CAN-ISA/200

ISA to 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.

Alternations in the hardware manual versus previous revision	Alternations in hardware	Alternations in documentation
Default value of address range corrected.	-	x
-	-	-

Technical details are subject to change without notice.

N O T E

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Contents

1. Overview

1.1 Module Description

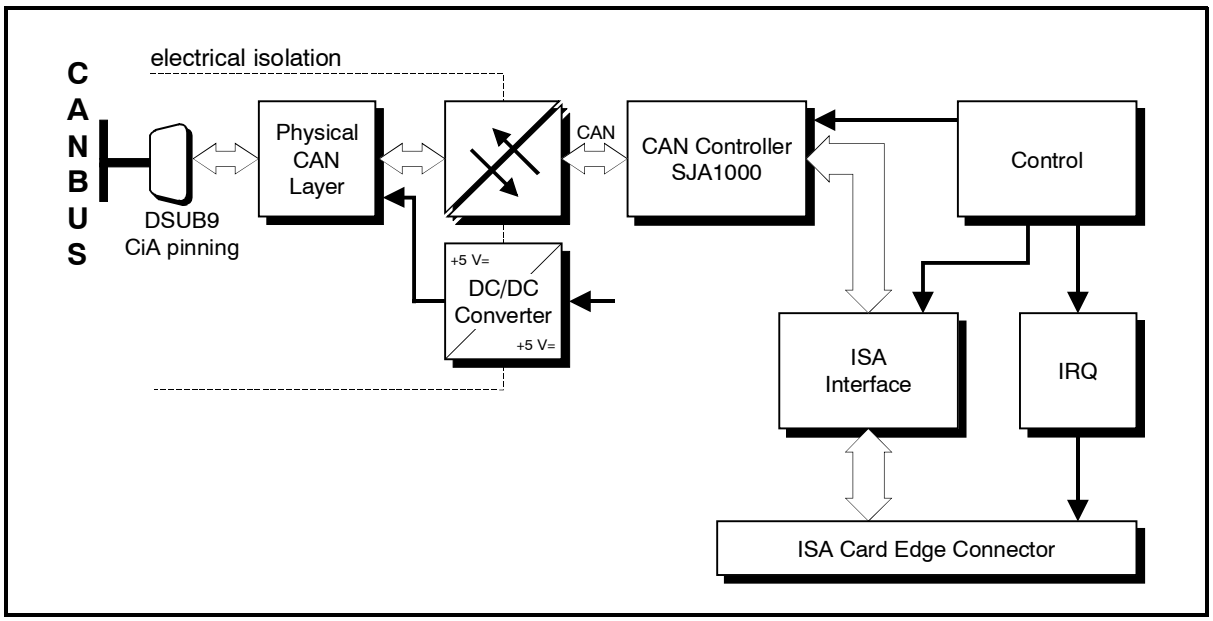


Figure 1.1.1: Block diagram of the module CAN-ISA/200

The module CAN-ISA/200 is a PC board designed for the ISA bus (ISA 8 bit). 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 Jumper Field and the Connectors

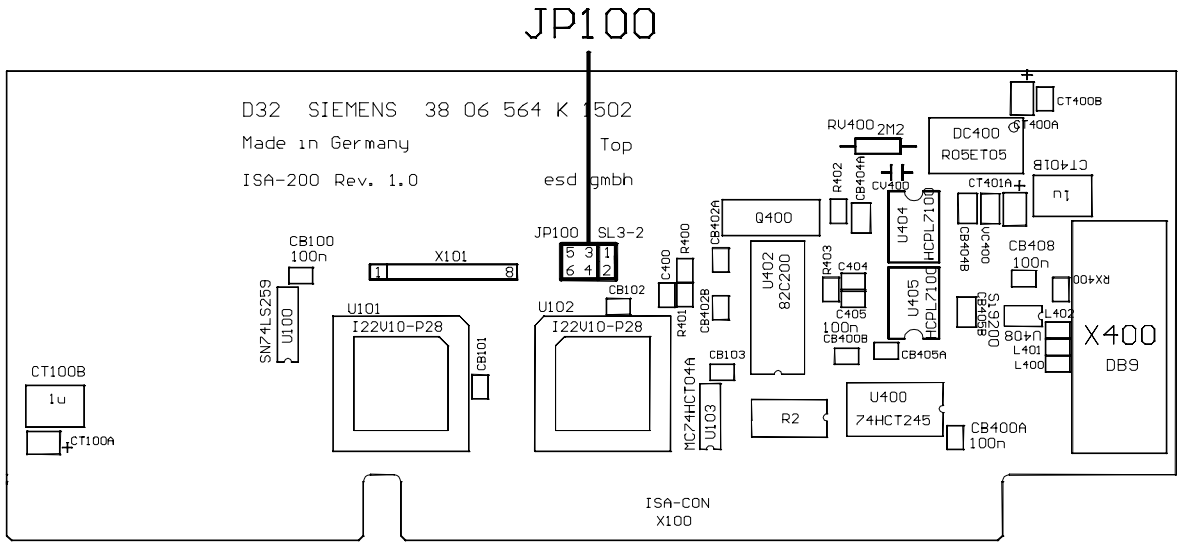
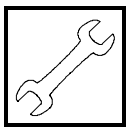


