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PMC-CAN/331

PMC-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 versus previous version
5.5	Chapter: 'Connection Options: DeviceNet and ISO-11898 CAN-Adapter' inserted
-	-

Further technical changes are subject to change without notice.

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Contents

1. Overview 3
1.1 Module Description 3
1.2 PCB View with Connector Designations 4

2. Hardware Installation 5

3. Summary of Technical Data 7
3.1 General Technical Data 7
3.2 PCI Bus 7
3.3 CAN-Interface 8
3.4 Software Support 9
3.5 Order Information 10

4. Configuration Resistors 11
4.1 Comparison of Different Signal Assignments 11
4.2 Changing the Signal Assignments 12
4.2.1 Signal Assignment 1: Unidirectional Signals to Local CAN-Interface 12
4.2.2 Signal Assignment 2: Unidirectional Signals to P14 13
4.2.3 Signal Assignment 3: Differential Signals to P14 14
5.1 CAN-Bus Interfaces (X400, X401) 15
5.2 Assignment of 64-pole PMC-Connector P11 16
5.3 Assignment of 64-pole PMC-Connector P12 17
5.4 Assignment of 64-pole PMC-Connector P14 18
5.5 Connection Options: DeviceNet- and ISO-11898 CAN-Adapter 19
5.5.1 CAN-ADA-DN (C.2012.25) and CAN-ADA-ISO11898 (C.2012.26) 19
5.5.2 CAN-PHYSLAY-HSP (C.1201.01) 20

6. Correctly Wiring Electrically Isolated CAN Networks 21

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1. Overview

1.1 Module Description

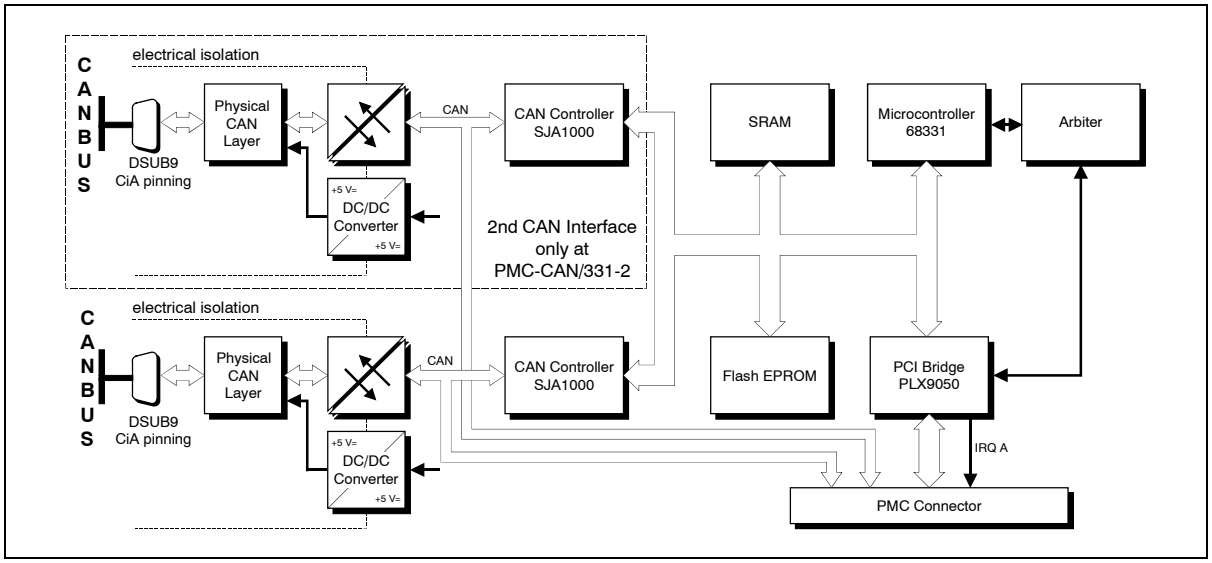


Fig. 1.1.1: Block-circuit diagram of the PMC-CAN/331 module

The module PMC-CAN/331 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 maximum data-transfer rate of 1 Mbit/s. Among many other features of the CAN interfaces, the bit rate can be set by software.
The CAN interfaces are electrically isolated from the other potentials and from each other by means of optocouplers and DC/DC-converters.

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1.2 PCB View with Connector Designations

