CPCI-CAN/360

CompactPCI-CAN-Interface

Hardware Installation
and
Technical Data

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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.

Chapter	Changes versus previous version
-	Module CAN-CPCI/360 renamed to CPCI-CAN/360
-	

Technical details are subject to change without further notice.

N O T E

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1. Overview

1.1 Module Description

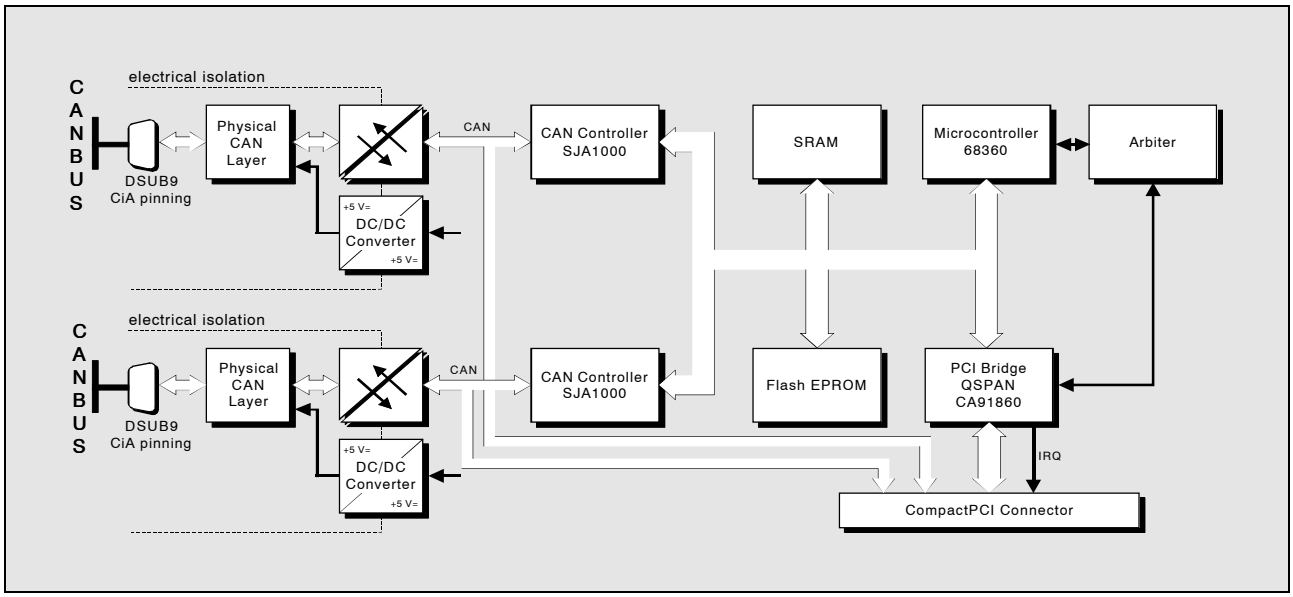


Fig. 1.1.1: Block-circuit diagram of the CPCI-CAN/360 module

The CPCI-CAN/360 is a CAN-interface board for the CompactPCI-bus. It uses a high-performance MC68360-type micro controller which manages the CAN data locally. The CAN data is buffered in a local SRAM. Data security and consistency are guaranteed up to 1 MBit/s.

The ISO 11898-compatible CAN interface allows a maximum data-transfer rate of 1MBit/s. The baud rate is among many features of the CAN interfaces which can be configured via software.
The CAN interface is electrically isolated from other voltage potentials by means of optocouplers and DC/DC-converters.

