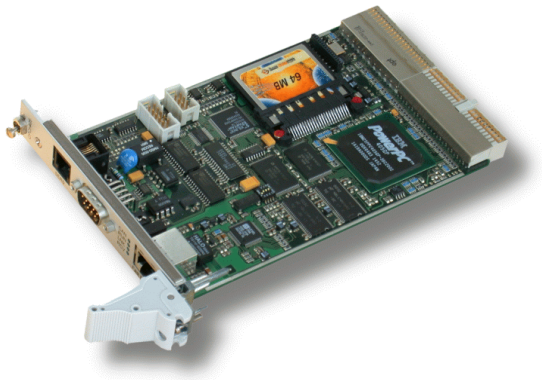
CPCI-405

CompactPCI-Controller Board with CAN and ETHERNET



Hardware Manual

to product: I.2306.04, I.2306.05, I.2306.07,
I.2306.08, I.2306.12, I.2306.47,
I.2306.49

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N O T E

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This manual contains important information and instructions on safe and efficient handling of the CPCI-405. Carefully read this manual before commencing any work and follow the instructions to avoid serious injury or death.
The manual is a product component, please retain it for future use.

Trademark Notices

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Changes in the chapters

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

Version	Chapter	Changes as compared with previous version
3.4	1.3.3	NVRAM specified
	2.1	Table completed
	3.1.2	Addresses inserted
	3.2.1	Default settings corrected (Handshake: none)
	3.3.1	Table completed
3.5	-	Safety instructions revised
	1.3.7	New chapter "CompactFlash Card Interface"
	4.1.1	Note concerning cable type inserted
	4.5	Note concerning cable type inserted
	6., 7.	Chapters updated
	8.	Declaration of Conformity updated
	9.	Chapter "Order Information" moved and revised

Technical details are subject to change without further notice.

Safety Instructions

- When working with CPCI-405 modules follow the instructions below and read the manual carefully to protect yourself and the CPCI-405 module from damage.
- The device is a built-in component. It is essential to ensure that the device is mounted in a way that cannot lead to endangering or injury of persons or damage to objects.
  Do not use damaged or defective cables to connect the CPCI-405 and follow the CAN wiring hints in chapter: "Correct Wiring of Electrically Isolated CAN Networks"
- The device has to be securely installed in the control cabinet before commissioning.
- Protect the CPCI-405 module from dust, moisture and steam.
- Protect the CPCI-405 module from shocks and vibrations.
- The CPCI-405 module may become warm during normal use. Always allow adequate ventilation around the CPCI-405 module and use care when handling.
- Do not operate the CPCI-405 module adjacent to heat sources and do not expose it to unnecessary thermal radiation. Ensure an ambient temperature as specified in the technical data.
- Do not use damaged or defective cables to connect the CPCI-405 module.
- In case of damages to the device, which might affect safety, appropriate and immediate measures must be taken, that exclude an endangerment of persons and domestic animals and property.
- Current circuits which are connected to the device have to be sufficiently protected against hazardous voltage (SELV according to EN 60950-1).
- The CPCI-405 may only be driven by power supply current circuits, that are contact protected. A power supply, that provides a safety extra-low voltage (SELV or PELV) according to EN 60950-1, complies with this conditions.

DANGER
Hazardous Voltage - **Risk of electric shock** due to unintentional contact with uninsulated live parts with high voltages inside of the system into which the CPCI-405 is to be integrated. Disconnect all hazardous voltages (mains voltage) before opening the system.

NOTICE
Electrostatic discharge may cause damage to electronic devices. In order to avoid this please discharge your personal static electricity *before* you touch the module.

Qualified Personal

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

Conformity

The CPCI-405 is an industrial product and meets the demands of the EU regulations and EMC standards printed in the conformity declaration at the end of this manual.

Warning: In a residential, commercial or light industrial environment the CPCI-405 may cause radio interferences in which case the user may be required to take adequate measures.

Data Safety

This device is equipped with an Ethernet or other interface which is suitable to establish a connection to data networks. Depending on the software used on the device, these interfaces may allow attackers to compromise

normal function, get illegal access or cause damage.
esd does not take responsibility for any damage caused by the device if operated at any networks. It is the responsibility of the device's user to take care that necessary safety precautions for the device's network interface are in place.

Intended Use

The intended use of the CPCI-405 module is the operation as High Performance PowerPC™ with Ethernet and CAN.
The esd guarantee does not cover damages which result from improper use, usage not in accordance with regulations or disregard of safety instructions and warnings.

- The CPCI-405 module is intended for installation in a CompactPCI-system only.
- The operation of the CPCI-405 module in hazardous areas, or areas exposed to potentially explosive materials is not permitted.
- The operation of the CPCI-405 module for medical purposes is prohibited.

Service Note

The CPCI-405 module does not contain any parts that require maintenance by the user. Unauthorized intervention in the device voids warranty claims.

Disposal

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

Contents

Page

1. Overview

1.1 Description of the CPCI-405 Board

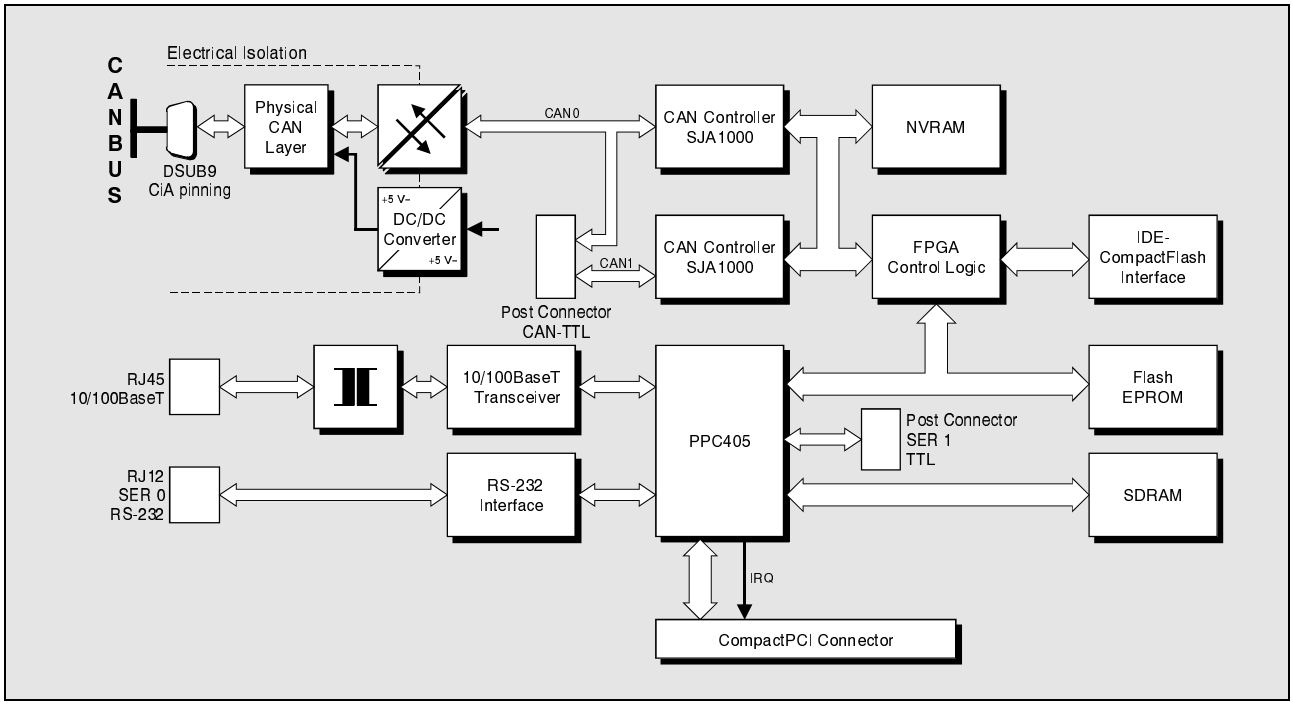


Fig. 1.1.1: Block circuit diagram

The CPCI-405 is a CompactPCI board in Euro format. It is available as PCI-master CPU or as intelligent slave board. Both options only differ in the configuration of the PowerPC 405GPr processor.

Apart from a powerful CPU the PowerPC 405GPr processor has got an SDRAM controller, a PCI-bus interface, a controller for serial interfaces and an MII-interface which is here used to realize an ETHERNET interface.

In addition to Flash EPROM and NVRAM as system memory, the memory of the CPCI-405 has got up to 128 Mbyte SDRAM as working memory. Furthermore, the board has got a CompactFlash card interface. The boards plugged in can be accessed by standard system drivers like an IDE-drive.

One of the two serial interfaces has been designed as an RS-232-interface. It can be accessed via an RJ12-connector in the front panel. The second serial interface is accessible via a post connector on board. The signals of this interface are of TTL-level.

The CAN-interface which can be accessed via the front panel, is controlled by an SJA1000-CAN-controller. The interface corresponds to ISO11898, is electrically insulated and can be used for transmission rates of up to 1 Mbit/s. The second CAN-interface has got an SJA1000-CAN-controller as well.

The TTL-signals of both controllers are led to a post connector. Here, two adapter boards can be connected via flat ribbon cables, realising the physical layer. The adapter boards are available with CAN (ISO11898) or DeviceNet interfaces. Optionally the CPCI-405 together with the adapter board is available in two special designs (page 37).

The ETHERNET interface is suitable for 10 Mbit/s and 100 Mbit/s networks. They are connected via an RJ45 socket in the front panel.

The status of the board is shown by LEDs in the front panel.

1.2 PCB View with Connector Designations

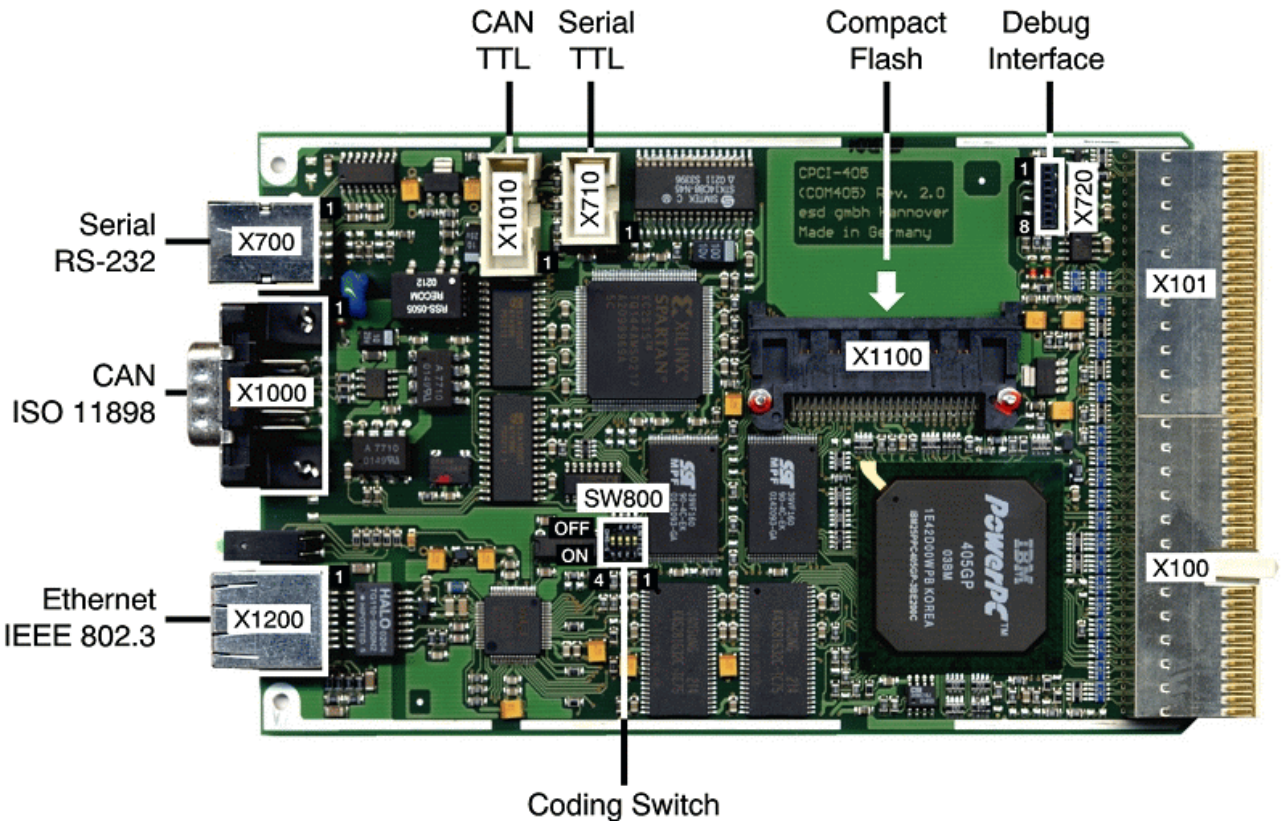


Fig. 1.2.1: PCB view (diagram without front panel)

The connector pin assignments can be found on page 25 and the following.

