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CAN-PCI/331

PCI-CAN Interface

Hardware Installation
and
Technical Data

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Changes in the Chapters

The changes in the user's manual listed below affect changes in the **hardware**, as well as changes in the **description** of the facts only.

Chapter	Changes with respect to previous revision
3.5	order no. changed
-	-

Further technical changes are subject to change without notice.

N O T E

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1. Overview

1.1 Module Description

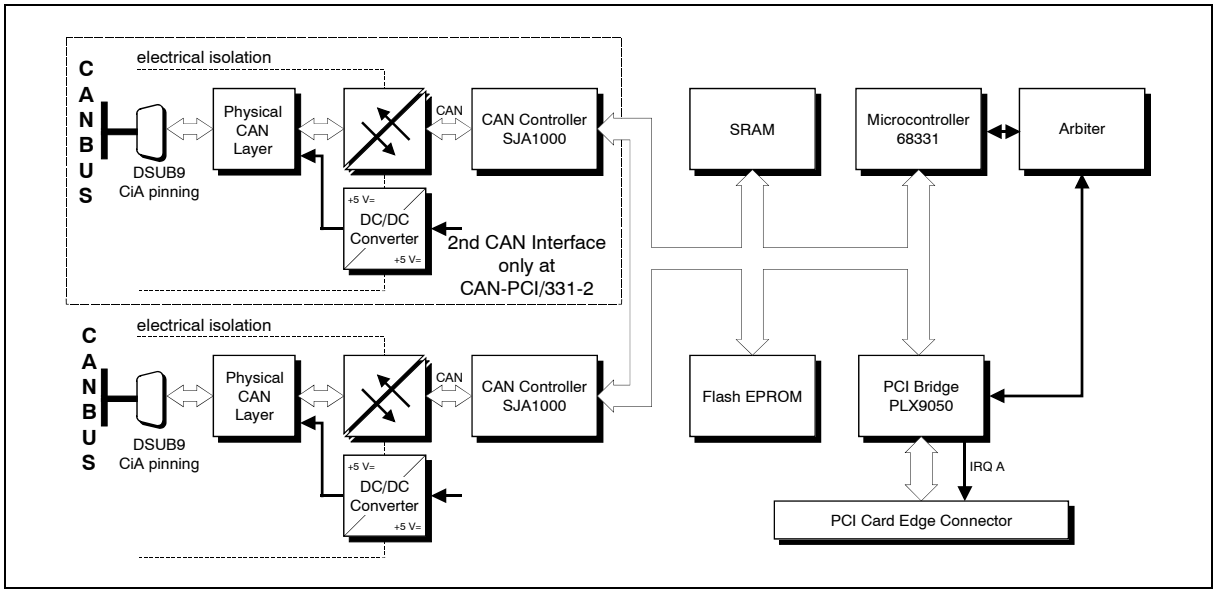


Fig. 1.1.1: Block diagram of the module CAN-PCI/331

The module CAN-PCI/331 is a PC board designed for the PCI bus. It uses a 68331 micro controller, which cares for the local CAN data management. The CAN data is stored in the local SRAM. Security and consistency of data is guaranteed up to 1 Mbit/s.

The ISO 11898 compliant CAN interfaces allow a data transfer rate of 1 Mbit/s. Among many other features, the bit rate can be set by software. The CAN interface is electrically isolated from the other potentials by optocouplers and DC/DC converters.

1.2 PCB View with Position of the Connectors

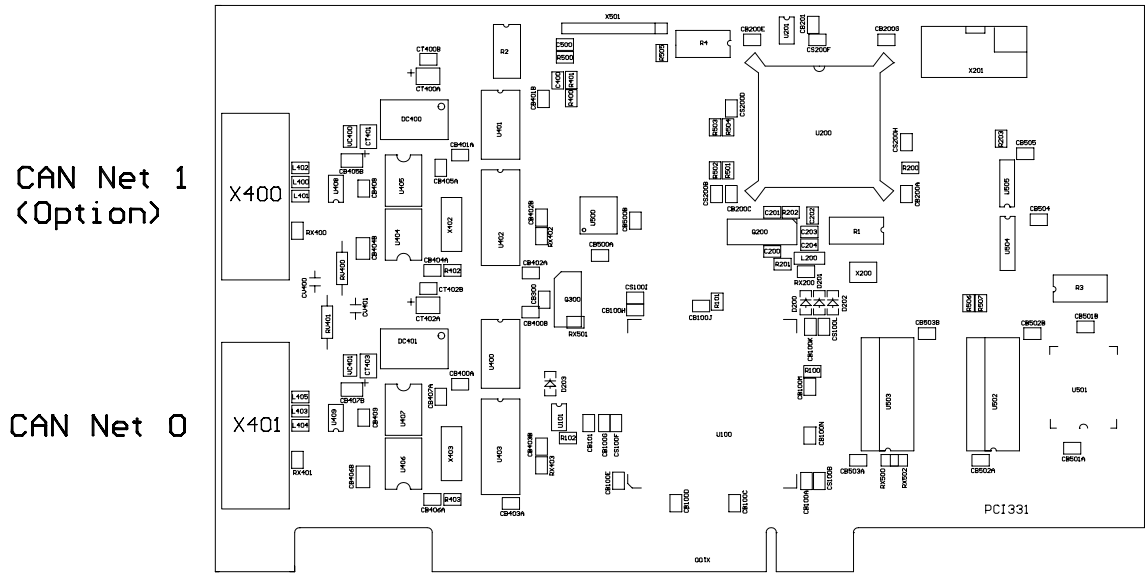
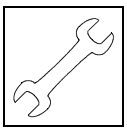