1.2 PCB View with Connector Designation

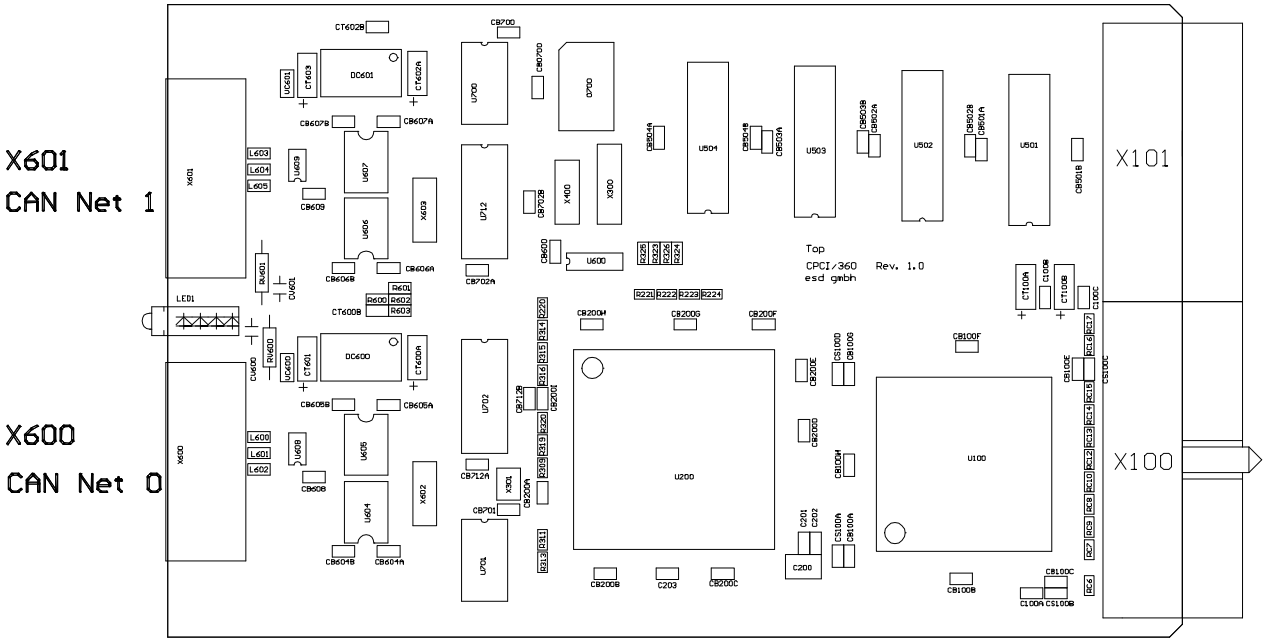
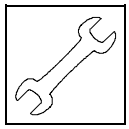


Fig. 1.2.1: View of the module (graphic without front panel)



2. Hardware Installation

Attention!
Electrostatic discharges may cause damage to electronic components. To avoid this, please perform the following steps *before* you touch the CAN module, in order to discharge the static electricity from your body:

- Switch off the power of your computer, but leave it connected to the mains.
- Please touch the metal case of the computer now to discharge yourself.
- Furthermore, you should prevent your clothes from touching the CAN module, because your clothes might be electrostatically charged as well.

Installation:

1. Switch off your PC and all connected peripheral devices (monitor, printer, etc.). Switch off the other CAN users to whose network the CAN module is to be connected, as well.

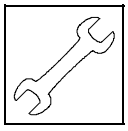
2. Discharge your body as described above.

3. Disconnect your computer from the mains.

4. Remove the case from your computer.

5. Select a free 3 HE-CompactPCI-bus slot:
   In *standard configuration* the CAN module fits into any 3 HE slot.

   Attention!
   - If the configuration of the board has been modified by changing the resistors in a way that the TTL-CAN signals are connected to the CompactPCI-I/O connector X101,
   - it must **not** be inserted into slots which are assigned with 64-bit-PCI signals!



6. Insert the CAN module into the slot you have selected.

7. Fix the module with the screw designed for it in the front panel.

8. Close the computer.

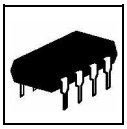
9. Connect the CAN.
   Please note that the CAN has to be terminated at both ends. **esd** offers T-pieces and terminations for this. Furthermore, the CAN-GND signal must be earthed at *exactly one* point in the CAN network. The termination connectors have a ground contact, therefore. A CAN user whose CAN interface is not electrically insulated acts as an earth connection like the CAN-GND.

   The first CAN interface (CAN network 0) is connected via DSUB connector (X600) and the second CAN interface (CAN network 1) is connected via DSUB connector (X601).

10. Connect your computer to the mains again.

11. Switch on your computer, the peripheral devices and the other CAN user again.

12. End of hardware installation.
    For software installation, installation programs for Windows operating systems are avialable. They are described in the software manual of the module.