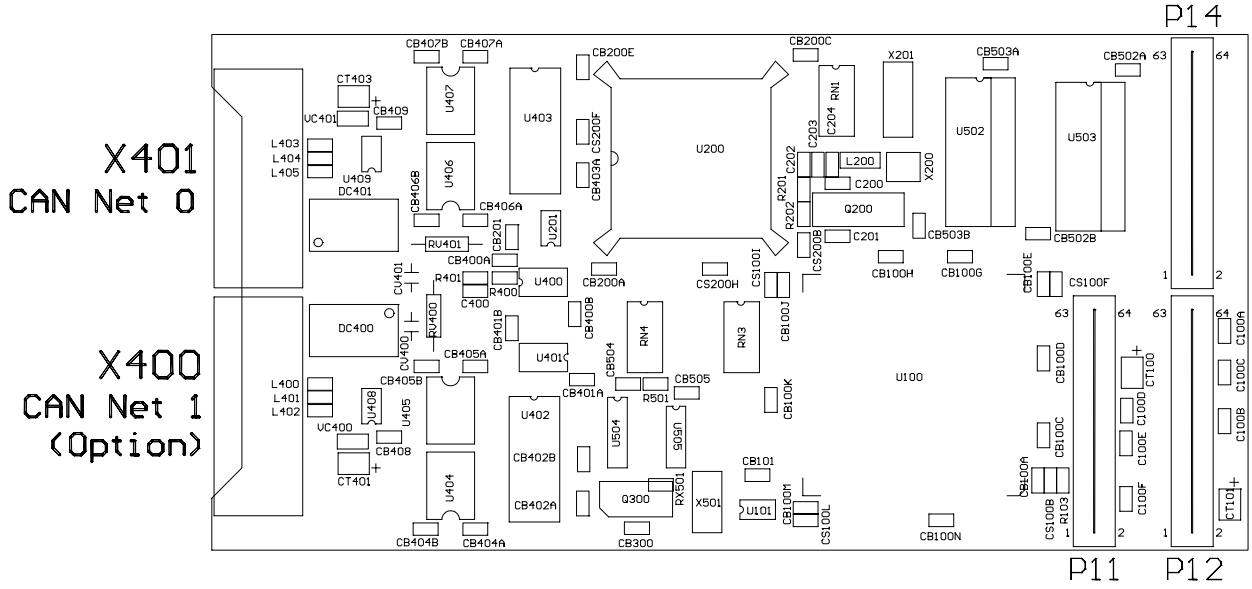


Fig. 1.2.1: View of PCB layer facing the carrier board with connector position

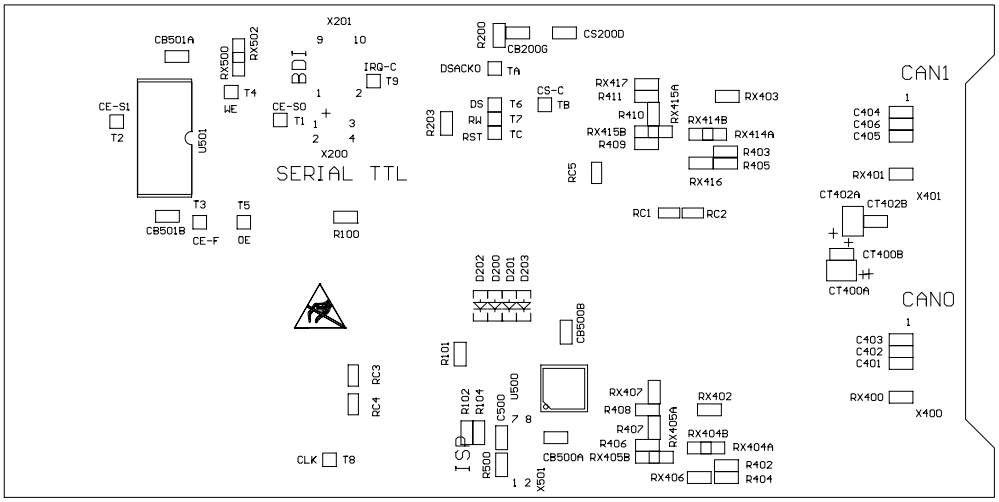
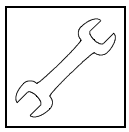


Fig. 1.2.2: View of PCB layer not facing the carrier board with position of the configuration resistors

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2. Hardware Installation

The PMC-CAN/331 module can be used on various carrier boards, therefore, the carrier system will generally be called ‘computer’, below.

Attention!
Electro static discharge may cause damage to electronic devices. In order to avoid this, please make sure to follow the instructions below *before* touching the CAN-module:

- Switch off the power supply of your computer but leave it connected to mains to make sure that the computer case remains earthed.
- Now touch the metal case of the PC to discharge your static electricity.
- Even your clothes must not touch the CAN-module.

1. Switch off your computer and all connected peripheral devices (monitor, printer, etc.). Switch off the CAN-devices of the network the CAN-module is to be connected to.

2. Discharge yourself as described above.

3. Disconnect the computer from mains.
   If the computer does not have a flexible network cable, but is directly connected to mains, disconnect the power supply via the safety fuse and make sure that the fuse cannot switch on again unintentionally (note).

4. Open the case.

5. Plug the PMC-CAN/331 module onto a suitable carrier board.
   Connect module and carrier board by means of screws. Use the four M2.5 x 6 mm screws which are contained in the product package of the module.

6. Install the carrier board into your system.

7. Close the computer case.

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8. Connect the CAN.
   Please note that the CAN-bus must be terminated at both ends. esd offers special T-connectors and terminators for this. Additionally, the CAN-GND must be connected to earth at *exactly one* point in the CAN network. Therefore, the terminator connectors additionally have an earth contact. A CAN-device whose CAN-interface is not electrically insulated acts as an earth connection like the CAN-GND.
   Please pay attention to the notes on a correct wiring of CAN-networks in the last chapter of this manual!

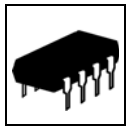
   The first CAN-interface (CAN-network 0) is connected via the DSUB-connector (X401) and the second CAN-interface (CAN-network 1) is connected via the DSUB-connector (X400).

9. Connect the computer to mains again (mains connector or safety fuse).

10. Switch on the computer, the peripheral devices and the other CAN-devices again.

11. End of hardware installation.
    The software installation will be described in the manual ‘CAN-API, Monitor Program CAN-Scope and Installation’.

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3. Summary of Technical Data

3.1 General Technical Data

Ambient temperature	0...50°C
Humidity	max. 90%, non-condensing
Power supply	via PMC-connector nominal voltage: 5 V ±5%, current (max., at 20°C): 0.50 A (1x CAN) 0.60 A (2x CAN)
Connectors	P11 (64-pole PMC-connector) - PCI-signals P12 (64-pole PMC-connector) - PCI-signals P14 (64-pole PMC-connector) - CAN-TTL-signals (optional) X400 (DSUB9/male) - CAN-interface 2 (network 1) X401 (DSUB9/male) - optional CAN-interface 1 (network 0) The following connectors are only equipped for programming and service: X200 (4-pole female con.) - CPU-interface (serial, TTL) X201 (10-pole male con.) - BDM-interface X501 (8-pole male con.) - ISP-programming
Dimensions	148.33 mm x 74.04 mm
Installation	by means of four screws M2.5 x 6 mm and spacing bolts (contained in the product package)
Weight	ca. 100 g

Table 3.1.1: General data of the module

3.2 PCI Bus

Host bus	PCI-bus in accordance with PCI Local Bus Specification 2.1
PCI-data bus	32 bit
Controller	PLX PCI9050
Interrupt	interrupt signal A

Table 3.2.1: PCI-bus data

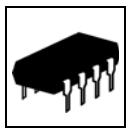
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3.3 CAN-Interface