Fig. 1.2.1: Top layer view of the module (without fastening angles)



2. Hardware Installation

Attention!
Electrostatic discharge may cause damage to electronic devices. In order to avoid this please follow the instructions below *before* you touch the CAN module to discharge your personal static electricity:

- Switch off the power supply of your PC but leave the connector plug in the socket.
- Then touch the metal case of the PC to discharge the static electricty.
- Furthermore you must avoid contact between your clothes and the CAN module.

Execute Hardware Installation:

1. Switch off the PC and all connected peripheral devices (monitor, printer, etc.). Switch off the CAN devices of the net to which the CAN module is to be connected.

2. Discharge yourself as described above.

3. Disconnect the power supply of the PC from the mains.

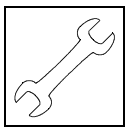
4. Remove the PC cover.
   Unfasten the mounting screws at the back of the PC and remove the cover.

5. Select an open PCI slot and remove the slot cover at the back of the PC. Unfasten the screw which fixes the slot cover and retain it for fixing the module afterwards.
   The CAN module can be inserted into every PCI slot. Be careful not to insert the board into an ISA slot, because this can damage the PC and the board!

6. Insert the CAN module into the selected PCI slot.
   Carefully push the board down until it snaps into place.

7. Attach the board.
   Use the screw you removed from the slot cover in step 5.

8. Replace the PC cover.
   Secure the cover with the screws you removed in step 4.



Installation

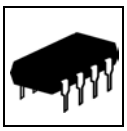
9. Connect the CAN wire.
   Please note that the CAN bus has to be terminated at both ends! esd offers special T connectors and terminator connectors. Additionally the CAN_GND signal has to be connected to earth at **exactly one** point. For easier wiring the termination connectors are equipped with an earth connector (4.8 mm fast-on, male).
   A CAN participant without an electrically isolated interface acts as an earth connection.

   The first CAN interface (CAN net 0) has to be connected via the lower DSUB connector (X401) and the second CAN interface (net 1) has to be connected via the upper DSUB connector (X400).

10. Reconnect the power supply of the PC.

11. Switch on the PC, the peripheral devices and the other CAN participants in any order.

12. End of hardware installation.
    Continue with the software installation (for Windows NT or Windows 95 as described in the manual ‘CAN-API, Monitor Program CAN Scope and Installation’).



3. Technical Data Summary

3.1 General Data

Ambient temperature	0...50 °C
Humidity	max. 90 %, non-condensing
Supply voltage	supplied by PCI bus, nominal voltage: 5 V ±5%, current (max., at 20°C): 0.5 A (1x CAN) 0.6 A (2x CAN)
Plug-and-socket connectors	X100 (card edge) - PCI bus X400 (DSUB9/male) - CAN net 1 X401 (DSUB9/male) - optional CAN net 0 The following connectors are only equipped for programming and service: X201 (10-pole female con.) - BDM interface X501 (5-pole male con.) - ISP programming
Dimensions	174.57 mm x 106.68 mm
Weight	< 200 g

Table 3.1.1: General data of the board

3.2 PCI Bus

Host bus	PCI in compliance with PCI Local Bus Spec. 2.1
PCI data bus	32 bit
Controller	PLX 9050
Interrupt	interrupt signal A
Slot position	no restrictions for the slot position, PCI bridges are tolerated
Board dimension	'short' PCI board
Connector	PCI card edge connector