1.3 Summary of Technical Data

1.3.1 General Technical Data

Ambient temperature	0...50 ˚C
Humidity	max. 90 %, non-condensing
Power supply	via CompactPCI-bus, 5 V ± 5% / 200 mA (from PCB-rev. 2.0 on) and 3.3 V ± 5% / 800 mA (from PCB-rev. 2.0 on)
Connectors	X100 (132-pin post connector) - CompactPCI-board connector J1 X101 (132-pin post connector) - CompactPCI-board connector J2 X700 (6-pin RJ12-socket) - RS-232-interface (SER 0) X710 (6-pin post connector) - serial interface with TTL-level (SER 1) X720 (8-pin SMD socket) - debug interface X1000 (9-pin DSUB-connector) - CAN 0 (ISO11898) X1010 (10-pin post connector) - CAN 0 (TTL) + CAN 1 (TTL) X1100 (50-pin CompactFlash board connector) - CompactFlash boards X1200 (8-pin RJ45-socket) - ETHERNET Twisted Pair (IEEE 802.3)
Dimensions	100 mm x 160 mm
Weight	200 g

Table 1.3.1: General technical data

1.3.2 CompactPCI Bus

Host bus	PCI-bus in accordance with PCI Local Bus Specification 2.2
PCI-data/address bus	32 bits
Controller	PowerPC 405GPr
Interrupt	interrupt signal A, B, C, D
Board dimension	in accordance with PCI-Specification, Rev. 1.0
Connectors	
Connector coding	Universal Board, not keyed (3,3 V or 5 V signalling voltage)

Table 1.3.2: CompactPCI Bus interface

1.3.3 Microprocessor and Memory

CPU	PowerPC 405GPr / 266 MHz (default at board type I.2306.04) / 32 bit (up to 400 MHz as an option)
NVRAM	32 K x 8 bits NVRAM: Simtek STK14C88 (no battery required) option: RTC with NVRAM STM M48T35Y (internal battery)
Flash-EPROM	up to 4 M x 16 bits
Serial EEPROM	1 Kbyte
SDRAM	16 M x 32 bits (64 Mbyte) (default at board type I.2306.04) 32 M x 32 bits (128 Mbyte) (optional)
CompactFlash slot	- for CompactFlash memory boards in accordance with CompactFlash™ specification - suitable for board design type I - 3.3 V-power supply - controlled in 'True IDE' mode

Table 1.3.3: Microprocessor and memory

1.3.4 Serial Interfaces

Number	2
Controller	PowerPC 405GPr
Bit rate	Microcontroller: 300 bit/s ... 115.200 bit/s RS-232-Transceiver: max. 115.200 Kbit/s
Physical interface	Serial 0: RS-232C Serial 1: TTL-level signals
Connectors	Serial 0: 6-pin RJ12-socket in front panel Serial 1: 6-pin post connector on board

Table 1.3.4: Serial interfaces

1.3.5 CAN-Interfaces

Number	2
CAN-controller	SJA1000
CAN-protocol	CAN 2.0A/2.0B
Physical interface	CAN 0: differential, connection in accordance with ISO 11898 CAN 1: TTL-level, connection together with CAN 0-TTL to 10-pin post connector
Transmission rate	10 Kbit/s ... 1 Mbit/s
Bus termination	has to be terminated externally
Connectors	CAN 0: DSUB9-connector in front panel and 10-pin post connector for adapter board X1010 CAN 1: 10-pin post connector for adapter board X1010
Adapter board	- to be connected to 10-pin post connector X1010 - available with differential CAN-interface (ISO11898) or DeviceNet interface (with Combicon socket)

Table 1.3.5: CAN-interfaces

1.3.6 ETHERNET Interface

Number	1
Bit rate	10 Mbit/s, 100 Mbit/s
Controller	PowerPC405GPr
Physical interface	Twisted Pair (IEEE 802.3) 10/100BASE-T
Electrical insulation	via repeating coil
Connector	8-pin RJ45-socket in front panel

Table 1.3.6: ETHERNET interface

1.3.7 CompactFlash Card Interface

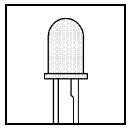
Information about Usage of CompactFlash® Cards!
A correct functionality of the CompactFlash interface can only be ensured by usage of CompactFlash cards with guaranteed SSD-properties.
esd therefore recommends to use one of the listed SLC-cards:
- Western Digital SiliconDrive II (e.g. 4GB: SSDC04G-4600)
- Cactus CompactFlash 303 Series (e.g. 4GB: KC4GR-303)
- Swissbit C-320 (e.g. 4GB: SFCF4096H1BO2TO-C-D1-523-SMA)

Only with this CF-cards the correct function of the CF-card interface is ensured and support for the devices is provided.
esd will evaluate more CF-cards and release them on success.

1.3.8 Software Support

The boot monitor U-Boot* is stored in the Flash memory. This makes it possible for the CPCI-405 to boot with various operating systems from the network, the local Flash memory or the Compact Flash memory.
The operating systems Linux and VxWorks are available with according drivers for the local interfaces. Further operating systems are available on request.
Furthermore the CAN-transmission protocols CANopen and DeviceNet and a local WEB-server are available.

* http://sourceforge.net/project/u-boot



2. Front Panel View with LED-Display

The module has got four LEDs in the front panel and another LED which can only be seen on the board itself when the case is open.

2.1 LEDs in the Front Panel

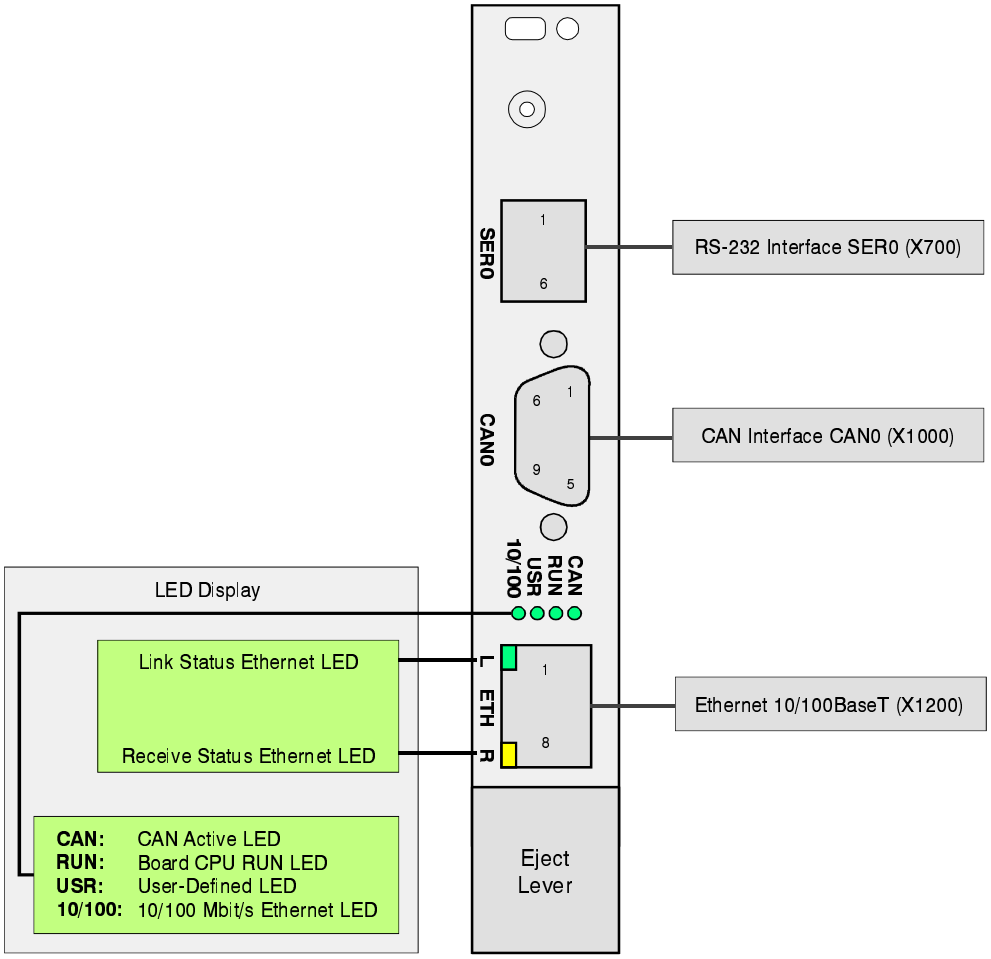
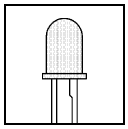


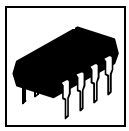
Fig. 2.1.1: Position and colours of LEDs



LED-Display

Name	Colour	Meaning of LED when on
CAN	green	CAN-frames are being received or transmitted The LED is hardwired. The LED cannnot be controlled through software.
RUN	green	local CPU is in RUN status (LED lights at every access to the SDRAM, therefore the LED can be blinking or permanently on in normal operation) The LED is hardwired. The LED cannnot be controlled through software.
USR	green	application-specific programmable function The USR LED is controlled by the 405 GPr CPU's GPIO24 signal. Clear GPIO24 to turn on the USR LED or set GPIO24 to turn it off.
RCV	green	ETHERNET bit rate: 100 Mbit/s The LED is hardwired. The LED cannnot be controlled through software.
Link Status	green	link status ETHERNET (link to server or hub detected)
Receive Status	yellow	receive status ETHERNET (reception of ETHERNET-data packages)

Table 2.1.1: Display functions of LEDs



3. Description of Units

3.1 PowerPC Microcontroller PPC405GPr

3.1.1 General

The general functions of the PowerPC 405GPr will not be explained in this manual. The manual of the microcontroller can be downloaded from the homepage of the manufacturer AMCC at:

http://www.amcc.com/Embedded/

3.1.2 Address Assignment

Start address [HEX]	End address [HEX]	Unit
0x0000_0000	0x03FF_FFFF	SDRAM (max. 64 Mbyte)
0X0000_0000	0xEF5F_FFFF	PCI Core memory
		Internal periphery:
0xEF60_0300	0xEF60_0307	UART0-register (see 405GP-Manual Table 3-6 , S. 3-9) *
0xEF60_0400	0xEF60_0407	UART1-register (see 405GP-Manual Table 3-7 , S. 3-10) *
0xEF60_0500	0xEF60_0510	IIC0-register (see 405GP-Manual Table 3-8 , S. 3-11)
0xEF60_0600	0xEF60_0601	OPB-arbiter register (see 405GP-Manual Table 3-9 , S. 3-12)
0xEF60_0700	0xEF60_077F	GPIO-controller register (see 405GP-Manual Table 3-10 , S. 3-13)
0xEF60_0800	0xEF60_0867	Ethernet register (see 405GP-Manual Table 3-11 , S. 3-14)
0xF000_0000	0xF000_007F	CAN-controller CAN 0
0xF000_0100	0xF000_017F	CAN-controller CAN 1
0xF010_0000	0xF010_001F	IDE/CompactFlash
0xF020_0000	0xF020_5FFF	NVRAM (or NVRAM with RTC) Free: User Space (24 Kbyte)
0xF020_6000	0xF020_6FFF	NVRAM (or NVRAM with RTC) Reserved: VxWorks and esd internal use (4 Kbyte)
0xF020_7000	0xF020_7FFF	NVRAM (or NVRAM with RTC) Reserved: PPCBoot/U-Boot environment variables (4 Kbyte) Option NVRAM with RTC: RTC: Register start address 0xF020_7FF8 end address 0xF020_7FFF
0xF040_0000	0xF04F_FFFF	FPGA internal registers
0xFFC0_0000	0xFFDF_FFFF	Flash-EPROM bank 0 (SST39VF160****)
0xFFE0_0000	0xFFFF_FFFF	Flash-EPROM bank 1 (SST39VF160****)

Table 3.1.1: Addresses

* The UARTS are 16550-compatible.

3.1.3 Interrupt Settings

Interrupt	External IRQ	Circuit	Level Detection
IRQ 25	EXT IRQ 0	CAN0	low active, level sensitive
IRQ 26	EXT IRQ 1	CAN1	low active, level sensitive
IRQ 27	EXT IRQ 2	PCI-INT_A	high active, level sensitive
IRQ 28	EXT IRQ 3	PCI-INT_B	high active, level sensitive
IRQ 29	EXT IRQ 4	PCI-INT_C	low active, level sensitive
IRQ 30	EXT IRQ 5	PCI-INT_D	low active, level sensitive
IRQ 31	EXT IRQ 6	CompactFlash	high active, level sensitive

Table 3.1.2: Interrupt Setting

All other interrupt sources are PowerPC405-internal. They are described in the PowerPC405-manual.

3.2 Serial Interface

3.2.1 Default Setting

The default setting for both serial interfaces is the following:

Bit rate:	9600 Baud
Data bits:	8
Parity:	no
Stop bits:	1
Handshake:	none

3.2.2 Configuration

The serial interfaces are controlled by the microcontroller PowerPC405GPr. The bit rate of the interfaces can be configured. The serial controller integrated in the PowerPC405GPr and the RS-232 driver used for interface SER 0 support bit rates of up to 115.200 kbit/s.

The bit rate can be changed by means of software. The procedure to change the bit rate depends on the operating system, it is therefore advisable to refer to the manual of the operating system.

3.2.3 Connecting the RS-232-Interface SER 0

The diagram is used to explain the short terms for signals as used in the chapter (Connector Assignments). The signal terms are exemplary for the connection of the CPCI-405 as a modem (DCE) via the adapter cable RJ12-DSUB9.

