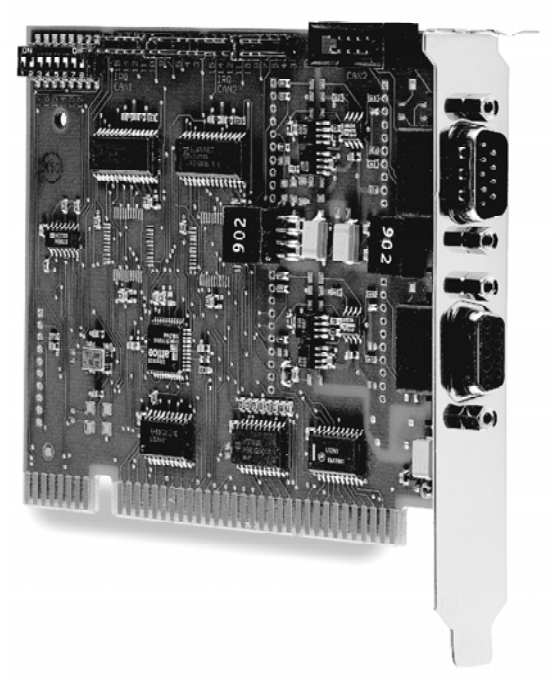
Hardware Manual

PC-I 03

Passive PC/CAN Interface



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1 Introduction

1.1 Overview

Congratulations on your purchase of the IXXAT PC/CAN interface PC-I 03, a high-quality electronic component developed and manufactured according to the latest technological standards.

This manual is intended to familiarize you with your interface, also referred to in the following as PC-I 03. Please read this manual before beginning with the installation.

The manual describes, among other things, the hardware architecture of the interface, knowledge of which is required for creating your own drivers.
If using the interface with the IXXAT driver VCI or other IXXAT software, you do not need to read sections 4 and 5.

1.2 Features

The main technical features are as follows:

- 8 bit AT slot interface
- Independent operation of two separate CAN lines each with a CAN controller Philips SJA1000 or Intel 82527 possible
- CAN controller with 16 MHz clock
- Each CAN controller can be allocated a separate PC interrupt line via jumper field for connection to the PC interrupt system. The following 10 interrupt lines are available: IRQ 3, 4, 5, 7, 9, 10, 11, 12, 14 and 15
- Support of shared interrupts
- Fast access to the CAN controllers due to direct memory mapping
- Support of the READY line (can be switched off via DIP switch)
- Basic addresses beginning with C000H can be set in 4 k steps via DIP switch, occupying 4 kbytes of address space
- Bus interface according to ISO 11898-2 on-board, galvanically isolated as an option
- Optional CAN protective circuit on-board
- CAN connection via 9-pin Sub-D connector / Sub-D socket
- Pin allocation according to CiA/DS-102

2 Installation

2.1 Hardware installation

For all work on the PC and interface, you must be statically discharged. Work must be carried out on an earthed, antistatic work mat.
Take the following steps in sequence:

(1) Find a free memory segment on the PC of at least 4 kbytes in the range < 1MB (ISA memory range) and a free IRQ for each CAN controller. Use the manual of your PC for this.

(2) Set this memory segment and the IRQ on the interface, as described in section 3.1.

(3) Switch the PC off and remove the mains plug.

(4) Open the PC according to the instructions of the PC manufacturer and find a suitable place to plug in. The interface is designed according to the PC standard and can easily be built into the computer. Do not use force when plugging in.

(5) Make sure the interface sits tightly in the PC.

(6) If your interface is equipped with 2 separate CAN lines, you must fit the additional slotplate and plug in the header on the interface (see section 3.2).

(7) Close the PC; the hardware installation is now complete.

2.2 Software installation

A driver is required to operate the interface. For installation of the CAN driver VCI under Windows, please refer to the VCI installation manual.

3 Configuration

3.1 Jumper settings

Figure 3-1 shows the positions of the connectors and jumpers on the interface.