Table 3.2.1: PCI bus data

3.3 CAN Interface

Number of CAN interfaces	1, optionally 2 CAN interfaces
CAN controller	SJA1000
CAN protocol	basic CAN 2.0A
Physical layer	Physical layer according to ISO 11898, transmission rate is programmable from 10 kbit/s to 1 Mbit/s
Termination	has to be done externally
Electrical separation of CAN interfaces from other units and from each other	separation by means of optocouplers and DC/DC converters
DeviceNet Option	adapter board with Phoenix Combicon style connector, optocouplers and CAN driver acc. to DeviceNet specification 'DeviceNet Communication Model and Protocol, Rel. 2.0'

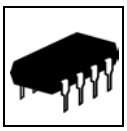
Table 3.3.1: CAN interface data

3.4 Software Support

The board is shipped with source codes of software examples for DOS and Windows 3.11. Moreover, software drivers (CAN-API) are available for Windows NT, Windows 95/98 and other operating systems. The Windows NT driver is contained in kernel mode and is multi processor conform. The Windows 95/98 driver is realized as VxD.
Drivers for other operating systems are available as well. The firmware can be loaded from the PC into the Flash EPROM.

The CAN-API is described in the manual:
CAN-API with Software Tools and Installation Notes
order no: C.2001.21

Software packages for CAL, CANopen or DeviceNet are available for Windows NT and Windows 95/98.



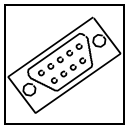
3.5 Order Information

Type	Description	Order no.
CAN-PCI/331-1	1x CAN 2.0A/B, ISO11898	C.2020.02
CAN-PCI/331-2	2x CAN 2.0A/B, ISO11898	C.2020.04
CAN-PCI/331-1DN	1x DeviceNet Interface	C.2020.07
CAN-PCI/331-2DN	2x DeviceNet Interface	C.2020.08
Options:		
CAN-PCI/331-95	Windows 95/98 VxD driver	C.2020.10
CAN-PCI/331-NT	Windows NT Device driver	C.2020.11
CAN-PCI/331-Co	CANopen Master/Slave Obj. Licence	C.2020.12
CAN-PCI/331-Linux	Linux Object Licence	C.2020.19
CAN-PCI/331-Lynx	LynxOS Object Licence	C.2020.31
CAN-PCI/331-QNX	QNX Object Licence	C.2020.32
CAN-PCI/331-VxW	VxW Object Licence	C.2020.55
CAN-PCI/331-ME *)	English users manual for C.2020.02 ... 08	C.2020.21
CAN-API-ME *)	English users manual for C.2020.10, C.2020.11 and C.2020.19...55	C.2001.21

*) If ordered together with the product, the manual will be delivered free of charge.

Table 3.5.1: Order information

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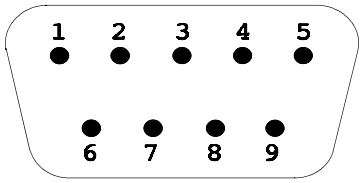
4. Connector Pin Assignment of the CAN Interfaces

4.1 CAN Interface at DSUB9 Connector

The assignment of the signals to the connector pins of the first CAN interface (X401) is equal to the assignment of the optional second CAN interface X400. Both connectors are 9-pole DSUBs with male contacts.

The DSUB connectors are not available, if the DeviceNet option is equipped.

Pin Location:



Pin Assignment:

Signal	Pin		Signal
		1	reserved
(CAN_GND)	6		
		2	CAN_L
CAN_H	7		
		3	CAN_GND
reserved	8		
		4	reserved
reserved	9		
		5	reserved

9-pole DSUB connector

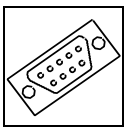
Signal Description:

CAN_L, CAN_H... CAN signals

CAN_GND ... reference GND of the physical CAN layer

reserved ... reserved for future use

(CAN_GND)... optional CAN-GND



Connector Pin Assignment

4.2 Option DeviceNet

The DeviceNet interface is designed according to the specification ‘DeviceNet Communication Model and Protocol, Release. 2.0’.

The power supply of the CAN bus driver has to be supported from external and the wiring is done by Phoenix Combicon style connectors MSTB 2.5/-GF-5.08 (or equivalent).

Pin Assignment:

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

Signal Description:

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

V-... reference GND for V+ and CAN+/CAN-

CAN+, CAN-... CAN signals

Shield... shielding
(via high resistance RC-combination connected to earth (shield panel))

5. Correctly Wiring Electrically Isolated CAN Networks

Generally all instructions applying for wiring regarding an electromagnetic compatible installation, wiring, cross sections of wires, material to be used, minimum distances, lightning protection, etc. have to be followed.