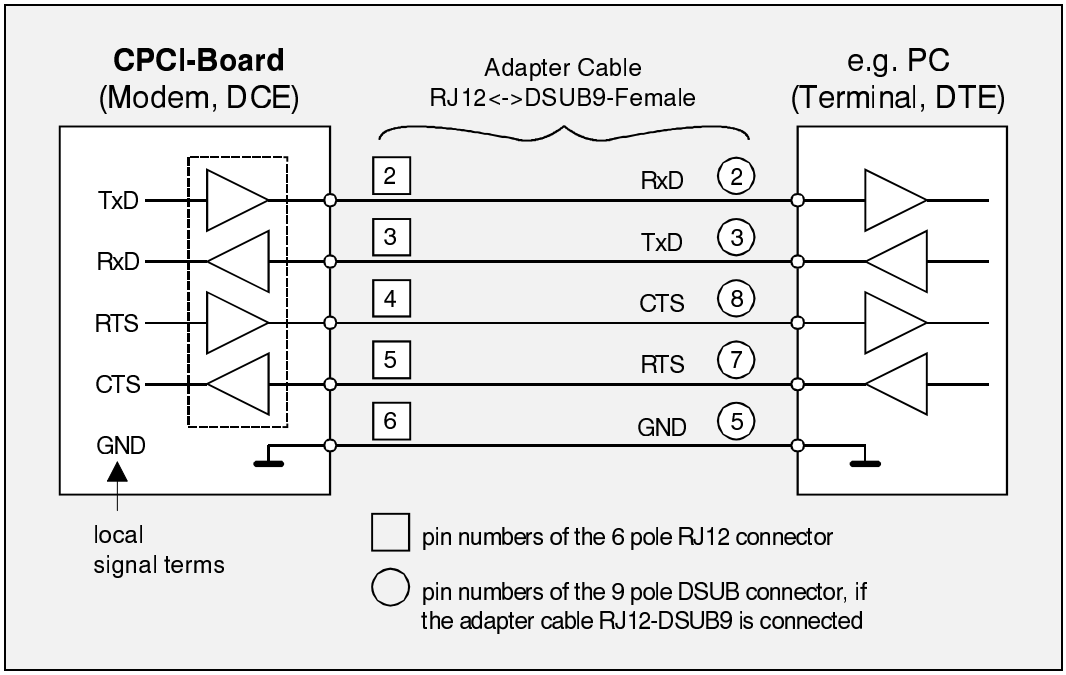


Fig. 3.2.1: Connection diagram for RS-232 operation

3.2.4 Connecting the Serial Interface SER 1 with TTL-Level

If another serial interface is required, an adapter, for instance, which converts TTL-signals into RS-232-signals can be connected to interface SER 1 via the 6-pin post connector X710 and flat ribbon cable.

Attention: The signals at the pins 3 and 6 will not only be used as TxD- and RxD-Signals. In the boot sequence of the PowerPC 405 these signals are used to define the setting of the operation mode (Strapping Pins). The level is defined by high-impedance local resistors on the board.
Therefore the user has to ensure, that no pull-up or pull-down resistors with values smaller than 10 kohm will be connected at the lines TxD-S1/STR17 or RxD-S1/STR18. This could be happen with some modem types !

3.3 Function of Coding Switch

3.3.1 Overview

Coding switch bit	Function	Default setting at delivery
1	no special function / general purpose	OFF
2	no special function / general purpose	OFF
3	no special function / general purpose	OFF
4	switching the boot Flash-EPROM	boot from Flash-EPROM U600

Table 3.3.1: Assignment of coding switch bits

The state of the DIP switches can be read at address 0xF040 0002. Each switch's state is represented in the least significant bits.

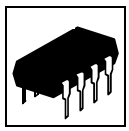
3.3.2 Switching the Boot-Flash-EPROM via Coding Switch Bit 4

The local operating system is booted from the Flash-EPROM U600 per default (chip select CS0 of PowerPC 405GP). By means of the coding switch the chip select signal can be switched so that the Flash-EPROM U610 will be accessed.

This switching can be used, for instance, to boot an 'Emergency Operating System' in the second Flash EPROM, if the board does not boot up again after a change in the default Flash-EPROM.

Position of coding switch bit 4	Function
0	Memory area of Flash-EPROM **U610** is at CS0
1	Memory area of Flash-EPROM **U600** is at CS0 **(default setting)**

Table 3.3.2: Meaning of coding switch bits 4



3.4 CAN/DeviceNet Unit

3.4.1 General

The CPCI-405 has got two independent CAN-channels. Each of these CAN-channels has got its own SJA1000 controller.

CAN-channel CAN0 can be accessed via 9-pin DSUB connector X1000 in the front panel. An 82C250/82C251 is used as driver unit. The differential CAN-bus signals are electrically insulated from other potentials.

The signals of CAN-channel CAN1 are at post connector X1010 in the form of TTL-signals. The TTL-signals of CAN0 are also led to this connector. By means of a flat ribbon cable two adapter boards can be connected to X1010. These adapter boards are available with the physical layer for CAN (ISO11898 with DSUB-connector), or with the physical layer for DeviceNet (Combicon socket). The flat ribbon cable for the connection of adapter boards can be fed through from one board to the next. This minimizes the wiring within the case.

Note: If the option of the external CAN or DeviceNet interface is used for CAN-channel CAN0 via the adapter board, the local CAN-interface cannot be used anymore, because it would require a change in the equipping!

3.4.2 Interface Circuits

The following diagram represents the principal circuit of the CAN-interface. The local CAN-interface of CAN0 is identically constructed to the CAN-interface on the adapter board.

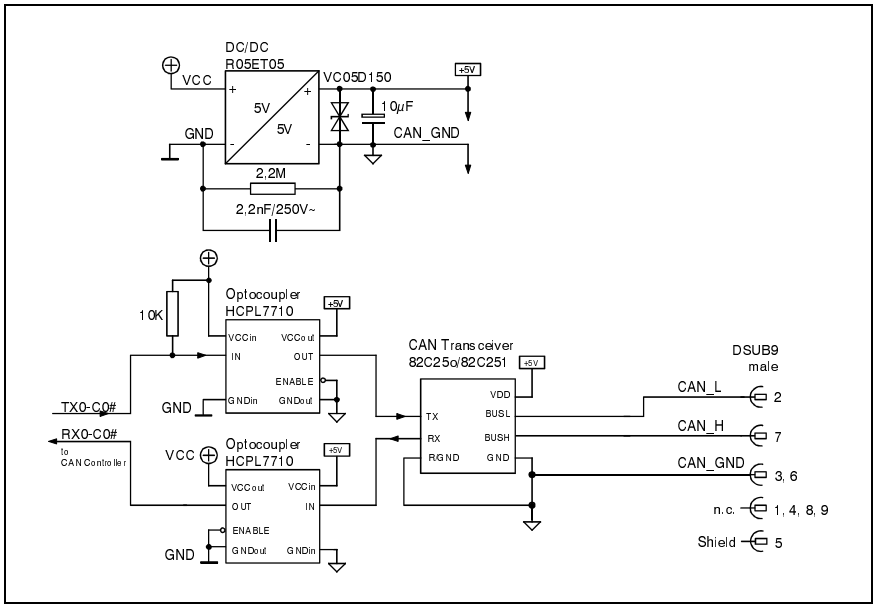


Fig. 3.4.1: Circuit of CAN-interface

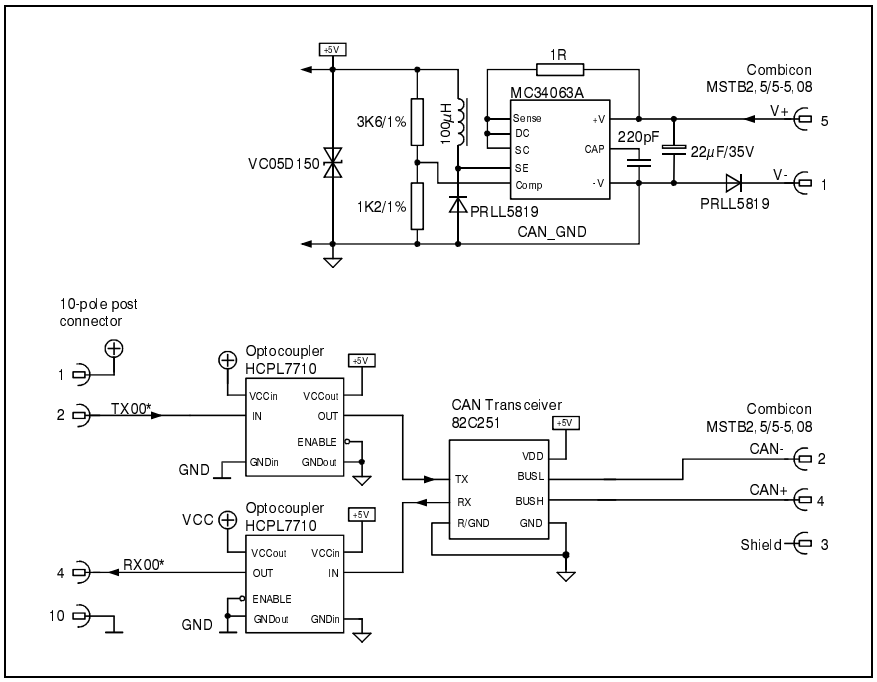


Fig. 3.4.2: Circuit of the DeviceNet interface on the adapter board

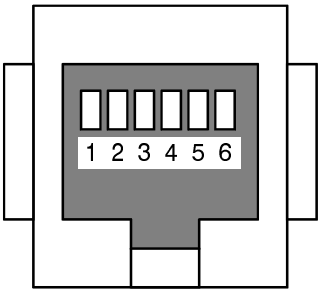
4. Connector Assignment

4.1 Serial Interfaces

For details on the connection of serial interfaces please refer also to chapter ‘Serial Interfaces’ on page 20. From the principle circuit diagrams represented in that chapter, you will be able to clearly determine the signal direction (Rx <-> Tx).

4.1.1 SER 0: Assignment of the RJ12 Socket X700

Pin Position:



Cut-out for
fastening lever

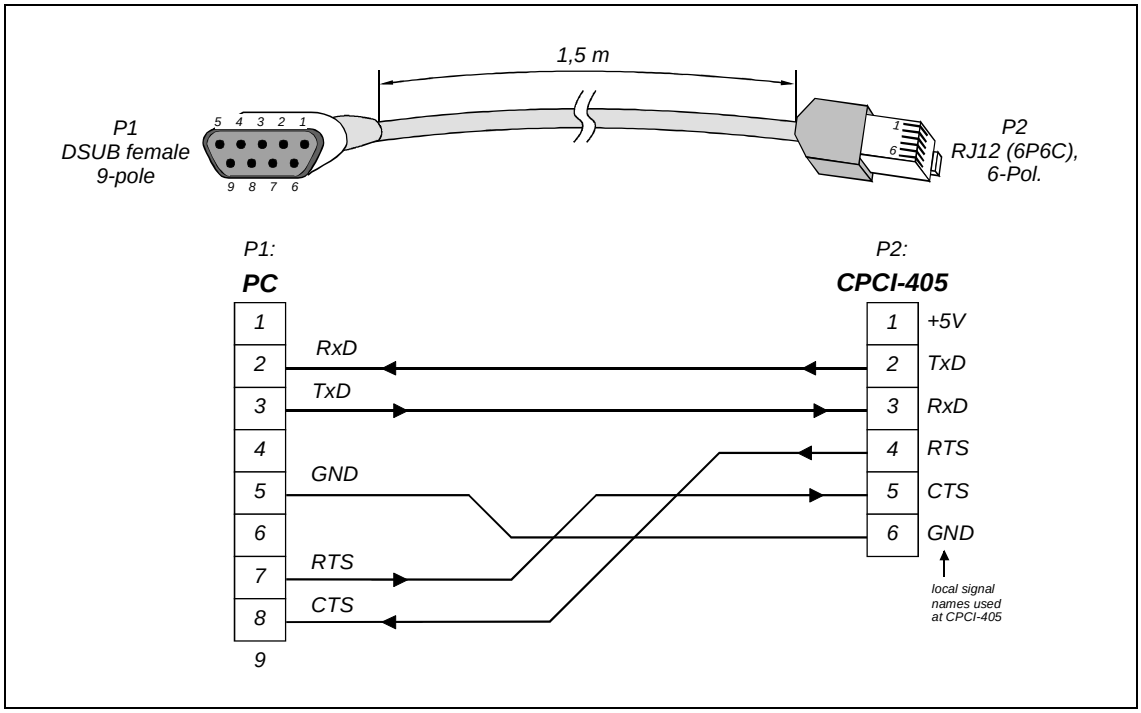
Pin Assignment:

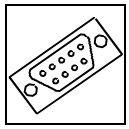
Pin	Local Signal Names	
1	+5 V	
2	TxD-S0	(Data Output)
3	RxD-S0	(Data Input)
4	RTS-S0	(Handshake Output)
5	CTS-S0	(Handshake Input)
6	GND	

The data direction of the signals is given as viewed from the CPCI-405 board.

Note:
esd only grants the compliance with directive 2014/30/EC, if the CAN wiring is carried out with at least single shielded **double twisted** pair cables.

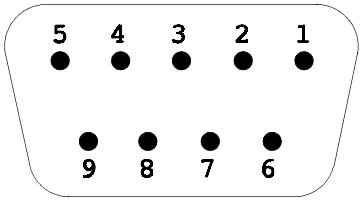
4.1.2 SER 0: Connection Cable RJ12-DSUB9





4.1.3 SER 0: DSUB-Socket when Using the Adapter Cable RJ12-DSUB9

Pin Position:

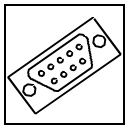


Pin Assignment:

Signal	Pin		Signal
n.c.	1	6	n.c.
RxD-S0 (output)	2	7	RTS-S0 (input)
TxD-S0 (input)	3	8	CTS-S0 (output)
n.c.	4	9	n.c.
GND	5		

9-pin DSUB female
n.c. ... not connected

The names of the signals are specified as seen from the terminal (PC). The signal direction specified in brackets is shown as seen from the CPCI-405 board.