3. Summary of Technical Data

3.1 General Technical Data

Ambient temperature	0...+50 ˚C, also available for -45 ˚C...+85 ˚C
Humidity	max. 90 %, non-condensing
Power supply	via CompactPCI-bus, nominal voltage: 5 V ±5%
Connectors	X100 (132-pin post connector) - CompactPCI-board connector X101 (132-pin post connector) - CompactPCI-rear-panel-I/O X600 (DSUB9/male) - CAN network 0 X601 (DSUB9/male) - CAN network 1 X602 (8-pin male) - opt. DeviceNet interface network 0 X603 (8-pin male) - opt. DeviceNet interface network 1 The following connectors are only equipped for programming and testing: X301 (4-pin SMD female) - serial interface X301 (10-pin post conn.) - BDM interface X400 (8-pin male) - ISP programming
Dimensions	100 mm x 160 mm
Weight	< 250 g

Table 3.1.1: General data of the module

3.2 CompactPCI Bus

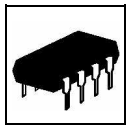
Host bus	PCI bus according to PCI Local Bus Specification 2.1
PCI-data/address bus	32 bits
Controller	QSPAN CA91860
Interrupt	Interrupt signal A
Board dimensions	according to CompactPCI-Specification, Rev. 1.0
Connectors	

Table 3.2.1: CompactPCI-bus data

3.3 CAN Interface

Number	2 CAN interfaces
CAN controller	SJA1000
CAN protocol	Basic-CAN 2.0A/B
Physical interface	Physical Layer according to ISO 11898, transmission rate programmable between 10 kbit/s and 1 Mbit/s
Bus termination of 120Ω	has to be set externally
Electrical insulation of CAN interfaces from other blocks	both CAN interfaces are electrically insulated from each other and other CompactPCI-bus potentials by means of optical couplers and DC/DC-converters
DeviceNet option	one adapter board each for every channel with Phoenix Combicon connector (or equivalent), optical couplers and CAN drivers according to DeviceNet Specification ‘DeviceNet Communication Model and Protocol, Rel. 2.0’, DeviceNet connectors accessible via front panel

Table 3.3.1: Data of CAN interface



3.4 Software Support

The product package includes software examples for DOS and Windows 3.11. Furthermor, software drivers for Windows NT/XP/2000 and Windows 9x/ME are available. The Windows-NT driver is written in kernel mode and is multi-processor conform. The Windows-9x/ME driver is realized as VxD. The firmware can be loaded from the PC into the flash EPROM.

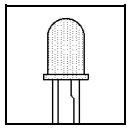
Software packages for CANopen are available.

3.5 Order Information

Type	Features	Order No.
CAN-CPCI/360-2	2xCAN, 0...+50˚C,	C.2026.02
CAN-CPCI/360-2-T	2xCAN, -40...+85˚C,	C.2026.03
Options:		
CAN-CPCI/360-95	Windows 9x/ME VxD driver	C.2026.10
CAN-CPCI/360-NT	Windows NT/XP/2000 Device driver	C.2026.11
CAN-CPCI/360-Co	CANopen Master/Slave-Object licence	C.2026.12
CAN-CPCI/360-Linux-Driver	Linux-Driver	C.2026.19
CAN-CPCI/360-VxW	VxWorks-Object licence	C.2026.55
CAN-CPCI/360-ME *)	English manual for C.2026.02 and C.2026.03	C.2026.21
CAN-API-ME *)	English manual for C.2026.10, C.2026.11, C.2026.19 and C.2026.55	C.2001.21
CAL/CANopen-ME *)	English manual for C.2026.12	C.2002.21

*) If manual and product are ordered together, the manual is included free of charge.

Table 3.5.1: Order information



4. LED Displays

The module has got four LEDs in the front panel. The green LED shows that the 5 V supply voltage is available. The other three LEDs can be controlled by three ports of controller 68360. The firmware does not support them yet (12/99).

