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CP346

3U CompactPCI
Quad Serial Controller Board

Manual ID: 27253, Rev. Index 03
June 2005

The product described in this manual is in compliance with all applied CE standards.

Revision History

Manual/Product Title:	CP346	
Manual ID Number:	27253	
Rev. Index	Brief Description of Changes	Date of Issue
01	Initial Issue	Sept. 2003
02	Addition of galvanic isolated version	Dec. 2003
03	Added chapter 5; minor changes to other chapters	June 2005

Imprint

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Explanation of Symbols



CE Conformity

This symbol indicates that the product described in this manual is in compliance with all applied CE standards. Please refer also to the section “Applied Standards” in this manual.



Caution, Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60V) when touching products or parts of them. Failure to observe the precautions indicated and / or prescribed by the law may endanger your life / health and / or result in damage to your material.

Please refer also to the section “High Voltage Safety Instructions” on the following page.



Warning, ESD Sensitive Device!

This symbol and title inform that electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Please read also the section “Special Handling and Unpacking Instructions” on the following page.



Warning!

This symbol and title emphasize points which, if not fully understood and taken into consideration by the reader, may endanger your health and / or result in damage to your material.



Note ...

This symbol and title emphasize aspects the reader should read through carefully for his or her own advantage.

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For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions



Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.



Caution, Electric Shock!

Before installing your new Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks.

Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

- Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.
- Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.
- It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

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General Instructions on Usage

- In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron Modular Computers GmbH and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.
- This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.
- In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.
- Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please repack it as nearly as possible in the manner in which it was delivered.
- Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

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Two Year Warranty

Kontron Modular Computers GmbH grants the original purchaser of Kontron's products a ***TWO YEAR LIMITED HARDWARE WARRANTY*** as described in the following. However, no other warranties that may be granted or implied by anyone on behalf of Kontron are valid unless the consumer has the express written consent of Kontron Modular Computers GmbH.

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If the customer's eligibility for warranty has not been voided, in the event of any claim, he may return the product at the earliest possible convenience to the original place of purchase, together with a copy of the original document of purchase, a full description of the application the product is used on and a description of the defect. Pack the product in such a way as to ensure safe transportation (see our safety instructions).

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Chapter 1

Introduction

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1. Introduction

1.1 System Overview

The CompactPCI board described in this manual operates with the PCI bus architecture to support additional I/O and memory-mapped devices as required by various industrial applications. For detailed information concerning the CompactPCI standard, please consult the complete Peripheral Component Interconnect (PCI) and CompactPCI Specifications. For further information regarding these standards and their use, visit the homepage of the *PCI Industrial Computer Manufacturers Group (PICMG)*.

Many system relevant CompactPCI features that are specific to Kontron Modular Computers CompactPCI systems may be found described in the Kontron CompactPCI System Manual. Due to its size, this manual cannot be downloaded via the internet. Please refer to the section “Related Publications” at the end of this chapter for the relevant ordering information.

The CompactPCI System Manual includes the following information:

- Common information that is applicable to all system components, such as safety information, warranty conditions, standard connector pinouts etc.
- All the information necessary to combine Kontron’s racks, boards, backplanes, power supply units and peripheral devices in a customized CompactPCI system, as well as configuration examples.
- Data on rack dimensions and configurations as well as information on mechanical and electrical rack characteristics.
- Information on the distinctive features of Kontron CompactPCI boards, such as functionality, hotswap capability. In addition, an overview is given for all existing Kontron CompactPCI boards with links to the relating datasheets.
- Generic information on the Kontron CompactPCI backplanes, such as the slot assignment, PCB form factor, distinctive features, clocks, power supply connectors and signalling environment, as well as an overview of the Kontron CompactPCI standard backplane family.
- Generic information on the Kontron CompactPCI power supply units, such as the input/output characteristics, redundant operation and distinctive features, as well as an overview of the Kontron CompactPCI standard power supply unit family.

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1.2 Board Overview

1.2.1 Board-Specific Information

The CP346 is a 4-channel serial I/O device supporting the RS232, RS422 and RS485 industry standards. Three board variants are currently available, a non-isolated standard version, a non-isolated variant provided with rear I/O connectivity, and an isolated variant. The external interfacing of the board is accomplished using a 37-pin row D-Sub connector.

- 32-bit CompactPCI board, 33 MHz
- Up to 115.2 kBaud asynchronous transmission
- Isolated or non-isolated board variants
- 4 independent serial channels
- One 37-pin, dual row, D-Sub connector
- RS232, RS422, and RS485 standards
- Each channel individually configurable per hardware/software
- Bus termination resistors (RS422/RS485) hardware selectable
- Control LED's on the front panel
- Rear I/O-capable board variant
- Windows® 2000, Windows® XP, Windows® XP Embedded, Linux® and VxWorks® drivers

1.2.2 Board Variants

Three different variants of the CP346 main board are available:

- Non-isolated standard version
- Non-isolated version providing rear I/O connectivity
- Galvanically isolated version

All board variants have in common four individually programmable RS232, RS422 or RS485 channels. However, the external interfacing is realized via different physical schemes. The various board variants are equipped with one of the following connectors:

- Front panel connector
- Rear I/O connector

The front panels of the board variants are different in terms of their external interfacing.

A complete list of the physical board interfaces of all board variants is given in the following table:

Table 1-1: Board Variants/Connectivity

Connectivity	Non-Isolated Standard Board Variant	Non-Isolated Rear I/O-Capable Board Variant	Isolated Board Variant
Front Panel Connectors	Serial I/O connector (37-pin D-Sub)	—	Serial I/O connector (37-pin D-Sub)
On-Board Connectors		Rear I/O connector (J2)	

1.2.3 Rear I/O Modules

The CP346 board allows for the installation of a rear I/O module. On the CP346 rear I/O capable board variant, the TTL serial signals are routed to the J2 rear I/O connector.

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1.2.4 Front Panel Adapter

The CP346 serial I/O board is provided with a 37-pin D-Sub connector. In order to provide discrete access to the separate serial I/O channels, a front panel adapter cable can be connected to the 37-pin frontend connector. This adapter cable terminates on the user side with four, male, 9-pin, D-Sub connectors (one per serial I/O channel).

1.2.5 System-Relevant Information

1.2.5.1 Board Location in the System

Board location within a system must be considered carefully. Depending on the number of boards, their locations in a given system, and the operating system being used by application programs may have difficulty identifying boards properly. In particular, when configuration changes such as board replacement, movement to another slot, etc. are made after the initial system implementation. Therefore, any changes made to a system should be carefully considered prior to making the change and proper operation be verified before the system is put into operation again.



Note...

When configuring a system it is recommended that all boards to be used be installed in the system prior to installing any drivers or other board-related software. Failure to do so may result in the non-identification of a given board or boards.

1.2.5.2 Operating Systems

The CP346 can operate under the following operating systems:

- Windows® 2000, Windows® XP, Windows® XP Embedded
- Linux®
- VxWorks®

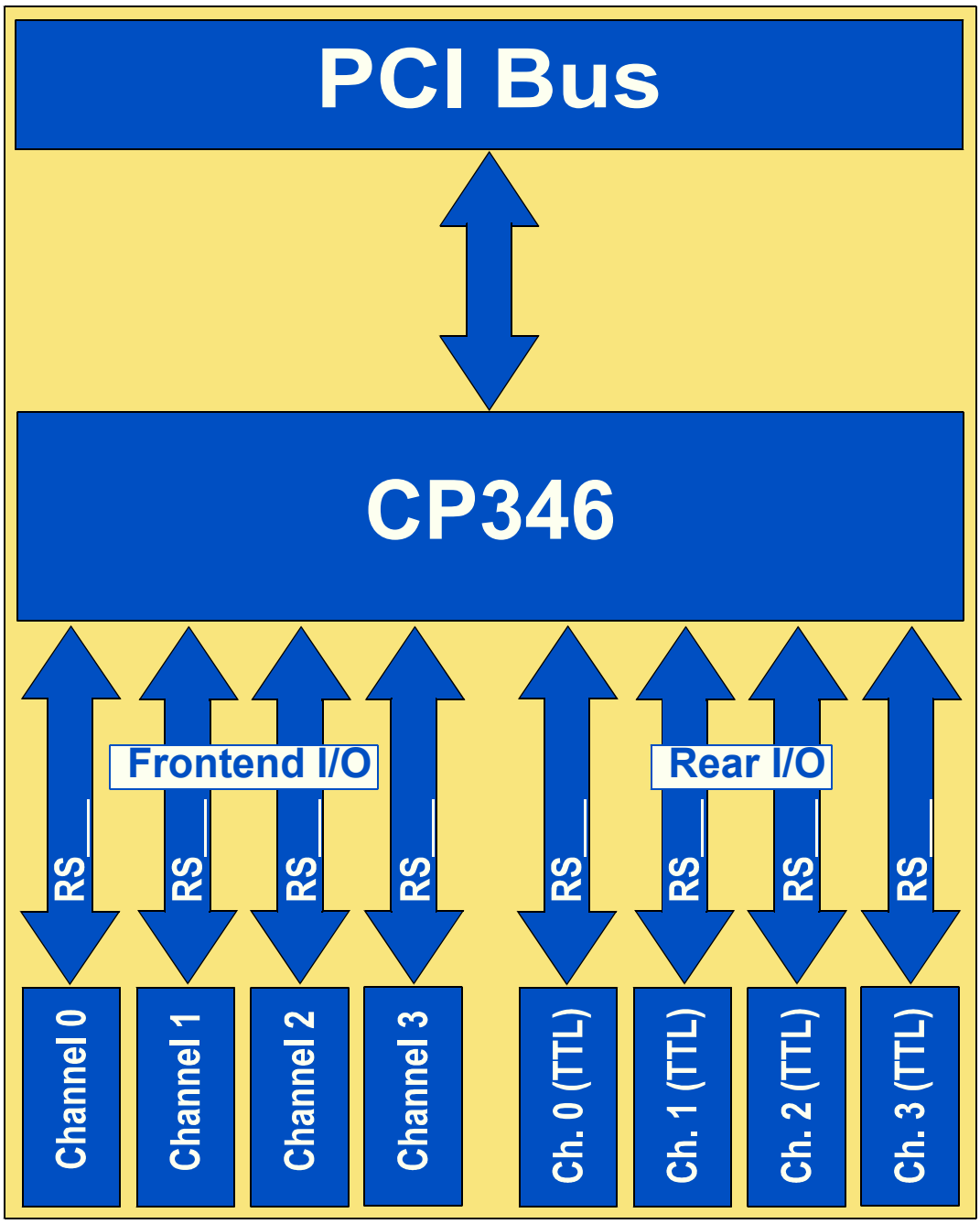
Drivers are supplied for these operating systems.