Number	1, optionally 2 CAN-interfaces
CAN-controller	SJA1000
CAN-protocol	Basic-CAN 2.0A/B
Physical interface	physical layer in accordance with ISO 11898, transfer rate programmable from 10 Kbit/s to 1 Mbit/s
Bus termination	has to be set externally
Electrical insulation of the CAN-interface from other units	both possible CAN-interfaces are electrically insulated from each other and from the PCI-bus potentials by means of optocouplers and DC/DC-converters
DeviceNet option	CAN-ADA-DN (Order No.: C.2012.25) external adapter board with pluggable screw terminal, optocouplers and CAN driver in accordance with DeviceNet specification 'DeviceNet Communication Model and Protocol, Rel. 2.0'; 1 Device Net interface, signals of the second DeviceNet interface can be connected through.
Option: ISO-11898 Transceiver Module	external adapter boards with CAN interface, DSUB9 connector, electrical isolation via optocouplers and DC/DC-converter, physical layer according to ISO11898, transmission rate programmable from 10 Kbit/s to 1 Mbit/s. - CAN-ADA-ISO11898 (Order No.: C.2012.26): 1 CAN interface, signals of the second CAN interface can be connected through, connection of the CAN-TTL-level signals via 10-pole ODU-connector - CAN-PHYSLAY-HSP (Order No.: C.1201.01): 1 CAN interface, connection of the CAN-TTL-level signals to the adapter board via 8-pole connection strip or via wires directly connected with the board.

Table 3.3.1: Data of the CAN-interface

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3.4 Software Support

Contained in the product package are software examples in source code for DOS and Windows 3.11. Furthermore, software drivers are available for Linux, LynxOS, RTOS-UH, VxWorks and Windows. The firmware can be loaded from the PC into the Flash EPROM.

Software packages for CAL, CANopen or DeviceNet are available for RTOS-UH, VxWorks, Windows or UNIX systems.

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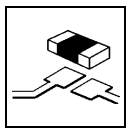
3.5 Order Information

Type	Description	Order No.
PMC-CAN/331-1	1xCAN 2.0A/B, ISO 11898 (1 CAN-network, SJA1000)	C.2025.02
PMC-CAN/331-2	2xCAN 2.0A/B, ISO 11898 (2 CAN-networks, SJA1000)	C.2025.04
Adapter:		
CAN-ADA-DN	DeviceNet adapter, CAN-TTL-signals at DeviceNet interface, TTL-signals of the second CAN interface can be connected through	C.2012.25
CAN-ADA-ISO11898	CAN adapter, CAN-TTL signals at CAN interface with DSUB9 connector (ISO11898), TTL-signals of the second CAN interface can be connected through	C.2012.26
CAN-PHYSLAY-HSP	CAN-TTL signals at CAN interface with DSUB9 connector (ISO11898)	C.1201.01
Options:		
CAN-DRV-LCD	Software Object Licence for Windows and Linux, incl. driver on CD	C.2025.10
PMC-CAN/331-Co	CANopen Master/Slave Obj. Licence	C.2025.12
PMC-CAN/331-DvN	DeviceNet Object Licence	C.2025.13
PMC-CAN/331-ME	English manual for C.2025.02 and C.2025.04 [1*)] (this manual)	C.2025.21
PMC-CAN/331-ENG	Engineering manual in English [2*)] Content: Circuit diagrams, PCB top overlay drawing, data sheets of significant components	C.2025.25
CAN-API-ME	Software manual of the CAN-API in English [1*)]	C.2001.21
CAL/CANopen-ME	CANopen software manual [1*)]	C.2002.21

1*) If ordered together with the product, the manual will be delivered free of charge.
2*) This manual is liable for costs, please contact our support.

Table 3.5.1: Order Information

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4. Configuration Resistors

By changing the resistors equipped, the assignment of the local interface and the PMC-connector P14 can be changed. In order to do this, existing resistors have to be removed and new ones have to be equipped.

4.1 Comparison of Different Signal Assignments

Signal assignment 1 (standard):
In PMC-CAN/331-standard the CAN-signals of the CAN-controller are assigned to the local ISO11898-interface (DSUB9). Only the GND-signals are assigned to P14.

Signal assignment 2:
Alternatively, the unidirectional CAN-signals of the controllers can be assigned to the connector P14. Assigning the signals to P14 and the DSUB-connectors at the same time is not permissible.

Signal assignment 3:
Another alternative is to assign the connector P14 with differential CAN-signals of the controllers. For this matter the controller has to be especially configured, because it drives the ports unidirectional in standard configuration.

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4.2 Changing the Signal Assignments