Figure 1.2.2: Top layer view of the CAN-ISA/200 with jumper location



2. Hardware Installation

2.1 Before Starting Hardware Installation

During the installation it is necessary to set the interrupt line and it may be necessary to change the ISA I/O port address of the board. The address is default factory set to **1E8...1EB** HEX at the jumper field JP100. The CAN module covers 8 data bytes.

The interrupt has to be set by software. There are no jumpers or switches to set the interrupt. The interrupt setting is described in the installation chapter in the software manual.

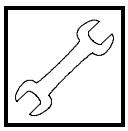
Make sure, that there will be no address conflict with other ISA boards in the PC and make sure, that there will be no conflict with other interrupts!

Windows NT Users:
To avoid system conflicts, you can control the used address ranges and the used interrupt lines of your system. This can be done in Windows NT 4.0 by selecting *Programs* and then selecting the folders *Administrative Tools(Common)* and *WindowsNT Diagnostics*. In the dialogue box *WindowsNT Diagnostics* call *Resources* and there select *I/O Port*.

A list with the used addresses appears. Make sure that the default value of the CAN module's address is placed in a free memory area. If it is not, compare the selectable address ranges of the module (shown in fig. 2.2.2) with the free memory areas. Note one selectable address area, and change the jumper settings during the hardware installation of the CAN module afterwards.

In the same dialogue box call *Interrupts*. A list with the used interrupt lines appears. Note a free interrupt, because you have to select an interrupt for the CAN module during the software installation. (The complete **software** installation sequence is described in the software manual 'CAN API, Monitor Program CAN-Scope and Installation'.)

Windows 95 Users:
If you use a Windows 95 operating system **first read the software installation guide** in the appendix of the manual 'CAN API, Monitor Program CAN-Scope and Installation' and then start with the installation sequence!



2.2 Execute Hardware Installation and Setting of ISA Bus Address

Attention !
Electro static discharge may cause damage to electronic devices. To avoid this, first do the following steps to discharge your personal static electricity, *before* you touch the CAN-ISA/200 board:

- Switch off the power supply of all units but leave the connector plug in the socket.
- Then touch the PC's metal case to discharge the static electricity.
- Even your clothes may not touch the CAN-ISA/200 board!

1. Switch off the PC and all peripheral devices.

2. Discharge yourself as described above if not yet done.

3. Disconnect the power supply of the PC by removing the power connector.

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

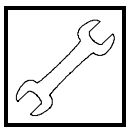
5. Select an open ISA slot and remove the slot cover of the selected slot at the back of the PC.

   The board can be inserted in every ISA slot. Do not insert the board in a PCI slot because this can damage the PC and the board!

   The slot cover is fixed by one screw. Unfasten it, remove the cover and retain the screw for fixing the CAN-ISA/200 board afterwards.

6. Have you controlled that there will be no address conflict with other ISA boards ? (See chapter '2.2.1 Before Starting Hardware Installation' above)
   If you have to change the CAN-ISA/200's address go on with step 7 otherwise go on with step 8.

7. Changing the ISA bus I/O port address.
   To change the ISA bus address, you have to change the jumpers at the jumper field JP100.
   The location of the jumper field at the PCB is shown in figure 1.2.2 at page 4.
   If a jumper is inserted, the according address select bit is decoded as "0".



