Modular Computers ®

CP345

Quad High-Speed
Serial Controller Board

Manual ID 19979, Rev. Index 03
Nov 00

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

Revision History

Manual/Product Title:	CP345		
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Rev. Index	**Brief Description of Changes**	**Board Index**	**Date of Issue**
01	Initial Issue	1000 / 0000	Mar 00
02	Third board variant, rear I/O module added	02 / 00	Nov. 00
03	Frontpanel adapters, 0-modem cable added	02 / 00	Nov. 00

Imprint

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This manual was realized by: **TPD/Engineering, PEP Modular Computers GmbH**.

Preface

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Preface

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Documentation Overview

This manual has been written for OEM software and hardware engineers to correctly understand the features and specifics of the product described in it. The manual is intended also for professional training purposes.

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Related Publications

For any details not described in the product documentation of the CP345 serial controller board, please refer to the following publications.

- PICMG CompactPCI Specification, V. 2.0, Rev. 3.0
- PCI Special Interest Group: PCI Local Bus Specification, V. 2.1 of 1 June 95
- *PEP Modular Computers GmbH:* CompactPCI System Manual, ID 19954

Terminology

In the following a glossary of technical terms and acronyms is supplied which may be used in this document.

ADC	Analog to Digital Converter
API	Application Program Interface
ASIC	Application-Specific Integrated Circuit
BIOS	Basic Input / Output System
BSP	Board Support Package
CPCI	CompactPCI
CPLD	Complex Programmable Logic Device
CPU	Central Processing Unit
DAC	Digital to Analog Converter
DIL	Dual In-Line package for components
DMA	Direct Memory Access
DOS	Disk-based Operating System
DP	Decentralized Periphery
DPRAM	Dual-Ported Random-Acces Memory
DRAM	Dynamic Random-Access Memory is a volatile memory known for its density and low cost
EEPROM	Electrically Erasable Programmable Read-Only Memory is nonvolatile and electrically byte-erasable
EMC	Electro Magnetic Compatibility
EPROM	Erasable Programmable Read-Only Memory is a mature, high-density, nonvolatile technology which provides a degree of updatability not found in ROM
FET	Field Effect Transistor
FIFO	First In / First Out memory
Flash EPROM	Block Erasable and Programmable Read Only Memory which combines advantages from each of the above mentioned memory technologies. In embedded memory applications, Flash EPROM memory provides higher performance for more flexibility then ROM and EPROM, while providing higher density and better cost effectiveness than battery-backed SRAM or EPROM.
FM-DP	PROFIBUS DP slave add-on module
GND	Signal Ground
HW	Hardware
HF	High Frequency
I/O	Input / Output

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IRQ	Interrupt request
ISA	Industrial Standard Architecture compatible with IEEE P996
OS	Operating System
PB	Piggyback, small exchangeable interface board plugged onto a mainboard.
PC	IBM compatible Personal Computer
PCB	Printed Circuit Board
PCI	Peripheral Component Interface
PICMG	PCI Industrial Computers Manufacturers Group
PLL	Phase-Lock Loop
PMC	PCI Mezzanine Card
PROFIBUS	PROcess FIeld BUS
RAM	Random Access Memory
ROM	Read-Only Memory is a mature, high-density, nonvolatile, reliable and low cost memory technology
RTOS	Real Time Operating System
SW	Software
SIMM	Single In-Line Memory Module
SMD	Surface Mount Device
SRAM	Static Random-Access Memory is a high-speed, reprogrammable memory technology which is limited by its volatility and relative high cost
SSP	System Support Package
STP	Shielded Twisted Pair cable (used for 10BT Ethernet transmissions)
TBD	To Be Defined
TSOP	Thin Small Outline Package
TTL	Transistor Transistor Logic
VCC	Supply Voltage (+5V)
XDR	External Data Representation

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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.



Developer’s Note

This symbol and title emphasize aspects that concern only system integrators including a *PEP* device into a larger equipment , or developers programming application software.



PEP Advantage

This symbol and title emphasize advantages or positive aspects of a product and/or procedure.

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Your new *PEP* product was developed and tested carefully to provide all features necessary to ensure the renown 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 interests of your own safety and of the correct operation of your new *PEP* product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions



Warning!

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Caution, Electric Shock!

However, serious electrical shock hazards exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable to avoid exposure to hazardous voltage.

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

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 safe work stations are not guaranteed, it is important for the user to be electri-cally 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 back-up, 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 tracks on the board.

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- 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 re-pack 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 following page of this manual.

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Chapter 1

Introduction

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1. Introduction

1.1 System Overview

The *PEP Modular Computers* CompactPCI product described in this chapter operates with the PCI bus architecture to support additional I/O and memory-mapped devices as required by various industrial applications. For detailled 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): http://www.picmg.org*.

Many system-relevant CompactPCI features that are specific for *PEP Modular Computers* CompactPCI systems can be found in the *PEP* CompactPCI System Manual. Please refer to the section “Related Publications” 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 necessary information to combine *PEP Modular Computers* 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 *PEP Modular Computers* CompactPCI boards, such as functionality, hot-swap capability. In addition, an overview is given for all existing *PEP Modular Computers* CompactPCI boards with links to the relating datasheets.
- Generic information on the *PEP Modular Computers* CompactPCI backplanes, such as the slot assignment, PCB form factor, distinctive features, clocks, power supply connectors and signalling environment, as well as an overview over the *PEP Modular Computers* CompactPCI standard backplane family.
- Generic information on the *PEP Modular Computers* CompactPCI power supply units, such as the input/output characteristics, redundant operation and distinctive features, as well as an overview over the *PEP Modular Computers* CompactPCI standard power supply unit family.

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1.2 Board Overview

1.2.1 Board-Specific Information

The CP345 is a high speed, 4-channel serial I/O device supporting the RS232, RS422 and RS485 industry standards. Three board variants are currently available, a non-optoisolated standard one, a non-optoisolated variant provided with rear I/O connectivity, and an optoisolated variant. The external interfacing of the board variants differ (four-RJ45 connector block or 50-pin row D-Sub connector), while the input/output signals are identical. The optoisolation of the front and rear panel interfaces respectively is accomplished through the use of a transition module (CP345-TR1) which plugs into the CP345 main board or through an optoisolated rear I/O module (CP-RIO-345-OPT).

- 32-bit CompactPCI board, 33 MHz
- Up to 1 MBaud asynchronous transmission
- Up to 10 MBaud synchronous transmission
  (with customized piggyback module or rear I/O)
- Optoisolated or non-optoisolated board variants
- 4 independent serial channels
- One RJ45 connector block (non-optoisolated version) or
  one 50-pin row D-Sub connector (optoisolated version)
- DMA-transfer, bus master capable
- RS232, RS422, and RS485 standards
- Each channel individually programmable per software
- Bus termination resistors (RS422/RS485) software selectable
- Control LED's on the front panel and, if used, on the rear I/O module
- Rear I/O-capable board variant
  (for optoisolated or non-optoisolated rear I/O module)
- Jumperless configuration
- Windows NT® 4.0, QNX® and VxWorks® drivers

1.2.2 Board Variants

Three different variants of the CP345 main board are available:

- Non-optoisolated standard version
- Non-optoisolated version providing rear I/O connectivity
- Optoisolated version with serial I/O transition module CP345-TR1 (no rear-I/O)

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

- Frontpanel connector block (one connector per I/O channel)
- Frontpanel connector (all I/O channels) plus transition module interface connectors
- Rear I/O connector

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

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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-Optoisolated Standard Board Variant	Non-Optoisolated Rear I/O-Capable Board Variant	Optoisolated Board Variant
Frontpanel Connectors	Serial I/O connector block (4 x RJ45)	—	Serial I/O connector (D-Sub, on T/M)
On-Board Connectors		Rear-I/O connector (J2)	T/M Interface (CON3)
		—	T/M Interface (CON2, on T/M)

T/M = Transition module

1.2.3 Transition Module

The transition module CP345-TR1 which connects to the optoisolated board variant mainboard provides the optoisolation, serial I/O transceivers and external interfacing connector of this board variant. Its own transition module interface connector CON2 (male) is mounted to the mainboard transition module interface connector CON3 (female) and is fixed using two stand-off bolts thus building a single unit.

The size of the transition module (53mm x 91mm) is such to allow the placement of four modules on a possible 6U serial I/O controller board.

1.2.4 Rear-I/O Modules

The non-optoisolated board variant allows for the installation of a rear-I/O module. If a rear-I/O module is used, the frontend signals are mirrored to a J2 rear-I/O connector. Two variants of the CP345 rear-I/O module can be installed:

- Non-optoisolated
- Optoisolated

The two variants of the rear-I/O module differ in terms of their interface connectors (see table above).

1.2.5 Frontpanel Adapters

The non-optoisolated standard variant of the CP345 serial I/O board is provided with a serial I/O connector block (four RJ45 connectors). Each of the RJ45 jacks is dedicated to a single serial I/O channel. In order to comply with standard PC interface technology, a single-channel RJ45-to-D-Sub frontpanel adapter (CP-ADAP-RJ45-D5009/PC) can be connected to the frontend interface of each channel. This adapter terminates on the user side with a 9-pin male D-Sub connector which includes the signals of the relating channel.

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The optoisolated board variant is equipped with a single serial I/O connector providing the signals for all four serial I/O channels. In order to provide separate serial I/O channelling, a frontpanel adapter (CP-ADAP-CP345-DSUB50) can be connected to the 50pin frontend connector. This adapter terminates on the user side with four male 9-pin DSub connectors, one per serial I/O channel.

Depending on the rear I/O module (optoisolated or non-opto-isolated) used, either one or the other of the two frontpanel adapters can be linked also to the frontpanel connector(s) of the rear I/O modules.

1.2.6 System-Relevant Information

1.2.6.1 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.