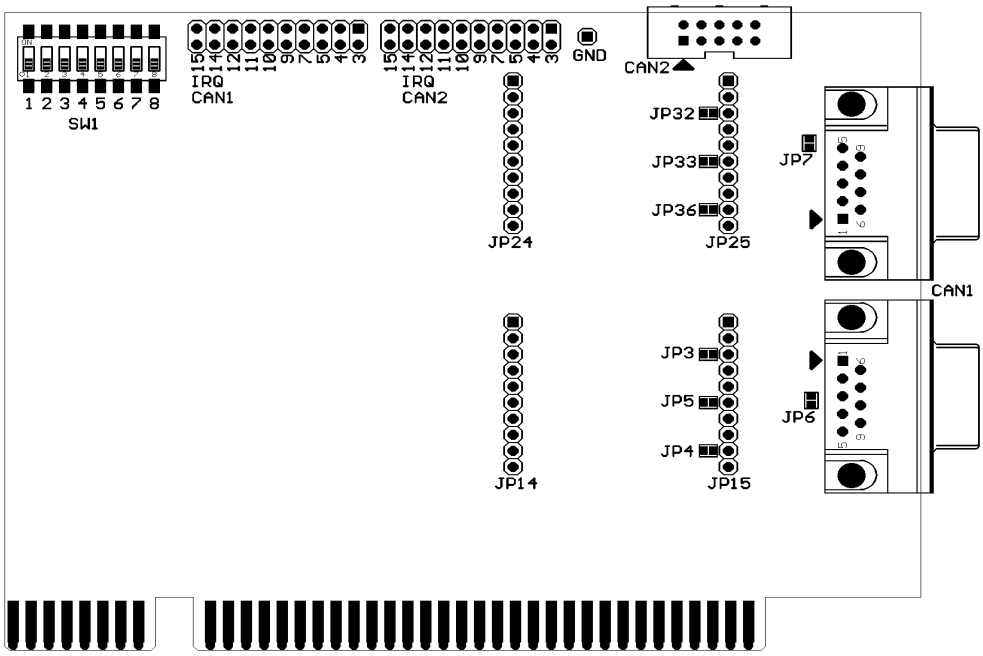

Fig. 3-1: Positions of the connectors and jumpers

3.1.1 Setting the basic address

Switches 1 to 6 of the DIP switch SW1 are used for the basic address. The following table shows the possible settings (def. = default settings).
Beginning with the selected basic address, the PC/CAN interface occupies an address space of 4 kbytes. In this address range the interface can be addressed as a normal RAM. No other interface may be present in the selected memory range.

Basic address	*SW1 1*	*SW1 2*	*SW1 3*	*SW1 4*	*SW1 5*	*SW1 6*
C000h	ON	ON	ON	ON	ON	ON
C100h	ON	ON	ON	ON	ON	OFF
C200h	ON	ON	ON	ON	OFF	ON
C300h	ON	ON	ON	ON	OFF	OFF
C400h	ON	ON	ON	OFF	ON	ON
C500h	ON	ON	ON	OFF	ON	OFF
C600h	ON	ON	ON	OFF	OFF	ON
C700h	ON	ON	ON	OFF	OFF	OFF
C800h	ON	ON	OFF	ON	ON	ON
C900h	ON	ON	OFF	ON	ON	OFF
CA00h	ON	ON	OFF	ON	OFF	ON
CB00h	ON	ON	OFF	ON	OFF	OFF
CC00h	ON	ON	OFF	OFF	ON	ON
CD00h	ON	ON	OFF	OFF	ON	OFF
CE00h	ON	ON	OFF	OFF	OFF	ON
CF00h	ON	ON	OFF	OFF	OFF	OFF
D000h (def.)	ON	OFF	ON	ON	ON	ON
D100h	ON	OFF	ON	ON	ON	OFF
D200h	ON	OFF	ON	ON	OFF	ON
D300h	ON	OFF	ON	ON	OFF	OFF
D400h	ON	OFF	ON	OFF	ON	ON
D500h	ON	OFF	ON	OFF	ON	OFF
D600h	ON	OFF	ON	OFF	OFF	ON
D700h	ON	OFF	ON	OFF	OFF	OFF
D800h	ON	OFF	OFF	ON	ON	ON
D900h	ON	OFF	OFF	ON	ON	OFF
DA00h	ON	OFF	OFF	ON	OFF	ON
DB00h	ON	OFF	OFF	ON	OFF	OFF
DC00h	ON	OFF	OFF	OFF	ON	ON
DD00h	ON	OFF	OFF	OFF	ON	OFF
DE00h	ON	OFF	OFF	OFF	OFF	ON
DF00h	ON	OFF	OFF	OFF	OFF	OFF