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1.3 Board Diagrams

1.3.1 Functional Block Diagram

Figure 1-1: CP346 Functional Block Diagram

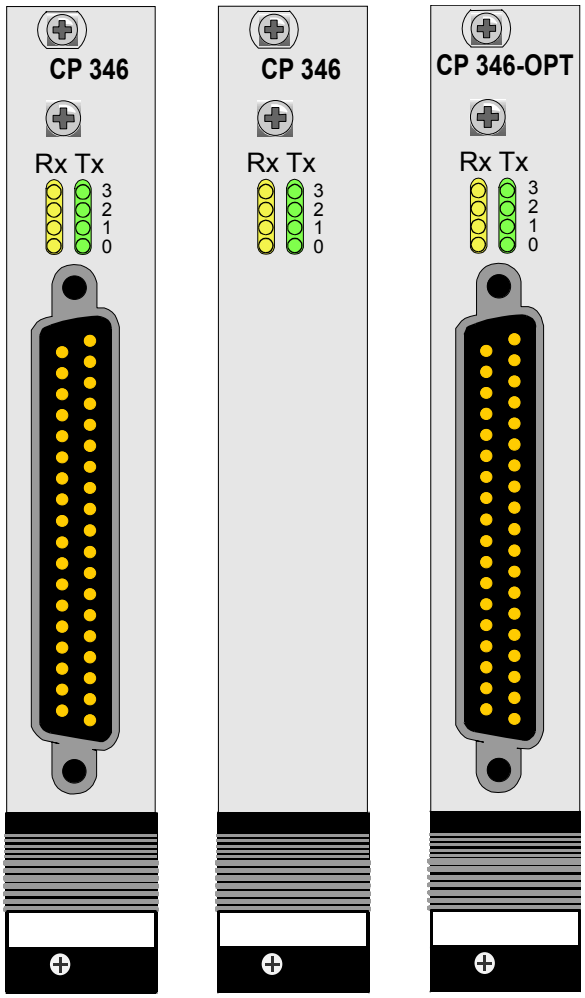


Frontend I/O, Rear I/O alternatively.
RS___: RS232 or RS422 or RS485. Each channel configurable individually.

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1.3.2 Front Panels

Figure 1-2: CP346 Front Panels



Legend:

LEFT: frontend variant
CENTER: rear I/O capable variant
RIGHT: galvanically isolated variant

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1.3.3 Board Layouts

Figure 1-3: CP346 Board Layout – Standard Variant

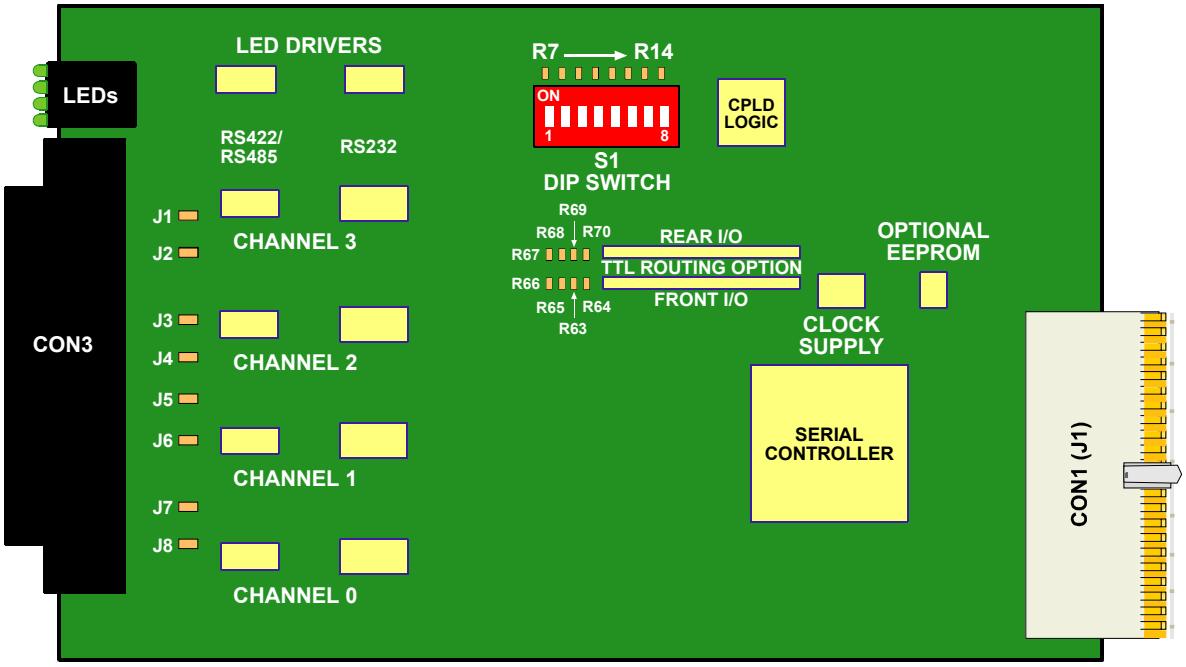
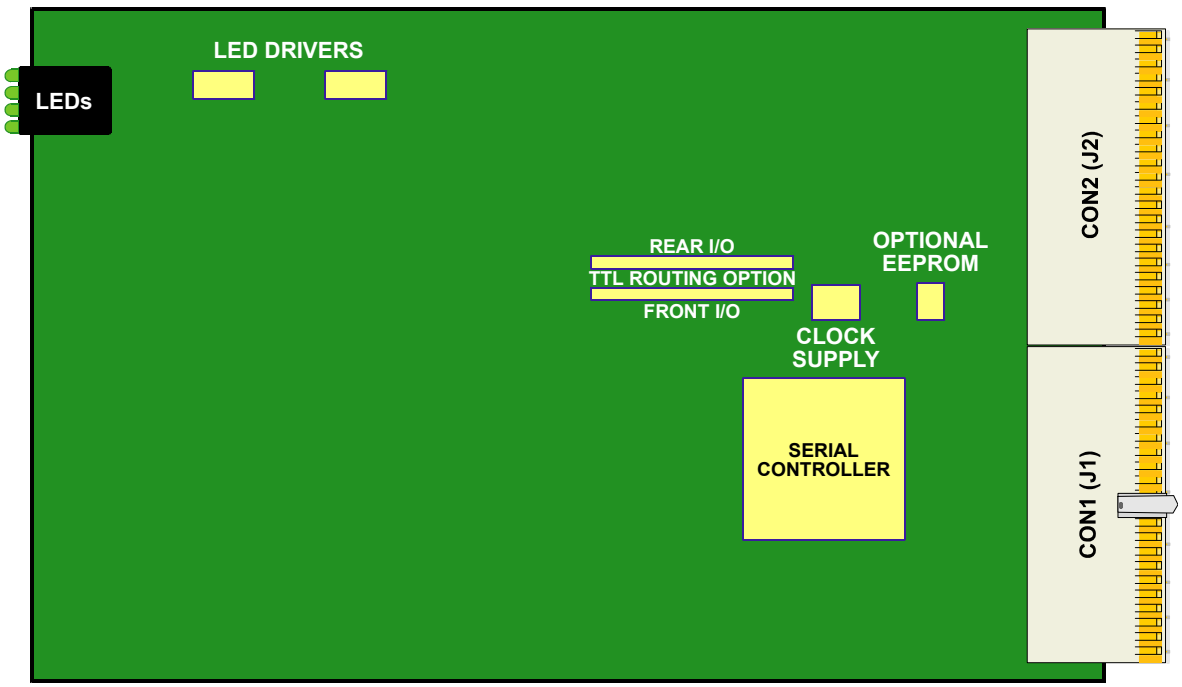
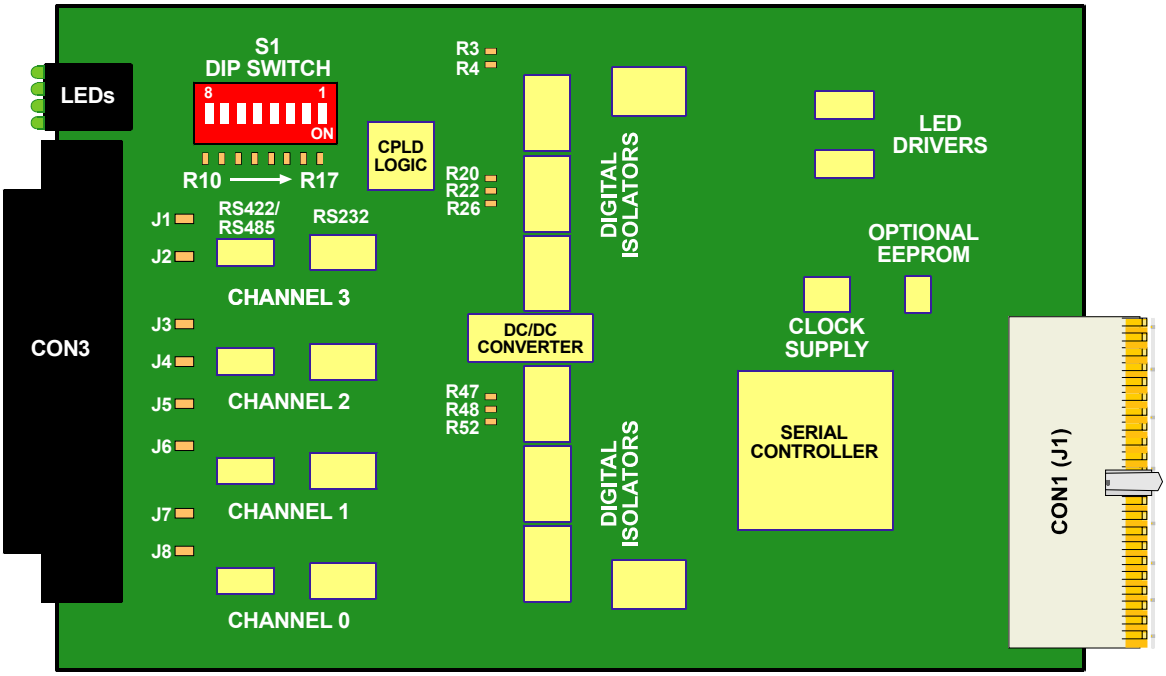