4.2.1 Signal Assignment 1: Unidirectional Signals to Local CAN-Interface

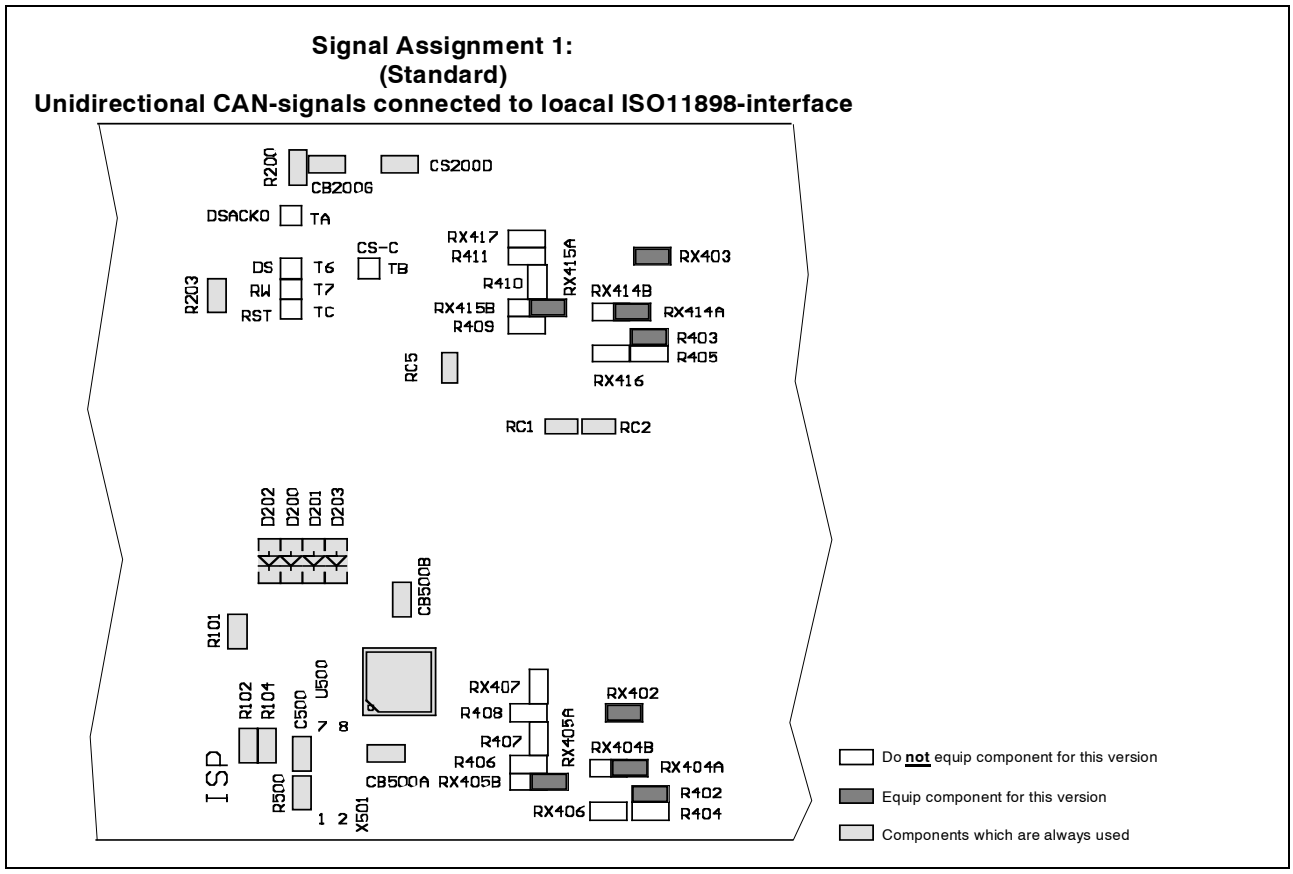


Fig. 4.2.1: Signal Assignment 1

Resistor values:	
CAN Net 0	*CAN Net 1*
R403 = 10 kΩ RX403 = 0 Ω R405 = n.e. R409 = n.e. R410 = n.e. R411 = n.e. RX414A = 0 Ω, RX414B = n.e. RX415A = 0 Ω, RX415B = n.e. RX416 = n.e. RX417 = n.e.	R402 = 10 kΩ RX402 = 0 Ω R404 = n.e. RX404A = 0 Ω, RX404B = n.e. RX405A = 0 Ω, RX404B = n.e. R406 = n.e. RX406 = n.e. R407 = n.e. RX407 = n.e. R408 = n.e.

n.e. ... component not equipped

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4.2.2 Signal Assignment 2: Unidirectional Signals to P14

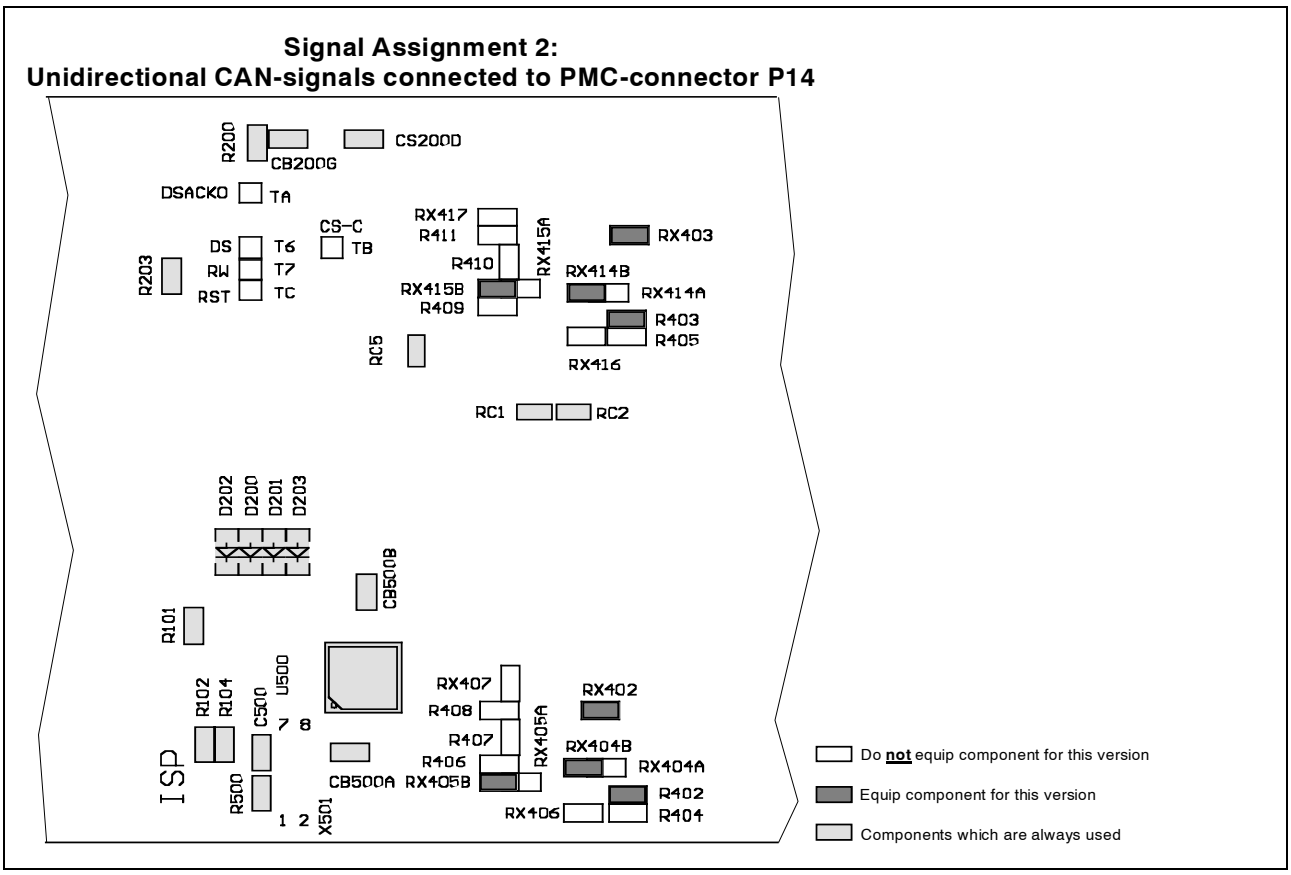


Fig. 4.2.2: Signal Assignment 2

Resistor values:	
CAN Net 0	*CAN Net 1*
R403 = 10 kΩ RX403 = 0 Ω R405 = n.e. R409 = n.e. R410 = n.e. R411 = n.e. **RX414A = n.e., RX414B = 0 Ω** **RX415A = n.e., RX415B = 0 Ω** RX416 = n.e. RX417 = n.e.	R402 = 10 kΩ RX402 = 0 Ω R404 = n.e. **RX404A = n.e., RX404B = 0 Ω** **RX405A = n.e., RX405B = 0 Ω** R406 = n.e. RX406 = n.e. R407 = n.e. RX407 = n.e. R408 = n.e.

n.e. ... component not equipped
Differences in equipment compared to signal assignment 1 are bold.