1.2.6.2 Operating Systems

The CP345 can operate under the following operating systems:

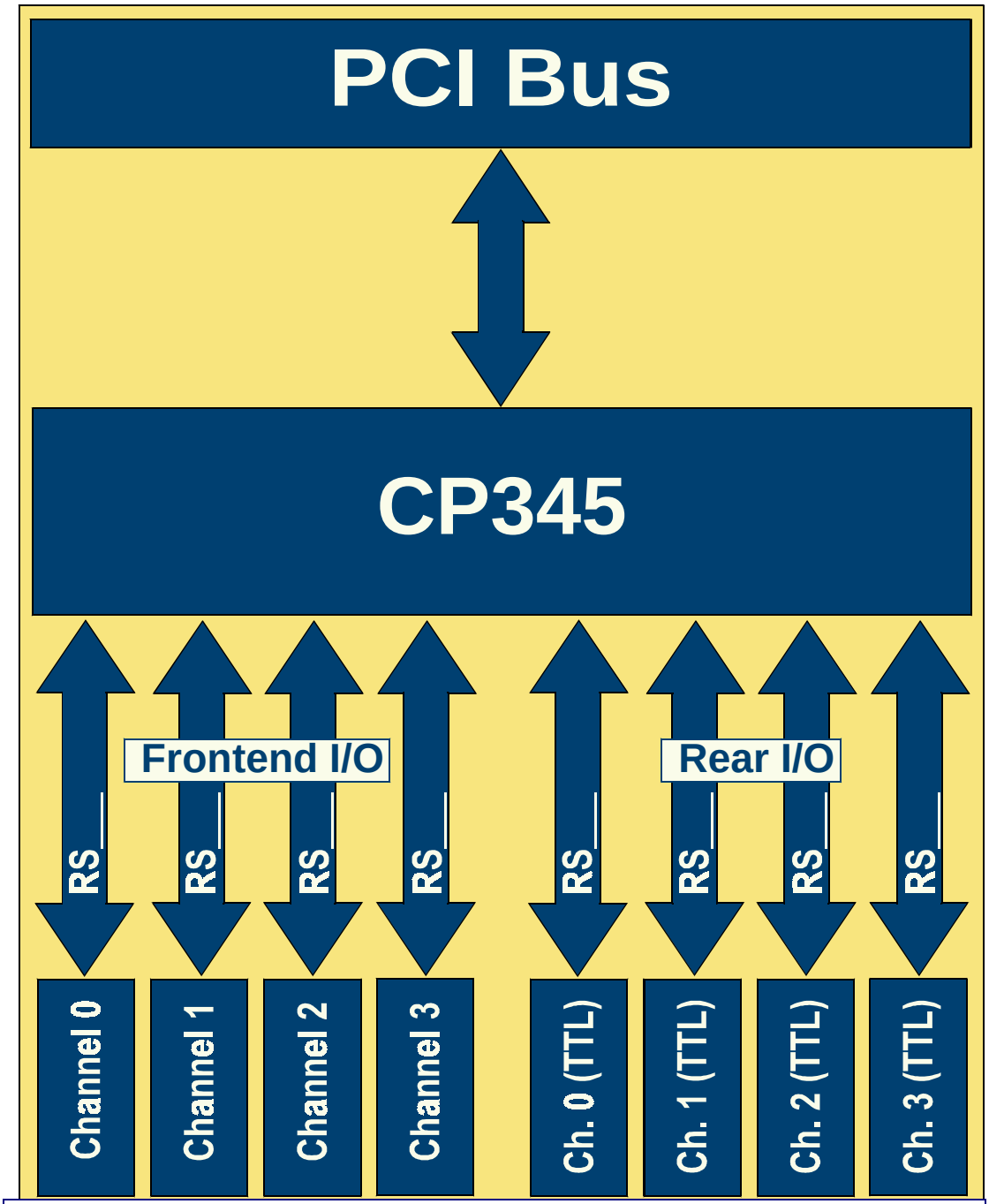
- Windows© NT 4.0
- QNX©
- VxWorks©

Drivers are supplied for these operating systems.

1.3 Board Diagrams

1.3.1 Functional Block Diagram

Figure 1-1: CP345 Functional Block Diagram



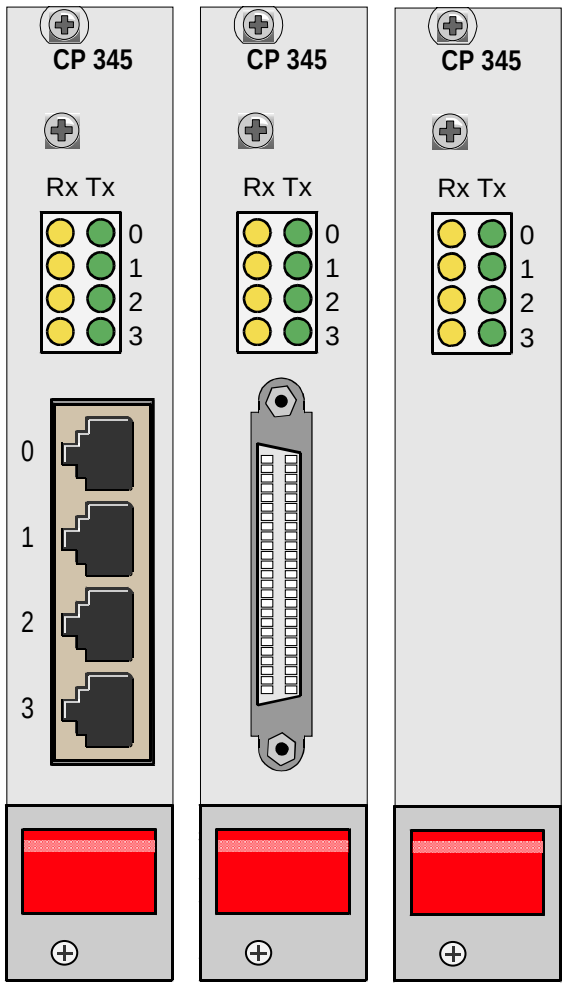
Frontend I/O, Rear I/O alternatively. For a functional block diagram of the rear I/O modules, please see the Rear I/O Modules chapter of this manual.

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

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1.3.2 Frontpanels

Figure 1-2: CP345 Frontpanels



Legend:

Non-optoisolated variant (left), optoisolated variant (center), rear I/O-capable variant (right).

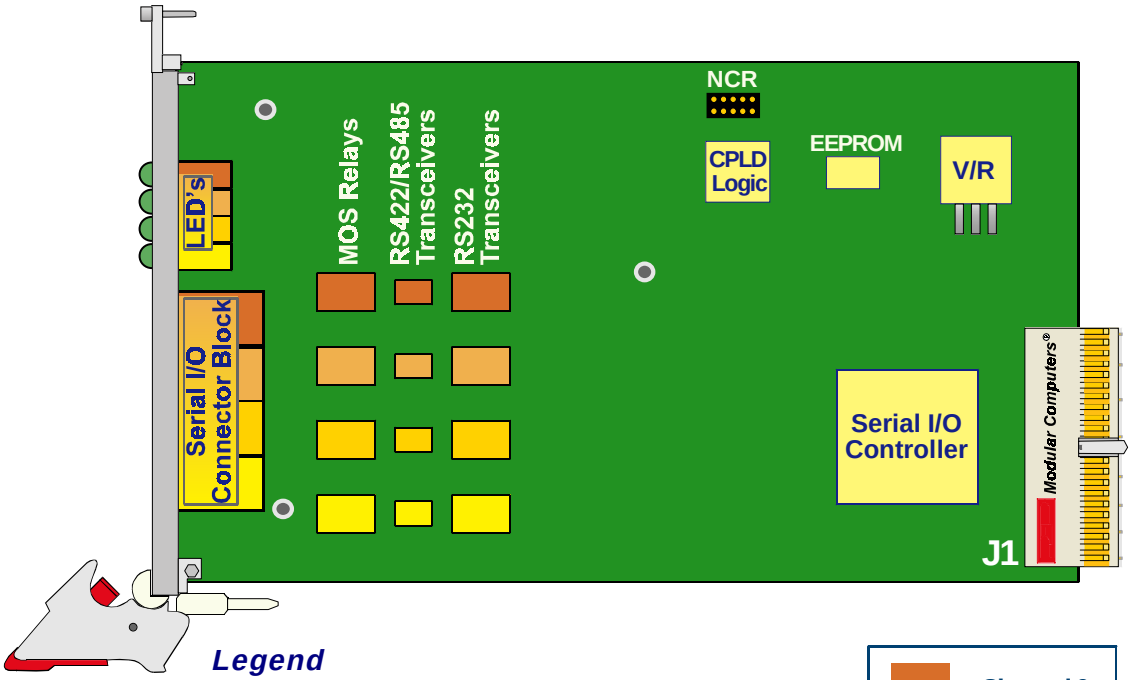
Note...

The frontpanels of the CP345 rear-I/O modules are identical to those of the non-optoisolated or, respectively, of the optoisolated mainboard variants except for the fact that their lower ends are fastened to the rack by means of screws.

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1.3.3 Board Layouts

Figure 1-3: CP345 Board Layout – Non-Optoisolated Board Variants

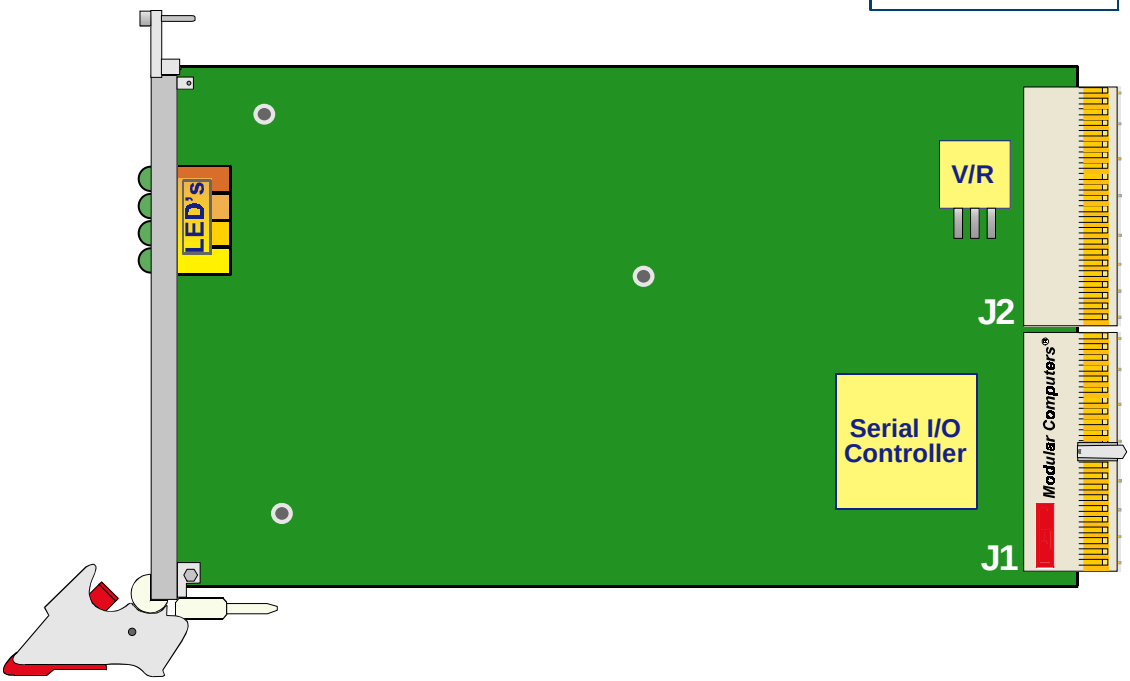


Legend

NCR= Not customer-relevant
V/R = Voltage regulator

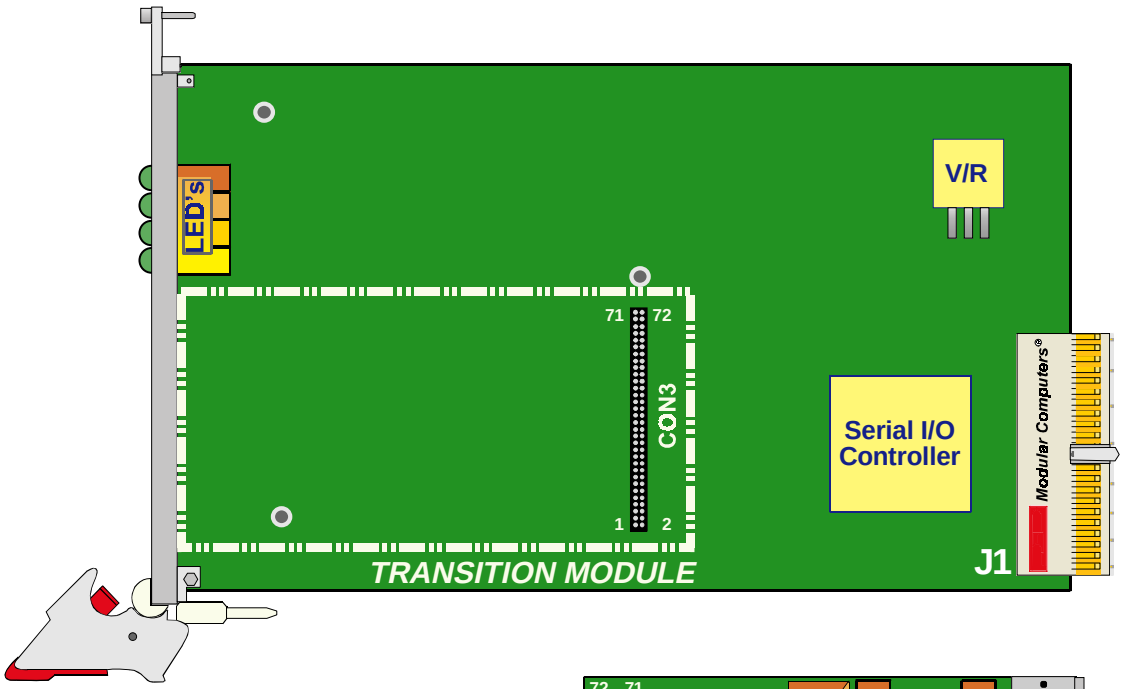
For the board diagrams of the CP-RIO-345 rear I/O modules please refer to the Rear I/O Modules chapter of this manual.