Basic address	*SW1 1*	*SW1 2*	*SW1 3*	*SW1 4*	*SW1 5*	*SW1 6*
E000h	OFF	ON	ON	ON	ON	ON
E100h	OFF	ON	ON	ON	ON	OFF
E200h	OFF	ON	ON	ON	OFF	ON
E300h	OFF	ON	ON	ON	OFF	OFF
E400h	OFF	ON	ON	OFF	ON	ON
E500h	OFF	ON	ON	OFF	ON	OFF
E600h	OFF	ON	ON	OFF	OFF	ON
E700h	OFF	ON	ON	OFF	OFF	OFF
E800h	OFF	ON	OFF	ON	ON	ON
E900h	OFF	ON	OFF	ON	ON	OFF
EA00h	OFF	ON	OFF	ON	OFF	ON
EB00h	OFF	ON	OFF	ON	OFF	OFF
EC00h	OFF	ON	OFF	OFF	ON	ON
ED00h	OFF	ON	OFF	OFF	ON	OFF
EE00h	OFF	ON	OFF	OFF	OFF	ON
EF00h	OFF	ON	OFF	OFF	OFF	OFF
F000h	OFF	OFF	ON	ON	ON	ON
F100h	OFF	OFF	ON	ON	ON	OFF
F200h	OFF	OFF	ON	ON	OFF	ON
F300h	OFF	OFF	ON	ON	OFF	OFF
F400h	OFF	OFF	ON	OFF	ON	ON
F500h	OFF	OFF	ON	OFF	ON	OFF
F600h	OFF	OFF	ON	OFF	OFF	ON
F700h	OFF	OFF	ON	OFF	OFF	OFF
F800h	OFF	OFF	OFF	ON	ON	ON
F900h	OFF	OFF	OFF	ON	ON	OFF
FA00h	OFF	OFF	OFF	ON	OFF	ON
FB00h	OFF	OFF	OFF	ON	OFF	OFF
FC00h	OFF	OFF	OFF	OFF	ON	ON
FD00h	OFF	OFF	OFF	OFF	ON	OFF
FE00h	OFF	OFF	OFF	OFF	OFF	ON
FF00h	OFF	OFF	OFF	OFF	OFF	OFF

The address range of the interface must not overlap with any other system components in the PC.

3.1.2 Setting the PC interrupt

The required interrupt can be set separately for each CAN controller. The Interrupt number and the number of the associated CAN controller are located on the board under the two jumper boards. The required PC interrupt is set with the corresponding jumper board by closing the jumper pair of the required IRQ.
Only one interrupt may be selected for each CAN controller. If no interrupt is required, no pin of the corresponding jumper board may be bridged. The factory setting of the interface is IRQ5 for the first CAN controller and (if present) IRQ10 for the second CAN controller (see Fig. 3-1). It must be ensured that no other system components occupy the selected interrupt, except for system components that work with shared interrupts.

3.1.3 READY signal

With assembled Intel 82527 the READY signal can be supported with the DIP switch SW1-7. For this the switch is set to OFF (factory setting: Switch SW1-7 set to ON). The READY signal is used when an error occurs during a read accesses on the Intel CAN controller (wrong index contents).

3.1.4 Supplying voltage via CAN connector

VCC or GND can be connected to the 9-pin Sub-D connector/socket with the soldered jumpers JP3, JP4, JP5, JP32, JP33 and JP36. For this the jumpers listed in the following table must be closed. The soldered jumpers are located on the back of the PC-I 03.

Connector board pin (JP15/JP25) - Signal	*Default setting*	*CAN line 1*	*CAN line 2*
3 - GND	closed	JP3	JP32
6 - GND	open	JP5	JP33
9 - VCC	open	JP4	JP36

Caution: This voltage may be loaded with maximum 100 mA.
With galavanically isolated bus interfaces, GND and VCC are also galvanically isolated from the power supply of the PC.

3.1.5 Bus terminal

Bus terminal resistors are assembled on the PC-I 03 for the first and second CAN line with 120 Ohms each. The bus terminal for the first CAN line is connected with the soldered jumper JP6, for the second CAN line with JP7. The bus is terminated between CAN-Low and CAN-High. When delivered, the bus terminals are not active.

3.2 Design of the CAN connectors

Two isolated high-speed bus interfaces according to ISO 11898-2 can be mounted on the interface.
The signals of the first bus interface are connected to the 9-pin Sub-D connector/socket. If the second bus interface is assembled, the signals for the CAN bus of the second bus

interface are connected to the header. A separate slotplate with two Sub-D-9 connectors is connected to the header via a 9-pin ribbon cable with the header of the interface. All pin allocations of the Sub-D connectors conform to the CiA specification CiA/DS-102.