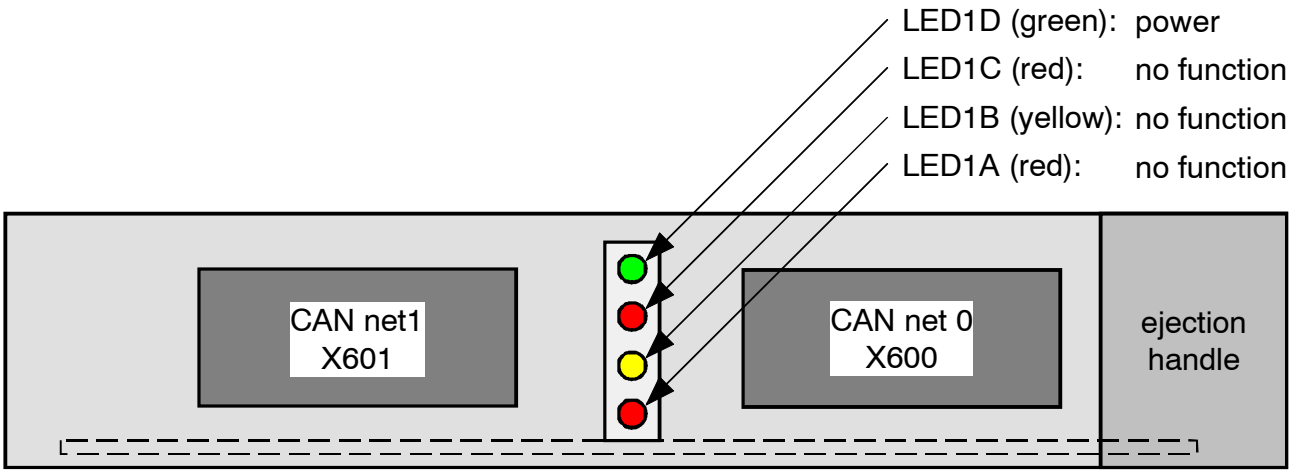


Fig. 4.1.1: Position and colours of the LEDs

LED	Colour	Name	Function of display when	
			LED off	LED on
LED1D	green	power	no power supply	power supply available
LED1C	red	-	not implemented	
LED1B	yellow	-	not implemented	
LED1A	red	-	not implemented	

Table 4.1.1: Display function of LEDs

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5. Assignment of CompactPCI-I/O Connector X101 with CAN Signals

The assignment of the local CAN interface and the CompactPCI-I/O connector X101 can be modified by varying the resistors, if required. By changing the assembly the CAN signals can be intercepted *before* the ISO11898 interface and be supplied to X101.
This option has to be stated in your order. Please do not hesitate to contact our Support.

Attention!
If the resistor bridges are assembled, only either the local physical interface or signals must be connected to X101, otherwise the CAN signals are short-circuited.

When the module is shipped in standard configuration, the CompactPCI-I/O connector X101 is only assigned with a few GND-signals. This means that in this case the boards can perfectly be inserted into slots in which the rear-panel-I/O connector on the CompactPCI-rear panel has been designed for 64-bits access. In every other configuration the module must only be inserted into slots which were designed for I/O-signals, otherwise the module or other parts of the CompactPCI system might be destroyed!

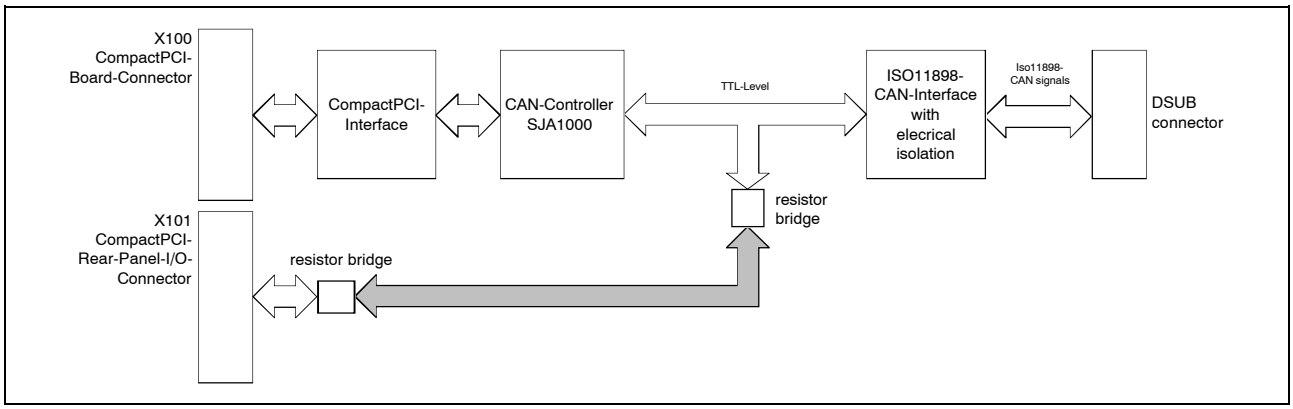

Fig. 5.1.1: Diagram of the possible assignments of connector X101 (only CAN network 0 is shown)

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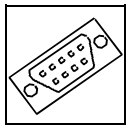
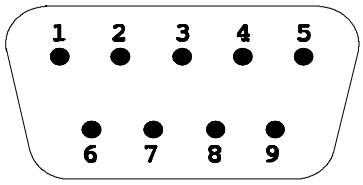