The following **general rules** for the CAN wiring must be followed:

1.	A CAN net must not branch (exception: short dead-end feeders) and has to be terminated by the wave impedance of the wire (generally 120 W ±10%) at both ends (between the signals CAN_L and CAN_H and **not** at GND)!
2.	A CAN data wire requires **two twisted** wires and a wire to conduct the reference potential (CAN_GND)! For this the shield of the wire should be used!
3.	The reference potential CAN_GND has to be connected to the earth potential (PE) at **one** point. Exactly **one** connection to earth has to be established!
4.	The bit rate has to be adapted to the wire length.
5.	Dead-end feeders have to kept as short as possible (l < 0.3 m)!
6.	When using double shielded wires the external shield has to be connected to the earth potential (PE) at **one** point. There must be not more than **one** connection to earth.
7.	A suitable type of wire (wave impedance ca. 120 Ω ±10%) has to be used and the voltage loss in the wire has to be considered!
8.	CAN wires should not be laid directly next to disturbing sources. If this cannot be avoided, double shielded wires are preferable.

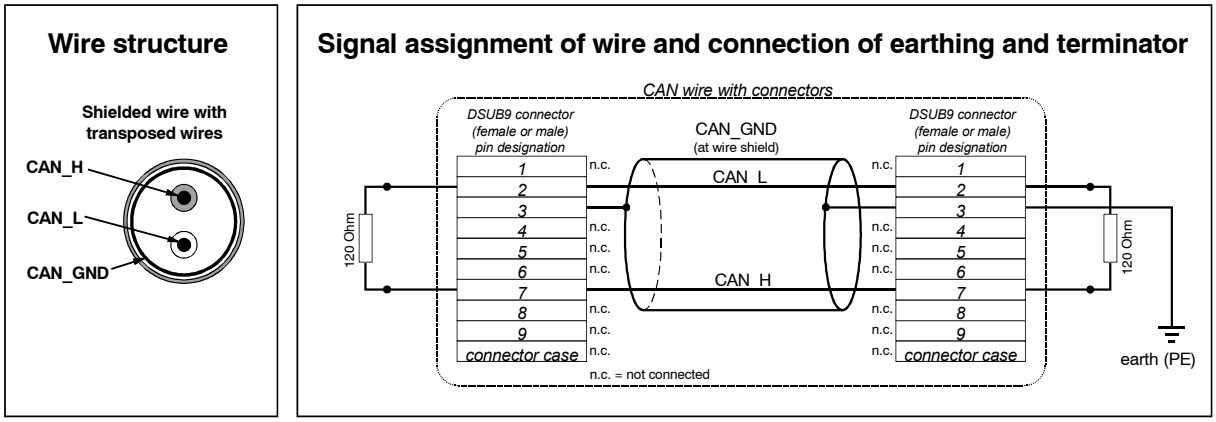


Figure: Structure and connection of wire

Cabling

- for devices which have only one CAN connector per net use T-connector and dead-end feeder (shorter than 0.3 m) (available as accessory)