Figure 1-4: CP346 Rear I/O Variant



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Figure 1-5: CP346-OPT Board Layout



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1.4 Technical Specifications

Table 1-2: CP346 Technical Specification (Sheet 1 of 2)

CP346	Specification
Serial I/O Standards	RS-232, RS-422 and RS-485
Channels	Four serial I/O channels, individually configurable via hardware and software
Controller	Oxford Semiconductor OX16PCI954
Data Rates	• asynchronous: max. 115 kBaud (all serial operating modes)
Programmable Data Formats	Data Bits: 5 to 8 Parity: Odd, even, none, mark, space Stop Bits: 1, 1.5 and 2 Flow Control: None, Xon/Xoff, hardware
Configurable Channel Modes	RS232 RS422 • full duplex (4 wire) RS485 with local echo • half duplex (2 wire) RS485 without local echo • half duplex (2 wire)
Resources Required	• Two IRQ's (INTB for unused bridge device which is not routed/opened on the CP346) • PCI function 0 - UART's: 64 bytes I/O space 8 Kbytes MEM space • PCI function 1 - local bus: 64 bytes I/O space 8 Kbytes MEM space (resources allocated, but not used on the CP346)
External Board Interfaces	• 1 x 37-pin D-Sub
LED's	8 operation indicator LED's, two for each channel: • Yellow RxD • Green TxD
Isolation Voltage (CP346-OPT only)	2 kV, process-to-system side
Overvoltage Protection	±12 V, both variants, serial channels
PCI Interface	5 V I/O (blue 5 V coding plug in CompactPCI connector)
Power Supply	5 V DC, + 5%, - 3% (3.3 V not used)
Power Consumption (typical)	CP346: 5V/250 mA for RS232 5V/310 mA for RS422 (4 wire) 5V/240 mA for RS485 (2 wire) CP346-OPT: 5V/310 mA for RS232 5V/400 mA for RS422 (4 wire) 5V/320 mA for RS485 (2 wire)
Temperature Ranges	Operation: • 0°C to +70°C (standard) • -40°C to +85°C (extended) Storage: • -55°C to +125°C (storage)

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Table 1-2: CP346 Technical Specification (Sheet 2 of 2)

CP346	Specification
Humidity	93% RH at 40°C non-condensing
Dimensions	• 100mm x 160mm
Weight	CP346: 140 g CP346-OPT: 145 g

1.5 Applied Standards

The *Kontron Modular Computers'* CompactPCI systems comply with the requirements of the following standards:

Table 1-3: Applied Standards

COMPLIANCE	TYPE	STANDARD	Test Level (Ruggedized Version)
CE	Emission	EN55022 EN61000-6-3	--
	Immission	EN61000-6-2 EN55024	--
	Electrical Safety	EN60950-1	--
Mechanical	Mechanical Dimensions	IEEE 1101.10	--
Environmental Aspects	Vibration (Sinusoidal)	IEC60068-2-6	2g/12-300Hz/10 acceleration / frequency range / test cycles per axis
	Random Vibration (Broadband)	IEC68-2-64	20-500Hz,0.05g²/500-2000Hz, 0.005g²/3.6g rms/3/30min frequency range1 / frequency range2 /acceleration / cycle / duration
	Permanent Shock	IEC60068-2-29	15g/11ms/500/1s peak acceleration / shock duration half sine / number of shocks / recovery time
	Single Shock	IEC60068-2-27	30g/9ms/18/5s peak acceleration / shock duration / number of shocks / recovery time in sec.
	Climatic Humidity	IEC60068-2-78	93% RH at 40°C, non-condensing
	RoHS	Directive 2002/95/EC	Restriction of the use of certain hazardous substances in electrical and electronic equipment



Important...

The values in the above table are valid for boards which are ordered with the ruggedized service. For more information please contact your local Kontron office.

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1.6 Related Publications

The following publications contain information relating to this product.

Table 1-4: Related Publications

PRODUCT	PUBLICATION
CompactPCI Systems and Boards	CompactPCI Specification 2.0, Rev. 3.0
	Kontron Modular Computers' CompactPCI System Manual, ID 19954

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Chapter 2

Functional Description

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2. Functional Description

2.1 General Information

The CP346 serial communications controller board is the realization of a low cost solution for industrial automation communication purposes and represents the implementation of a serial communication controller board at the basic OSI levels.

The main functions implemented on the CP346 board are the OSI Layer 2 control for RS232, RS422 and RS485 communication purposes as well as the OSI Layer 1 physical signal level adaptation for the above mentioned interfaces, where the RS422/RS485 interface is realized for half duplex as well as for full duplex operation.

The physical layer adaptation (OSI Layer 1) of the TTL interface signals is realized independently for each channel via corresponding on-board RS232, RS422/RS485 transceivers where each of the four serial communication links are configured individually for serial interface operation per hardware and software, including the serial line termination for balanced serial communication.

The supply voltage for the CP346 is 5V DC. The isolated board variant is provided with one 5V/5V on-board DC/DC converter.

2.2 Specifics

The OSI Layer 2 functions for serial communication are handled entirely by the Oxford Semiconductor serial communication controller OX16PCI954. This controller handles all the on-board serial communication tasks related to the OSI Layer 2, and also the data transfer to the system host CPU over the CompactPCI bus.

Configuration of the serial communication links for the various operation types as well as serial line termination for differential communication (RS422/RS485) is accomplished via hardware and software. The four serial I/O channels are independent and can be configured individually for RS232, RS422/RS485 serial communication.

Data transfer operation of the serial channels is indicated at the front panel by four, channel-related pairs of LEDs for the indication of receive and transmit operations.

All the above mentioned communication functions including the RS232, RS422 and RS485 serial I/O functions are tied to the host system via the standard PCI interface provided directly on the Oxford semiconductor serial communication controller OX16PCI954. Logical control of the CP346 serial communication operation is accomplished via the OX16PCI954 command and status registers which can be accessed independently for each channel directly from the PCI side.

The CP346 serial I/O board is provided with a 37-pin D-Sub connector providing the signals for all four serial I/O channels. In order to provide separate serial I/O channelling, a front panel adapter can be connected to the 37-pin frontend connector. This adapter terminates on the user side with four, male, 9-pin, D-Sub connectors (one per serial I/O channel).

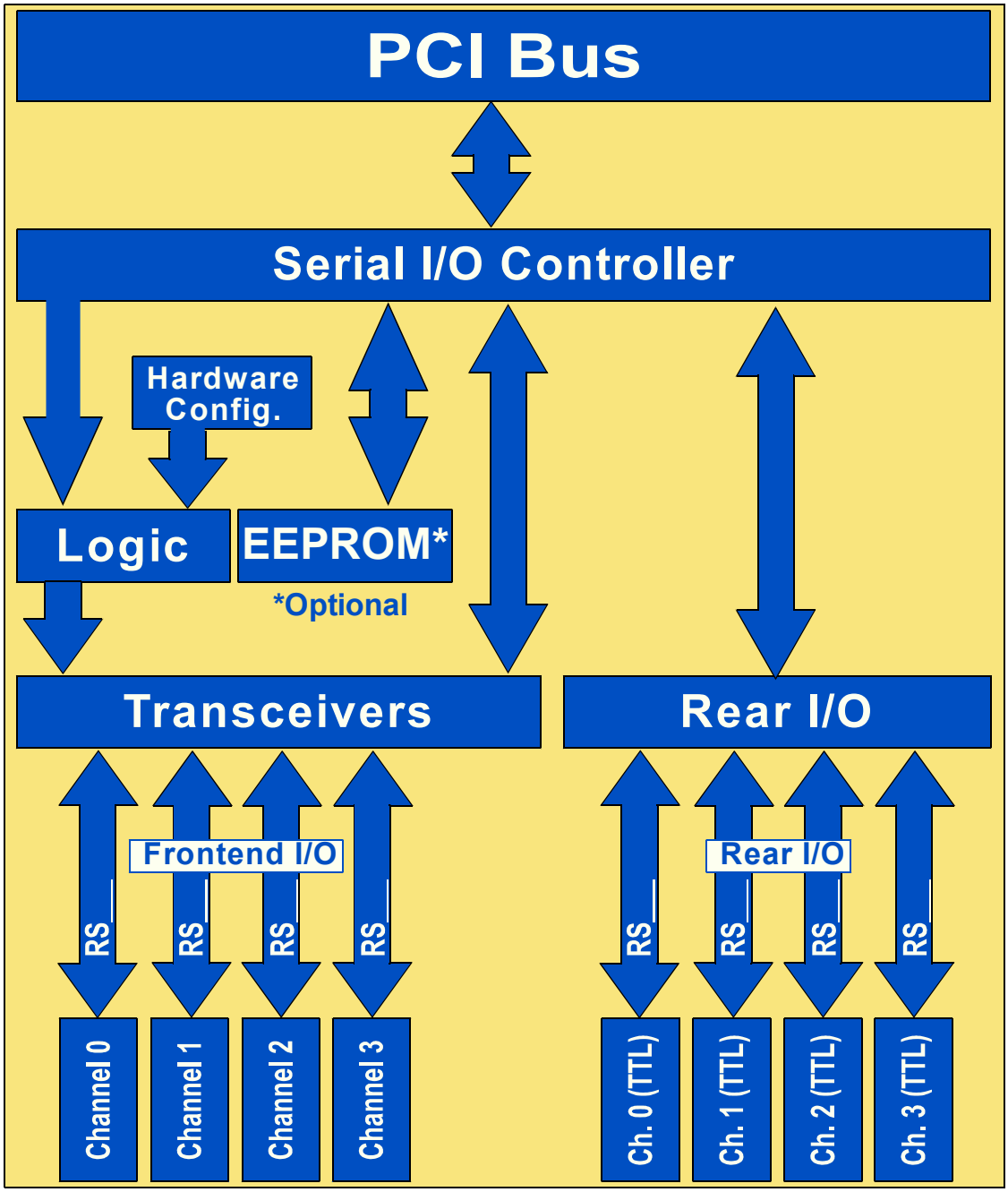
Optionally, the CP346 provides rear I/O connectivity instead of frontend connectivity, where all serial signals are routed at TTL level to a J2 rear I/O connector.

In addition to the rear I/O variant, the CP346 is available with galvanic isolation for all four channels. This is accomplished through the use of digital isolators from Analog Devices which use *i*Coupler® technology.