6. Connector Assignment

6.1 CAN Interfaces (X600, X601)

The signals in the connectors of CAN interface 1 (network 0: X600) and interface 2 (network 1: X601) are identical. The connectors are 9-pin male 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-pin DSUB connector

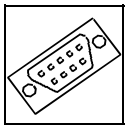
Signal Description:

CAN_L, CAN_H... CAN-signal lines

CAN_GND ... reference potential of local CAN-physical layer

shield ... potential of connector case

reserved... reserved for future applications

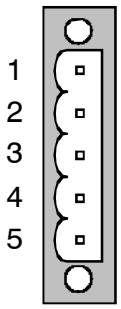


Connector Assignment

6.2 DeviceNet Option

If the module has got the DeviceNet interface, the DSUB connectors are not available.
5-pin Phoenix-Combicon connectors MSTB 2.5/-GF-5.08 (or equivalent) are used.

Pin Position:



Pin assignment:

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

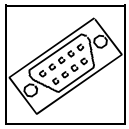
Signal Description:

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

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

CAN+, CAN-... CAN signals

shield... shield
(earthed (front panel) via high-impedance RC-combination (1MΩ, 10nF/500V)



6.3 Assignement of I/O-Connector X101

In standard configuration only the GND-signals are assigned to connector X101. The following signal assigment is only valid, if the configuration resistors are assembled accordingly (refer to page 13).

Pin	Signal						
	Row Z	Row A	Row B	Row C	Row D	Row E	Row F
1	-	-	R01*	R00*	T01*	T00*	GND
2	-	-	-	-	-	-	-
3	-	-	-	-	-	-	GND
4	-	-	-	-	-	-	-
5	-	-	-	-	-	-	GND
6	-	-	-	-	-	-	-
7	-	-	-	-	-	-	GND
8	-	-	-	-	-	-	-
9	-	-	-	-	-	-	GND
10	-	-	-	-	-	-	-
11	-	-	-	-	-	-	GND
12	-	-	-	-	-	-	-
13	-	-	-	-	-	-	GND
14	-	-	-	-	-	-	-
15	-	-	-	-	-	-	GND
16	-	-	-	-	-	-	-
17	-	-	-	-	-	-	GND
18	-	-	-	-	-	-	-
19	-	-	-	-	-	-	GND
20	-	-	-	-	-	-	-
21	-	-	-	-	-	-	GND
22	-	-	T10*	T11*	R10*	R11*	-

Signal Description:

T10*, R10*, T11*, R11* CAN signals, which can be supplied to X101, if the resistors are assembled differently (CAN-controller network 0)

T00*, R00*, T01*, R01* CAN signals, which can be supplied to X101, if the resistors are assembled differently (CAN-controller network 1)

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7. Correctly Wiring Electrically Insulated 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 Ω ±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.