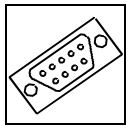
Connector Assignment

4.1.4 SER 1: Assignment of the 6-pin Post Connector X710

The signals of the serial interface SER 1 at X710 have **TTL-Level**!

Signal	Connector pin		Signal
+5 V	1	2	RxD
TxD-S1/STR17	3	4	GND
CTS	5	6	RTS-S1/STR18

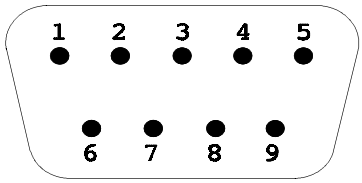
Attention: The signals at the pins 3 and 6 will not only be used as TxD- and RxD-Signals. In the boot sequence of the PowerPC 405 these signals are used to define the setting of the operation mode (Strapping Pins). The level is defined by high-impedance local resistors on the board.
Therefore the user has to ensure, that no pull-up or pull-down resistors with values smaller than 10 kohm will be connected at the lines TxD-S1/STR17 or RxD-S1/STR18. This could be happen with some modem types !



4.2 CAN-Bus Interface (X1000)

The position of the signals in the DSUB-connector of CAN-channel CAN0 (X1000) in the front panel, and the DSUB-connector on the optional adapter board are identical.

Pin Position:



Pin Assignment:

Signal	Pin		Signal
		1	reserved
CAN0_GND	6		
		2	CAN0_L
CAN0_H	7		
		3	CAN0_GND
reserved	8		
		4	reserved
reserved	9		
		5	shield

9-pin DSUB male

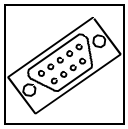
Signal Description:

CAN0_L, CAN0_H... CAN-signal lines (generated from the CAN-controller TTL-signals Tx0-CAN0* and Rx0-CAN0*)

CAN0_GND ... reference potential of the local CAN-physical layer

shield ... potential of connector case

reserved ... reserved for future applications



4.3 CAN-TTL Signals (X1010)

Connector X1010 has been assigned with the Rx/Tx-signals of both CAN-controllers. The signals are on TTL-level and are *not* electrically insulated from the microcontroller units!

X1010 has been designed for the connection of the optional adapter boards to the physical layer for CAN or DeviceNet.

Signal name	Pin		Signal name
+5V	1	2	Tx0-CAN1*
Tx1-CAN1*	3	4	Rx0-CAN1*
Rx1-CAN1*	5	6	Tx0-CAN0*
Tx1-CAN0*	7	8	Rx0-CAN0*
Rx1-CAN0*	9	10	GND

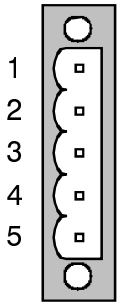
Note: If the option of the external CAN or DeviceNet interface is used for CAN-channel CAN0 via the adapter board, the local CAN-interface cannot be used anymore, because it would require a change in the equipping!
This concerns the signals Tx0-CAN0* and Rx0-CAN0*.

4.4 Option: DeviceNet-Adapter Boards

Both CAN-channels can be connected to two adapter boards by means of connector X1010. When using the DeviceNet option the adapter boards are equipped with Phoenix-Combicon connectors MSTB 2.5/-GF-5.08 (or equal).

The DeviceNet interface has been constructed in accordance with the 'DeviceNet Communication Model and Protocol, Rel. 2.0'. The power for the CAN-bus driver is here supplied externally.

Pin Position:



Pin Assignment:

Pin	Signal
1	V-
2	CAN-
3	shield
4	CAN+
5	V+

Signal Description:

V+... power supply (U_{VCC} = 24 V ± 4%)

V-... reference potential to V+ and CAN+/CAN-

CAN+, CAN-... CAN-signal lines

shield... shield
(connected to ground via high-impedance RC-member)

The DeviceNet option includes the CPCI-405, the DeviceNet-adapter board, the flat ribbon cable, the fastening angles and all screws, nuts and securing plates required.

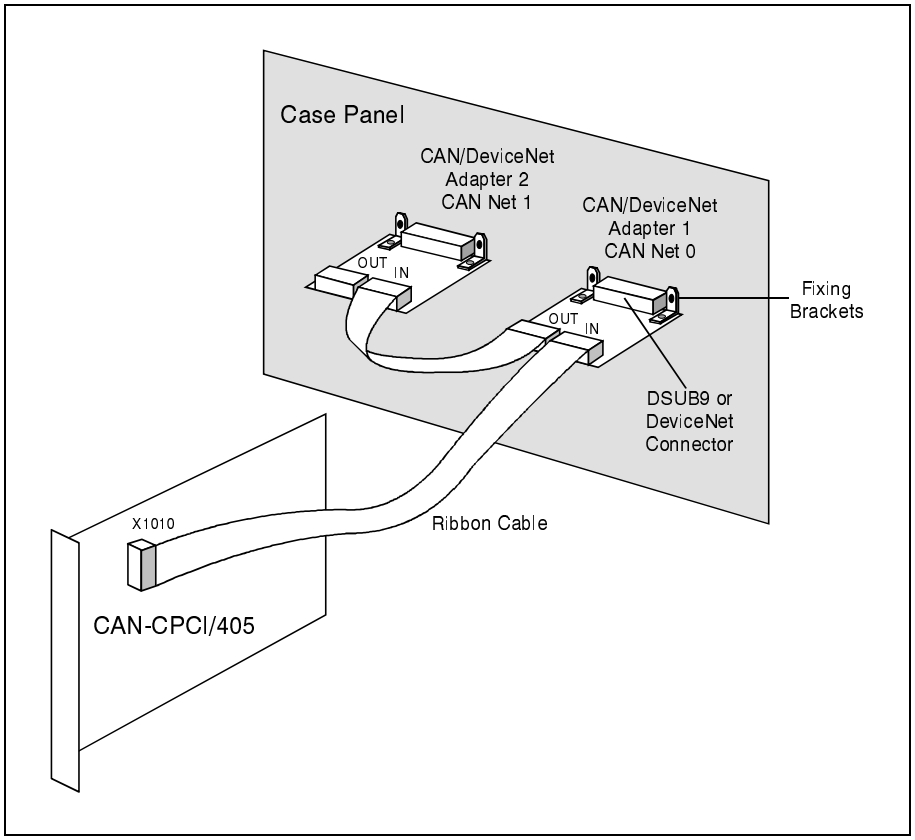


Fig. 4.3.1: Wiring of adapter boards

The dimensions specified in the following diagrams are in millimetres.

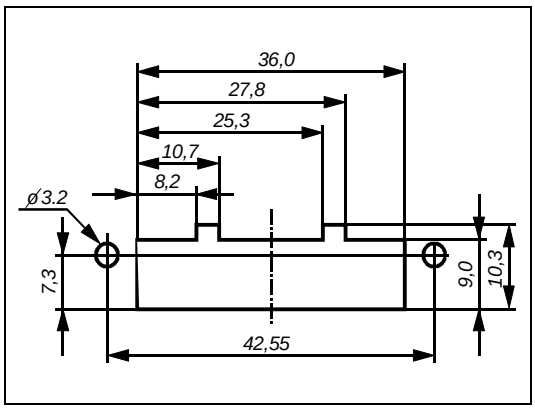


Fig. 4.3.2: Cut-out in the case wall for adapter boards with DeviceNet connector

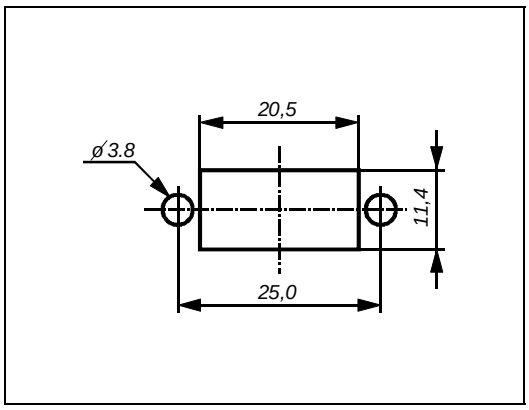


Fig. 4.3.3: Cut-out in the case wall for adapter boards with DSUB9-connector

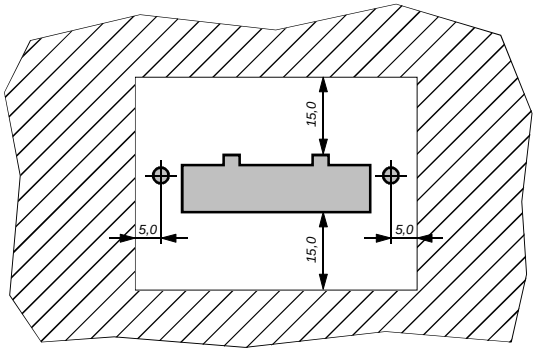


Fig. 4.3.4: Recommended space at the external case wall for adapter boards with DeviceNet connector (considers for instance the following Phoenix Combicon connector groups:
MSTB, MSTBP, MVSTBR, MVSTBW, TMSTBP)

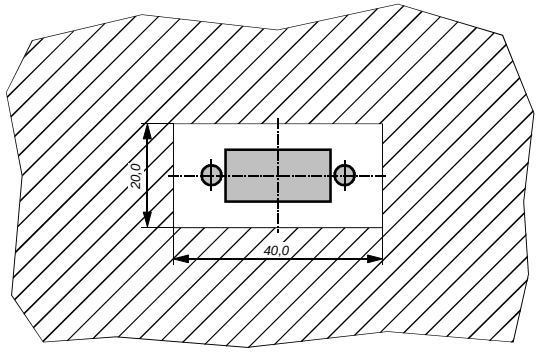


Fig. 4.3.5: Recommended space at the external case wall for adapter boards with DSUB9 connector

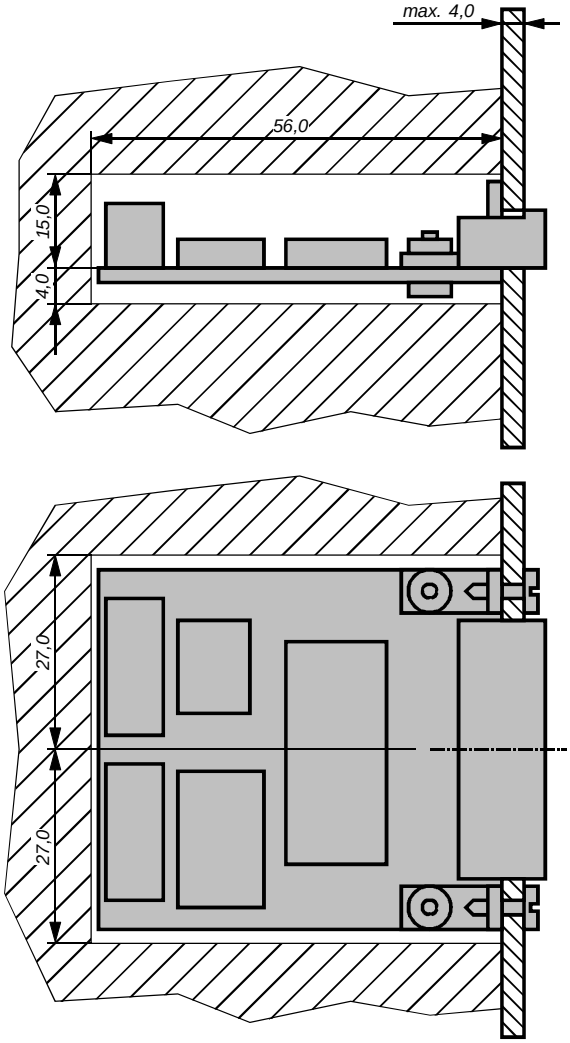
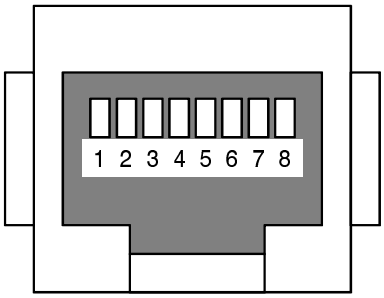


Fig. 4.3.6: Minimum required space within the case for adapter boards with DeviceNet or DSUB9 connectors

4.5 ETHERNET 10/100BASE-T Connection (X1200)

Pin Position:



Cut-out for
fastening lever

Pin Assignment:

Pin	Signal
1	TP01 (TxD+)
2	TP02 (TxD-)
3	TP03 (RxD+)
4	TP04
5	TP05
6	TP06 (RxD-)
7	TP07
8	TP08

8-pin RJ45-socket

Permissible cable types:
Cables of category 5e or higher have to be used to grant the function in networks with up to 100 Mbits/s.
esd grants the EC conformity of the product if the wiring is carried out with shielded twisted pair cables of class SF/UTP or higher.