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4.2.3 Signal Assignment 3: Differential Signals to P14

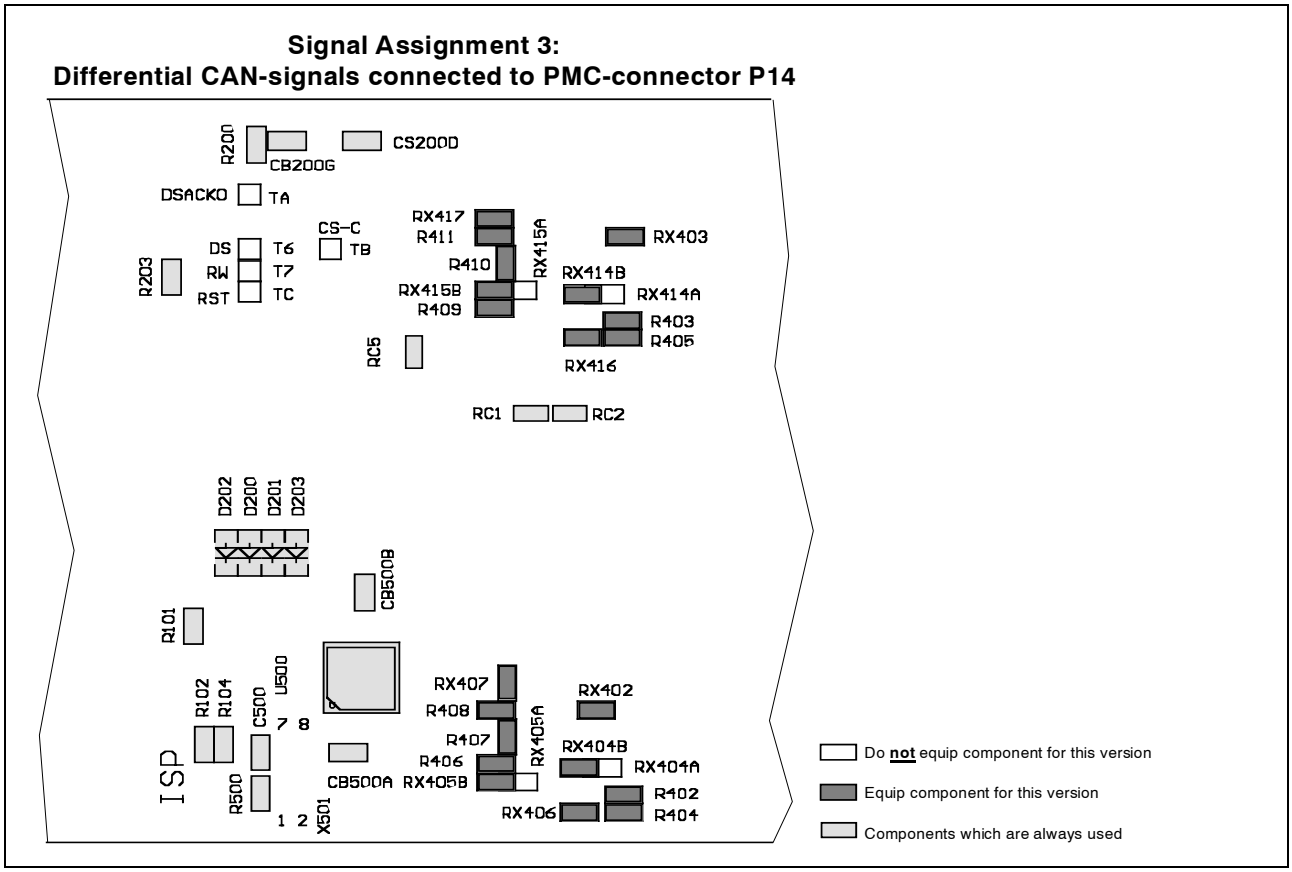
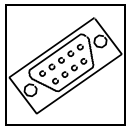


Fig. 4.2.1: Signal Assignment 3

Resistor values:	
CAN Net 0	*CAN Net 1*
R403 = 10 kΩ RX403 = 0 Ω **R405 = 10 kΩ** **R409 = 10 kΩ** **R410 = 220 Ω** **R411 = 10 kΩ** **RX414A = n.e., RX414B = 0 Ω** **RX415A = n.e., RX415B = 0 Ω** **RX416 = 0 Ω** **RX417 = 0 Ω**	R402 = 10 kΩ RX402 = 0 Ω **R404 = 10 kΩ** **RX404A = n.e., RX404B = 0 Ω** **RX405A = n.e., RX405B = 0 Ω** **R406 = 10 kΩ** **RX406 = 0 Ω** **R407 = 220 Ω** **RX407 = 0 Ω** **R408 = 10 kΩ**

n.e. ... component not equipped
Differences in equipment compared to signal assignment 1 are bold.

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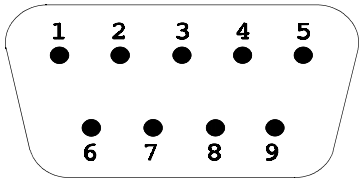


5. Connector Assignment

5.1 CAN-Bus Interfaces (X400, X401)

The signals are identically assigned to the connector of CAN interface 1 (X401) and optionalCAN interface 2 (X400). The connectors are male 9-pole DSUB-connectors.