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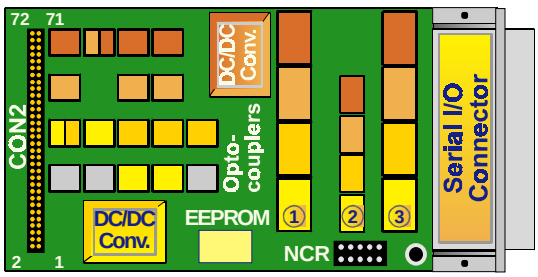
Figure 1-4: CP345 (Optoisolated Variant) and CP345-TR1 Board Layouts

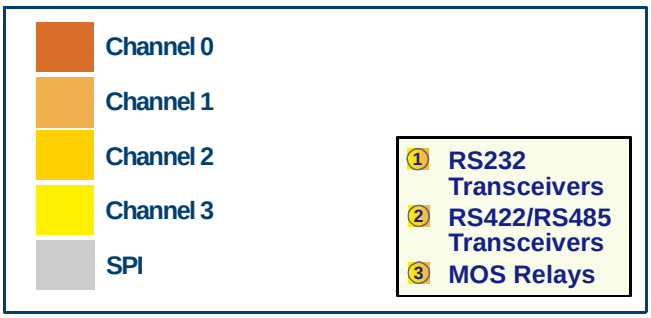


Legend

NCR = Not customer relevant

Transition Module CP345-TR1





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1.4 Technical Specifications

Table 1-2: CP345 Technical Specification (Sheet 1 of 2)

CP345	Specification
Serial I/O Standards	RS-232, RS-422 and RS-485
Channels	Four serial I/O channels, individually configurable via software
Controller	Siemens DSCC-4 (PEB 20534)
Data Rates	• asynchronous: max. 1 MBaud (RS-232: max. 120kBaud) • synchronous: max. 10 MBaud* *With customized piggyback module or rear I/O
Programmable Data Formats	Data Bits: 5 to 8 Parity: Odd, even, none Stop Bits: 1 or 2
Programmable Channel Modes	RS232 • unbalanced • disabled RS422 • balanced, half duplex • balanced, full duplex • disabled RS485 • balanced, half duplex • balanced, full duplex • disabled Disabled
Resources Required	• One IRQrequired • Memory-mapped areas of 256 Byte and 64 kByte required
External Board Interfaces	• 4 x RJ45 (non-optoisolated version) • 50-pin high-density D-Sub (optoisolated version)
LED's	8 operation indicator LED's, two for each channel: • Yellow RxD • Green TxD
Optoisolation Voltage	1 kV, process-to-system side (CP345-TR1)
Overvoltage Protection	±12 V, both variants
Power Supply	5V DC ±5%

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Table 1-2: CP345 Technical Specification (Sheet 2 of 2)

CP345	Specification
Power Consumption	Typ. power consumption at 5V DC measured with Windows© NT V.4.0 driver in RS232 mode at 9.6kBaud (2 channels active): • Non-optoisolated variants: - standard variant: 540mA - rear I/O variant*: depending on rear I/O module *Please refer to the Rear I/O Modules chapter of this manual • Optoisolated variant (incl. CP345-TR1): 780mA
Temperature Ranges	Operation: • 0°C to +60°C (standard) • -25°C to +75°C (extended) Storage: • -55°C to +125°C (storage)
Humidity	0..95%, non-condensing
Dimensions	• 100mm x 160mm (CP345) • 53mm x 91mm (CP345-TR1)
Weight	• Non-optoisolated version: 150g • Optoisolated version: 180g (incl. CP345-TR1) • Rear-I/O version: 150g (without module)

1.5 Applied Standards

1.5.1 CE Compliance

The *PEP Modular Computers'* CompactPCI systems comply with the requirements of the following CE-relevant standards:

- Emission EN50081-1
- Immission EN50082-2
- Electrical Safety EN60950

1.5.2 Mechanical Compliance

- Mechanical Dimensions IEEE 1101.10

1.5.3 Electrical Compliance

- Signalling TIA/EIA-232, TIA/EIA-422, TIA/EIA-485

1.5.4 Environmental Tests

- Vibration IEC68-2-6
  Random Vibration, Broadband IEC68-2-64 (3U boards)
- Permanent Shock IEC68-2-29
- Single Shock IEC68-2-27

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Chapter 2

Functional Description

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2. Functional Description

2.1 General Information

The CP345 serial communications controller board is the realization of a low cost, high speed 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 CP345 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.

Enhanced communication features such as optoisolated serial interfaces or frontend connector options are realized by means of a dedicated transition module, the CP345-TR1, interfaced to the CP345 mainboard directly via the common serial interface, or via a rear I/ O module. In fact, a non-optoisolated variant of the CP345 can be equipped with rear-I/O connectivity. If a rear-I/O module is used, the frontend signals are routed to a J2 rear-I/O connector.

The physical layer adaptation (OSI Layer 1) of the CSI-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 software including the serial line termination for balanced serial communication.

The supply voltage for the CP345 is 5V DC. The transition module for the optoisolated board variant is provided with two 5V/5V on-board DC/DC converters, one for the channels 0/1 and one for 2/3.

2.2 Specifics

The OSI Layer 2 functions for serial communication are handled entirely by the Siemens enhanced, DMA supported, intelligent serial communication controller DSCC4. This controller handles all the onboard serial communication tasks related to OSI Layer 2 comminication tasks for synchronous and asynchronous serial communication, significantly reducing the workload to the system host CPU.

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 software. The four serial I/O channels are independent and can be software 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 LED’s 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 CompactPCI interface provided directly on the Siemens serial communication controller DSCC4. Work load data transfer to and from the PCI host system is done in a DMA based manner for all four serial channels. Logical control of the CP345 serial communication oper-

ation is accomplished via the DSCC4 command and status registers which can be accessed independently for each channel directly from the PCI side.

The common serial interface (CSI) subsequently provides an identical set of serial communication interface signals at TTL signalling level for RS232 unbalanced and for RS422/RS485 balanced serial communication purposes for each of the four serial channels. Additionally, the common serial interface provides all necessary signals for “full modem” serial communication for four serial I/O channels as well as a subset of supply and ground lines for the corresponding serial communication interfacing devices, and a three wire serial SPI interface utilized for communication purposes to the local EEPROM and CPLD logic device.

The non-optoisolated standard variant of the CP345 serial I/O board is provided with a serial I/O connector block (four RJ45 connectors). Each of the RJ45 jacks is dedicated to a single serial I/O channel. In order to comply with standard PC interface technology, a single-channel RJ45-to-D-Sub frontpanel adapter (CP-ADAP-RJ45-D5009/PC) can be connected to the frontend interface of each channel. This adapter terminates on the user side with a 9-pin male D-Sub connector which includes the signals of the relating channel.

The optoisolated board variant is equipped with a single serial I/O connector providing the signals for all four serial I/O channels. In order to provide separate serial I/O channelling, a frontpanel adapter (CP-ADAP-CP345-DSUB50) can be connected to the 50pin frontend connector. This adapter terminates on the user side with four male 9-pin DSub connectors, one per serial I/O channel.

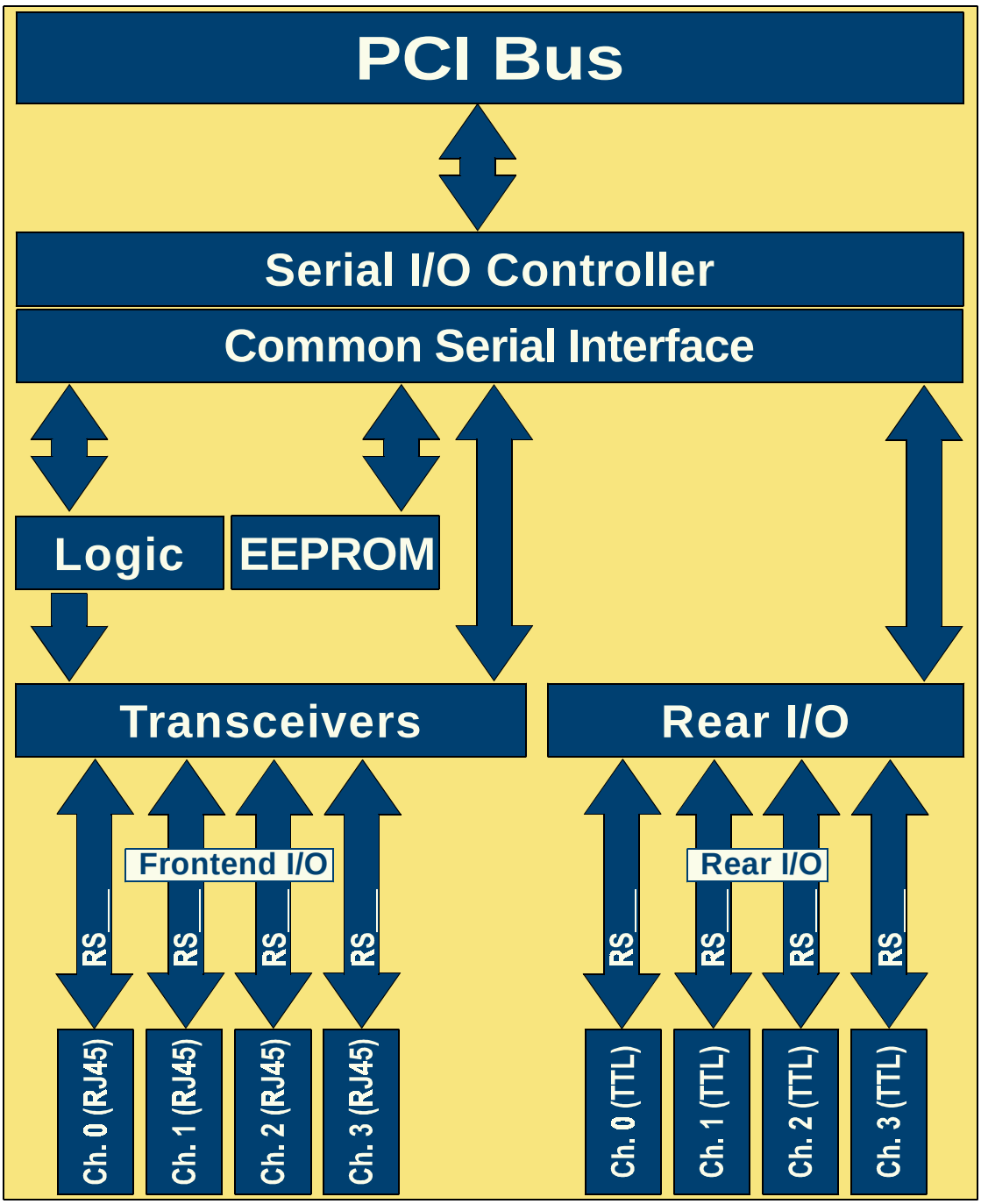
A second non-optoisolated board variant provides rear-I/O connectivity instead of frontend connectivity, as all frontend signals are routed at TTL level to a J2 rear-I/O connector. This CP345 rear I/O variant can be installed alternatively with either a non-optoisolated or an optoisolated variant of the CP345 rear-I/O module. The two variants differ in terms of their interface connectors. The above mentioned adapters can be used on the rear-I/O modules, too.