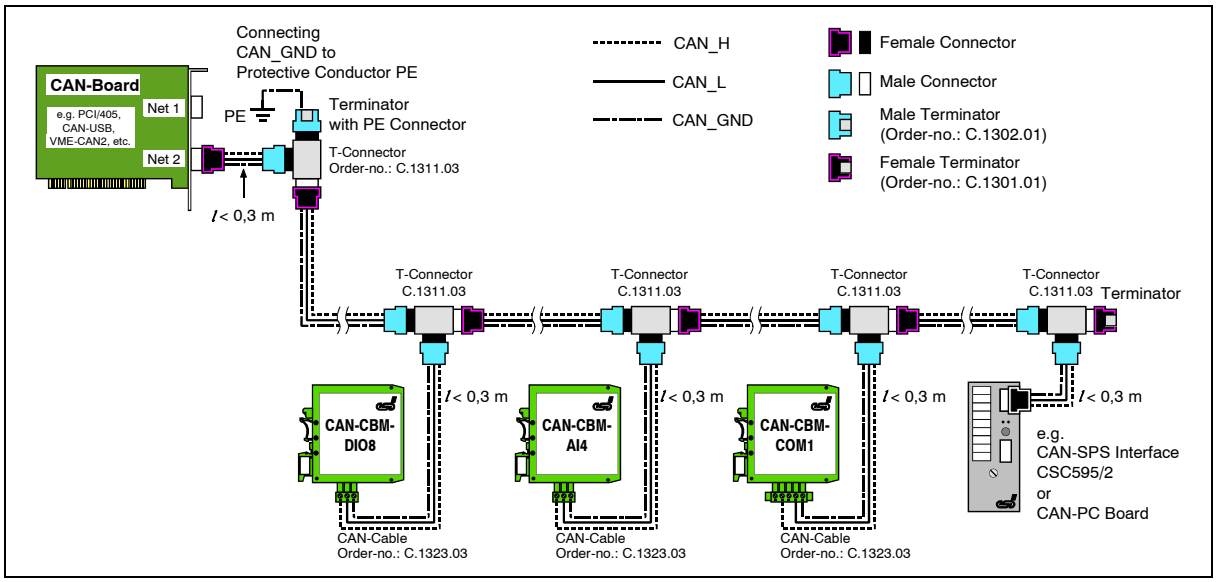


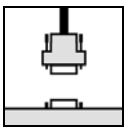
Figure: Example for correct wiring (when using single shielded wires)

Terminal Resistance

- use **external** terminator, because this CAN later be found again more easily!
- 9-pin DSUB-terminator with male and female contacts and earth terminal are available as accessories

Earthing

- CAN_GND has to be conducted in the CAN wire, because the individual esd modules are electrically isolated from each other!
- CAN_GND has to be connected to the earth potential (PE) at **exactly one** point in the net!
- each CAN user without electrically isolated interface works as an earthing, therefore: do not connect more than one user without potential separation!
- Earthing CAN e.g. be made at a connector

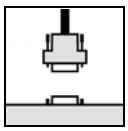


Wire Length

❍ Optical couplers are delaying the CAN signals. By using fast optical couplers and testing each board at 1 Mbit/s, however, esd CAN guarantee a reachable length of 37 m at 1 Mbit/s for most esd CAN modules within a closed net without impedance disturbances like e.g. longer dead-end feeders. (Exception: CAN-CBM-DIO8, -AI4 and AO4 (these modules work only up to 10 m with 1 Mbit/s))

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
666.6	80	-
500	130	100
333.3	180	-
250	270	250
166	420	-
125	570	500
100	710	650
66.6	1000	-
50	1400	1000
33.3	2000	-
20	3600	2500
12.5	5400	-
10	7300	5000

Table: Reachable wire lengths depending on the bit rate when using esd-CAN interfaces



Wiring

Examples for CAN Wires

Manufacturer	Type of wire	
U.I. LAPP GmbH Schulze-Delitzsch-Straße 25 70565 Stuttgart Germany www.lappkabel.de	e.g. UNITRONIC ®-BUS CAN UL/CSA UNITRONIC ®-BUS-FD P CAN UL/CSA	 (UL/CSA approved) (UL/CSA approved)
ConCab GmbH Äußerer Eichwald 74535 Mainhardt Germany www.concab.de	e.g. BUS-PVC-C (1 x 2 x 0,22 mm²) BUS-Schleppflex-PUR-C (1 x 2 x 0,25 mm²)	 Order No.: 93 022 016 (UL appr.) Order No.: 94 025 016 (UL appr.)
SAB Bröckskes GmbH&Co. KG Grefrather Straße 204-212b 41749 Viersen Germany www.sab-brockskes.de	e.g. SABIX® CB 620 (1 x 2 x 0,25 mm²) CB 627 (1 x 2 x 0,25 mm²)	 Order No.: 56202251 Order No.: 06272251 (UL appr.)

Note: Completely configured CAN wires can be ordered from **esd**.

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DECLARATION OF CONFORMITY

Adresse *Address*	**esd electronic system design gmbh** **Vahrenwalder Str. 205** **30165 Hannover** **Germany**
esd erklärt, daß das Produkt *esd declares, that the product*	**CAN-PCI/331**
Typ, Modell, Artikel-Nr. *Type, Model, Article No.*	**C.2020.02, C.2020.04**
die Anforderungen der Normen *fullfills the requirements of the standards*	**DIN EN 50081-1 (03.1993)** **DIN EN 50082-2 (1996)**
gemäß folgendem Prüfbericht erfüllt. *according to test certificate.*	**1679.1407.99**
Das Produkt entspricht damit den EG-Richtlinien *Therefore the product corresponds to the EU-Directives*	**89/336/EWG (23.05.1989),** **92/31/EWG (28.04.1992)**

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Name / *Name*	Dr. Ing. Werner Schulze
Funktion / *Title*	Geschäftsführer
Datum / *Date*	Hannover, den 20.06.2000

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