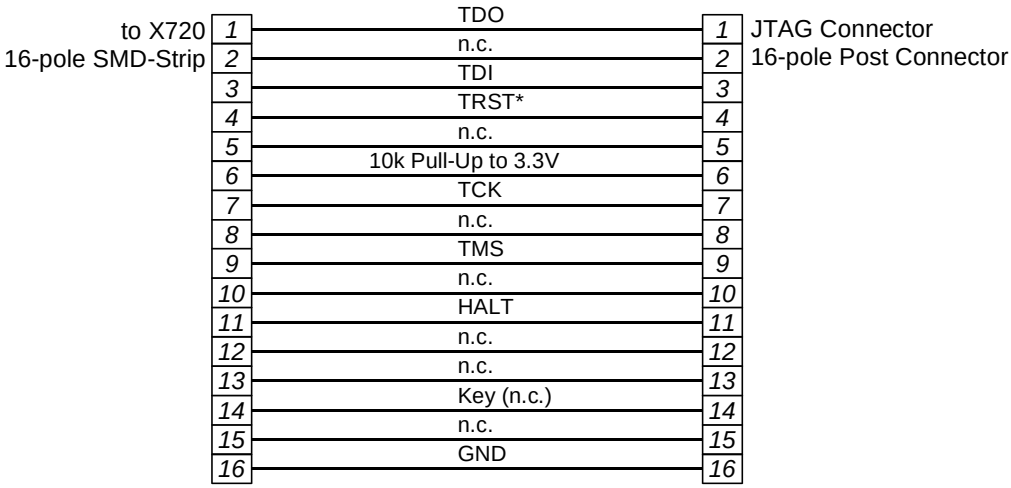
4.6 Debug Port X720

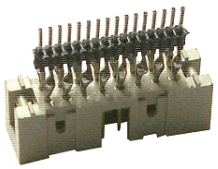
With the debug port e.g. firmware updates can be executed. It can be connected via a SMD-pin contact strip connector. It is recommended to build a simple adapter from the SMD-pin contact strip connector to a 16-pin post connector to connect the port.

At the CPCI-405 board of the first series (PCB-rev. 1.x) a SMD-pin contact strip connector with 16 pins is used. Later series of the CPCI-405 (from PCB-rev. 2.x) carry an 8-pin SMD-pin contact strip connector.

Attention: The SMD-pin contact strip connector case has no polarity! Take care to insert it into the correct position. The orientation of the pins of X720 is shown at page 10.

4.6.1 Signal Alignment of the 16-pole SMD-Strip and JTAG-Adapter (PCB-Rev. 1.x)



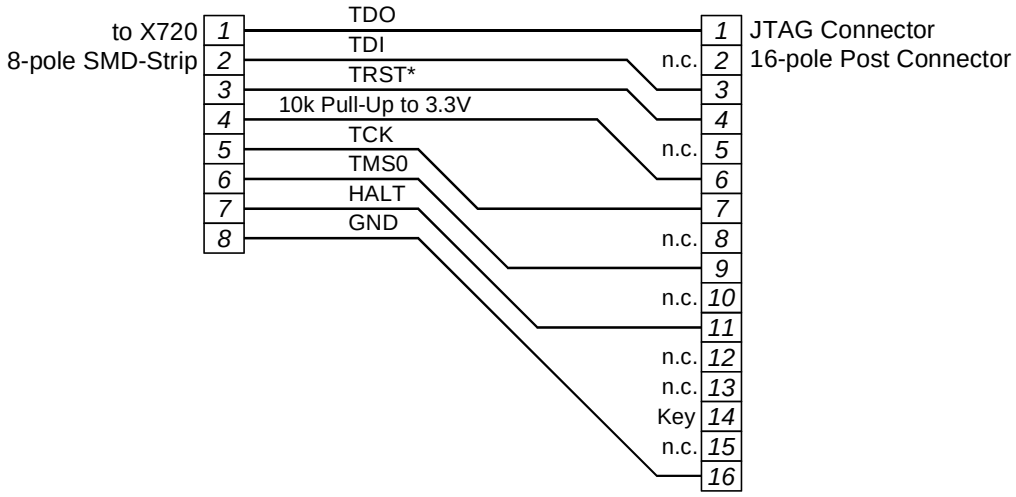


Example of an Adapter (Uncasted)

Connectors to build adapter:

	SMD-pin contact strip:	Fa. Samtec, ‘modified pin contact strip’, order-no. MTMS-116-52-T-S-205
	2.54 mm post connector:	i.e. Fa. Harting, 16-pole, straight, order-no. 09185167324

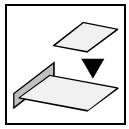
4.6.2 Signal Alignment of 8-pole SMD-Strip and JTAG-Adapter (from PCB-Rev. 2.x)



Example of an
Adapter (Uncasted)

Connectors to build adapter: SMD-pin contact strip: Fa. Samtec, 'modified pin contact strip', order-no. MTMS-108-58-T-S-485

2.54 mm post connector: i.e. Fa. Harting, 16-pole, straight, order-no. 09185167324



5. Special Designs: CPCI-405 with CPCI-CAN-ISO11898 Add-On

In the special designs the add-on CPCI-CAN-ISO11898 (I.2301.03) is already integrated in the CPCI-405 module which comes with a 8 HP front panel (I.2306.49, I.2306.12) or a 6 U front panel (I.2306.47). The interfaces are easy to access as RS-232 interface (SER1) and as CAN interface (CAN1) directly via the front panel. In this chapter only the additional connectors of the CPCI-405 special designs are described. Refer to the previous chapters for the description of the connectors X700, X1000, X1200 and the LED-display.

5.1 CPCI-405-2 PowerPC Host with 8 HP Front Panel (I.2306.49)

In this design the adapter board CPCI-CAN-ISO11898 is connected directly to the CPCI-405.

(Fig. shows CPCI-405-2-Design up to S/N BC882)

Fig. 5.1.1: CPCI-405-2 with adapter board and 8 HP front panel

5.1.1 Front Panel view of CPCI-405-2 with Adapter Board and 8 HP Front Panel

The assignment and display function of the LEDs and the position and assignment of connector X700, X1000 and X1200 are the same as described for the CPCI-405.

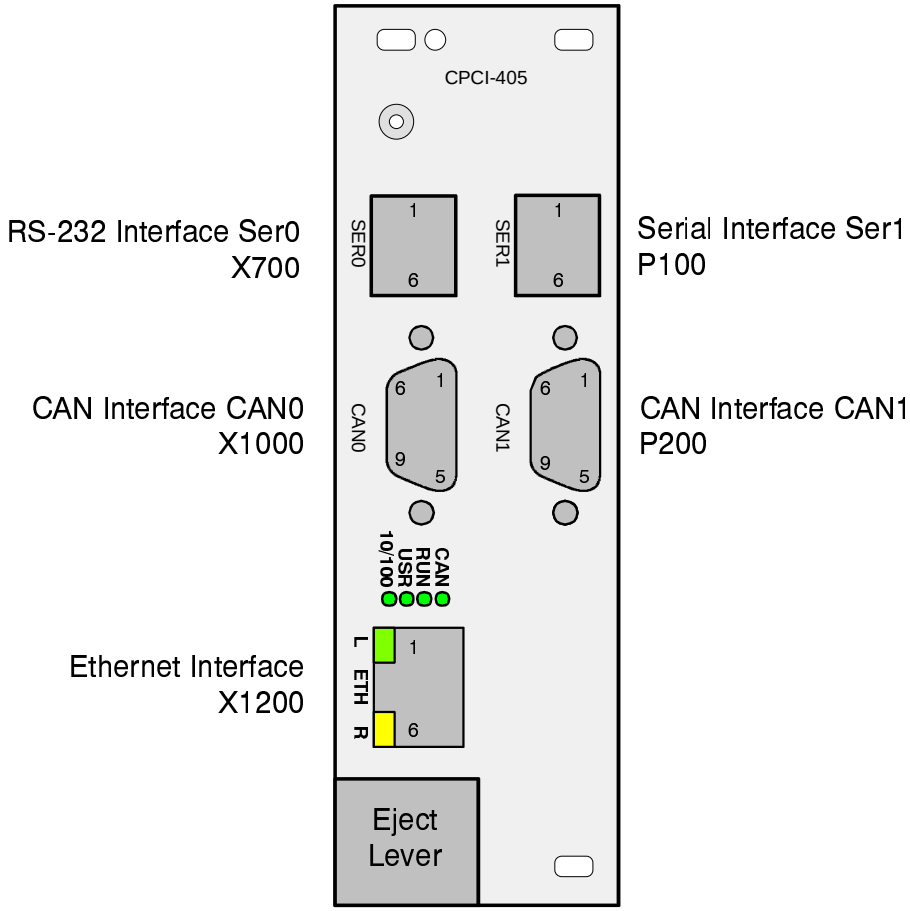


Fig. 5.1.2: Front panel view

5.2 CPCI-405-A PCI-Adapter with 6 U Front Panel (I.2306.47)

In this design the adapter board CPCI-CAN-ISO11898 is connected to the CPCI-405 via ribbon cable.

(Fig. shows CPCI-405-A-design up to S/N BC882)

Fig. 5.2.1: CPCI-405-A PCI-adapter with adapter board and 6 U front panel

5.2.1 Front Panel view of the CPCI-405-A PCI-Adapter with 6 U Front Panel

The assignment and display function of the LEDs and the position and assignment of connector X700, X1000 and X1200 are the same as described for the CPCI-405.

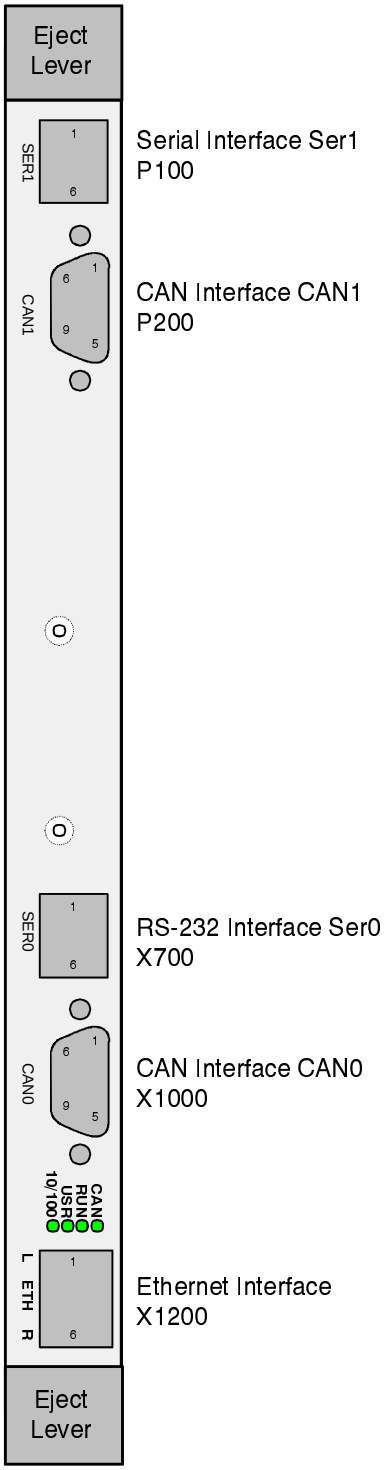
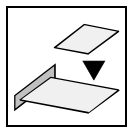


Fig. 5.2.2: Front panel view of the CPCI-405 with 6 U Front panel



5.3 Serial Interface

The serial Interface SER1 is per default configured for RS-232 operation. The interface can be configured as RS-422 or RS-485 interface via the solder bridges LB100 - LB103 (page 43).
The following figures explain the code designation of the signals used in the connector assignments.

5.3.1 RS-232 Interface

The Figure exemplifies the connection of the CPCI-405 via the adapter cable RJ12 <-> DSUB-socket to a terminal. The names of the signals of the adapter cable are chosen correspondingly.