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2.3 Functional Block Diagrams

Figure 2-1: CP346 Functional Block Diagram (Standard Variant)



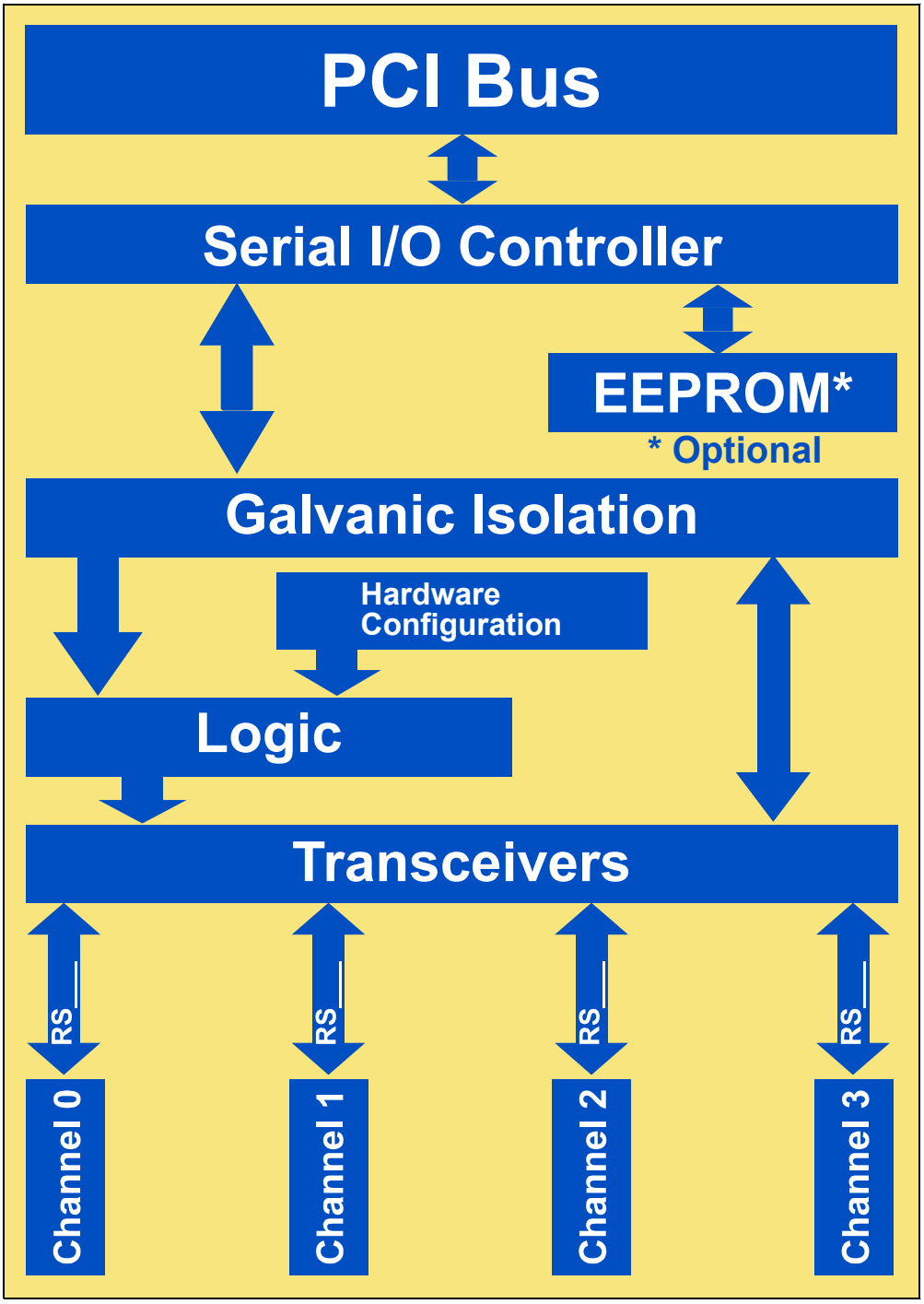
Legend

Frontend I/O, Rear I/O: alternatively.

RS___: RS232 or RS422 or RS485. Each channel configurable individually.

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Figure 2-2: CP346-OPT Functional Block Diagram (Isolated Variant)



Legend

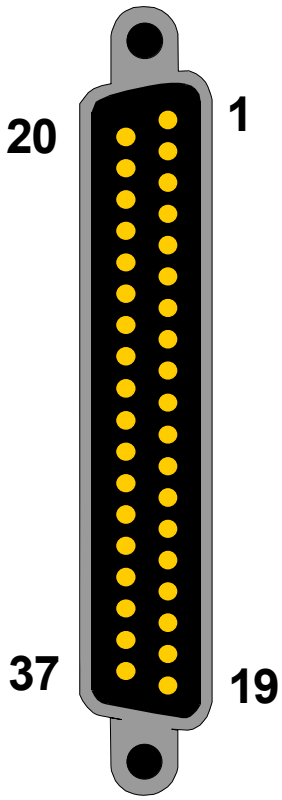
RS___: RS232 or RS422 or RS485. Each channel configurable individually.

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2.4 Board Interfaces

2.4.1 Frontend Serial I/O Interfaces

Figure 2-3: Serial I/O Interface



Note...

This section includes pinout tables of the 37-pin D-Sub frontend connector as well as of the 9-pin D-Sub connectors of the four-channel front panel adapter cable.

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2.4.1.1 Front Panel Connector

The CP346 is equipped with a 37-pin, dual row, male connector comprising the signals of serial I/O channels 0 to 3. The pinouts of the D-Sub connector are shown in the following table.



Warning!

Where signals are not indicated in the table below or marked with NC, please do not connect external wiring to the connector pins. Failure to comply may result in damage to your board.

Table 2-1: Pinouts of Frontend 37-Pin D-Sub Connector (Sheet 1 of 2)

RS232	RS485 Half Duplex	RS422 Full Duplex	Pins	Channel
DCD	NC	RXD+	1	Channel 3
DSR	NC	RXD-	20	
RXD	NC	NC	2	
RTS	NC	NC	21	
TXD	TRXD+	TXD+	3	
CTS	TRXD-	TXD-	22	
DTR	NC	NC	4	
RI	NC	NC	23	
GND	*GND*	*GND*	*5*	*GND*
GND	*GND*	*GND*	*24*	
RI	NC	NC	6	Channel 2
DTR	NC	NC	25	
CTS	TRXD-	TXD-	7	
TXD	TRXD+	TXD+	26	
RTS	NC	NC	8	
RXD	NC	NC	27	
DSR	NC	RXD-	9	
DCD	NC	RXD+	28	

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Table 2-1: Pinouts of Frontend 37-Pin D-Sub Connector (Sheet 2 of 2)

RS232	RS485 Half Duplex	RS422 Full Duplex	Pins	Channel
DCD	NC	RXD+	10	Channel 1
DSR	NC	RXD-	29	
RXD	NC	NC	11	
RTS	NC	NC	30	
TXD	TRXD+	TXD+	12	
CTS	TRXD-	TXD-	31	
DTR	NC	NC	13	
RI	NC	NC	32	
GND	*GND*	*GND*	*14*	*GND*
GND	*GND*	*GND*	*33*	
RI	NC	NC	15	Channel 0
DTR	NC	NC	34	
CTS	TRXD-	TXD-	16	
TXD	TRXD+	TXD+	35	
RTS	NC	NC	17	
RXD	NC	NC	36	
DSR	NC	RXD-	18	
DCD	NC	RXD+	37	
NC	NC	NC	19	

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2.4.1.2 Connectors of 37-Pin-to-4x9-Pin Front Panel Adapter

In order to provide separate serial I/O channelling, a four-channel front panel adapter cable can be connected to the 37-pin front panel connector. This adapter terminates on the user side with four male 9-pin D-Sub connectors which include the signals of channels 0 to 3. The pinouts of the adapter's 9-pin D-Sub connectors are shown in the following table.



Warning!

Where signals are not indicated in the table below or marked with NC, please do not connect external wiring to the connector pins. Failure to comply may result in damage to your board.

Table 2-2: 9-Pin D-sub Connector Pinouts for Front Panel

DSUB Pin No.	RS 232 Signal	RS 485 Signal Half-Duplex	RS 422 Signal Full-Duplex
1	DCD	NC	RXD+
2	RXD	NC	NC
3	TXD	TRXD+	TXD+
4	DTR	NC	NC
5	*GND*	*GND*	*GND*
6	DSR	NC	RXD-
7	RTS	NC	NC
8	CTS	TRXD-	TXD-
9	RI	NC	NC

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2.4.2 PCI Interface

All variants of the CP346 are equipped with the standard PCI interface connector J1. For its pinouts please refer to the *Kontron Modular Computers* CompactPCI System Manual or to the CompactPCI Specification.



Note...

The CP346 requires 5V PCI V(I/O) signalling. It will not function properly with 3.3V V(I/O).

2.4.3 Rear I/O Interface

The rear I/O capable non-isolated board variant is provided with a PCI rear I/O interface connector J2. All signals from the TTL serial I/O interface are routed to this connector.

Table 2-3: Pinouts of Rear I/O Connector J2

Pin	Row “A”	Row “B”	Row “C”	Row “D”	Row “E”	Row “F”
1	reserved	GND	reserved	reserved	N/C	GND
2	reserved	+5V	reserved	reserved	N/C	GND
3	N/C	GND	N/C	N/C	reserved	GND
4	N/C	+5V	N/C	GND	reserved	GND
5	N/C	GND	N/C	N/C	N/C	GND
6	N/C	+5V	RI2	GND	N/C	GND
7	RI3	GND	N/C	RI1	RI0	GND
8	DCD3	+5V	DCD2	GND	DCD0	GND
9	DSR3	GND	N/C	DCD1	DSR0	GND
10	CTS3	+5V	DSR2	GND	CTS0	GND
11	RxD3	GND	N/C	DSR1	RxD0	GND
12	DTR3	+5V	CTS2	GND	DTR0	GND
13	RTS3	GND	N/C	CTS1	RTS0	GND
14	TxD3	+5V	RxD2	GND	TxD0	GND
15	N/C	GND	DTR2	RxD1	N/C	GND
16	+5V	+5V	RTS2	GND	+5V	GND
17	N/C	GND	TXD2	DTR1	N/C	GND
18	+5V	N/C	+5V	GND	+5V	GND
19	GND	GND	N/C	RTS1	N/C	GND
20	N/C	GND	N/C	GND	N/C	GND
21	N/C	GND	N/C	TxD1	N/C	GND
22	N/C	N/C	N/C	N/C	N/C	GND

N/C = not connected.

