

A Software driver is available for QNX. Software drivers for VxWorks or Windows are available on request.

2. PCB View with Connectors

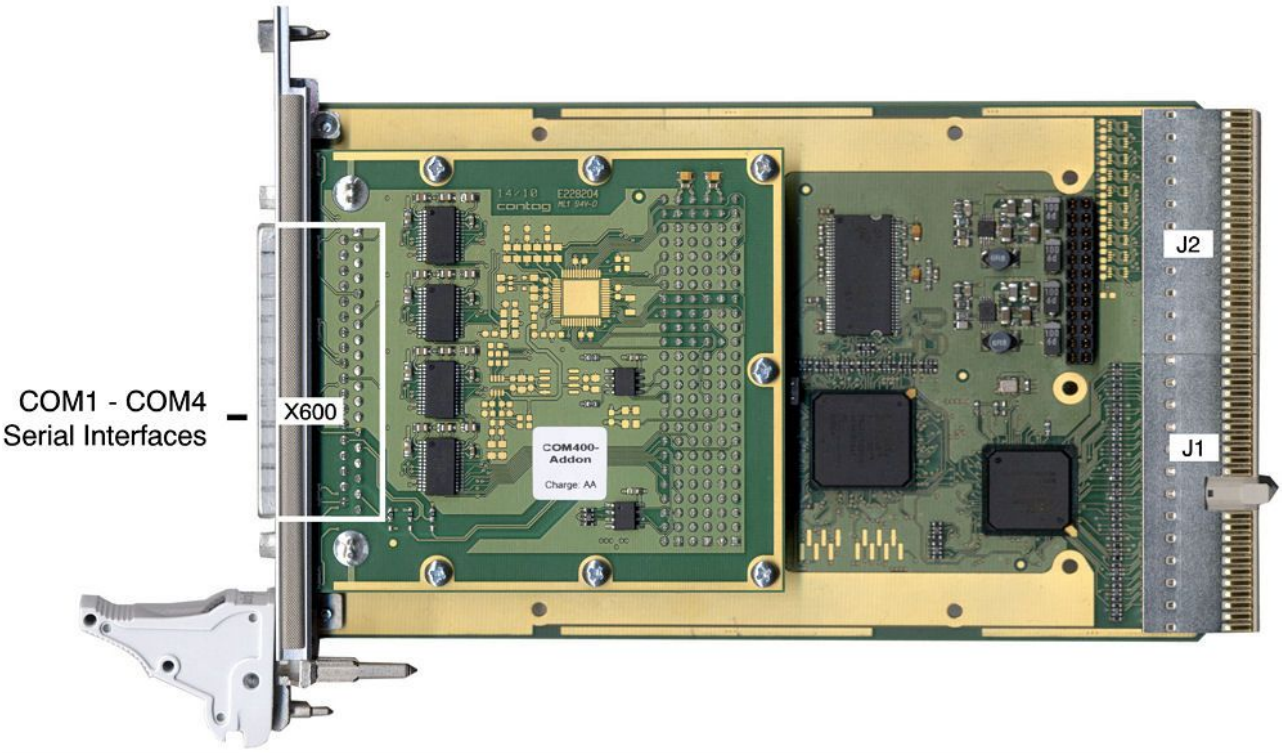


Figure 2: PCB top view

See also page 14 for signal assignment of the COM connector.

3. Hardware Installation

Read the safety instructions at the beginning of this document carefully, before you start with the hardware installation!

Danger!
Electric shock risk. Never carry out work while power supply voltage is switched on!

Attention !
Electrostatic discharges may cause damage to electronic components. To avoid this, please perform the following steps *before* you touch the CPCI-COM4, in order to discharge the static electricity from your body:

- Switch off the power of your computer, but leave it connected to the mains until you have discharged yourself (if applicable).
- Please touch the metal case of the computer now to discharge yourself.
- Furthermore, you should prevent your clothes from touching the computer, because your clothes might be electrostatically charged as well.

Procedure:

1. Switch off your computer and all connected peripheral devices (monitor, printer, etc.).
2. Discharge your body as described above.
3. Disconnect the computer from the mains.
   If the computer does not have a flexible mains cable, but is directly connected to mains, disconnect the power supply via the safety fuse and make sure that the fuse cannot switch on again unintentionally (i.e. with caution label).