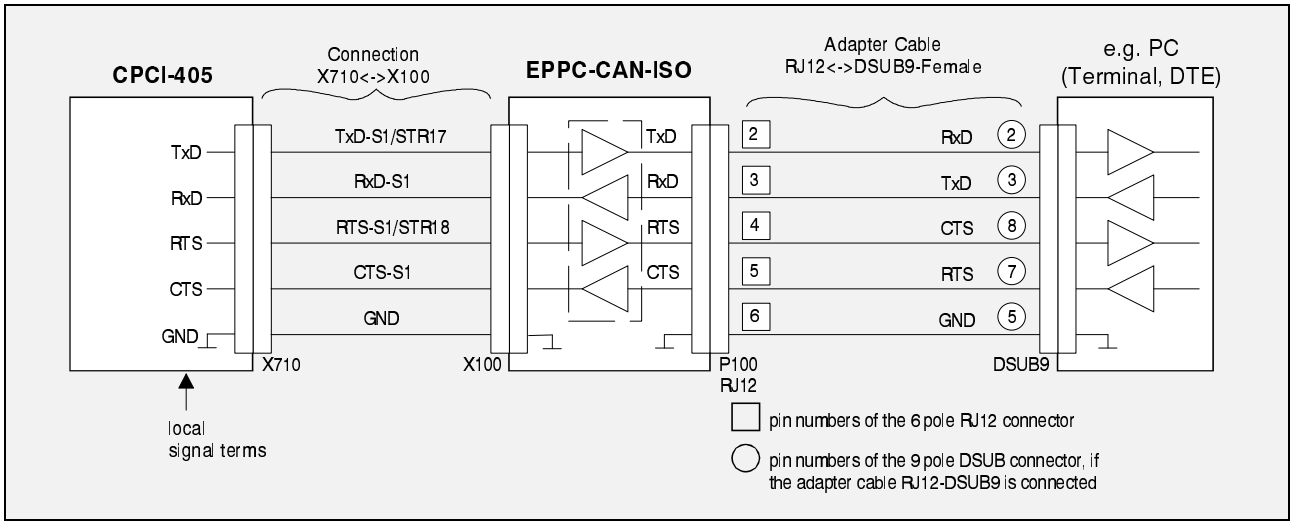


Fig. 5.3.1: Connection scheme of RS-232 operation

5.3.2 RS-422 interface

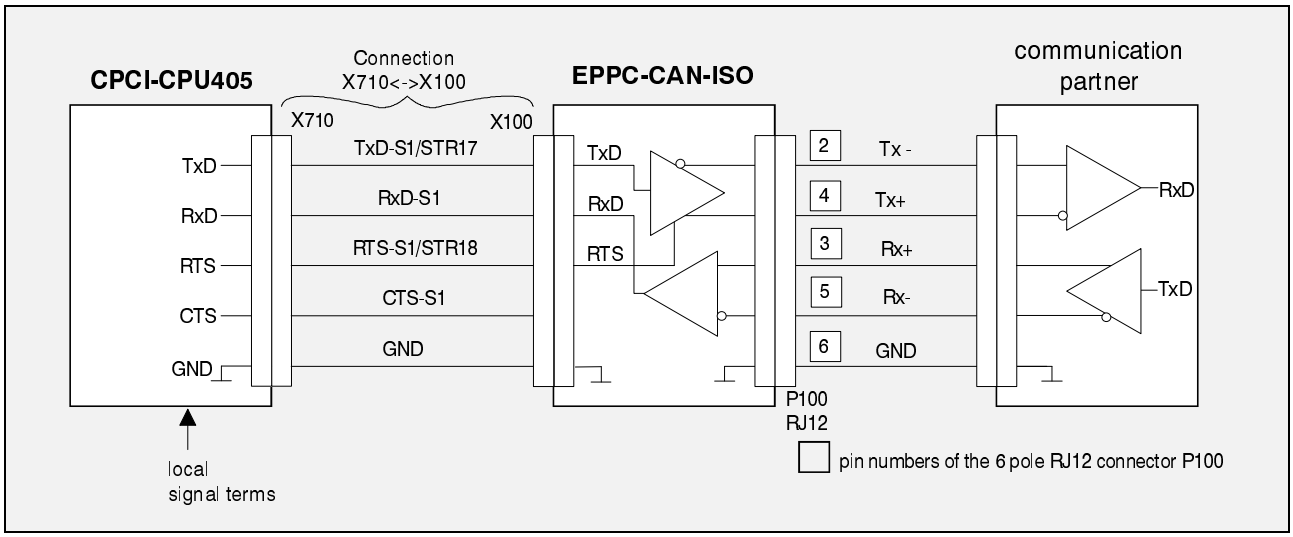


Fig. 5.3.2: Connection scheme for RS-422 operation

5.3.3 RS-485 interface

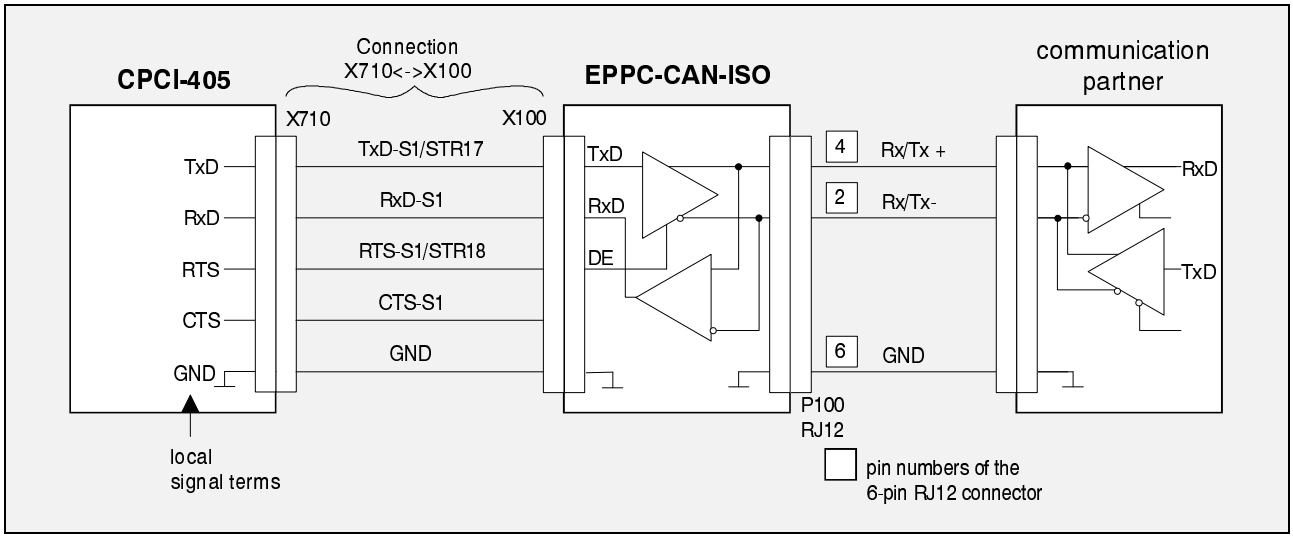


Fig. 5.3.3: Connection scheme for RS-485 operation

For the RS-485 interface the data direction (receive/transmit) of the driver component has to be switched by software. The data direction can be switched with the RTS-signal, which is connected with the data enable (DE) of the driver component.

receive: DE(RTS) has to be set to '0'
transmit: DE(RTS) has to be set to '1' and reset with stop-bit

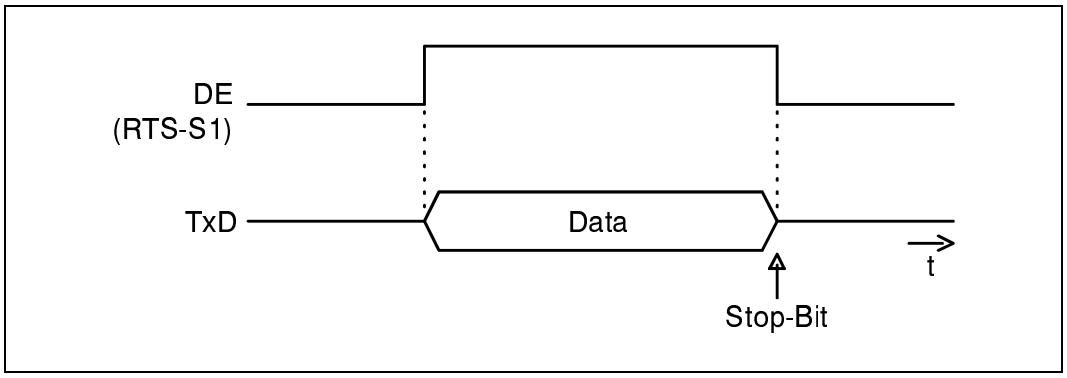


Fig. 5.3.4: Set RTS to transmit and receive

5.3.4 Solder Bridges for the Configuration of the Serial Interface SER1

The serial interface SER1 can be configured with the solder bridges LB100 - LB103.

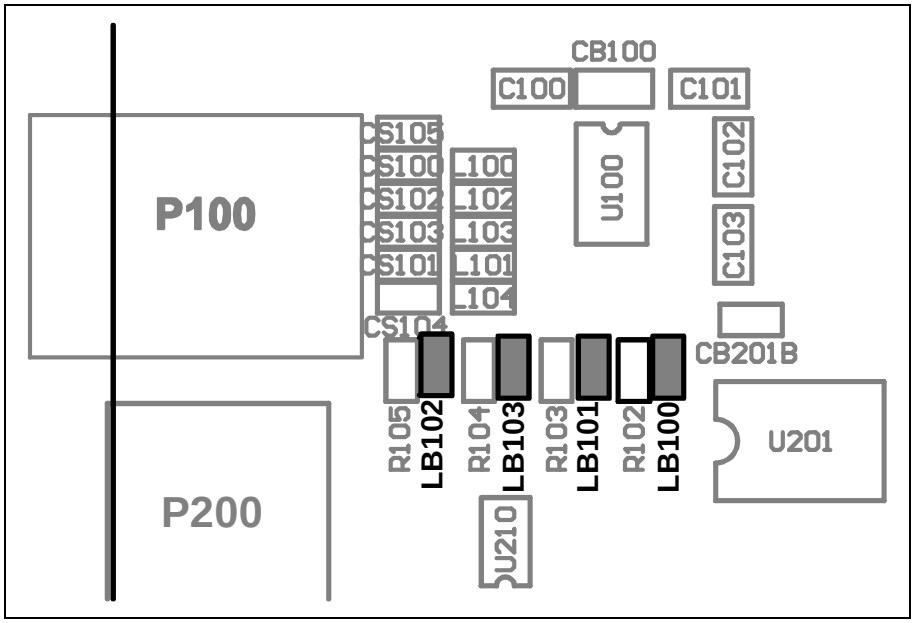


Fig. 5.3.5: Position of the solder bridges on the board (detail drawing)

Configuration of the serial interface SER1 with the solder bridges LB100-LB102:

solder bridge	RS-232 interface	RS-422 interface	RS-485 interface
LB100	closed	open	open
LB101	closed	closed	open
LB102	open	closed	open

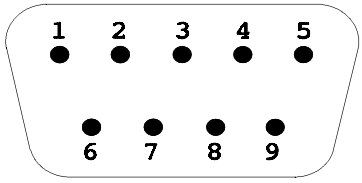
Table 5.3.1: Configuration of the serial interface SER1

With the solder bridge **LB103** the FAST control pin can be set. The FAST control pin is used to select the slew-rate limiting of the RS-232 transmitters and the RS-485/422 driver. With the solder bridge LB103 (FAST unasserted), the RS-232 transmitters and the RS-485/-422 driver are slew-rate limited to reduce disturbances by electromagnetic impulses (EMI).
For further information, please refer to the datasheet of the serial driver MAX3160: www.maxim.de

5.4 Connector Assignments of the Special Designs

5.4.1 CAN-Interface CAN 1

Pin Position:



Pin Assignment:

Signal	Pin		Signal
		1	reserved
CAN1_GND	6		
		2	CAN1_L
CAN1_H	7		
		3	CAN1_GND
reserved	8		
		4	reserved
reserved	9		
		5	Shield

9-pin DSUB connector

Signal Description:

CAN1_L, CAN1_H... CAN-signal lines (generated from the CAN-Controller TTL-signals Tx0-CAN1* and Rx0-CAN1*)

CAN1_GND ... reference potential of the local CAN-physical layer

Shield ... potential of the connector case

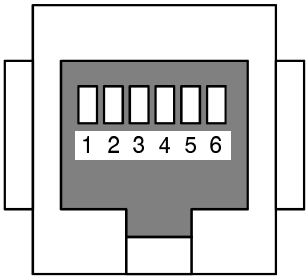
reserved ... reserved for future applications

5.4.2 SER1: Assignment of the RJ12 Socket P100

The serial interface SER1 of the adapter board can be configured as RS-232, RS-422 or RS-485 interface. The configuration via the solder bridges is described in the previous chapter (see page 43).

For notes on the connection of serial interfaces please refer to chapter 'Serial Interfaces' on page 41. From the principle circuit diagrams represented in that chapter, you will be able to clearly determine the signal direction (Rx<->Tx).

Pin Position:



Cut-out for
fastening lever

Pin Assignment:

Pin	Signal		
	RS3232	**RS422**	**RS485**
1	n.c.	n.c.	n.c.
2	TxD-S1 Data Output	Tx-	Tx/Rx-
3	RxD-S1 Data Input	Rx+	n.c.
4	RTS-S1 Handshake Output	Tx+	Tx/Rx+
5	CTS-S1 Handshake Input	Rx-	n.c.
6	GND	GND	GND

The data direction of the signals is given as viewed from EPPC-CAN-ISO adapter board.
The signal direction does not switch automatically for the RS-485 interface! The signal direction must be set by software via RTS-control.
An example for the assignment of a connection cable RJ12 <-> DSUB9 for RS-232 operation is described on page 26.

6. Correct Wiring of Electrically Isolated CAN Networks

For the CAN wiring all applicable rules and regulations (EU, DIN), e.g. regarding electromagnetic compatibility, security distances, cable cross-section or material, have to be met.

6.1 Standards concerning CAN Wiring

The flexibility in CAN network design is one of the key strengths of the various extensions and additional standards like e.g. CANopen, ARINC825, DeviceNet and NMEA2000 that have been built on the original ISO 11898-2 CAN standard. In using this flexibility comes the responsibility of good network design and balancing these tradeoffs.

Many CAN organizations and standards have scaled the use of CAN for applications outside the original ISO 11898. They have made system level tradeoffs for data rate, cable length, and parasitic loading of the bus.

However for CAN network design margin must be given for signal loss across the complete system and cabling, parasitic loadings, network imbalances, ground offsets against earth potential and signal integrity. **Therefore the practical maximum number of nodes, bus length and stub length are typically much lower.**

esd has concentrated her recommendations concerning CAN wiring on the specifications of the ISO 11898-2. Thus this wiring hints forgoes to describe the special features of the derived standards CANopen, ARINC825, DeviceNet and NMEA2000.

The consistent compliance to ISO 11898-2 offers significant advantages:

- Durable operation due to well proven design specifications
- Minimizing potential failures due to sufficient margin to physical limits
- Trouble-free maintenance during future network modifications or during fault diagnostics due to lack of exceptions

Of course reliable networks can be designed according the specifications of CANopen, ARINC825, DeviceNet and NMEA2000, **however it must be observed that it is strictly not recommended to mix the wiring guidelines of the various specifications!**

6.2 Heavy Industrial Environment (Double Twisted Pair Cable)

6.2.1 General Rules

Note:
esd only grants the compliance with directive 2014/30/EC, if the CAN wiring is carried out with single shielded **double twisted** pair cables that match the requirements of ISO 11898-2.