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Warning!

The power signals (+5V and GND) are power supply **OUTPUTS** to supply the rear I/O module with power. These pins **MUST NOT** be connected to any other power source, either within the backplane itself or within a rear I/O module.

Failure to comply with the above will result in damage to your board.

In addition, all pins marked reserved or N/C must not be used for any other purposes.

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Chapter 3

Installation

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3. Installation

3.1 Hardware Installation

The board described in this manual can be installed in any CompactPCI backplane slot except the system master slot. The front panel of the board should be safely secured by screws to the chassis to avoid loosening of the board through vibration and to ensure correct earth connection.



Caution!

If your board type is not specifically qualified as being hotswap capable, switch off the CompactPCI system power before installing the board in a free CompactPCI slot. Failure to do so could endanger your life or health and may damage your board or system.



ESD Equipment!

This CompactPCI board contains electrostatically sensitive devices. Please observe the necessary precautions to avoid damage to your board:

- Discharge your clothing before touching the assembly. Tools must be discharged before use.
- Do not touch components, connector-pins or traces.
- If working at an anti-static workbench with professional discharging equipment, please do not omit to use it.

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3.2 Standard Installation Procedures

To install the CP346 in a system proceed as follows:

1. Ensure that the safety requirements indicated Chapter 3.1 are observed.



Warning!

Failure to comply with the instruction below may cause damage to the board or result in improper system operation.

2. Ensure that the board is properly configured for operation in accordance with application requirements before installing. For information regarding the configuration of the CP346 refer to Chapter 4. For the installation of CP346 specific peripheral devices and rear I/O devices refer to the appropriate chapters in Chapter 3.



Warning!

Care must be taken when applying the procedures below to ensure that neither the CP346 nor other system boards are physically damaged by the application of these procedures.

3. To install the CP346 perform the following:
   1. Ensure that no power is applied to the system before proceeding.



Warning!

When performing the next step, **DO NOT** push the board into the backplane connectors. Use the ejector handles to seat the board into the backplane connectors.

   2. Carefully insert the board into the slot designated by the application requirements for the board until it makes contact with the backplane connectors.
   3. Using the ejector handle, engage the board with the backplane. When the ejector handle is locked, the board is engaged.
   4. Fasten the front panel retaining screws.
   5. Connect all external interfacing cables to the board as required.
   6. Ensure that the board and all required interfacing cables are properly secured.

4. The CP346 is now ready for operation. For operation of the CP346, refer to appropriate CP346 specific software, application, and system documentation.

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3.3 Standard Removal Procedures

To remove the board proceed as follows:

1. Ensure that the safety requirements indicated in Chapter 3.1 are observed.



Warning!

Care must be taken when applying the procedures below to ensure that neither the CP346 nor system boards are physically damaged by the application of these procedures.

2. Ensure that no power is applied to the system before proceeding.
3. Disconnect any interfacing cables that may be connected to the board.
4. Unscrew the front panel retaining screws.
5. Disengage the board from the backplane by first unlocking the board ejection handle and then by pressing the handle as required until the board is disengaged.
6. After disengaging the board from the backplane, pull the board out of the slot.
7. Dispose of the board as required.

3.4 CP346 Specific Installation

3.4.1 Board Location in the System

Board location within a system must be carefully considered. Depending on the number of CP346 boards, their locations in a given system and the operating system being used, application programs may have difficulty in identifying boards properly. In particular, when configuration changes such as board replacement, movement to another slot etc. are made after the initial system implementation. Therefore, any changes made to a system should be carefully considered before making the change, and proper operation be verified before the system is put into operation again.



Note...

When configuring a system it is recommended that all boards to be used first be installed in the system prior to installing any drivers or other board related software. Failure to do so may result in the non-identification of a given board or boards.

3.4.2 Cabling

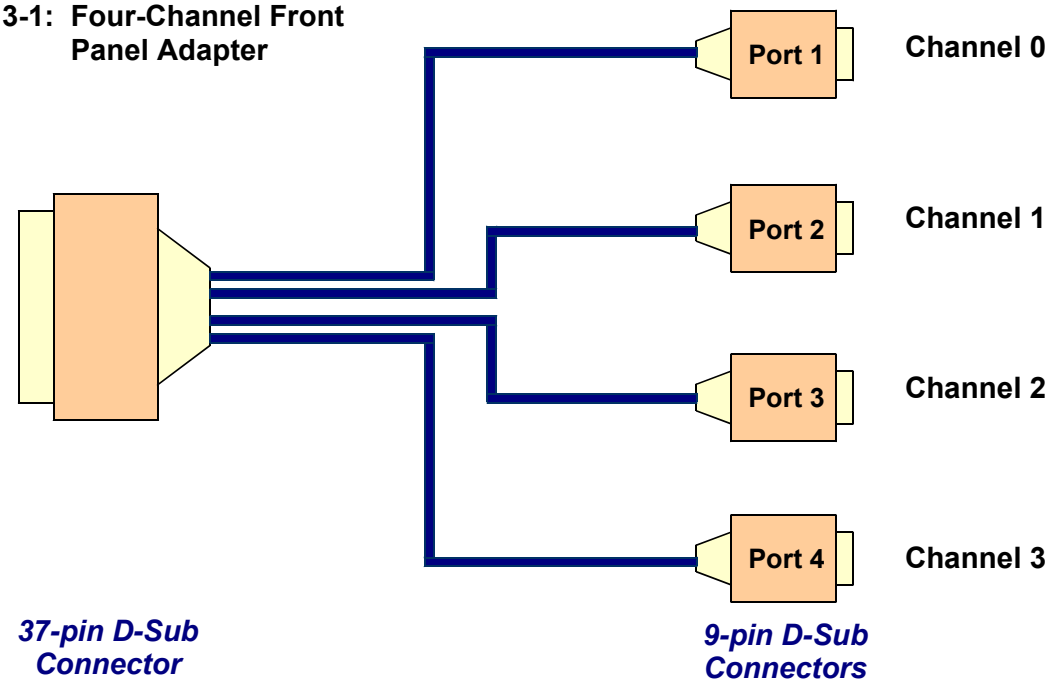
3.4.2.1 Four-Channel Front Panel Adapter

In order to provide separate serial I/O channelling, a four-channel front panel adapter cable can be connected to the 37-pin frontend connector of the CP346. This adapter terminates on the user side with four male 9-pin D-Sub connectors which include the signals of channels 0 to 3.

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The pinouts of the adapter's 37-pin and 9-pin D-Sub connectors are shown in the Functional Description chapter of this manual.

Figure 3-1: Four-Channel Front Panel Adapter



Note...

The port labelling on the 9-pin D-sub connectors is different to the channel numbering on the CP346.

Channel 0 corresponds to Port 1

Channel 1 corresponds to Port 2

Channel 2 corresponds to Port 3

Channel 3 corresponds to Port 4

3.4.2.2 Null-Modem Cable

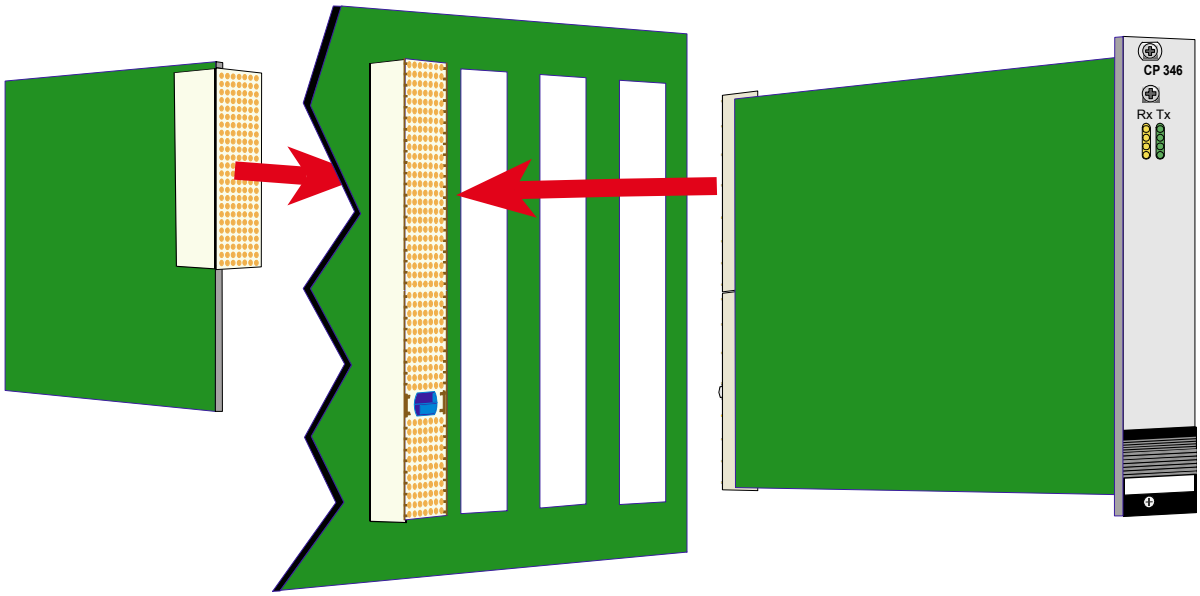
If operating in RS232 mode, a null-modem cable can be used in order to allow the use of a terminal program. The null-modem cable is provided with a 9-pin female D-Sub connector on either end, thus linking the adapter interface with the PC interface.

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3.4.3 Rear I/O Module

The rear I/O-capable variant of the CP346 is provided with a J2 connector for the transmission of the serial I/O via the CompactPCI backplane to a rear I/O module. A schematic view of the installation procedure is illustrated in the following figure.

Figure 3-2: Installation of Mainboard and Rear I/O Module



Note...

The rear I/O-capable CP346 board variant and the corresponding rear I/O module can only be installed in a backplane slot provided with a rear I/O-capable P2 connector.

3.5 Software Installation

Drivers for Windows® 2000, Windows® XP, Windows® XP Embedded, Linux® and VxWorks® are available for the CP346. For the installation of any required driver, please refer to the driver documentation contained in the software kit.

Note...

Before installing the driver software it is recommended that all boards required for the application be installed. Failure to do so may result in improper operation of the system.