Both non-optoisolated board variants as well as the transition module of the optoisolated board variant are equipped with a 10-pin row JTAG/ISP connector for test purposes and in-system programming of the control logic. This functionality would normally not be used by the customer and is, therefore, marked as “NCR”, i.e. not customer-relevant on the board diagrams.

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2.3 Functional Block Diagrams

Figure 2-1: CP345 Functional Block Diagram (Non-Optoisolated Variants)



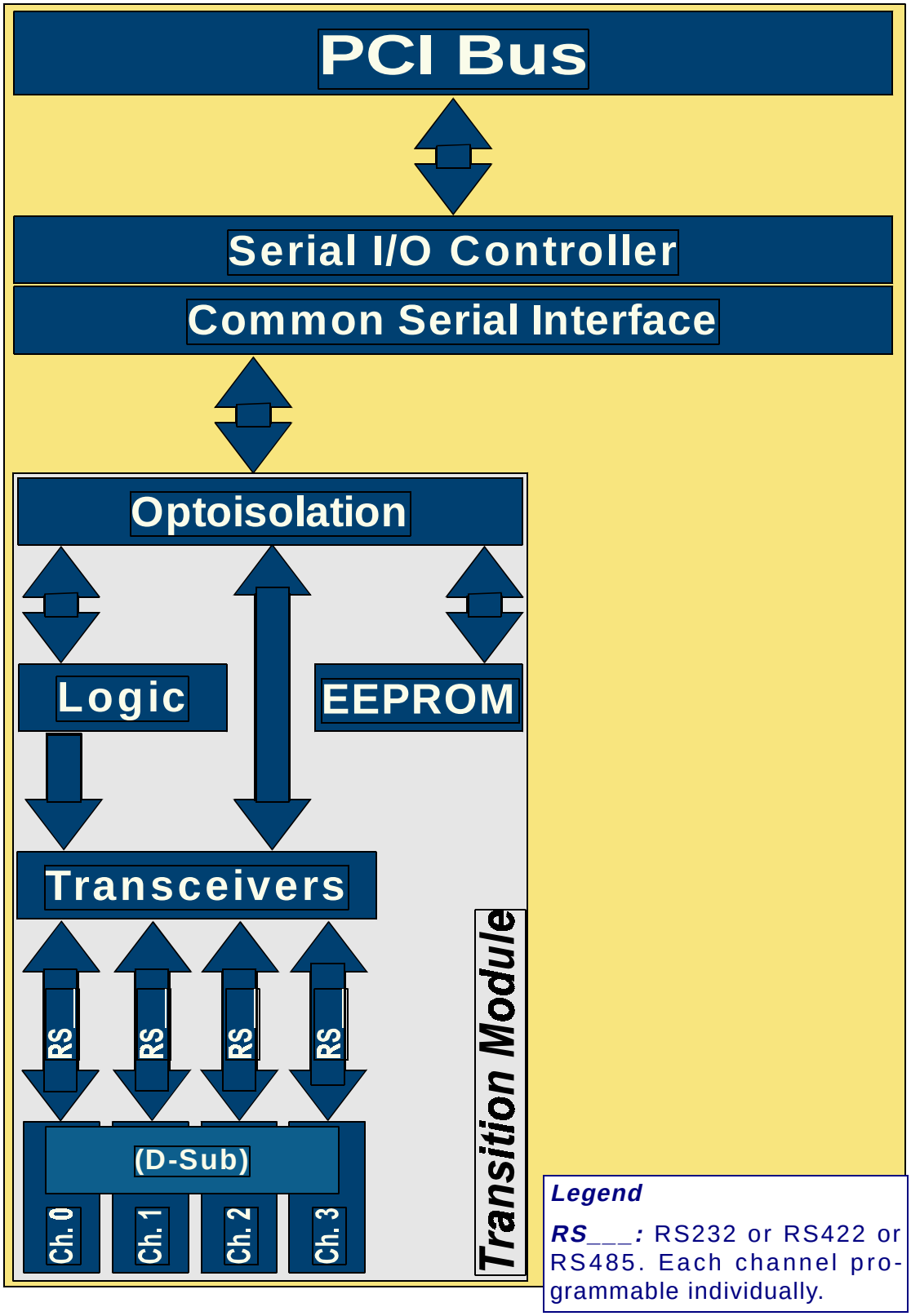
Legend

Frontend I/O, Rear I/O: alternatively. For a functional block diagram of the rear I/O modules, please see the Rear I/O Modules chapter of this manual.

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

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Figure 2-2: CP345 Functional Block Diagram (optoisolated version)

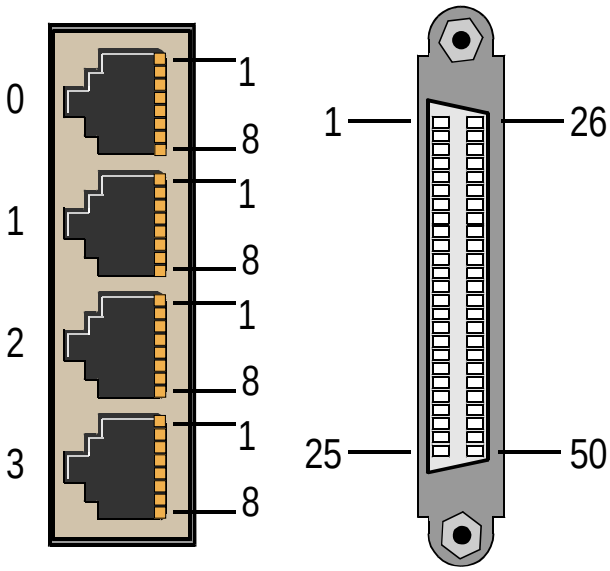


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2.4 Board Interfaces

2.4.1 Front-End Serial I/O Interfaces

Figure 2-3: Orientation of Serial I/O Connector Block (left) and Connector (right)



Legend

4xRJ45 connector block of non-optoisolated standard board variant (left) and D-Sub connector of optoisolated board variant (right).



Note...

This section includes pinout tables of the optoisolated variant's 50-pin D-Sub frontend connector as well as of the 50-pin and 9-pin D-Sub connectors of the four-channel frontpanel adapter CP-ADAP-CP345-DSUB50.

For a description of the board interfaces of the CP-RIO-345 rear I/O modules please refer instead to the Rear I/O Modules chapter of this manual.

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2.4.1.1 Frontend Connector Block (Non-Optoisolated Board Variant)

The standard non-optoisolated variant of the CP345 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.



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 2-1: Pinouts of Frontend RJ45 Connectors 0..3 (Sheet 1 of 2)

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pin	Channel
DSR	—	RxD-	1	0
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	
DSR	—	RxD-	1	1
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	
DSR	—	RxD-	1	2
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	

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Table 2-1: Pinouts of Frontend RJ45 Connectors 0..3 (Sheet 2 of 2)

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pin	Channel
DSR	—	RxD-	1	3
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	

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2.4.1.2 Connectors of RJ45-to-D-Sub Frontpanel Adapter

In order to comply with standard PC interface technology, a single-channel RJ45-to-DSub frontpanel adapter (CP-ADAP-RJ45-D5009/PC) can be connected to the frontend interface of each channel of the of the non-optoisolated board variant. This adapter terminates on the user side with a 9-pin male D-Sub connector which includes the signals of the relating channel. The pinouts of the adapter's RJ45 and 9-pin DSub connectors are shown in the following table.



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 3-2: Pinouts of RJ45-to-D-Sub Frontpanel Adapter Connectors

RJ45 Connector	RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	9-Pin Row Connector	Channel
1	DSR	—	RxD-	6	*n* with *n* = 0..3
2	RTS	—	—	7	
3	GND	GND	GND	5	
4	TxD	TRxD+	TxD+	3	
5	RxD	—	—	2	
6	DCD	—	RxD+	1	
7	CTS	TRxD-	TxD-	8	
8	DTR	—	—	4	
—	—	—	—	9	

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2.4.1.3 Frontend Connector (Optoisolated Board Variant)

The transition module of the optoisolated variant of the CP345 is equipped with a 50-pin row female 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 below table, please do not connect external wiring to the connector pins. Failure to comply may result in damage to your board.

Table 3-3: Pinouts of Frontend 50-Pin D-Sub Connector (Sheet 1 of 2)

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pins		Channel
TxD	TRxD+	TxD+	1	—	0
CTS	TRxD-	TxD-	—	26	
—	—	—	2	—	
—	—	—	—	27	
DCD	—	RxD+	3	—	
DSR	—	RxD-	—	28	
—	—	—	4	—	
—	—	—	—	29	
RTS	—	—	5	—	
DTR	—	—	—	30	
GND	GND	GND	6	—	
RxD	—	—	—	31	
TxD	TRxD+	TxD+	7	—	1
CTS	TRxD-	TxD-	—	32	
—	—	—	8	—	
—	—	—	—	33	
DCD	—	RxD+	9	—	
DSR	—	RxD-	—	34	
—	—	—	10	—	
—	—	—	—	35	
RTS	—	—	11	—	
DTR	—	—	—	36	
GND	GND	GND	12	—	
RxD	—	—	—	37	

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Table 3-3: Pinouts of Frontend 50-Pin D-Sub Connector (Sheet 2 of 2)

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pins		Channel
TxD	TRxD+	TxD+	13	—	2
CTS	TRxD-	TxD-	—	38	
—	—	—	14	—	
—	—	—	—	39	
DCD	—	RxD+	15	—	
DSR	—	RxD-	—	40	
—	—	—	16	—	
—	—	—	—	41	
RTS	—	—	17	—	
DTR	—	—	—	42	
GND	GND	GND	18	—	
RxD	—	—	—	43	
TxD	TRxD+	TxD+	19	—	3
CTS	TRxD-	TxD-	—	44	
—	—	—	20	—	
—	—	—	—	45	
DCD	—	RxD+	21	—	
DSR	—	RxD-	—	46	
—	—	—	22	—	
—	—	—	—	47	
RTS	—	—	23	—	
DTR	—	—	—	48	
GND	GND	GND	24	—	
RxD	—	—	—	49	
—	—	—	25	—	—
—	—	—	—	50	

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2.4.1.4 Connectors of 50-Pin-to-4x9-Pin Frontpanel Adapter

In order to provide separate serial I/O channelling, a four-channel frontpanel adapter (CP-ADAP-CP345-DSUB50) can be connected to the 50-pin frontend connector of the optoisolated board variant. 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 50-pin and 9-pin DSub connectors are shown in the following table.