   Danger!
   Never carry out work while power supply voltage is switched on!
4. Open the case.
5. Insert the CPCI-COM4 board into a free CompactPCI slot in your computer.
6. Close the computer case again.
7. Fix the CPCI-COM4 board with the screws on the front panel.
8. Connect the serial interfaces (COM1- COM4) via the DSUB37 connector in the front panel of the CPCI-COM4 (see page 7).
9. Connect the computer to mains again (mains connector or safety fuse).
10. Switch on the computer and the peripheral devices.
11. End of hardware installation.

4. LEDs

4.1 Position of the LEDS

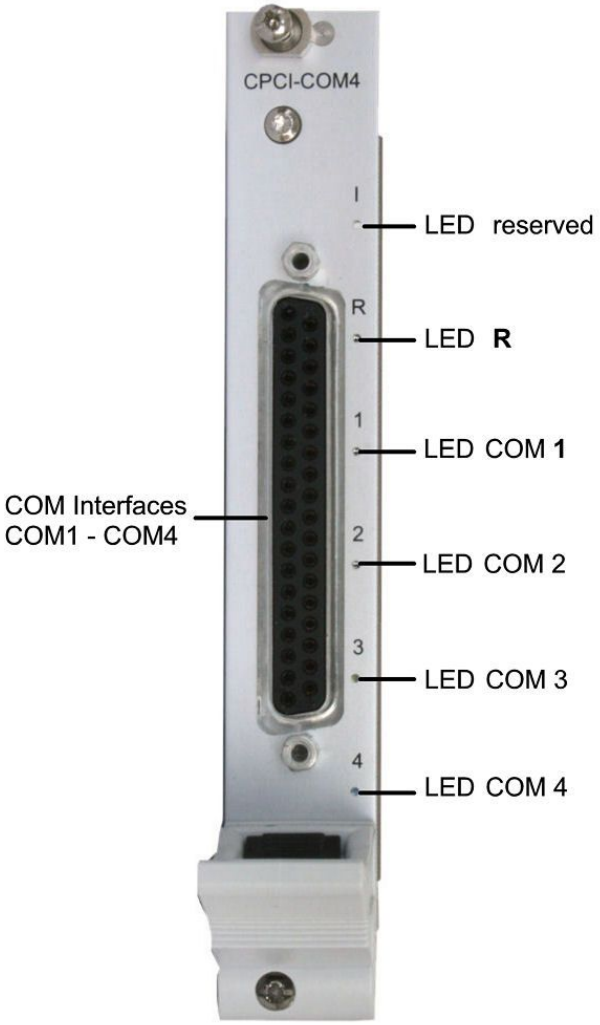


Figure 3: Connectors and LEDs

4.2 LED Indication

LED	Colour	Function	Indicator State	Description	LED name in schematic diagram
I	green	IRIG-B	always off	reserved for future application	LED223
R	green	Power (optional)	off	CPCI-COM4 not ready, FPGA not loaded	LED224
			on	CPCI-COM4 is ready for operation, FPGA is loaded	

Table 1: Description of LEDs R and I

LED	Colour	Function	Indicator State	Description	LED name in schematic diagram
1	green	COM1 Traffic	off	no serial traffic on COM 1	LED221
			blinking	serial traffic on COM 1	
2	green	COM2 Traffic	off	no serial traffic on COM 2	LED220
			blinking	serial traffic on COM 2	
3	green	COM3 Traffic	off	no serial traffic on COM 3	LED222
			blinking	serial traffic on COM 3	
4	green	COM4 Traffic	off	no serial traffic on COM 4	LED225
			blinking	serial traffic on COM 4	

Table 2: Description of COM LEDs

5. Technical Data

5.1 General Technical Data

Power supply voltage	via CompactPCI bus: nominal voltage:	3.3 V (5V tolerant),
	current consumption	typical at 5 V: < 10 mA (without IRIG-B), this voltage is only used for IRIG-B typical at 3.3V: < 200 mA (FPGA not booted) < 350 mA (FPGA booted)
Connectors	CAN0 ... CAN3	(X600, 37-pin DSUB) – serial interfaces COM1-COM4, optional IRIG-B
	J1	CompactPCI board connector (X100, 132-pin male connector)
	J2	CompactPCI board connector (X101, 132-pin male connector)
	X303	reserved for future use
Temperature range	0...50 °C ambient temperature	
Humidity	max. 90%, non-condensing	
Dimensions	100 mm x 160 mm	
Weight	approximately 240 g	

Table 3: General data of the module

5.2 Microprocessor and Memory

BlockRAM (FPGA)	72 KB
DRAM	64 MB
Microprocessor	Optional 32-bit microcontroller in FPGA (MicroBlaze) on request