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Chapter 4

Configuration

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4. Configuration

4.1 Hardware Configuration

4.1.1 Serial Mode Configuration

The CP346 offers the possibility to configure the operation mode of each channel either with a per default mounted eight Port DIP switch or with solder jumpers (maybe as replacement in case of special conformal coating requirements). Because the switches are implemented as GND switches and the DIP switch and the jumper option are wired OR, it is also thinkable to use both, where a set switch/jumper has always the higher priority.

Two dedicated switches/jumpers are necessary to configure each channel, where the following tables show the possible settings:

Table 4-1: Serial Mode Configuration for CP346

	Channel0		Channel1		Channel2		Channel3	
	DIP-Sw./Resistor		DIP-Sw./Resistor		DIP-Switch		DIP-Switch	
	1/R7	2/R8	3/R9	4/R10	5/R11	6/R12	7/R13	8/R14
RS232 (default)	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open
RS422 (4wire)	Off/Open	On/Set	Off/Open	On/Set	Off/Open	On/Set	Off/Open	On/Set
RS485 (2wire) with local echo	On/Set	Off/Open	On/Set	Off/Open	On/Set	Off/Open	On/Set	Off/Open
RS485 (2wire) without local echo	On/Set	On/Set	On/Set	On/Set	On/Set	On/Set	On/Set	On/Set

Table 4-2: Serial Mode Configuration for CP346-OPT

	Channel0		Channel1		Channel2		Channel3	
	DIP-Sw./Resistor		DIP-Sw./Resistor		DIP-Switch		DIP-Switch	
	1/R17	2/R16	3/R15	4/R14	5/R13	6/R12	7/R11	8/R10
RS232 (default)	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open	Off/Open
RS422 (4wire)	Off/Open	On/Set	Off/Open	On/Set	Off/Open	On/Set	Off/Open	On/Set
RS485 (2wire) with local echo	On/Set	Off/Open	On/Set	Off/Open	On/Set	Off/Open	On/Set	Off/Open
RS485 (2wire) without local echo	On/Set	On/Set	On/Set	On/Set	On/Set	On/Set	On/Set	On/Set

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4.1.2 RS422/485 Termination Jumpers

The CP346 offers onboard two 120 ohm termination resistors per channel, which can be used to terminate the differential line pairs in case the serial channel is a beginning or end node of a RS422/485 network.

Table 4-3: Termination Jumper Settings for CP346 and CP346-OPT

Ch.0	Ch.1	Ch.2	Ch.3	Setting	Description
J7	J6	J3	J2	Open (default) Set	Termination between TRXD± in half duplex mode or TXD± in full duplex mode Open: No 120 ohm termination Set: 120 ohm term. between differential lines
J8	J5	J4	J1	Open (default) Set	Termination between RXD± in full duplex mode Open: No 120 ohm termination Set: 120 ohm term. between differential lines

4.1.3 Handshake Control in Half Duplex RS485 Mode

In the two-wire half-duplex RS485 mode a handshake mechanism is necessary to prevent the sending and receiving of data at the same time over the same RS485 cabling. Otherwise a data crash would occur.

For the handshake mechanism the driver enable (DE) and receiver enable (RE) signals of the RS422/485 transceivers must be managed. This is achieved with the help of the CPLD logic receiving the RTS or DTR serial signals as inputs and generating the DE and RE signals as outputs for the transceivers. The Oxford OX16PCI954 driver uses the DTR signal for such control, but there may be other software on the market, where the RTS signal executes this task. Therefore on the CP346 and CP346-OPT the input signal to the CPLD is configurable as shown in the following tables:

Table 4-4: RS485 Transceiver Control for CP346

	Channel0		Channel1		Channel2		Channel3	
	R67	R68	R69	R70	R65	R66	R63	R64
DTR signal controls DE/RE (default)	Open	Set	Open	Set	Open	Set	Open	Set
RTS signal controls DE/RE	Set	Open	Set	Open	Set	Open	Set	Open

Table 4-5: RS485 Transceiver Control for CP346-OPT

	Channel0		Channel1		Channel2		Channel3	
	R4	R3	R52	R48	R47	R26	R22	R20
DTR signal controls DE/RE (default)	Open	Set	Open	Set	Open	Set	Open	Set
RTS signal controls DE/RE	Set	Open	Set	Open	Set	Open	Set	Open

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Depending on whether the RS485 mode is selected with or without local echo (refer to chapter 4.1.1 for the corresponding setting), the receiver RE signal is always “On” (with local echo) or the RE signal is inverted to the activation/deactivation of the driver DE signal (without local echo).



Note...

The hardware implementation on the CP346 works with low active DTR/RTS handshaking.

4.2 Software Configuration

Configuring is done as required using the drivers for Windows® 2000, Windows® XP, Windows® XP Embedded, Linux® and VxWorks®. For driver installation, please refer to the driver documentation supplied with the driver kit.

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Chapter 5

Rear I/O Modules

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5. Rear I/O Modules

This chapter includes a description of the rear I/O modules designed for operation with the rear I/O-capable board variant of the CP346 serial I/O controller board. The rear I/O modules are designed to optimize the cabling of a CP346 serial communications controller operating at the basic OSI levels, as it is described in the previous chapters of this manual.

Two types of rear I/O modules for the CP346 are currently available by Kontron Modular Computers. One is designed as a 4-channel serial I/O device supporting the RS232 industry standard. The other is designed as a 4-channel serial I/O device supporting the RS485 industry standard with optoisolation. The external interfacing connectors of the two modules also differ:

- CP-RIO3-46: an RS232, non-optoisolated, rear I/O module with four RJ45 connectors
- CP-RIO3-46-OPT: an RS485, optoisolated, two-wire, rear I/O module with a single, 50-pin, D-Sub connector

Like the non-rear I/O CP346 mainboard variants, the main functions implemented on the CP-RIO3-46 and CP-RIO3-46-OPT rear I/O modules are the OSI layer 2 control for RS232 or RS485 communications as well as the OSI layer 1 physical signal level adaptation for the above mentioned interfaces, where the RS485 interface is realized for half duplex operation.

The rear I/O modules are interfaced to the CP346 mainboard via their rJ2 rear I/O interface connector. The interface signals, which on the mainboard have been routed to the J2 connector instead of the front panel interfaces, are at TTL level. Their physical layer adaptation (OSI Layer 1) is realized for each channel via corresponding on-board RS232 or RS485 transceivers.

Mainboard Location in the System

Location of the CP346 mainboard within a system must be considered carefully. Depending on the number of boards, their locations in a given system, and the operating system being used application programs may have difficulty identifying boards properly. In particular, when configuration changes such as board replacement, movement to another slot, etc. are made after the initial system implementation. Therefore, any changes made to a system should be carefully considered prior to making the change and proper operation be verified before the system is put into operation again.



Note...

When configuring a system it is recommended that all boards to be used be installed in the system prior to installing any drivers or other board-related software. Failure to do so may result in the non-identification of a given board or boards.

Operating Systems

The CP346 and its rear I/O modules can operate under the following operating systems:

- Windows® 2000, Windows® XP, Windows® XP Embedded,
- Linux®
- VxWorks®

Drivers are supplied for these operating systems.

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5.1 Non-Optoisolated Rear I/O Module

The CP-RIO3-46 rear I/O module is a 4-channel serial I/O device supporting the RS232 industry standard. The CP-RIO3-46 is provided with the following key features:

- up to 115.2 kBaud asynchronous transmission
- 4 serial channels
- RJ45 connector block (one connector for each channel)
- RS232 standard
- control LEDs both on the module's and the mainboard's front panels
- Windows® 2000, Windows® XP, Windows® XP Embedded, Linux® and VxWorks®, drivers

The supply voltage for the module is 5V DC.



Warning!

The power signals (+5V and GND) are power supply **INPUTS** to supply the rear I/O module with power. These pins **MUST NOT** be connected to any other power source, either within the backplane itself or within the rear I/O module.

Failure to comply with the above will result in damage to the CPU board, and can result in damage to the RIO module.

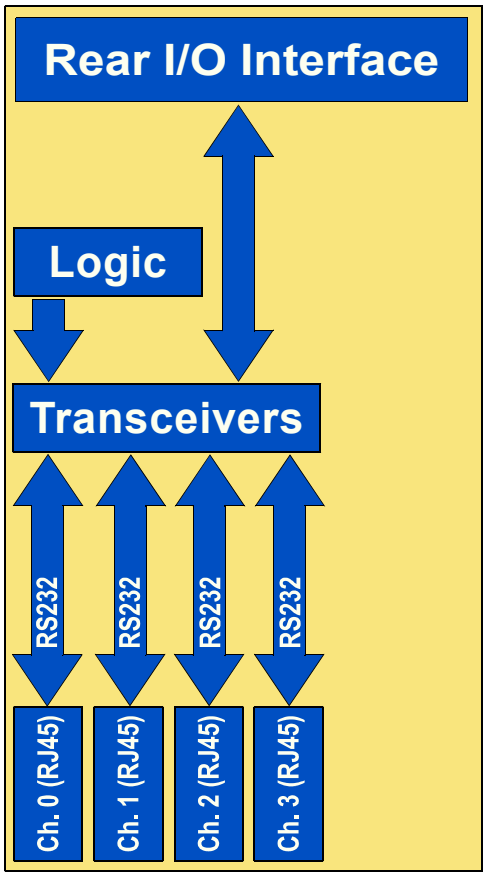
In addition, all pins that are reserved or N/C must not be used for any other purposes.