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 3-4: Pinouts of Frontpanel Adapter Connectors (Sheet 1 of 2)

50-Pin Row Connector	RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	9-Pin Row Connectors	Channel
1	TxD	TRxD+	TxD+	3	0
26	CTS	TRxD-	TxD-	8	
2	—	—	—	—	
27	—	—	—	—	
3	DCD	—	RxD+	1	
28	DSR	—	RxD-	6	
4	—	—	—	—	
29	—	—	—	—	
5	RTS	—	—	7	
30	DTR	—	—	4	
6	GND	GND	GND	5	
31	RxD	—	—	2	
7	TxD	TRxD+	TxD+	3	1
32	CTS	TRxD-	TxD-	8	
8	—	—	—	—	
33	—	—	—	—	
9	DCD	—	RxD+	1	
34	DSR	—	RxD-	6	
10	—	—	—	—	
35	—	—	—	—	
11	RTS	—	—	7	
36	DTR	—	—	4	
12	GND	GND	GND	5	
37	RxD	—	—	2	

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Table 3-4: Pinouts of Frontpanel Adapter Connectors (Sheet 2 of 2)

50-Pin Row Connector	RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	9-Pin Row Connectors	Channel
13	TxD	TRxD+	TxD+	3	2
38	CTS	TRxD-	TxD-	8	
14	—	—	—	—	
39	—	—	—	—	
15	DCD	—	RxD+	1	
40	DSR	—	RxD-	6	
16	—	—	—	—	
41	—	—	—	—	
17	RTS	—	—	7	
42	DTR	—	—	4	
18	GND	GND	GND	5	
43	RxD	—	—	2	
19	TxD	TRxD+	TxD+	3	3
44	CTS	TRxD-	TxD-	8	
20	—	—	—	—	
45	—	—	—	—	
21	DCD	—	RxD+	1	
46	DSR	—	RxD-	6	
22	—	—	—	—	
47	—	—	—	—	
23	RTS	—	—	7	
48	DTR	—	—	4	
24	GND	GND	GND	5	
49	RxD	—	—	2	
25	—	—	—		—
50	—	—	—		

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2.4.2 Transition Module Interfaces

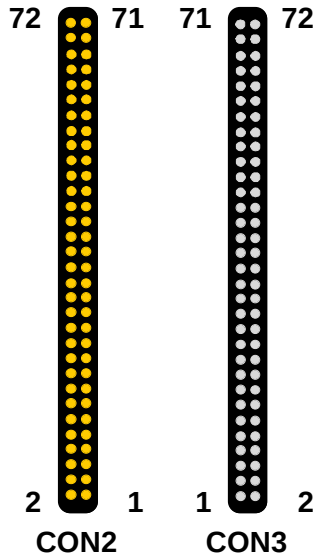


Figure 2-4: Orientation and Pinouts of Transition Module Interface Connectors

The optoisolated board variant is provided with two 72-pin row transition module interface connectors, one being located on the mainboard (CON3, female) and one on the transition module (CON2, male).

The pinouts of the transition module interface connectors are shown in the following table.

Table 3-5: Pinouts of Transition Module Interface Connectors

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	VCC	19	VCC	37	VCC	55	VCC
2	GND	20	GND	38	GND	56	GND
3	GND	21	GND	39	GND	57	GND
4	VCC	22	VCC	40	VCC	58	VCC
5	VCC	23	VCC	41	VCC	59	VCC
6	GND	24	GND	42	GND	60	GND
7	MD30	25	MD20	43	MD10	61	MD00
8	MD31	26	MD21	44	MD11	62	MD01
9	TxCLK3	27	TxCLK2	45	TxCLK1	63	TxCLK0
10	RxCLK3	28	RxCLK2	46	RxCLK1	64	RxCLK0
11	DCD3	29	DCD2	47	DCD1	65	DCD0
12	RES3	30	RES2	48	RES1	66	RES0
13	CTS3	31	CTS2	49	CTS1	67	CTS0
14	DSR3	32	DSR2	50	DSR1	68	DSR0
15	DTR3	33	DTR2	51	DTR1	69	DTR0
16	RxD3	34	RxD2	52	RxD1	70	RxD0
17	TxD3	35	TxD2	53	TxD1	71	TxD0
18	RTS3	36	RTS2	54	RTS1	72	RTS0

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2.4.3 PCI Interface

All variants of the CP345 are equipped with the standard PCI interface connector J1. For its pinouts please refer to the *PEP Modular Computers* CompactPCI System Manual or to the CompactPCI Specification.

2.4.4 Rear I/O Interface

The rear-I/O capable non-optoisolated 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. The active high/low status of the signals depends on the protocol used.

Table 2-6: Pinouts of Rear I/O Connector J2

Pin	Row “Z”	Row “A”	Row “B”	Row “C”	Row “D”	Row “E”	Row “F”
1	N/C	MD31	GND	MD21	MD11	N/C	GND
2	N/C	MD30	+5V	MD20	MD10	N/C	GND
3	N/C	N/C	GND	RxCLK2	RxCLK1	MD01	GND
4	N/C	N/C	+5V	TxCLK2	GND	MD00	GND
5	N/C	RxCLK3	GND	N/C	TxCLK1	RxCLK0	GND
6	N/C	TxCLK3	+5V	RES2	GND	TxCLK0	GND
7	N/C	RES3	GND	N/C	RES1	RES0	GND
8	N/C	DCD3	+5V	DCD2	GND	DCD0	GND
9	N/C	DSR3	GND	N/C	DCD1	DSR0	GND
10	N/C	CTS3	+5V	DSR2	GND	CTS0	GND
11	N/C	RxD3	GND	N/C	DSR1	RxD0	GND
12	N/C	DTR3	+5V	CTS2	GND	DTR0	GND
13	N/C	RTS3	GND	N/C	CTS1	RTS0	GND
14	N/C	TxD3	+5V	RxD2	GND	TxD0	GND
15	N/C	N/C	GND	DTR2	RxD1	N/C	GND
16	N/C	+5V	+5V	RTS2	GND	+5V	GND
17	N/C	N/C	GND	TXD2	DTR1	N/C	GND
18	N/C	+5V	N/C	+5V	GND	+5V	GND
19	N/C	GND	GND	N/C	RTS1	N/C	GND
20	N/C	N/C	GND	N/C	GND	N/C	GND
21	N/C	N/C	GND	N/C	TxD1	N/C	GND
22	N/C	N/C	N/C	N/C	N/C	N/C	GND

N/C = not connected.

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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 compatible computer with a free bus master slot. The frontpanel of the board should be safely secured by screws to the chassis to avoid lossening of the board through vibration and to ensure correct earth connection.



Caution, Electric Shocks!

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



ESD Equipment!

Your 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.

To install the board, please proceed as follows:

1. Ensure that the safety requirements indicated above are observed
2. As required, ensure that the CP345-TR1transition module is properly installed (see appropriate documentation for configuration)
3. Install the board in an appropriate slot and engage the retaining mechanism
4. Connect external interfacing cables to the board as required
5. Ensure that the board and interfacing cables are properly secured

To remove the board, please proceed as follows:

1. Ensure that the safety requirements indicated above are observed
2. Disconnect any interfacing cables that may be connected to the board
3. Disengage the board retaining mechanism by first lifting the board release handle slightly and at the same time pulling the red sliding retainer towards you as far as possible (5 mm approx.)
4. Now press down on the board release handle disengaging the board from the backplane connector and pull the board out of the slot.

3.1.1 Board Location in the System

Board location within a system must be considered carefully. Depending on the number of CP345 boards, their locations in a given system and the operating system being used, application programs may have difficulty to identify 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.

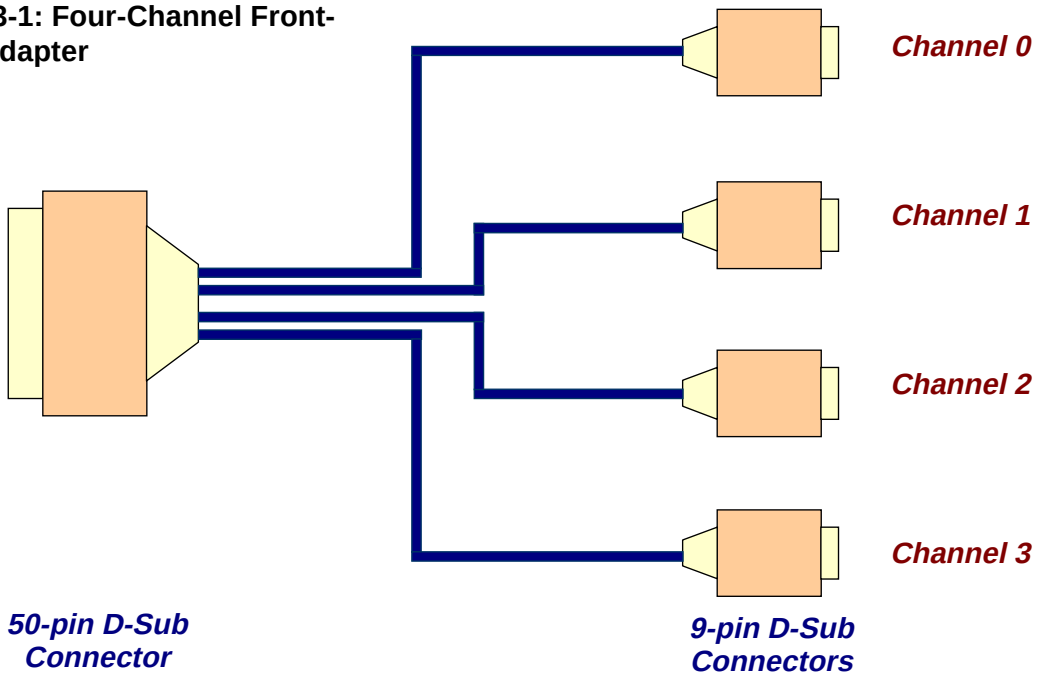
3.1.2 Cabling

3.1.2.1 Four-Channel Frontpanel Adapter

In order to provide separate serial I/O channelling, a four-channel frontpanel adapter (CP-ADAP-CP345-DSUB50) can be connected to the 50-pin frontend connector of the optoisolated variant of the CP345 mainboard (CP345-OPT) or the optoisolated rear I/O module (CP-RIO-345-OPT) of the rear-I/O capable board (CP345-RIO). 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 approx. 15 cm.