Pin Position:



Pin Assignment:

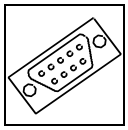
Signal	Pin		Signal
		1	reserved
CAN_GND	6		
		2	CAN_L
CAN_H	7		
		3	CAN_GND
reserved	8		
		4	reserved
reserved	9		
		5	shield

9-pole DSUB-connector

Signal Description:

CAN_L, CAN_H...	CAN-signal lines
CAN_GND ...	reference potential of the local CAN-physical layer
Shield ...	potential of the connector case
reserved ...	reserved for future applications

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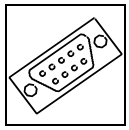


5.2 Assignment of 64-pole PMC-Connector P11

Pin	Signal name	Signal name	Pin
1	-	-	2
3	GND	INTA*	4
5	-	-	6
7	PMCPRSNT*=GND	+5V	8
9	-	-	10
11	GND	-	12
13	CLK	GND	14
15	GND	-	16
17	-	+5V	18
19	+5V	AD31	20
21	AD28	AD27	22
23	AD25	GND	24
25	GND	C/BE3*	26
27	AD22	AD21	28
29	AD19	+5V	30
31	+5V	AD17	32
33	FRAME*	GND	34
35	GND	IRDY*	36
37	DEVSEL*	+5V	38
39	GND	LOCK*	40
41	-	SBO*	42
43	-	GND	44
45	+5V	AD15	46
47	AD12	AD11	48
49	AD09	+5V	50
51	GND	C/BE0*	52
53	AD06	AD05	54
55	AD04	GND	56
57	+5V	AD01	58
59	AD02	AD01	60
61	AD00	+5V	62
63	GND	-	64

Connector design in accordance with PMC SPECIFICATION IEEE1386.1/Draft 2.0 - 04-APR-1995

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5.3 Assignment of 64-pole PMC-Connector P12

Pin	Signal name	Signal name	Pin
1	-	-	2
3	-	-	4
5	-	GND	6
7	GND	-	8
9	-	-	10
11	-	3.3V	12
13	RST*	-	14
15	3.3V	-	16
17	-	GND	18
19	AD30	AD29	20
21	GND	AD26	22
23	AD24	3.3V	24
25	IDSEL	AD23	26
27	3.3V	AD20	28
29	AD18	GND	30
31	AD16	C/BE2*	32
33	GND	-	34
35	TRDY*	3.3V	36
37	GND	STOP*	38
39	PERR*	GND	40
41	3.3V	SERR*	42
43	C/BE1*	GND	44
45	AD14	AD13	46
47	GND	AD10	48
49	AD08	3.3V	50
51	AD07	-	52
53	3.3V	-	54
55	-	GND	56
57	-	-	58
59	GND	-	60
61	-	3.3V	62
63	GND	-	64

Connector design in accordance with PMC SPECIFICATION IEEE1386.1/Draft 2.0 - 04-APR-1995

\- This pin is not assigned on the module.

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5.4 Assignment of 64-pole PMC-Connector P14

The Rx/Tx-signals of the CAN-controllers can be assigned to PMC-connector P14. The signals are only available, if the configuration resistors (see chapter of the same name) are accordingly set.

Attention: The signals are TTL-level and are not electrically isolated from the micro controller units!

Pin	Signal name of signal assignment			Pin	Signal name of signal assignment		
	1	2	3		1	2	3
1	-	-	-	2	-	-	-
3	-	-	-	4	-	-	-
5	-	-	-	6	-	-	-
:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:
41	-	-	-	42	-	-	-
43	-	-	-	44	-	-	-
45	-	-	-	46	-	-	-
47	-	-	-	48	-	GND	GND
49	-	RX10*	RX10*	50	-	GND	GND
51	-	TX10*	TX10*	52	-	GND	GND
53	-	-	RX11*	54	-	GND	GND
55	-	-	TX11*	56	-	GND	GND
57	-	-	RX01*	58	-	GND	GND
59	-	RX00*	RX00*	60	-	GND	GND
61	-	-	TX01*	62	-	GND	GND
63	-	TX00*	TX00*	64	-	GND	GND

Connector design in accordance with PMC SPECIFICATION IEEE1386.1/Draft 2.0 - 04-APR-1995

\- This pin is not assigned on the module.

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5.5 Connection Options: DeviceNet- and ISO-11898 CAN-Adapter

5.5.1 CAN-ADA-DN (C.2012.25) and CAN-ADA-ISO11898 (C.2012.26)

The adapters CAN-ADA-DN (C.2012.25) and CAN-ADA-ISO11898 (C.2012.26) can be connected with a ribbon cable to a backplane connector of the board which carries the PMC module. According to the adapter used the CAN-TTL signals led through the backplane can then be transferred to a DeviceNet- or a CAN-ISO11898-Interface.