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5.1.1 Board Diagrams

5.1.1.1 Functional Block Diagram

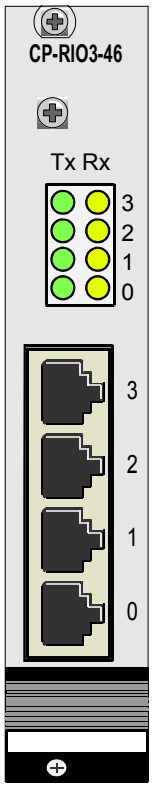
Figure 5-1: CP-RIO3-46 Functional Block Diagram



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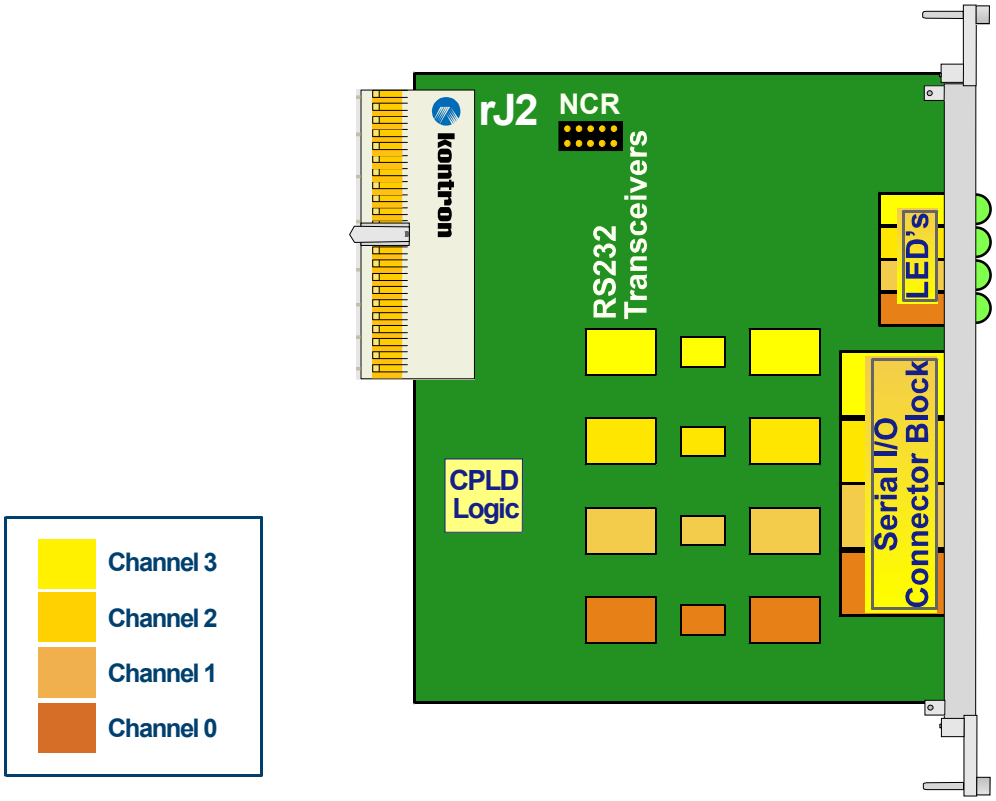
5.1.1.2 Front Panel

Figure 5-2: CP-RIO3-46 Front Panel



5.1.1.3 Board Layout

Figure 5-3: CP-RIO3-46 Board Layout



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5.1.2 Module Front Panel Interfacing

The non-optoisolated rear I/O module CP-RIO3-46 is equipped with a serial I/O connector block consisting of four RJ45 connectors which include the signals of channels 0 to 3. The pinouts of the RJ45 connectors are shown in the following table.

Figure 5-4: Orientation and Pinouts of the CP-RIO3-46 Serial I/O Connector

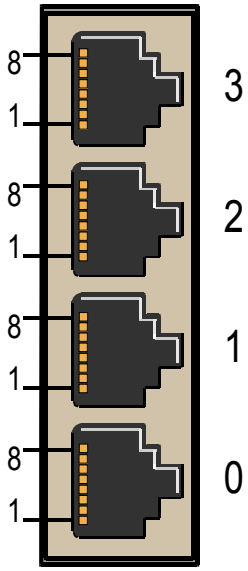


Table 5-1: Pinouts of Rear I/O Module RJ45 Connectors 0 ... 3

RS232	Pin	Channel	RS232	Pin	Channel
DSR	1	0	DSR	1	2
RTS	2		RTS	2	
GND	3		GND	3	
TxD	4		TxD	4	
RxD	5		RxD	5	
DCD	6		DCD	6	
CTS	7		CTS	7	
DTR	8		DTR	8	
DSR	1	1	DSR	1	3
RTS	2		RTS	2	
GND	3		GND	3	
TxD	4		TxD	4	
RxD	5		RxD	5	
DCD	6		DCD	6	
CTS	7		CTS	7	
DTR	8		DTR	8	

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5.1.3 Single-Channel Front Panel Adapter

In order to comply with standard PC interface technology, a single-channel RJ45-to-D-Sub front panel adapter (CP-ADAP-RJ45-DSUB9-PC) can be connected to the RJ45 frontend connector of each channel of the non-optoisolated rear I/O module (CP-RIO3-46). This adapter terminates on the user side with a 9-pin, male, D-Sub connector which includes the signals of the relating channel. The shielded adapter cable has a length of approximately 15 cm.

Figure 5-5: Four-Channel Front Panel Adapter



Warning!

Where signals are not indicated in the table below, do not connect external wiring to the connector pins. Failure to comply may result in damage to the RIO module.

Table 5-2: Pinouts of RJ45-to-D-Sub Frontpanel Adapter Connectors

RJ45 CONNECTOR	RS232	9-PIN ROW CONNECTOR	CHANNEL
1	DSR	6	*n* with *n* = 0..3
2	RTS	7	
3	GND	5	
4	TxD	3	
5	RxD	2	
6	DCD	1	
7	CTS	8	
8	DTR	4	
—	—	9	

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5.1.4 Technical Specifications

Table 5-3: CP-RIO3-46 Technical Specifications

CP-RIO3-46	SPECIFICATIONS
Serial I/O Standards	RS232
Channels	Four serial I/O channels
Data Rates	Maximum: 115.2 kBaud, asynchronous
Programmable Data Formats	Data Bits: 5 to 8 Parity: Odd, even, none, mark, space Stop Bits: 1, 1.5, or 2 Flow Control: None, Xon/Xoff, hardware
Channel Mode	RS232
External Board Interfaces	4 x RJ45 connectors
LEDs	8 operation indicator LEDs, two for each channel: • Yellow RxD • Green TxD The same LEDs are repeated on the mainboard's front panel.
Electrical Parameters	• Overvoltage protection: ±12 V • Power supply: 5 V DC +5%, -3% • Power consumption: 280 mA * * At 5V DC inclusive CP346-RIO mainboard
General Parameters	Temperature Ranges: • 0°C to +70°C (operation, standard) • -40°C to +85°C (operation, extended) • -55°C to +125°C (storage) Humidity: 0..90%, non-condensing Dimensions: 80mm x 100mm Weight: 95g approximately

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5.2 Optoisolated Rear I/O Module

The CP-RIO3-46-OPT rear I/O module is a 4-channel serial I/O device supporting the RS485 industry standard. The serial I/O channels of this module are optoisolated. The CP-RIO3-46-OPT is provided with the following key features.

- up to 115.2 kBaud asynchronous transmission
- 4 serial channels
- 50-pin, dual row, female, D-Sub connector (all channels on one connector)
- RS485 standard (without local echo)
- 1kV process-to-system side optoisolation
- bus termination resistors, hardware selectable
- control LEDs both on the module's and mainboard's front panels
- Windows® 2000, Windows® XP, Windows® XP Embedded, Linux® and VxWorks® drivers

The supply voltage for the module is 5V DC. It is provided by two 5V/5V on-board DC/DC converters, one for the channels 0/1 and one for channels 2/3.



Warning!

The power signals (+5V and GND) are power supply **INPUTS** to supply the rear I/O module with power. These pins **MUST NOT** be connected to any other power source, either within the backplane itself or within the rear I/O module.

Failure to comply with the above will result in damage to the CPU board, and can result in damage to the RIO module.

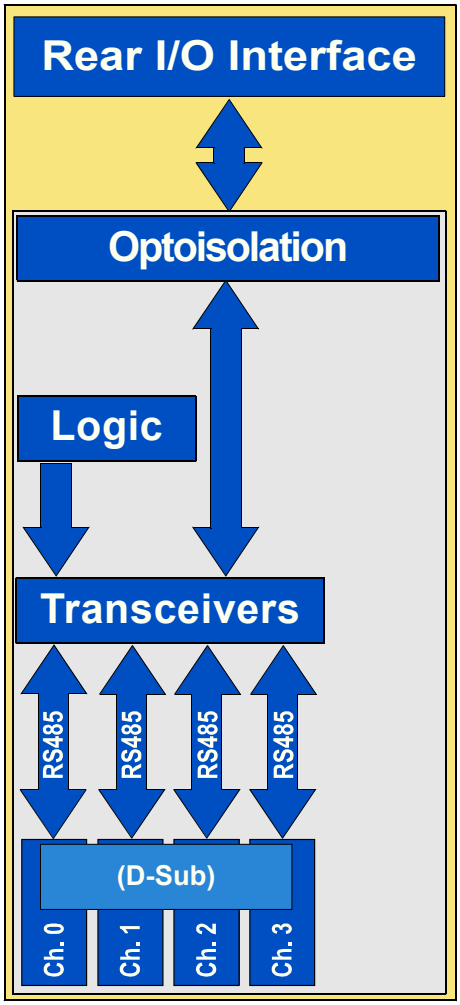
In addition, all pins that are reserved or N/C must not be used for any other purposes.

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5.2.1 Board Diagrams

5.2.1.1 Functional Block Diagram

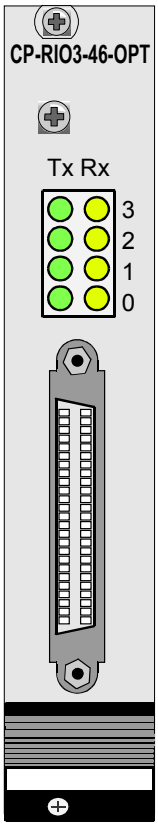
Figure 5-6: CP-RIO3-46-OPT Functional Block Diagram