The pinouts of the adapter's 50-pin and 9-pin DSub connectors are shown in the Functional Description chapter of this manual.

Figure 3-1: Four-Channel Frontpanel Adapter



3.1.2.2 Single-Channel Frontpanel Adapter

In order to comply with standard PC interface technology, a single-channel RJ45-to-DSub frontpanel adapter (CP-ADAP-RJ45-D5009/PC) can be connected to the RJ45 frontend connector of each channel of the optoisolated variant of the CP345 mainboard (CP345-OPT) or the optoisolated rear I/O module (CP-RIO-345-OPT) of the rear-I/O capable board (CP345-RIO). This adapter terminates on the user side with a 9-pin male D-Sub connector which includes the signals of the relating channel.

This adapter terminates on the user side with a male 9-pin D-Sub connector which includes the signals of the relating channel. The shielded adapter cable has a length of approx. 15 cm.

The pinouts of the adapter's RJ45 and 9-pin DSub connectors are shown in the Functional Description chapter of this manual.

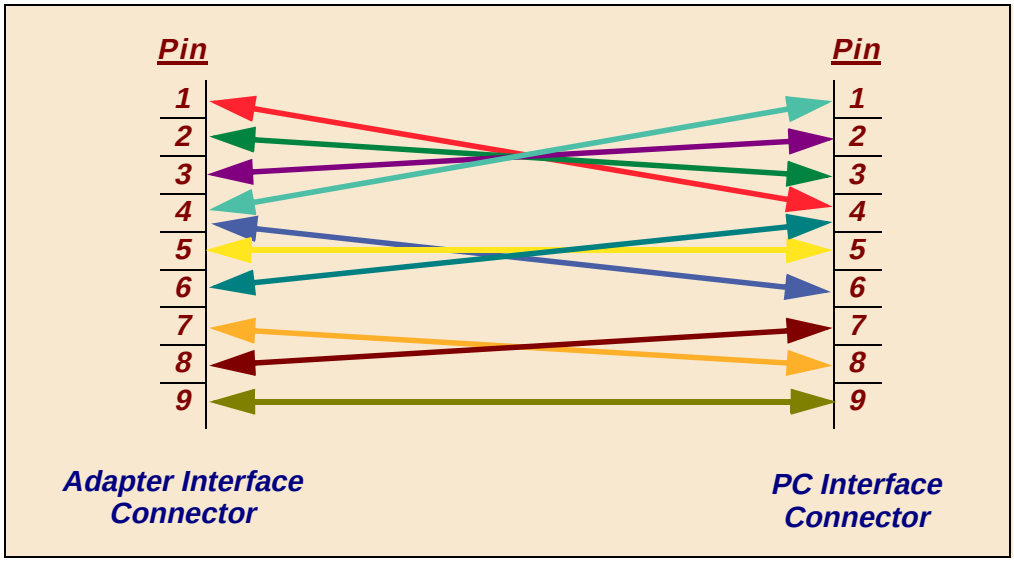
Figure 3-2: Four-Channel Frontpanel Adapter



3.1.2.3 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. The null-modem cable is not supplied by PEP Modular Computers. It can be manufactured by the customer according to the following pin assignment diagram.

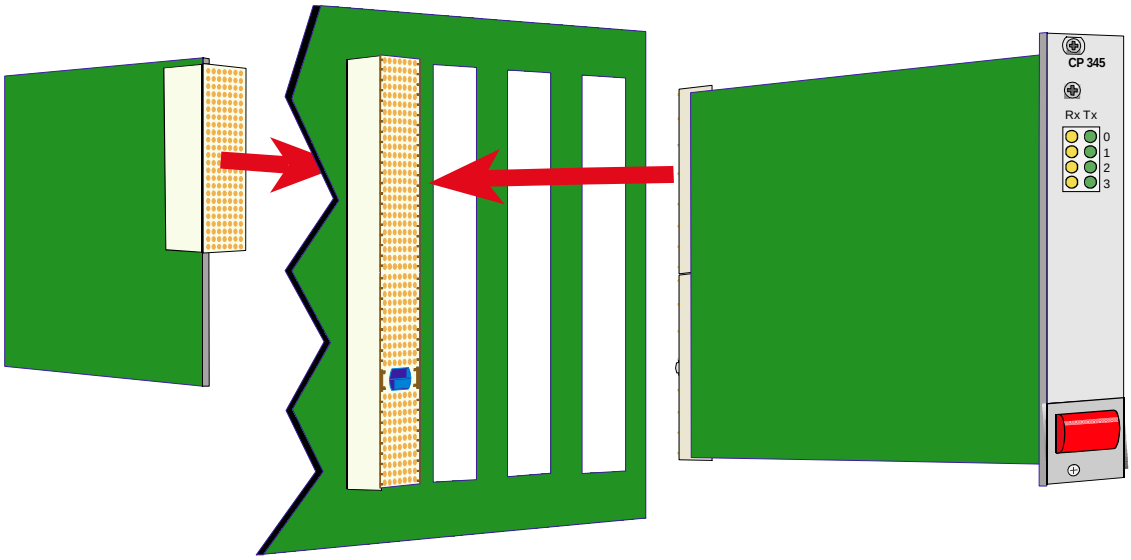
Figure 3-3: Null-Modem Pin Assignment



3.1.3 Rear I/O Module

The rear I/O-capable variant of the CP345 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 3-4: Installation of Mainboard and Rear I/O Module



Note...

The rear I/O-capable CP345 board variant and the relative rear I/O module can be installed in a backplane slot provided with a rear I/O-capable P2 connector only.

3.2 Software Installation

Drivers for Windows© NT, QNX© and VxWorks© are available for the CP345. 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

The CP345 complies fully with the Plug and Play philosophy. The board has no jumpers to be configured by the customer.

4.2 Software Configuration

Configuring is done as required using the drivers for Windows© NT, QNX© or VxWorks©. For driver installation, please refer to chapter 3.2 of this manual and to the driver documentation supplied on 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 CP345 serial I/O controller board. The rear I/O modules are designed to optimize the cabeling of a CP345 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 CP345 are currently available by *PEP Modular Computers*. Both are designed as high speed, 4-channel serial I/O devices supporting the RS232, RS422 and RS485 industry standards. The external interfacing of the two modules variants differ (four-RJ45 connector block or 50-pin row D-Sub connector), whereas the input/output signals are identical:

- non-optoisolated rear I/O module (CP-RIO-345)
- optoisolated rear I/O module (CP-RIO-345-OPT)

Like the non-rear I/O CP345 mainboard variants, the main functions implemented on the CP-RIO-345 and CP-RIO-345-OPT rear I/O modules 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 rear-I/O modules are interfaced to the CP345 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 frontpanel interfaces, are at CSI-TTL level. Their physical layer adaptation (OSI Layer 1) is realized independently for each channel via corresponding onboard RS232, RS422/RS485 transceivers. Each of the four serial communication links are configured individually for serial interface operation via software including the serial line termination for balanced serial communication.

Both the CP-RIO-345 and CP-RIO-345-OPT rear I/O modules are equipped with a 10-pin row JTAG/ISP connector for test purposes and in-system programming of the control logic. This functionality would normally not be used by the customer and is, therefore, marked as “NCR”, i.e. not customer-relevant on the board diagrams.

Mainboard Location in the System

Location of the CP345 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 intial 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.

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Operating Systems

The CP345 and its rear I/O modules can operate under the following operating systems:

- Windows© NT 4.0
- QNX©
- VxWorks©

Drivers are supplied for these operating systems.

5.1 Non-Optoisolated Rear I/O Module

The CP-RIO-345 rear I/O module is a high speed, 4-channel serial I/O device supporting the RS232, RS422 and RS485 industry standards. The CP-RIO-345 is provided with the following key features.

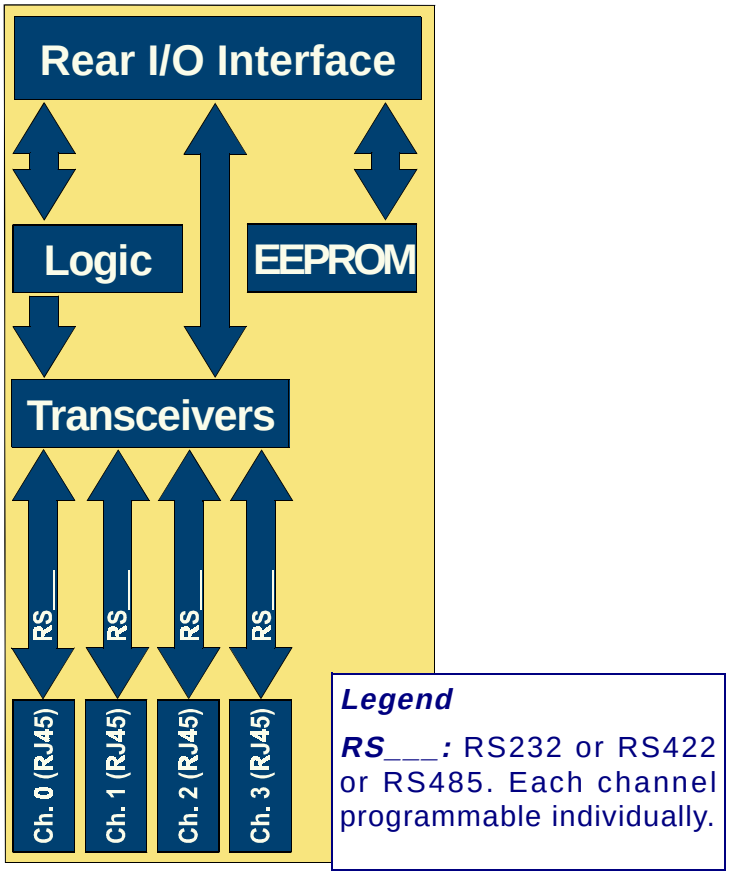
- 32-bit CompactPCI board, 33 MHz
- Up to 1 MBaud asynchronous transmission
- 4 independent serial channels
- RJ45 connector block (one connector for each channel)
- RS232, RS422, and RS485 standards
- Each channel individually programmable per software
- Bus termination resistors (RS422/RS485) software selectable
- Control LED’s both on the module’s and mainboard’s frontpanels
- Jumperless configuration
- Windows NT®, QNX® and VxWorks® drivers

The supply voltage for the module is 5V DC.