The following **general rules** for CAN wiring with single shielded single twisted pair cable must be followed:

1	A cable type with a wave impedance of about 120 Ω ±10% with an adequate conductor cross section (≥ 0.22 mm²) has to be used. The voltage drop over the wire has to be considered.
2	For heavy industrial environment use a **four-wire** CAN cable. Connect ● two twisted wires to the data signals (CAN_H, CAN_L) and ● other two twisted wires to the reference potential (CAN_GND) and ● cable shield to functional earth (FE) at least at one point.
3	The reference potential CAN_GND has to be connected to the functional earth (FE) at exactly **one** point.
4	A CAN bus line must not branch (exception: short cable stubs) and has to be terminated with the characteristic impedance of the line (generally 120 Ω ±10%) at both ends (between the signals CAN_L and CAN_H and **not** to CAN_GND).
5	Keep cable stubs as short as possible (l < 0.3 m).
6	Select a working combination of bit rate and cable length.
7	Keep away CAN cables from disturbing sources. If this cannot be avoided, double shielded cables are recommended.

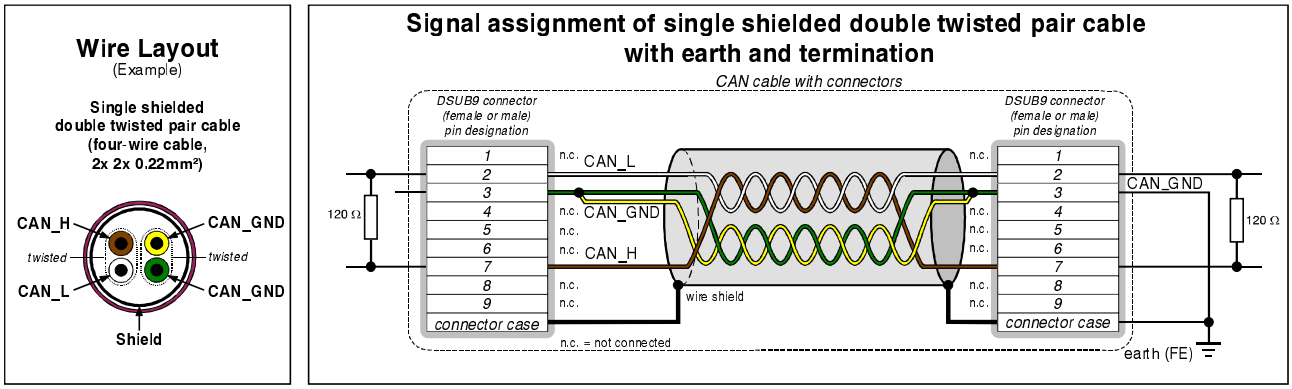


Fig. 2: CAN wiring for heavy industrial environment

6.2.2 Device Cabling

Attention:
If single shielded double twisted pair cables are used, realize the T-connections by means of connectors that support connection of two CAN cables at one connector where the cable's shield is looped through e.g. DSUB9-connector from ERNI (ERBIC CAN BUS MAX, order no.:154039).

The usage of esd's T-connector type C.1311.03 is not recommended for single shielded *double* twisted pair cables because the shield potential of the conductive DSUB housing is not looped through this T-connector type.

If a mixed application of single twisted and double twisted cables is unavoidable, take care that the CAN_GND line is not interrupted!

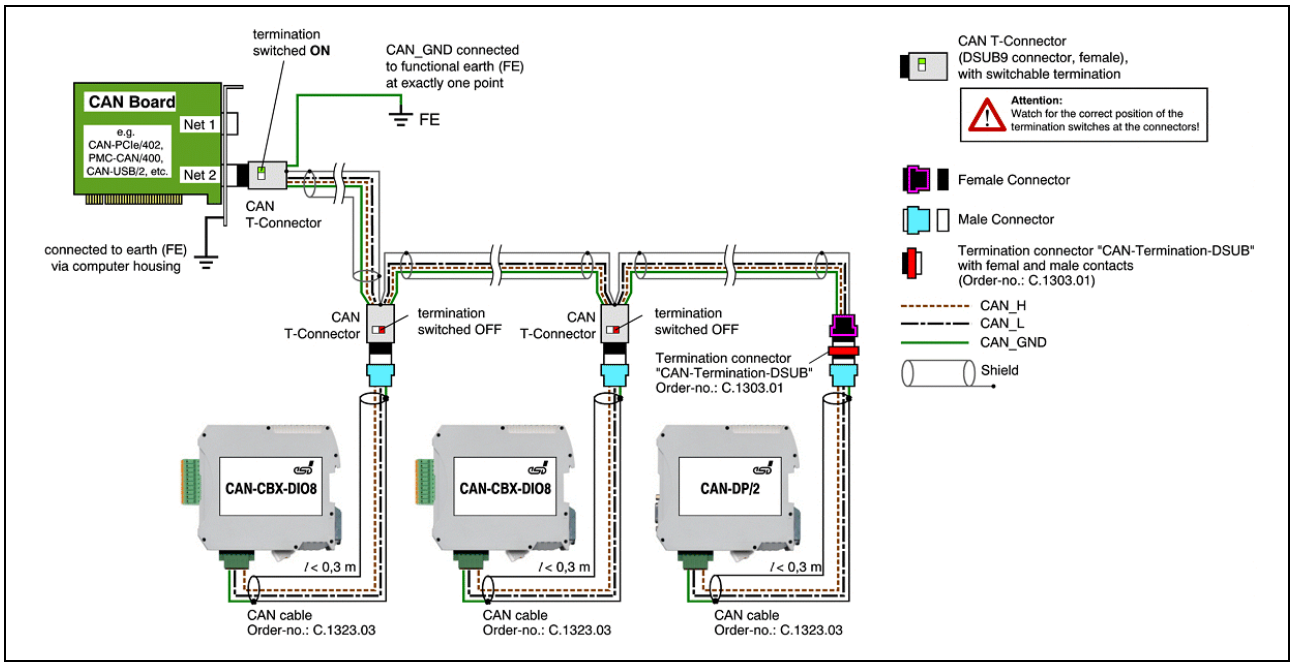


Fig. 3: Example for proper wiring with single shielded double twisted pair cables

6.2.3 Termination

- A termination resistor has to be connected at both ends of the CAN bus. If an integrated CAN termination resistor which is equipped at the CAN interface at the end of the bus is connected, this one has to be used for termination instead of an external CAN termination plug.
- 9-pin DSUB-termination connectors with integrated termination resistor and male and female contacts (gender changer) are available from esd (order no. C.1303.01).
- 9-pin DSUB-connectors with integrated switchable termination resistor can be ordered e.g. from ERNI (ERBIC CAN BUS MAX, female contacts, order no.:154039).

6.3 Light Industrial Environment (Single Twisted Pair Cable)

6.3.1 General Rules

Note:
esd only grants the compliance with directive 2004/30/EC, if the CAN wiring is carried out with single shielded **double twisted pair** cables that match the requirements of ISO 11898-2. See previous chapter: 'Heavy Industrial Environment (Double Twisted Pair Cable)'.

The following **general rules** for CAN wiring with single shielded *single* twisted pair cable should be followed:

1	A cable type with a wave impedance of about 120 Ω ±10% with an adequate conductor cross section (≥ 0.22 mm²) has to be used. The voltage drop over the wire has to be considered!
2	For light industrial environment use at least a **two-wire** CAN cable. Connect ● the two twisted wires to the data signals (CAN_H, CAN_L) and ● the cable shield to the reference potential (CAN_GND).
3	The reference potential CAN_GND has to be connected to the functional earth (FE) at exactly **one** point.
4	A CAN net must not branch (exception: short cable stubs) and has to be terminated with the characteristic impedance of the line (generally 120 Ω ±10%) at both ends (between the signals CAN_L and CAN_H and **not** at CAN_GND)!
5	Keep cable stubs as short as possible (l < 0.3 m)!
6	Select a working combination of bit rate and cable length.
7	Keep away cables from disturbing sources. If this cannot be avoided, double shielded wires are recommended.

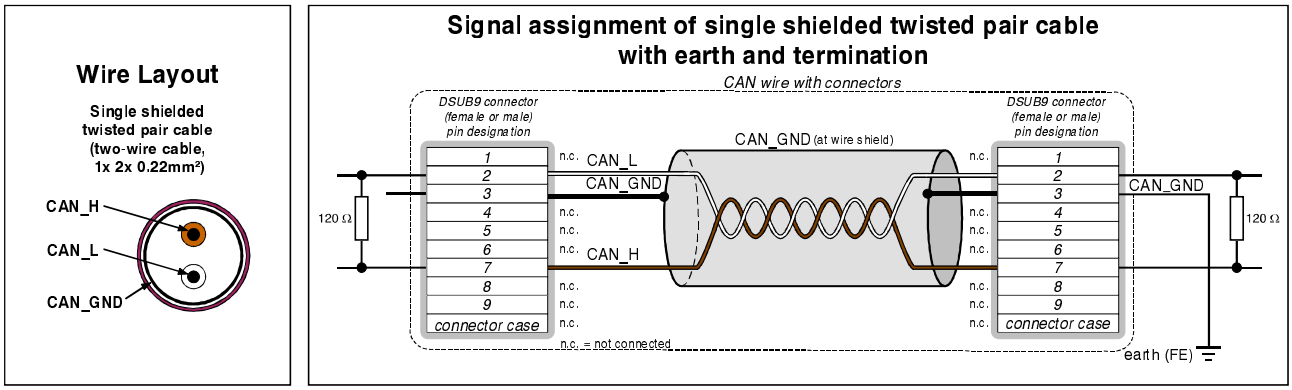


Figure. 4: CAN wiring for light industrial environment

6.3.2 Cabling

- To connect CAN devices with just one CAN connector per net use a short stub (< 0.3 m) and a T-connector (available as accessory). If this devices are located at the end of the CAN network, the CAN terminator “CAN-Termination-DSUB9” can be used.

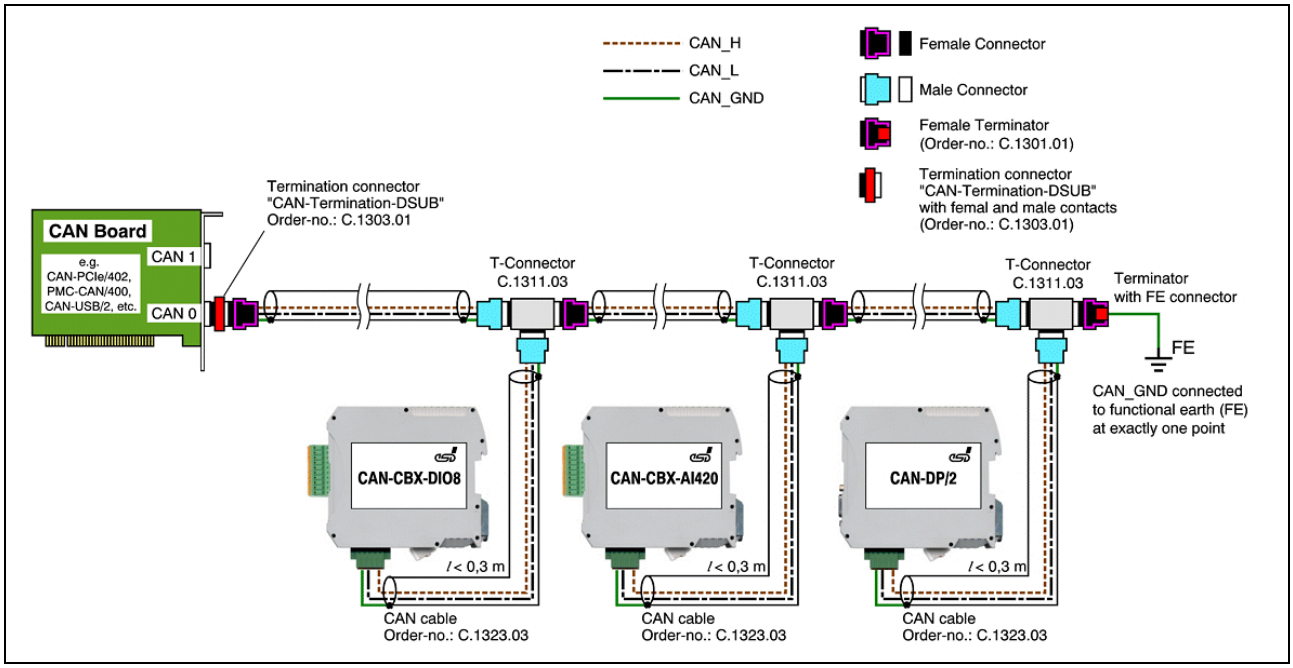


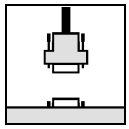
Figure. 5: Example for proper wiring with single shielded single twisted pair wires

6.3.3 Termination

- A termination resistor has to be connected at both ends of the CAN bus.
  If an integrated CAN termination resistor which is equipped at the CAN interface at the end of the bus is connected, this one has to be used for termination instead of an external CAN termination plug.

- 9-pin DSUB-termination connectors with integrated termination resistor and male and female contacts (gender changer) are available from esd (order no. C.1303.01).