Jumper Pin:	5	3	1
	O	O	O
Address Select Bit:	**S2**	**S1**	**S0**
	O	O	O
Jumper Pin:	6	4	2

Fig. 2.2.1: Jumper JP100 (view from top layer, orientation with X400 at the right side of the board)

During the software installation you have to notify the jumpered address to the software driver. The selection box of Windows NT proposes e.g. the following alternative I/O port addresses:

Address Range	Jumper JP100
reserved	
0x100 - 0x103 HEX	
0x1E0 - 0x1E3 HEX	
0x1E8 - 0x1EB HEX (default setting)	
0x250 - 0x253 HEX	
0x2A0 - 0x2A3 HEX	
0x390 - 0x393 HEX	
0x3F0 - 0x3F3 HEX	

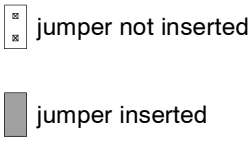
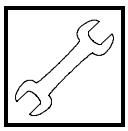


Fig. 2.2.2: Software supported jumper settings

All other jumper settings are *not* supported by the Windows installation software.

8. Insert the CAN-ISA/200 board in the selected ISA slot.
   Gently push the CAN-ISA/200 down until it snaps into place. Make sure that it is securely seated in the ISA slot.



Installation

9. Attach the board.
   Use the screw you removed from the expansion slot in step 5 to secure the CAN-ISA/200 in place.

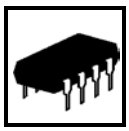
10. Replace the PC's cover
    Secure the cover with the mounting screws you removed in step 4.

11. Connect the CAN wire to the 9-pole DSUB connector X400.

12. Connect the power supply of the PC and the peripheral devices.

13. Switch on the power supply of the PC and the peripheral devices in any order.
    Please pay attention to the notes on correct wiring of CAN nets in the last chapter of this manual!

14. End of hardware installation.
    Continue with software installation as described in the manual 'CAN API, Monitor Program CAN-Scope and Installation'.



3. Technical Data Summary

3.1 General Data

Operating ambient temperature	0...50°C
Humidity	max 90 %, non-condensing
Supply voltage	supplied by ISA bus, nominal voltage: 5 V ±5% supply current: 0,4 A
Plug-and-socket connectors	X100 (card edge) - ISA bus X400 (DSUB9/male) - CAN
Dimensions	157.48 mm x 63.5 mm
Weight	< 100 g

Table 3.1.1: General data of the board

3.2 ISA Bus

Host bus	ISA
ISA data bus width	8 bits
Data interface	multiplexed interface SJA1000
Address	selectable by jumpers
Interrupt	1 of 12
Slot position	no restrictions for the position of the CAN-ISA/200 on the ISA bus
Board dimensions	ISA short card
Connector	ISA card edge connector

Table 3.2.1: ISA bus data

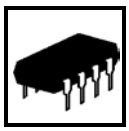
3.3 CAN Bus

Controller components	SJA1000
CAN protocol	basic CAN 2.0A or 2.0B
Physical layer	physical layer according to ISO 11898, transmission rate is programmable from 10 kbit/s to 1 Mbit/s
Bus termination	termination resistor has to be set externally
Electrical separation of CAN interfaces from other units and from each other	separation by means of optocouplers and DC/DC converters

Table 3.3.1: CAN interface data

3.4 Software Support

The product package includes source codes of software examples for DOS and Windows 3.11. Moreover, software drivers are available for Windows NT and Windows 95. The Windows NT driver is contained in kernel mode and is multi processor conform.
The Windows 95 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.

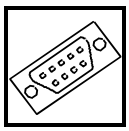


3.5 Order Information

Type	Description	Order-no.
CAN-ISA/200	1x CAN 2.0A, ISO 11898	C.2011.02
Options:		
CAN-ISA/200-95	Windows 95 VxD Driver	C.2011.10
CAN-ISA/200-NT	Windows NT Device Driver	C.2011.11
CAN-ISA/200-Co	CANopen Master/Slave Obj. Licence	C.2011.12
CAN-ISA/200-ME *)	English users manual for C.2011.02	C.2011.21
CAN-API-ME *)	English users manual for C.2011.10 and C.2011.11	C.2001.21
CAL/CANopen-ME *)	English users manual for C.2011.12	C.2002.21

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

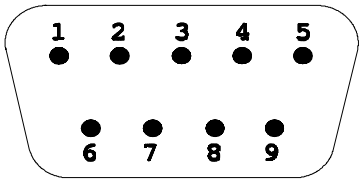
Table 3.5.1: Order information



4. Connector Pin Assignment

4.1 CAN Connector X400

Pin Orientation:



Pin Assignment:

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

9-pole DSUB connector with male contacts
Screw top type UNC 4-40

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.