5.1.1 Board Diagrams

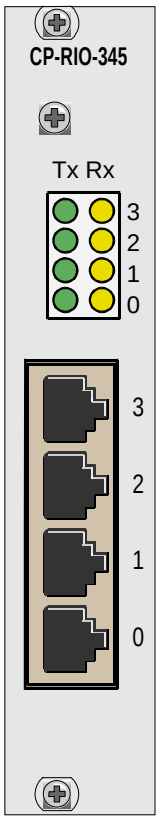
5.1.1.1 Functional Block Diagram

Figure 5-1: CP-RIO-345 Functional Block Diagram



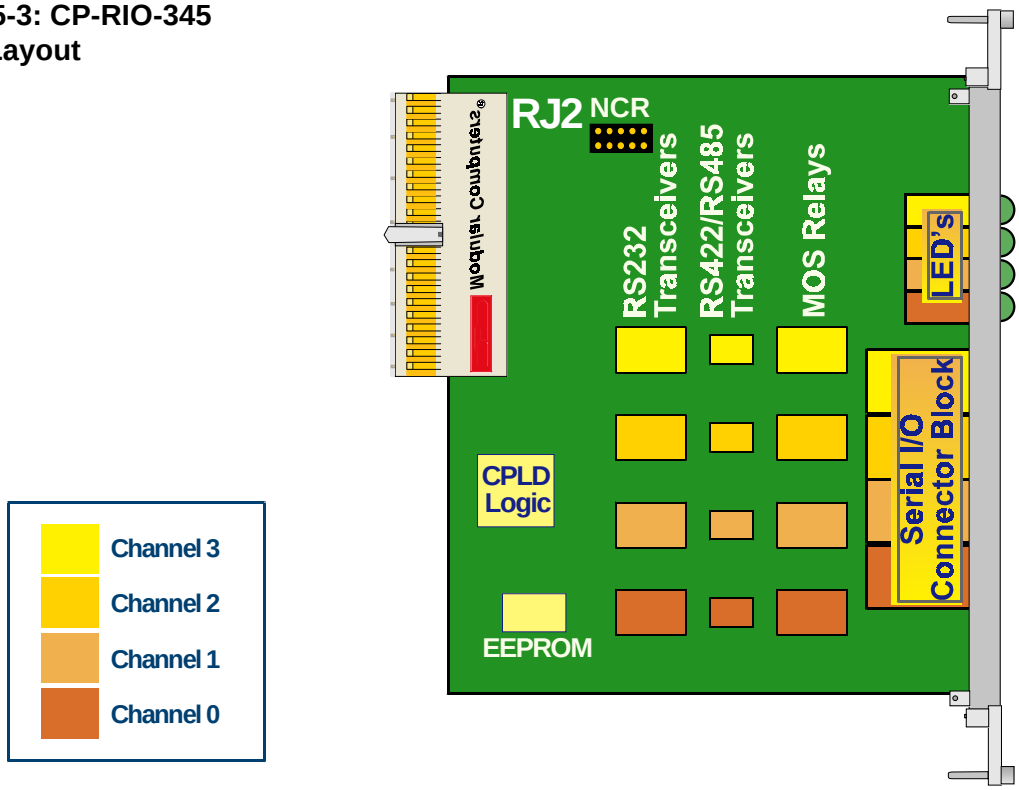
5.1.1.2 Frontpanel

Figure 5-2: CP-RIO-345 Frontpanel



5.1.1.3 Board Layout

Figure 5-3: CP-RIO-345 Board Layout

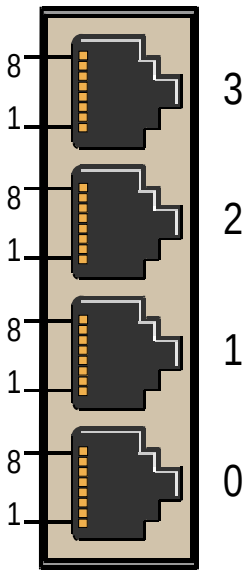


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5.1.2 Module Interfaces

5.1.2.1 Front-End Serial I/O Interface

Figure 5-4: Orientation and Pinouts of the CP-RIO-345 Serial I/O Connector



The non-optoisolated rear I/O module CP-RIO-345 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.



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 5-1: Pinouts of Rear I/O Module **RJ45 Connectors 0..3 (Sheet 1 of 2)**

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pin	Channel
DSR	—	RxD-	1	0
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	
DSR	—	RxD-	1	1
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	

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Table 5-1: Pinouts of Rear I/O Module **RJ45 Connectors 0..3 (Sheet 2 of 2)**

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pin	Channel
DSR	—	RxD-	1	2
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	
DSR	—	RxD-	1	3
RTS	—	—	2	
GND	GND	GND	3	
TxD	TRxD+	TxD+	4	
RxD	—	—	5	
DCD	—	RxD+	6	
CTS	TRxD-	TxD-	7	
DTR	—	—	8	

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5.1.2.2 Rear I/O Interface

The non-optoisolated rear I/O module CP-RIO-345 is provided with a PCI rear I/O interface connector RJ2. All signals from the TTL serial I/O interface are routed to this connector. The active high/low status of the signals depends on the protocol used.

Table 2-2: Pinouts of Rear I/O Module Rear I/O Connector RJ2

Pin	Row “Z”	Row “A”	Row “B”	Row “C”	Row “D”	Row “E”	Row “F”
1	N/C	MD31	GND	MD21	MD11	N/C	GND
2	N/C	MD30	+5V	MD20	MD10	N/C	GND
3	N/C	N/C	GND	RxCLK2	RxCLK1	MD01	GND
4	N/C	N/C	+5V	TxCLK2	GND	MD00	GND
5	N/C	RxCLK3	GND	N/C	TxCLK1	RxCLK0	GND
6	N/C	TxCLK3	+5V	RES2	GND	TxCLK0	GND
7	N/C	RES3	GND	N/C	RES1	RES0	GND
8	N/C	DCD3	+5V	DCD2	GND	DCD0	GND
9	N/C	DSR3	GND	N/C	DCD1	DSR0	GND
10	N/C	CTS3	+5V	DSR2	GND	CTS0	GND
11	N/C	RxD3	GND	N/C	DSR1	RxD0	GND
12	N/C	DTR3	+5V	CTS2	GND	DTR0	GND
13	N/C	RTS3	GND	N/C	CTS1	RTS0	GND
14	N/C	TxD3	+5V	RxD2	GND	TxD0	GND
15	N/C	N/C	GND	DTR2	RxD1	N/C	GND
16	N/C	+5V	+5V	RTS2	GND	+5V	GND
17	N/C	N/C	GND	TXD2	DTR1	N/C	GND
18	N/C	+5V	N/C	+5V	GND	+5V	GND
19	N/C	GND	GND	N/C	RTS1	N/C	GND
20	N/C	N/C	GND	N/C	GND	N/C	GND
21	N/C	N/C	GND	N/C	TxD1	N/C	GND
22	N/C	N/C	N/C	N/C	N/C	N/C	GND

N/C = not connected.

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5.1.3 Technical Specifications

Table 5-3: CP-RIO-345 Technical Specification

CP345	Specification
Serial I/O Standards	RS-232, RS-422 and RS-485
Channels	Four serial I/O channels, individually configurable via software
Data Rates	Max. 1MBaud, asynchronous (RS-232: max. 120kBaud)
Programmable Data Formats	Data Bits: 5 to 8 Parity: Odd, even, none Stop Bits: 1 or 2
Programmable Channel Modes	RS232 • unbalanced • disabled RS422 • balanced, half duplex • balanced, full duplex • disabled RS485 • balanced, half duplex • balanced, full duplex • disabled Disabled
External Board Interfaces	• 4 x RJ45
LED's	8 operation indicator LED's, two for each channel: • Yellow RxD • Green TxD *Note:* The same LED's are repeated on the mainboard's frontpanel.
Electrical Parameters	• Overvoltage protection: ±12 V • Power supply: 5V DC ±5% • Power consumption*: typ. 540mA at 5V DC *At 5V DC incl. CP345-RIO mainboard measured with Windows© NT V.4.0 driver in RS232 mode at 9.6kBaud (2 channels active)
General Parameters	Temperature Ranges: • 0°C to +60°C (operation, standard) • -25°C to +75°C (operation, extended) • -55°C to +125°C (storage) Humidity: 0..95%, non-condensing Dimensions: 80mm x 100mm Weight: 95g approx. (rear I/O module only)

5.2 Optoisolated Rear I/O Module

The CP-RIO-345-OPT rear I/O module is a high speed, 4-channel serial I/O device supporting the RS232, RS422 and RS485 industry standards. This serial I/O channels of this module are optoisolated. The CP-RIO-345-OPT is provided with the following key features.

- 32-bit CompactPCI board, 33 MHz
- Up to 1 MBaud asynchronous transmission
- 4 independent serial channels
- 50-pin row D-Sub connector (all channels on one connector)
- RS232, RS422, and RS485 standards
- 1kV process-to-system side optoisolation
- Each channel individually programmable per software
- Bus termination resistors (RS422/RS485) software selectable
- Control LED's both on the module's and mainboard's frontpanels
- Jumperless configuration
- Windows® NT, QNX® and VxWorks® drivers

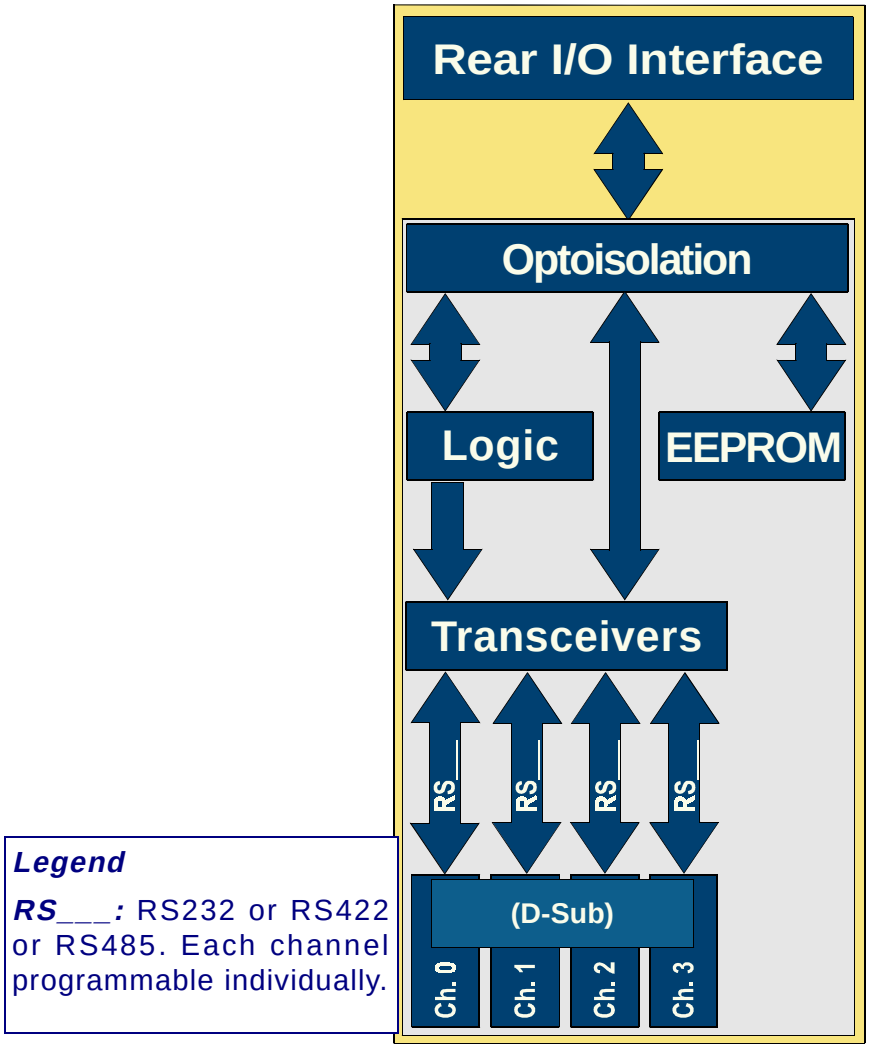
The supply voltage for the module is 5V DC. It is provided with two 5V/5V on-board DC/DC converters, one for the channels 0/1 and one for 2/3.