- DSUB termination connectors with male contacts (order no. C.1302.01) or female contacts (order no. C.1301.01) and additional functional earth contact are available, if CAN termination and grounding of CAN_GND is required.



6.4 Electrical Grounding

- For CAN devices with electrical isolation the CAN_GND must be connected between the CAN devices.
- CAN_GND should be connected to the earth potential (FE) at **exactly one** point of the network.
- Each *CAN interface with electrical connection to earth potential* acts as grounding point. For this reason it is recommended not to connect more than one *CAN device with electrical connection to earth potential*.
- Grounding can be made e.g. at a connector (e.g. order no. C.1302.01 or C.1301.01)

6.5 Bus Length

Bit-Rate [kBit/s]	Typical values of reachable wire length **with esd interface** l_{max} [m]	**CiA recommendations** (07/95) for reachable wire lengths l_{min} [m]
1000	37	25
800	59	50
666.$\overline{6}$	80	-
500	130	100
333.$\overline{3}$	180	-
250	270	250
166	420	-
125	570	500
100	710	650
83.$\overline{3}$	850	-
66.$\overline{6}$	1000	-
50	1400	1000
33.$\overline{3}$	2000	-
20	3600	2500
12.5	5400	-
10	7300	5000

Table 2: Recommended cable lengths at typical bit rates (with esd-CAN interfaces)

- Optical couplers are delaying the CAN signals. esd modules typically reach a wire length of 37 m at 1 Mbit/s within a proper terminated CAN network without impedance disturbances like e.g. caused by cable stubs > 0.3 m.

Note:
Please note the recommendations of ISO 11898 regarding to the configuration of the conductor cross section in dependance of the cable length.

6.6 Examples for CAN Cables

esd recommends the following two-wire and four-wire cable types for CAN network design. These cable types are used by esd for ready-made CAN cables, too.

6.6.1 Cable for Light Industrial Environment Applications (Two-Wire)

Manufacturer	Cable Type
U.I. LAPP GmbH Schulze-Delitzsch-Straße 25 70565 Stuttgart Germany www.lappkabel.de	e.g. UNITRONIC ®-BUS CAN UL/CSA (1x 2x 0.22) (UL/CSA approved) Part No.: 2170260 UNITRONIC ®-BUS-FD P CAN UL/CSA (1x 2x 0.25) (UL/CSA approved) Part No.: 2170272
ConCab GmbH Äußerer Eichwald 74535 Mainhardt Germany www.concab.de	e.g. BUS-PVC-C (1x 2x 0.22 mm²) Part No.: 93 022 016 (UL appr.) BUS-Schleppflex-PUR-C (1x 2x 0.25 mm²) Part No.: 94 025 016 (UL appr.)

6.6.2 Cable for Heavy Industrial Environment Applications (Four-Wire)

Manufacturer	Cable Type
U.I. LAPP GmbH Schulze-Delitzsch-Straße 25 70565 Stuttgart Germany www.lappkabel.de	e.g. UNITRONIC ®-BUS CAN UL/CSA (2x 2x 0.22) (UL/CSA approved) Part No: 2170261 UNITRONIC ®-BUS-FD P CAN UL/CSA (2x 2x 0.25) (UL/CSA approved) Part No.: 2170273
ConCab GmbH Äußerer Eichwald 74535 Mainhardt Germany www.concab.de	e.g. BUS-PVC-C (2x 2x 0.22 mm²) Part No.: 93 022 026 (UL appr.) BUS-Schleppflex-PUR-C (2x 2x 0.25 mm²) Part No.: 94 025 026 (UL appr.)

Note:
Ready-made CAN cables with standard or custom length can be ordered from **esd.**

7. CAN-Bus Troubleshooting Guide

The CAN Troubleshooting Guide is a guide to find and eliminate the most frequent hardware-error causes in the wiring of CAN networks.

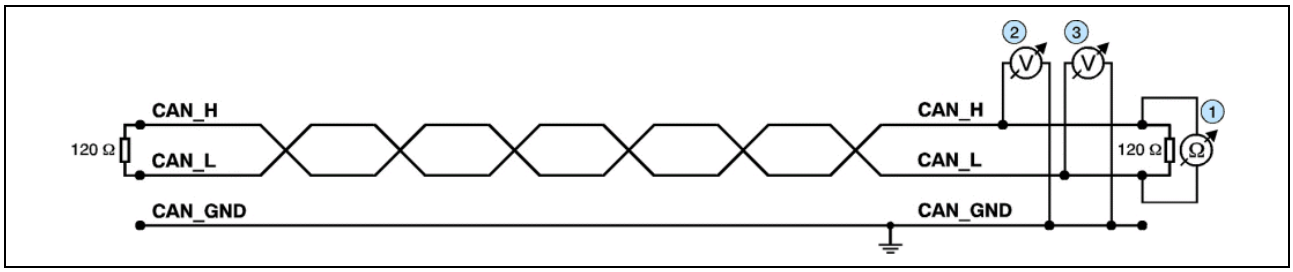


Figure. 6: Simplified diagram of a CAN network

7.1 Termination

The termination is used to match the impedance of a node to the impedance of the transmission line being used. When impedance is mismatched, the transmitted signal is not completely absorbed by the load and a portion is reflected back into the transmission line. If the source, transmission line and load impedance are equal these reflections are avoided. This test measures the series resistance of the CAN data pair conductors and the attached terminating resistors.

To test it, please

1. Turn off all power supplies of the attached CAN nodes.
2. Measure the DC resistance between CAN_H and CAN_L at one end of the network (1) (see figure above)

The measured value should be between 50 Ω and 70 Ω.

If the value is below 50 Ω, please make sure that:
- there is no **short circuit** between CAN_H and CAN_L wiring
- there are **not more than two** terminating resistors connected
- the nodes do not have faulty transceivers.

If the value is higher than 70 Ω, please make sure that:
- there are no open circuits in CAN_H or CAN_L wiring
- your bus system has two terminating resistors (one at each end) and that they are 120 Ω each.

7.2 Electrical Grounding

CAN_GND of the CAN network should be connected to Functional earth potential (FE) at only **one** point. This test will check if the CAN_GND is grounded in several places.
To test it, please

1. Disconnect the CAN_GND from the earth potential (FE).

2. Measure the DC resistance between CAN_GND and earth potential (see figure on the right).

3. Reconnect CAN_GND to earth potential.

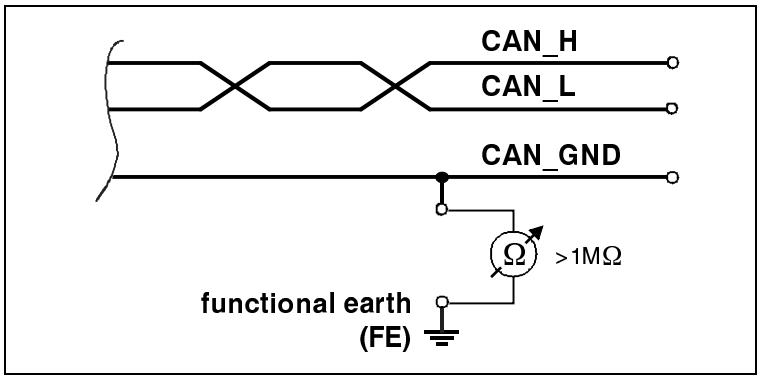


Fig. 7: Simplified schematic diagram of ground test measurement

The measured resistance should be higher than 1 M Ω. If it is lower, please search for additional grounding of the CAN_GND wires.

7.3 Short Circuit in CAN Wiring

A CAN bus might possibly still be able to transmit data if there is a short circuit between CAN_GND and CAN_L, but generally the error rate will increase strongly. Make sure that there is no short circuit between CAN_GND and CAN_L!

7.4 CAN_H/CAN_L Voltage

Each node contains a CAN transceiver that outputs differential signals. When the network communication is idle the CAN_H and CAN_L voltages are approximately 2.5 V measured to CAN_GND. Faulty transceivers can cause the idle voltages to vary and disrupt network communication.

To test for faulty transceivers, please

1. Turn on all supplies.
2. Stop all network communication.
3. Measure the DC voltage between CAN_H and CAN_GND (2) (see figure at previous page).
4. Measure the DC voltage between CAN_L and CAN_ GND (3) (see figure at previous page).

Normally the voltage should be between 2.0 V and 3.0 V.

If it is lower than 2.0 V or higher than 3.0 V, it is possible that one or more nodes have faulty transceivers. For a voltage lower than 2.0 V please check CAN_H and CAN_L conductors for continuity.

To find the node with a faulty transceiver within a network please test the CAN transceiver resistance (see below) of the nodes.

7.5 CAN Transceiver Resistance Test

CAN transceivers have circuits that control CAN_H and CAN_L. Experience has shown that electrical damage of the circuits may increase the leakage current in these circuits.

To measure the current leakage through the CAN circuits, please use a resistance measuring device and:

1. Switch off the node and disconnect it from the network (4) (see figure below).

2. Measure the DC resistance between CAN_H and CAN_GND (5) (see figure below).

3. Measure the DC resistance between CAN_L and CAN_GND (6) (see figure below).

The measured resistance has to be about 500 kΩ for each signal. If it is much lower, the CAN transceiver is probably faulty. Another indication for a faulty transceiver is a very high deviation between the two measured input resistances (>> 200%).

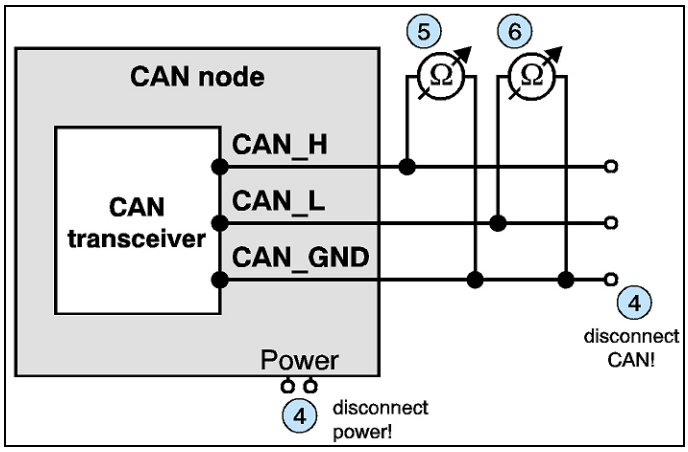


Figure 8: Simplified diagram of a CAN node

7.6 Support by esd

If you have executed the fault diagnostic steps of this troubleshooting guide and you even can not find a solution for your problem our support department will be able to assist.
Please contact our support via email at **support@esd.eu** or by phone **+40-511-37298-130**.

8. EU Declaration of Conformity

EU-KONFORMITÄTSERKLÄRUNG
EU DECLARATION OF CONFORMITY

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

esd erklärt, dass das Produkt *esd declares, that the product*	Typ, Modell, Artikel-Nr. *Type, Model, Article No.*
CPCI-405 Host	**I.2306.04, I.2306.05, I.2306.11, I.2306.14 bis/up to I.2306.19, I.2306.23, I.2306.24**
CPCI-405-A Target Adapter	**I.2306.07 bis/up to I.2306.09, I.2306.22**
CPCI-405-2 Host	**I.2306.12, I.2306.49, I.2306.50**

die Anforderungen der Normen
fulfills the requirements of the standards
EN 61000-6-2:2005,
EN 61000-6-4:2007+A1:2011

gemäß folgendem Prüfbericht erfüllt.
according to test certificate.
H-K00-0359-09, H-K00-0406-10, H-Z01-0359-13

Das Produkt entspricht damit der EU-Richtlinie „EMV"
Therefore the product corresponds to the EU Directive 'EMC'
2014/30/EU

Das Produkt entspricht der EU-Richtlinie „RoHS"
The product corresponds to the EU Directive 'RoHS'
2011/65/EU

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

Name / *Name* T. Ramm
Funktion / *Title* CE-Koordinator / *CE Coordinator*
Datum / *Date* Hannover, 2015-10-20

Rechtsgültige Unterschrift / *authorized signature*

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9. Order Information

Type	Features	Order No.
CPCI-405	AMCC PowerPC405GPr, 266 MHz, 64 MB SDRAM, 4 MB Flash, CPCI-*host*	I.2306.04
CPCI-405-64	as I.2306.04, but AMCC PowerPC405GPr with 400 MHz	I.2306.05
CPCI-405-A	as I.2306.04, but CPCI-*target* adapter	I.2306.07
	as I.2306.07, but with 4 HP / 6 U front panel	I.2306.47
CPCI-405-A-64	as I.2306.05, but CPCI-*target* adapter	I.2306.08
CPCI-405-2 Host 400 MHz/128MB/RTC	AMCC PowerPC 405GPr Host, 400MHz,: 128MB SDRAM, Real Time Clock, CompactPCI 8TE/3U board, Front panel: 2x CAN, 2x Serial RS-232, 1x Ethernet	I.2306.12
CPCI-405-2	as I.2306.04, but 2x CAN ISO11898 and 2x Serial RS-232, 8 HP / 3 U front panel	I.2306.49
CPCI-405-VxW	VxWorks BSP	I.2306.30
CPCI-405-Linux	Linux BSP/Adaption	I.2306.32
CPCI-405-QNX	QNX6 BSP	I.2306.34

Table 3: Order information

PDF Manuals
Manuals are available in English and usually in German as well. For availability of English manuals see the following table.
Please download the manuals as PDF documents from our esd website www.esd.eu for free.

Manuals		Order No.
CPCI-405-ME	Manual in English	C.3010.21

Table 4: Available manuals

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