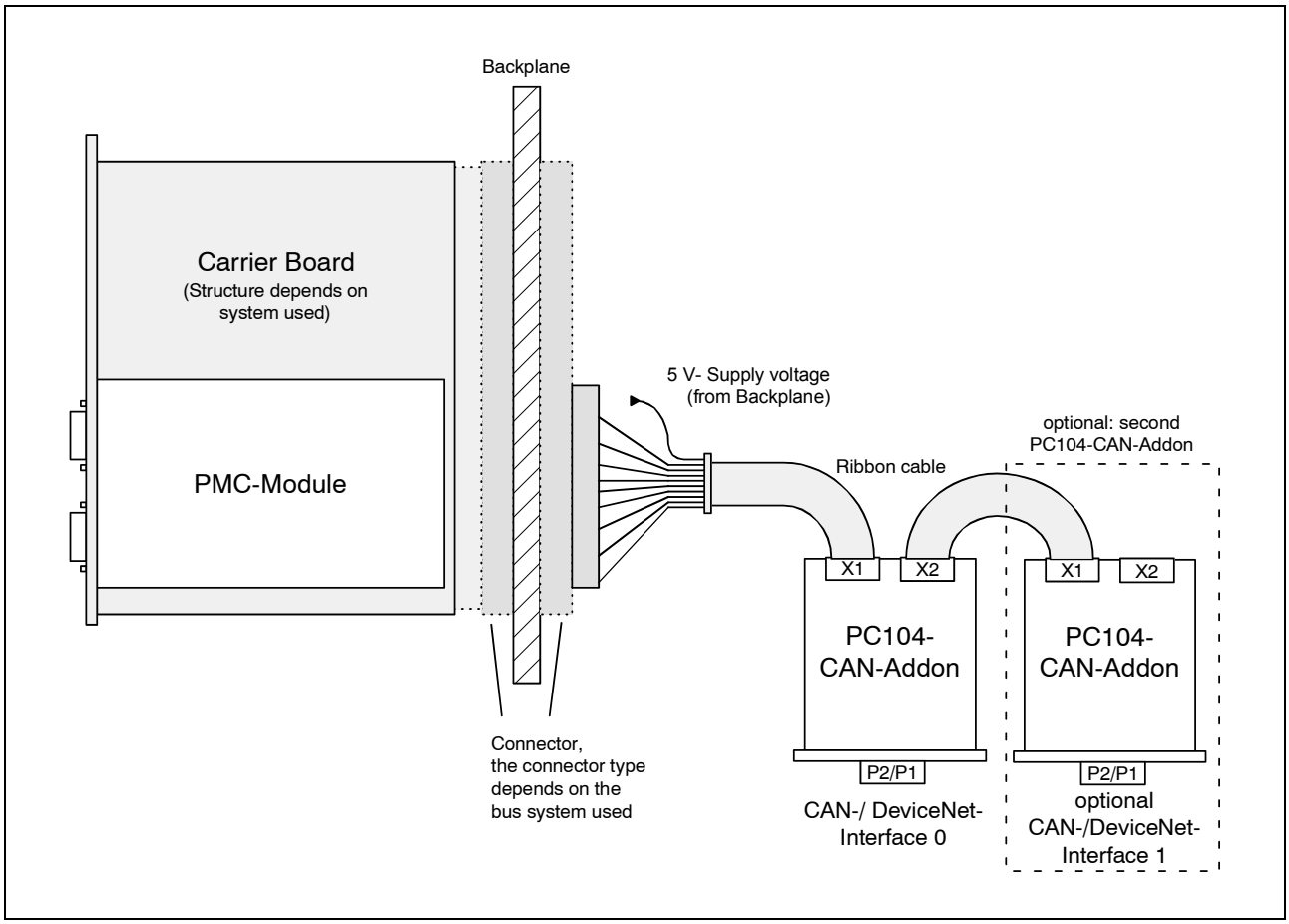


Fig. 5.5.1: Wiring CAN-ADA-ISO11898 /- DN adapter

Both adapter versions are equipped with two post connectors (X1, X2). The ribbon cable with the CAN-TTL signals is connected to post connector X1. A second adapter can be connected via post connector X2. The adapter version CAN-ADA-ISO11898 is equipped with a CAN-Interface with DSUB9 connector and adapter version CAN-ADA-DN is equipped with a DeviceNet-Interface.

For further information about the adapters please refer to the manual CAN-ADA-ISO11898 / CAN-ADA-DN.

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5.5.2 CAN-PHYSLAY-HSP (C.1201.01)

The adapter CAN-PHYSLAY (C.1201.01) can be connected with a ribbon cable to the backplane connector of the board which carries the PMC module. The CAN-TTL signals led through the backplane can then be transferred via a 8-pole strip or via 4 wires directly soldered on the adapter board to a CAN-ISO11898-Interface.

For every CAN channel one CAN-PHYSLAY-HSP adapter is required.