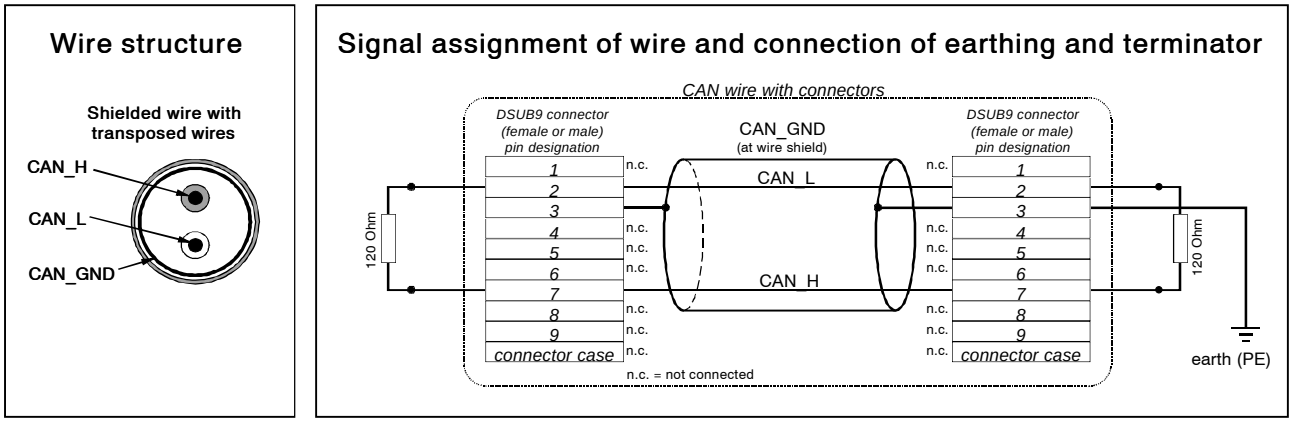


Figure: Structure and connection of wire

Cabling

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

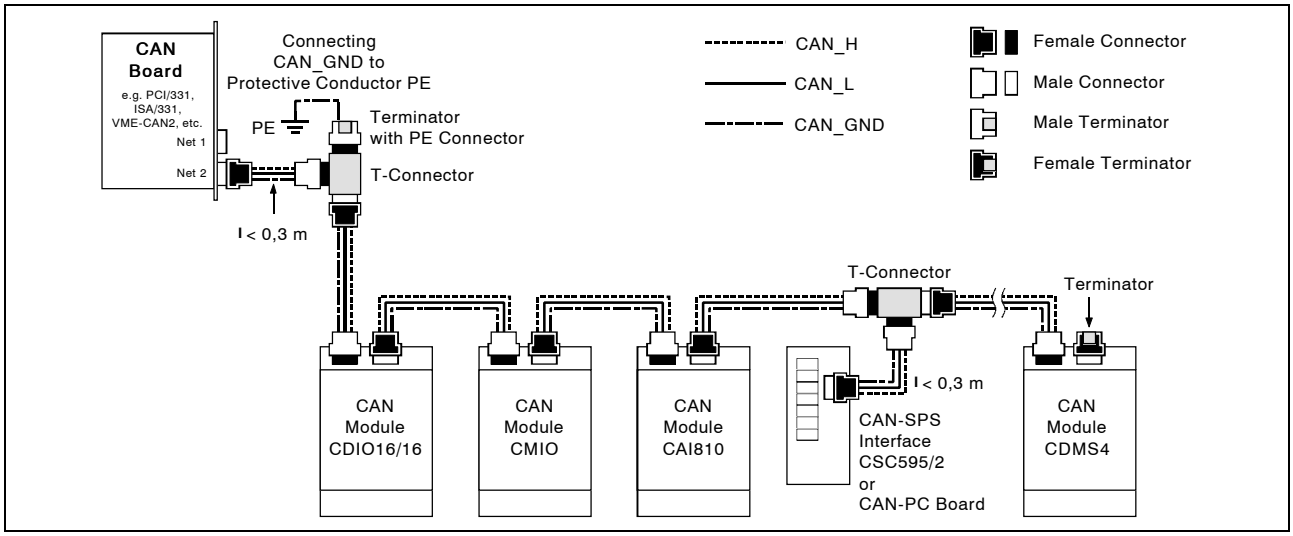


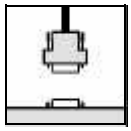
Figure: Example for correct wiring (when using single shielded wires)

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 insulated 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 insulated 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))

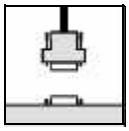
Bit rate [kbit/s]	Typical values of reachable wire length **with esd interface** l_{max} [m]	**CiA recommendations** (07/95) for reachable wire lengths l_{min} [m]
1000	37	25
800	59	50
666.6	80	-
500	130	100
333.3	180	-
250	270	250
166	420	-
125	570	500
100	710	650
66.6	1000	-
50	1400	1000
33.3	2000	-
20	3600	2500
12.5	5400	-
10	7300	5000

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

Examples for Suitable Types of Wire

Manufacturer	Type of wire
U.I. LAPP GmbH & Co. KG Schulze-Delitzsch-Straße 25 70565 Stuttgart	UNITRONIC ®-BUS LD, UNITRONIC ®-BUS FD P LD
metrofunk KABEL-UNION GmbH Postfach 410109 12111 Berlin	LiYCY 2 x 0,38 mm², LiYCY 2 x 0,5 mm², LiYCY 2 x 0,75 mm², LiYCY 2 x 1,0 mm², 1P x AWG 22 C, 1P x AWG 20 C

Manufacturer	Type of wire
Alcatel Kabelmetal Kabelkamp 20 30179 Hannover	DUE 4401, DUE 4001, DUE 4402
ConCab Kabel GmbH Äußerer Eichwald 74535 Mainhardt	1 x 2 x 0,22 mm² Order no.: 93022016 (UL approved)



Wiring

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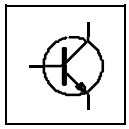

8. Circuit Diagrams

The PDF-file of this document does not contain the circuit diagrams. The circuit diagrams are shipped on request.