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5.2.1 Board Diagrams

5.2.1.1 Functional Block Diagram

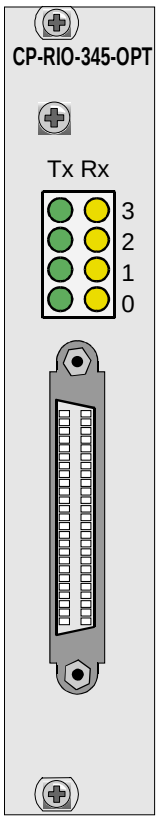
Figure 5-5: CP-RIO-345-OPT Functional Block Diagram



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5.2.1.2 Frontpanel

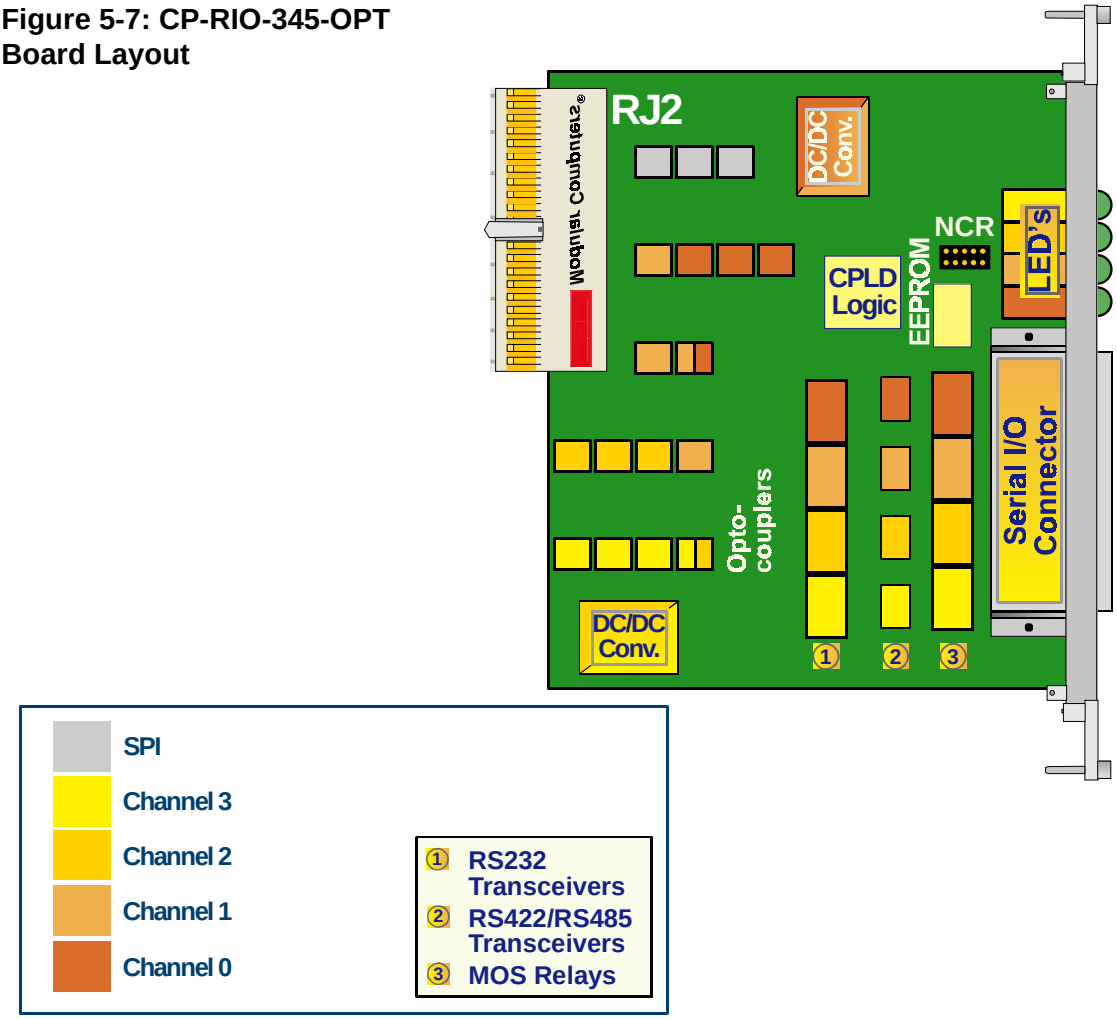
Figure 5-6: CP-RIO-345-OPT Frontpanel



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5.2.1.3 Board Layout

Figure 5-7: CP-RIO-345-OPT Board Layout

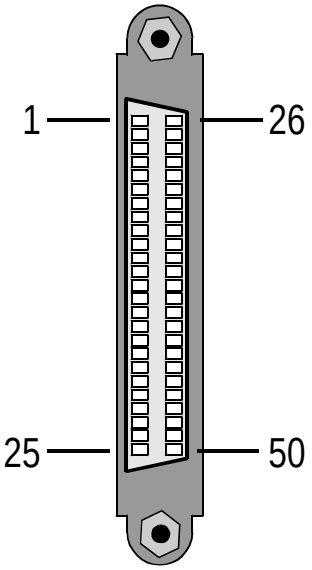


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5.2.2 Module Interfaces

5.2.2.1 Front-End Serial I/O Interface

Figure 5-8: Orientation and Pinouts of the CP-RIO-345-OPT Serial I/O Connector



The optoisolated rear I/O module CP-RIO-345-OPT is equipped with a 50-pin row female 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 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: Pinouts of 50-Pin Female High-Density D-Sub Connector (Sheet 1 of 3)

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pins		Channel
TxD	TRxD+	TxD+	1	—	0
CTS	TRxD-	TxD-	—	26	
—	—	—	2	—	
—	—	—	—	27	
DCD	—	RxD+	3	—	
DSR	—	RxD-	—	28	
—	—	—	4	—	
—	—	—	—	29	
RTS	—	—	5	—	
DTR	—	—	—	30	
GND	GND	GND	6	—	
RxD	—	—	—	31	

Table 5-4: Pinouts of 50-Pin Female High-Density D-Sub Connector (Sheet 2 of 3)

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pins		Channel
TxD	TRxD+	TxD+	7	—	1
CTS	TRxD-	TxD-	—	32	
—	—	—	8	—	
—	—	—	—	33	
DCD	—	RxD+	9	—	
DSR	—	RxD-	—	34	
—	—	—	10	—	
—	—	—	—	35	
RTS	—	—	11	—	
DTR	—	—	—	36	
GND	GND	GND	12	—	
RxD	—	—	—	37	
TxD	TRxD+	TxD+	13	—	2
CTS	TRxD-	TxD-	—	38	
—	—	—	14	—	
—	—	—	—	39	
DCD	—	RxD+	15	—	
DSR	—	RxD-	—	40	
—	—	—	16	—	
—	—	—	—	41	
RTS	—	—	17	—	
DTR	—	—	—	42	
GND	GND	GND	18	—	
RxD	—	—	—	43	

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Table 5-4: Pinouts of 50-Pin Female High-Density D-Sub Connector (Sheet 3 of 3)

RS232	RS422/RS485 Half Duplex	RS422/RS485 Full Duplex	Pins		Channel
TxD	TRxD+	TxD+	19	—	3
CTS	TRxD-	TxD-	—	44	
—	—	—	20	—	
—	—	—	—	45	
DCD	—	RxD+	21	—	
DSR	—	RxD-	—	46	
—	—	—	22	—	
—	—	—	—	47	
RTS	—	—	23	—	
DTR	—	—	—	48	
GND	GND	GND	24	—	
RxD	—	—	—	49	
—	—	—	25	—	—
—	—	—	—	50	

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5.2.2.2 Rear I/O Interface

The optoisolated rear I/O module CP-RIO-345-OPT is provided with a PCI rear I/O interface connector RJ2. All signals from the TTL serial I/O interface are routed to this connector. The active high/low status of the signals depends on the protocol used.

Table 2-5: Pinouts of Rear I/O Connector RJ2

Pin	Row “Z”	Row “A”	Row “B”	Row “C”	Row “D”	Row “E”	Row “F”
1	N/C	MD31	GND	MD21	MD11	N/C	GND
2	N/C	MD30	+5V	MD20	MD10	N/C	GND
3	N/C	N/C	GND	RxCLK2	RxCLK1	MD01	GND
4	N/C	N/C	+5V	TxCLK2	GND	MD00	GND
5	N/C	RxCLK3	GND	N/C	TxCLK1	RxCLK0	GND
6	N/C	TxCLK3	+5V	RES2	GND	TxCLK0	GND
7	N/C	RES3	GND	N/C	RES1	RES0	GND
8	N/C	DCD3	+5V	DCD2	GND	DCD0	GND
9	N/C	DSR3	GND	N/C	DCD1	DSR0	GND
10	N/C	CTS3	+5V	DSR2	GND	CTS0	GND
11	N/C	RxD3	GND	N/C	DSR1	RxD0	GND
12	N/C	DTR3	+5V	CTS2	GND	DTR0	GND
13	N/C	RTS3	GND	N/C	CTS1	RTS0	GND
14	N/C	TxD3	+5V	RxD2	GND	TxD0	GND
15	N/C	N/C	GND	DTR2	RxD1	N/C	GND
16	N/C	+5V	+5V	RTS2	GND	+5V	GND
17	N/C	N/C	GND	TXD2	DTR1	N/C	GND
18	N/C	+5V	N/C	+5V	GND	+5V	GND
19	N/C	GND	GND	N/C	RTS1	N/C	GND
20	N/C	N/C	GND	N/C	GND	N/C	GND
21	N/C	N/C	GND	N/C	TxD1	N/C	GND
22	N/C	N/C	N/C	N/C	N/C	N/C	GND

N/C = not connected.

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5.2.3 Technical Specifications

Table 5-6: CP-RIO-345-OPT Technical Specification

CP345	Specification
Serial I/O Standards	RS-232, RS-422 and RS-485
Channels	Four serial I/O channels, individually configurable via software
Data Rates	Max. 1MBaud, asynchronous (RS-232: max. 120kBaud)
Programmable Data Formats	Data Bits: 5 to 8 Parity: Odd, even, none Stop Bits: 1 or 2
Programmable Channel Modes	RS232 • unbalanced • disabled RS422 • balanced, half duplex • balanced, full duplex • disabled RS485 • balanced, half duplex • balanced, full duplex • disabled Disabled
External Board Interfaces	• 50-pin high-density D-Sub connector
LED's	8 operation indicator LED's, two for each channel: • Yellow RxD • Green TxD *Note:* The same LED's are repeated on the mainboard's frontpanel.
Electrical Parameters	• Overvoltage protection: ±12 V • Power supply: 5V DC ±5% • Power consumption*: typ. 780mA • Optoisolation voltage: 1kV, process-to-system side *At 5V DC incl. CP345-RIO mainboard measured with Windows© NT V.4.0 driver in RS232 mode at 9.6kBaud (2 channels active)
General Parameters	Temperature Ranges: • 0°C to +60°C (operation, standard) • -25°C to +75°C (operation, extended) • -55°C to +125°C (storage) Humidity: 0..95%, non-condensing Dimensions: 80mm x 100mm Weight: 95g approx. (rear I/O module only)

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