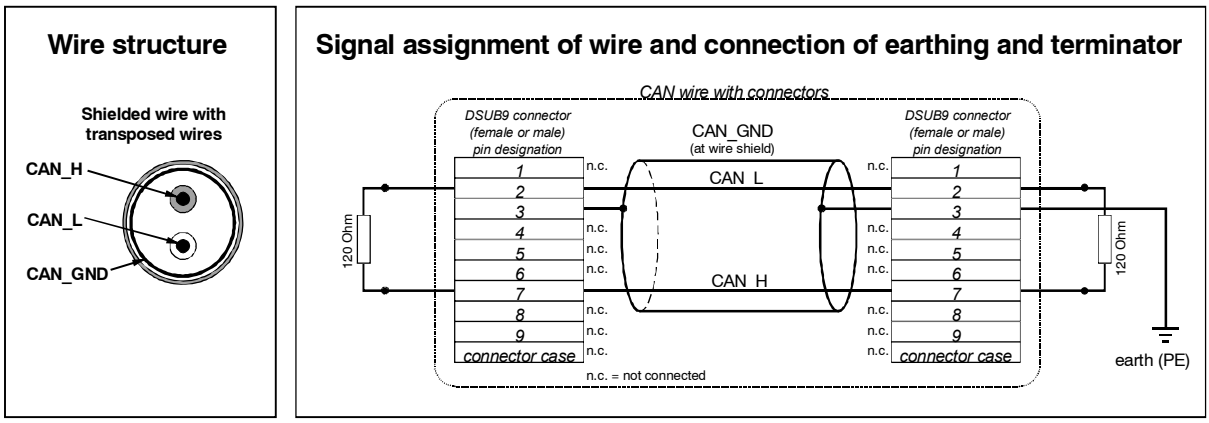


Figure: Structure and connection of wire

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)

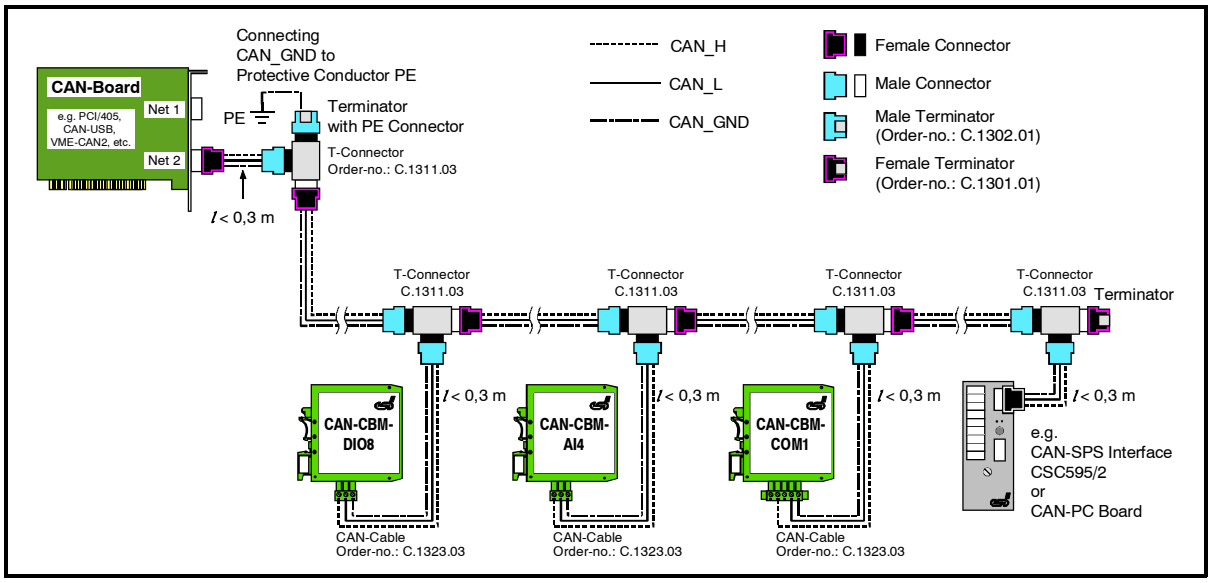


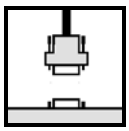
Figure: Example for correct wiring (when using single shielded wires)

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

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**.

EG-KONFORMITÄTSERKLÄRUNG
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-ISA/200**
Typ, Modell, Artikel-Nr. *Type, Model, Article No.*	**C.2011.02**
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.*	**1710.0308.99**
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)**

Diese Erklärung gilt für alle Exemplare, die das CE-Zeichen tragen und verliert ihre Gültigkeit, wenn Veränderungen am Produkt vorgenommen werden.
This declaration is valid for all units with the CE label on it and it lose its validity if a modification is done on the product.

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

Rechtsgültige Unterschrift / *authorized Signature*

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