Table 4: Microprocessor and Memory

5.3 Serial Interface

Controller	integrated in in FPGA Spartan® 3e, number of serial interfaces and physical layer selection configurable by software
Physical Interface	asynchronous interfaces (UART), including all handshaking signals, bit rate up to 115 200 Baud: - 4x RS-232 or - 4x RS-422 or - 4x RS-485 or synchronous interfaces, including clock signals, bitrate up to 307.2 kBaud: - 4x HDLC/RS-422
Software	Standard operating system driver
Connector	37-pin DSUB

Table 5: Data of the serial interface

5.4 CompactPCI Bus

Host bus	PCI-Bus according to PCI Local Bus Specification 2.2
PCI-data/address bus	32 Bit, 33/66 MHz
Microprocessor	optional 32-bit µC in FPGA (MicroBlaze)
Board dimension	according to CompactPCI-Specification, Rev. 2.2
Connector	
Connector coding	Universal-Board, not keyed (3.3 V or 5 V signalling voltage)

Table 6: Data of the CompactPCI bus

5.5 IRIG-B Interface (Option)

An IRIG-B option is available on request.

Number	1x analogue and 1x RS-422 compatible (via front panel, both electrically isolated), 1x RS-422 compatible (at J2 only)
Controller	8051 microcontroller
Connector	DSUB37

Table 7: Data of the optional IRIG-B interface

5.6 Software Support

Device drivers for QNX[1] are available.
Drivers for VxWorks and Windows are available on request.

1 For detailed information about the driver availability of your special operating system please contact our sales team.

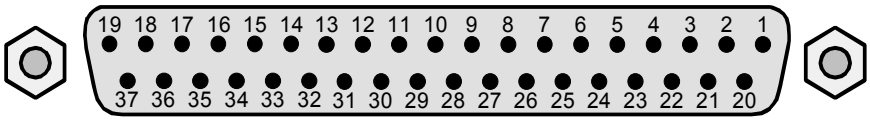
6. Connector Assignments

The number of serial interfaces and the physical layer selection is configured by software. Thus the pin assignment of the DSUB37 is determined by software

6.1 4x RS-232-Interface

Device connector: 37-pin DSUB connector, female

Pin Position:



Pin Assignment:

Port	Signal		Pin	Pin	Signal	
COM1	(Input)	DCD	1	20	DSR	(Input)
	(Input)	Rx	2	21	RTS	(Output)
	(Output)	Tx	3	22	CTS	(Input)
	(Output)	DTR	4	23	RI	(Input)
	(reference potential)	GND	5	24	DCD	(Input)
COM2	(Input)	DSR	6	25	Rx	(Input)
	(Output)	RTS	7	26	Tx	(Output)
	(Input)	CTS	8	27	DTR	(Output)
	(Input)	RI	9	28	GND	(reference potential)
COM3	(Input)	DCD	10	29	DSR	(Input)
	(Input)	Rx	11	30	RTS	(Output)
	(Output)	Tx	12	31	CTS	(Input)
	(Output)	DTR	13	32	RI	(Input)
	(reference potential)	GND	14	33	DCD	(Input)
COM4	(Input)	DSR	15	34	Rx	(Input)
	(Output)	RTS	16	35	Tx	(Output)
	(Input)	CTS	17	36	DTR	(Output)
	(Input)	RI	18	37	GND	(reference potential)
	-	n.c.	19			

Shield	S

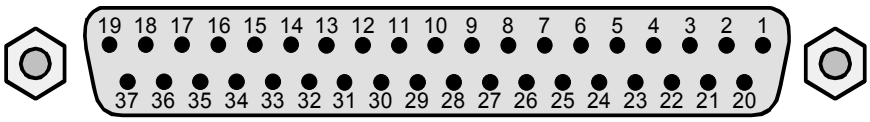
Signal Description:

Rx, Tx, DCD, DTR, RI,
DSR, RTS, CTS... RS-232 signal lines of the corresponding COM port
Shield ... shielding (connected with the case of the 37-pin DSUB connector)
n.c. ... not connected

6.2 4x HDCL-Interface

Device connector: 37-pin DSUB connector, female

Pin Position:



Pin Assignment:

Port	Signal		Pin	Pin	Signal	
COM1	(Output)	TX+ (A)	1			
	(Input)	RX+ (A)	2	20	TX- (B)	(Output)
	(Output)	TX-CLK+ (A)	3	21	RX- (B)	(Input)
	(Input)	RX-CLK+ (A)	4	22	TX-CLK- (B)	(Output)
	(reference potential)	GND	5	23	RX-CLK- (B)	(Input)
COM2	(Output)	TX- (B)	6	24	TX+ (A)	(Output)
	(Input)	RX- (B)	7	25	RX+ (A)	(Input)
	(Output)	TX-CLK- (B)	8	26	TX-CLK+ (A)	(Output)
	(Input)	RX-CLK- (B)	9	27	RX-CLK+ (A)	(Input)
COM3	(Output)	TX+ (A)	10	28	GND	(reference potential)
	(Input)	RX+ (A)	11	29	TX- (B)	(Output)
	(Output)	TX-CLK+ (A)	12	30	RX- (B)	(Input)
	(Input)	RX-CLK+ (A)	13	31	TX-CLK- (B)	(Output)
	(reference potential)	GND	14	32	RX-CLK- (B)	(Input)
COM4	(Output)	TX- (B)	15	33	TX+ (A)	(Output)
	(Input)	RX- (B)	16	34	RX+ (A)	(Input)
	(Output)	TX-CLK- (B)	17	35	TX-CLK+ (A)	(Output)
	(Input)	RX-CLK- (B)	18	36	RX-CLK+ (A)	(Input)
		n.c.	19	37	GND	(reference potential)

	Shield	S

Signal Description:

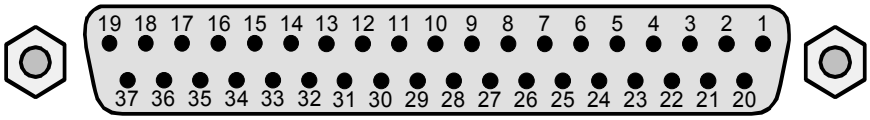
Rx+/-, Tx+/- ...	RS-422 signal lines of the corresponding COM port
Tx_CLK+/-, Rx_CLK+/-...	Clock-signal lines of the corresponding COM port
Shield ...	shielding (connected with the case of the 37-pin DSUB connector)
n.c. ...	not connected

6.3 4x RS-422 Asynchronous Interface or RS485

For usage of the RS485 interface, the RS-422 signal lines have to be connected via an external adapter as described below.

Device connector: 37-pin DSUB connector, female

Pin Position:



Pin Assignment:

Port	Signal RS-485	Signal RS-422	Pin		Signal RS-422	Signal RS-485
COM1	Rx/Tx+ connect externally	TX+ (A)	1	20	TX- (B)	n.c.
		RX+ (A)	2	21	RX- (B)	
	Rx/Tx- connect externally	RTS+ (A)	3	22	RTS- (B)	n.c.
		CTS+ (A)	4	23	CTS- (B)	
	(reference potential)	GND	5	24	TX+ (A)	Rx/Tx+ connect externally
COM2	n.c.	TX- (B)	6	25	RX+ (A)	
		RX- (B)	7	26	RTS+ (A)	Rx/Tx- connect externally
	n.c.	RTS- (B)	8	27	CTS+ (A)	
		CTS- (B)	9	28	GND	(reference potential)
COM3	Rx/Tx+ connect externally	TX+ (A)	10	29	TX- (B)	n.c.
		RX+ (A)	11	30	RX- (B)	
	Rx/Tx- connect externally	RTS+ (A)	12	31	RTS- (B)	n.c.
		CTS+ (A)	13	32	CTS- (B)	
	(reference potential)	GND	14	33	TX+ (A)	Rx/Tx+ connect externally
COM4	n.c.	TX- (B)	15	34	RX+ (A)	
		RX- (B)	16	35	RTS+ (A)	Rx/Tx- connect externally
	n.c.	RTS- (B)	17	36	CTS+ (A)	
		CTS- (B)	18	37	GND	(reference potential)
	-	n.c.	19			

Shield	S

Signal Description:

Rx+/-, Tx+/-, RTS+/-, CTS+/-...	RS-422 signal lines of the corresponding COM port
Rx/Tx+, Rx/Tx-	RS-485 signal lines of the corresponding COM port
Shield ...	shielding (connected with the case of the 37-pin DSUB connector)
n.c. ...	not connected

7. Order Information

Type	Properties	Order No.
CPCI-COM4	interfaces configurable by software: - 4x RS-232 or - 4x RS422 or - 4x RS-485	I.2328.01
Accessories		
CPCI-COM4-QNX	QNX object licence (For detailed information about the driver availability of your special operating system please contact our sales team)	I.2328.15
Manuals		
CPCI-COM4-ME	Manual in English	I.2328.21

Table 8: Order information