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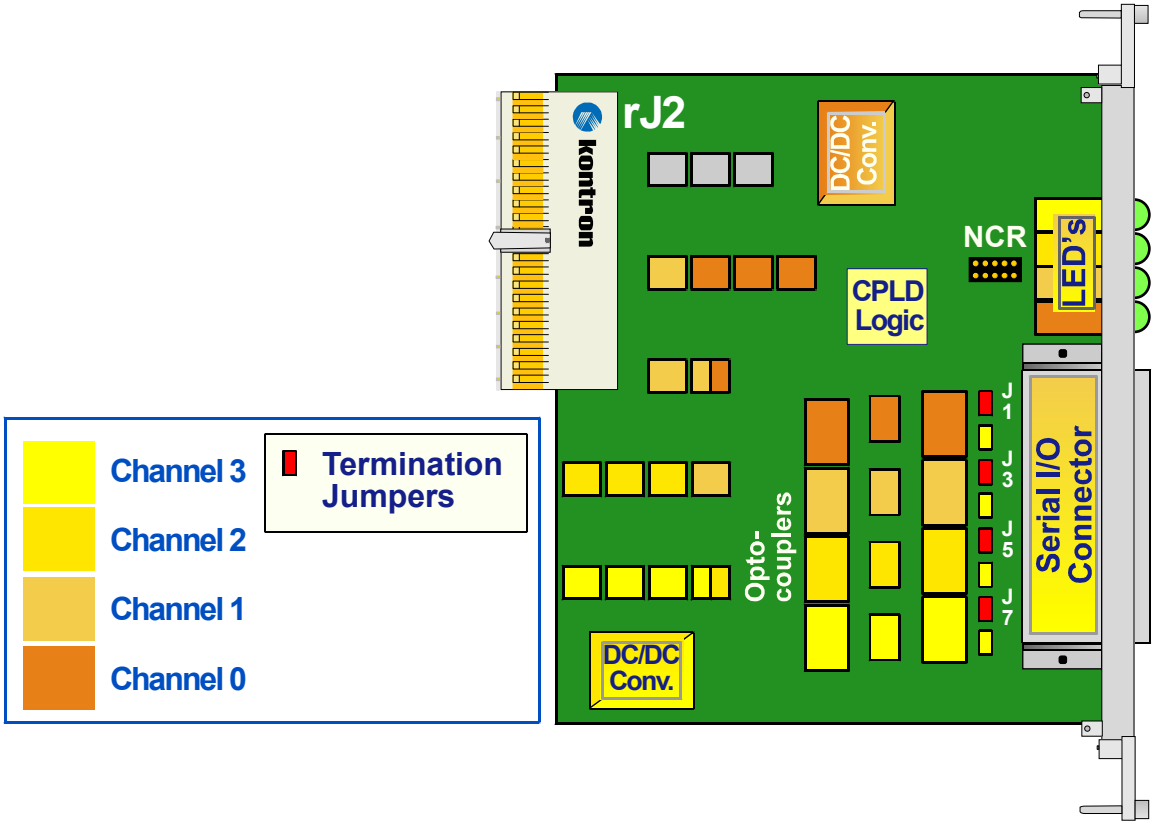
5.2.1.2 Front Panel

Figure 5-7: CP-RIO3-46-OPT Front Panel



5.2.1.3 Board Layout

Figure 5-8: CP-RIO3-46-OPT Board Layout



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5.2.2 Module Front Panel Interfacing

The optoisolated rear I/O module CP-RIO3-46-OPT is equipped with a 50-pin, dual row, female D-Sub connector comprising the signals of serial I/O channels 0 to 3. The pinouts of the D-Sub connector are shown in the following table.

Figure 5-9: Orientation and Pinouts of the CP-RIO3-46-OPT Serial I/O Connector



Warning!

Where signals are not indicated in the below table, please do not connect external wiring to the connector pins. Failure to comply may result in damage to your board.

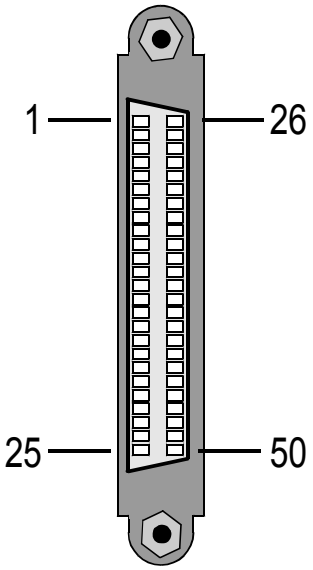


Table 5-4: Pinout of 50-Pin Female High-Density D-Sub Connector

RS485 HALF DUPLEX	PIN	CHNL	PIN	RS485 HALF DUPLEX
TRxD+	1	0	26	TRxD-
—	2		27	—
—	3		28	—
—	4		29	—
—	5		30	—
GND	6		31	—
TRxD+	7	1	32	TRxD-
—	8		33	—
—	9		34	—
—	10		35	—
—	11		36	—
GND	12		37	—

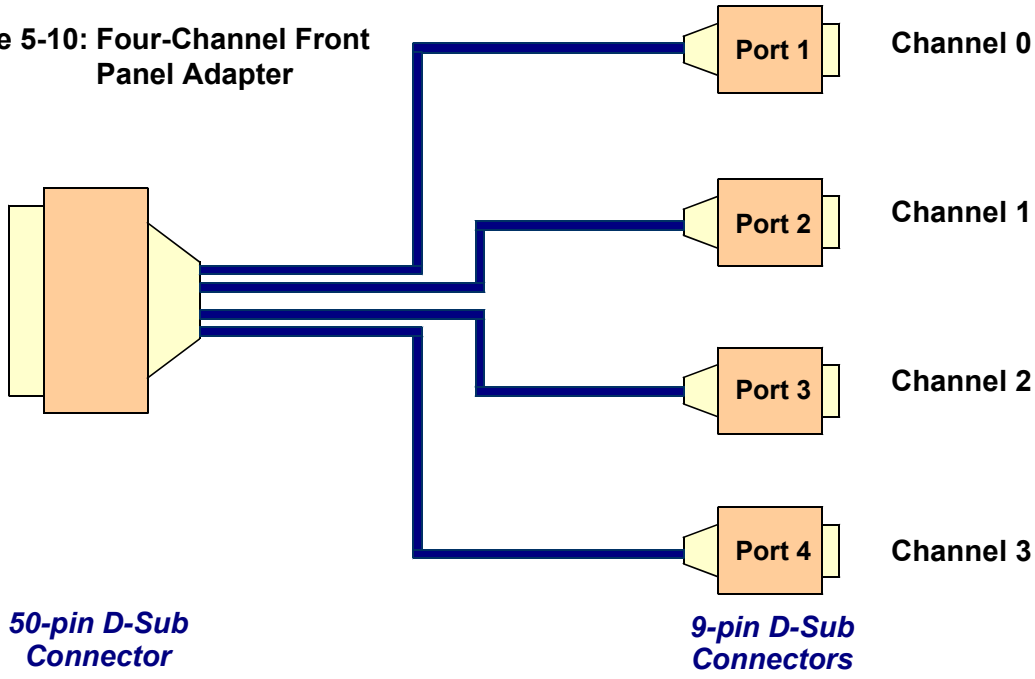
RS485 HALF DUPLEX	PIN	CHNL	PIN	RS485 HALF DUPLEX
TRxD+	13	2	38	TRxD-
—	14		39	—
—	15		40	—
—	16		41	—
—	17		42	—
GND	18		43	—
TRxD+	19	3	44	TRxD-
—	20		45	—
—	21		46	—
—	22		47	—
—	23		48	—
GND	24		49	—
—	25		50	—

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5.2.3 Four-Channel Frontpanel Adapter

In order to provide separate serial I/O channelling, a four-channel front panel adapter (CP-ADAP-CP345-DSUB50) can be connected to the 50-pin frontend connector of this optoisolated rear I/O module. This adapter terminates on the user side with four, male, 9-pin, D-Sub connectors which include the signals of channels 0 to 3. The adapter cables have a length of approximately 15 cm.

Figure 5-10: Four-Channel Front Panel Adapter





Note...

The port labelling on the 9-pin D-sub connectors is different to the channel numbering on the CP346.

Channel 0 corresponds to Port 1

Channel 1 corresponds to Port 2

Channel 2 corresponds to Port 3

Channel 3 corresponds to Port 4



Warning!

Where signals are not indicated in the table below, please do not connect external wiring to the connector pins. Failure to comply may result in damage to your board.

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Table 5-5: Pinouts of Front Panel Adapter Connectors (Sheet 1 of 2)

50-Pin Row Connector	RS422/RS485 Half Duplex	9-Pin Row Connectors	Channel
1	TRxD+	3	0
26	TRxD-	8	
2	—	—	
27	—	—	
3	—	1	
28	—	6	
4	—	—	
29	—	—	
5	—	7	
30	—	4	
6	GND	5	
31	—	2	
7	TRxD+	3	1
32	TRxD-	8	
8	—	—	
33	—	—	
9	—	1	
34	—	6	
10	—	—	
35	—	—	
11	—	7	
36	—	4	
12	GND	5	
37	—	2	
13	TRxD+	3	2
38	TRxD-	8	
14	—	—	
39	—	—	
15	—	1	
40	—	6	
16	—	—	
41	—	—	
17	—	7	
42	—	4	
18	GND	5	
43	—	2	

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Table 5-5: Pinouts of Front Panel Adapter Connectors (Sheet 2 of 2)

50-Pin Row Connector	RS422/RS485 Half Duplex	9-Pin Row Connectors	Channel
19	TRxD+	3	3
44	TRxD-	8	
20	—	—	
45	—	—	
21	—	1	
46	—	6	
22	—	—	
47	—	—	
23	—	7	
48	—	4	
24	GND	5	
49	—	2	
25	—		—
50	—		

5.2.4 RS485 Termination Jumpers

The CP-RIO3-46-OPT offers onboard one 120 ohm termination resistor per channel which can be used to terminate the differential line pairs in case the serial channel is a beginning or end node of a RS485 two-wire network.

Table 5-6: Termination Jumper Settings for CP-RIO3-46-OPT

CHANNEL				SETTING	DESCRIPTION
0	1	2	3		
J1	J3	J5	J7	Open (default)	No 120 ohm termination
				Set	120 ohm termination between the differential lines Termination between TRXD± in half duplex mode.

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5.2.5 Technical Specifications

Table 5-7: CP-RIO3-46-OPT Technical Specifications

CP-RIO3-46-OPT	SPECIFICATIONS
Serial I/O Standard	RS485
Channels	Four serial I/O channels
Data Rates	Maximum: 115.2 kBaud, synchronous
Data Formats	Data Bits: 5 to 8 Parity: Odd, even, none, mark, space Stop Bits: 1, 1.5, or 2 Flow Control: None, Xon/Xoff, hardware
Channel Mode	RS485 • balanced, half duplex • without local echo • with local echo (optional)
External Board Interfaces	• 50-pin, dual row, female, high-density D-Sub connector
LEDs	8 operation indicator LEDs, two for each channel: • Yellow RxD • Green TxD The same LEDs are repeated on the mainboard's front panel.
Electrical Parameters	Overvoltage protection: ± 12 V Power supply: 5 V DC + 5%, - 3% Power consumption: 490 mA * typ. Optoisolation voltage: 1kV (process-to-system side) * At 5V DC inclusive CP346-RIO mainboard
General Parameters	Temperature Ranges: • 0°C to +70°C (operation, standard) • -40°C to +85°C (operation, extended) • -55°C to +125°C (storage) Humidity: 0..90%, non-condensing Dimensions: 80mm x 100mm Weight: 95g approximately

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