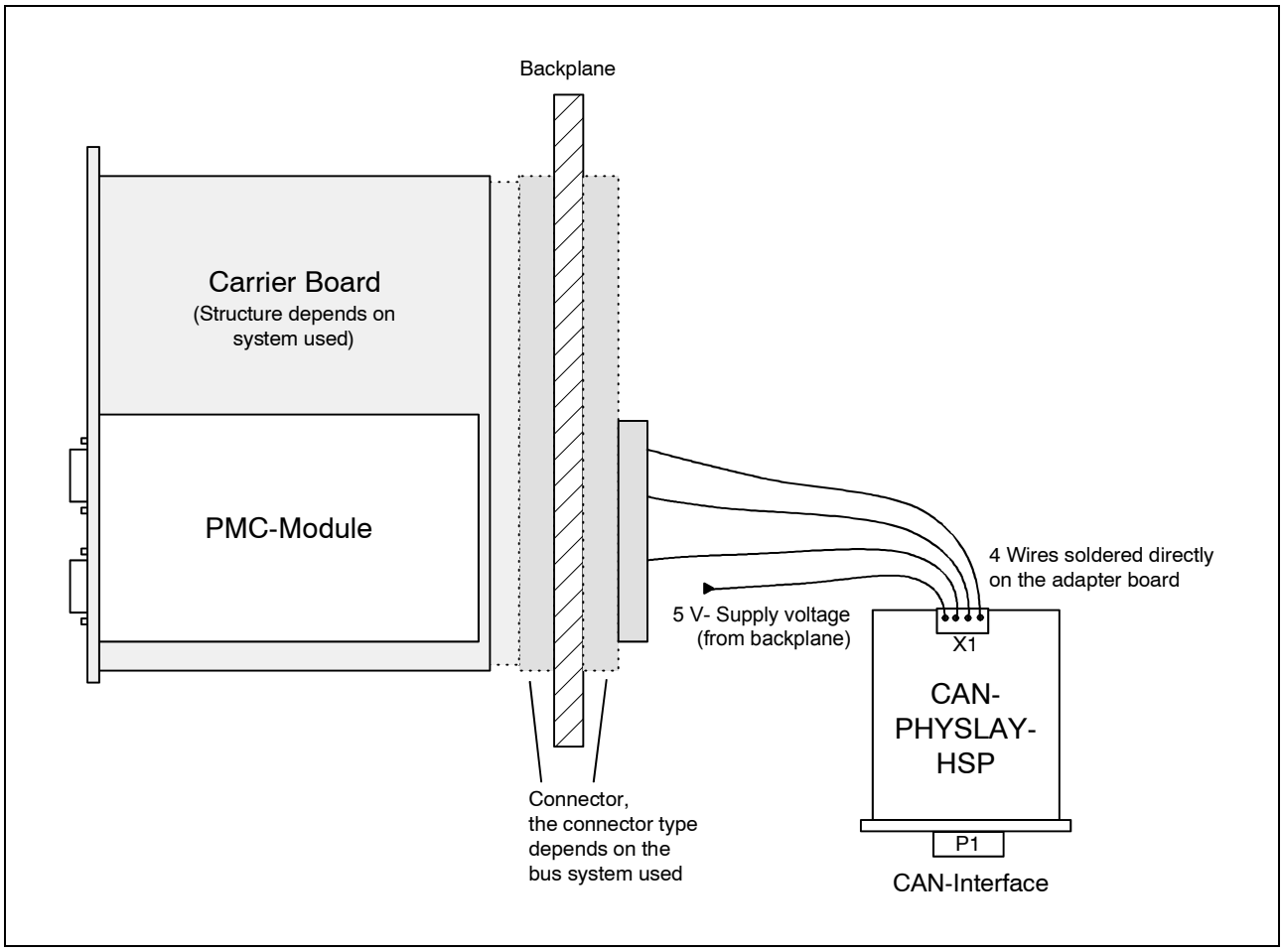


Fig. 5.5.2: Wiring CAN-PHYSLAY-HSP adapter

For further information about the adapter please refer to the manual CAN-PHYSLAY-HSP.

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6. 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.

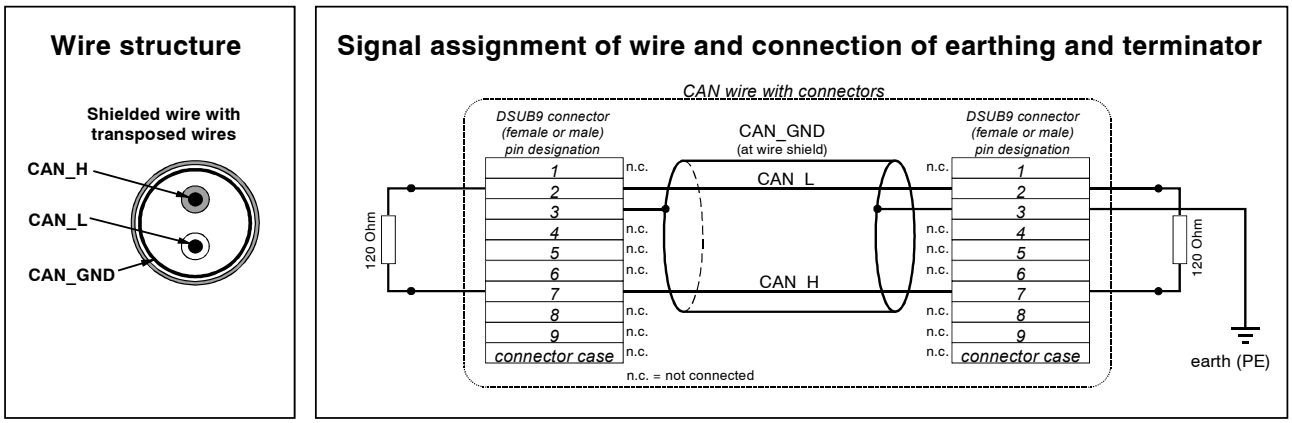


Figure: Structure and connection of wire

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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)

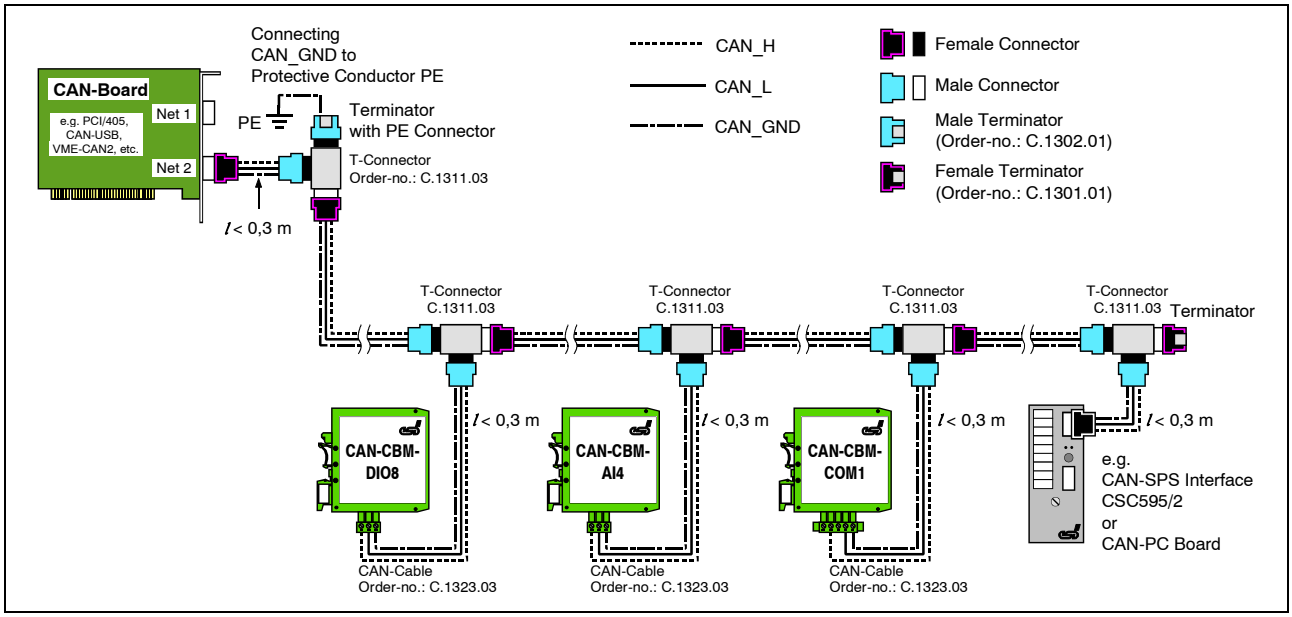


Figure: Example for correct wiring (when using single shielded wires)

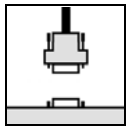
Terminal Resistance

- 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

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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

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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 (UL/CSA approved) UNITRONIC ®-BUS-FD P CAN UL/CSA (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) Order No.: 93 022 016 (UL appr.) BUS-Schleppflex-PUR-C (1 x 2 x 0,25 mm²) 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) Order No.: 56202251 CB 627 (1 x 2 x 0,25 mm²) Order No.: 06272251 (UL appr.)

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

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