As a further option, a version without bus connection on the interface is available. In this case the signals are led out on two connector boards each (JP14/JP15 for the first CAN line, JP24/JP25 for the second CAN line). This enables the implementation of alternative bus connections.

A CAN protective circuit, consisting of a special CAN coil is also available as an option. The circuit suppresses faults and short spikes on the CAN lines.

3.2.1 Connection of the bus interface

The signals of the **first bus interface** are connected to the 9-pin Sub-D connector/socket.

Pin no. JP15	***Pin no. Sub-D-9***	***Signal name***
1	1	n.c.
2	2	CAN-Low
3	3	GND (via JP3/JP32)
4	4	n.c.
5	5	n.c.
6	6	GND (via JP5/JP33)
7	7	CAN-High
8	8	n.c.
9	9	VCC (via JP4/JP36)
10	-	-

The signals of the second **bus interface** are connected on the header as follows:

Pin no. JP25	*Pin no. header*	*Signal name*
1	1	n.c.
2	3	CAN-Low
3	5	GND (via JP3/JP32)
4	7	n.c.
5	9	n.c.
6	2	GND (via JP5/JP33)
7	4	CAN-High
8	6	n.c.
9	8	VCC (via JP4/JP36)
10	10	n.c.

With galavanically isolated bus interfaces, GND and VCC are also galvanically isolated from the power supply of the PC.

3.2.2 Connection between CAN controllers and bus interfaces

For the implementation of specific bus interfaces, the connections JP14, JP15, JP24 and JP25 are available. These are only required if the interface is designed without on-board bus connection.
The signals of the CAN controllers 1 and 2 are connected to JP14 and JP24 respectively.

Pin no. JP14/JP24	*Signal*
1	VCC
2	GND
3	n.c.
4	RX 0
5	RX 1
6	TX 1
7	TX 0
8	n.c.
9	n.c.
10	n.c.

JP15 connects the signals of the **first bus interface** to the Sub-D-9 connector/socket.

Pin no. JP15	***Signal name***
1	n.c.
2	CAN-Low
3	GND (via JP3/JP32)
4	n.c.
5	n.c.
6	GND (via JP5/JP33)
7	CAN-High
8	n.c.
9	VCC (via JP4/JP36)
10	-

JP25 connects the signals of the **second bus interface** to the header.

Pin no. JP25	***Signal***
1	n.c.
2	CAN-Low
3	GND (via JP3/JP32)
4	n.c.
5	n.c.
6	GND (via JP5/JP33)
7	CAN-High
8	n.c.
9	VCC (via JP4/JP36)
10	n.c.

4 Architecture

4.1 PC-side memory allocation

The CAN controllers are displayed directly in the memory area of the PC.

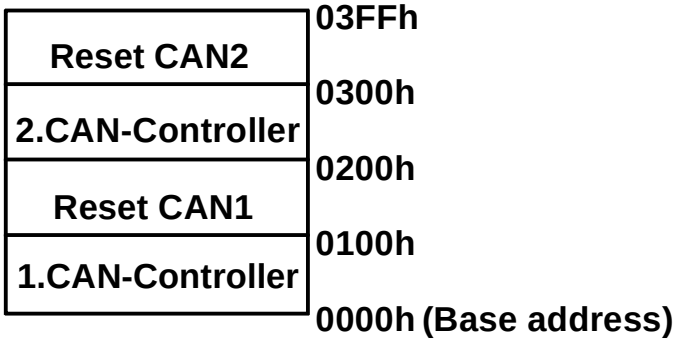

Fig. 4-1: PC-side memory allocation of the PC-I 03

4.1.1 Access to CAN controllers

Up to two CAN controllers either of type Philips SJA1000 and/or Intel 82527 can be assembled on the interface.
The first CAN controller is displayed in the range from 0000h to 00FFh, the second CAN controller in the range from 0200h to 02FFh from the basic address of the board. With access to the individual memory range, the corresponding CAN controller is automatically selected. The basic address can be configured as described in section 3.1.1.
The exact index description of the SJA1000 and of the Intel 82527 is found in the corresponding data sheets of Philips and Intel (Web addresses in Appendix).
The Output Control Register of the CAN controllers must be loaded with the value 5Eh.

4.1.2 Resetting the CAN controllers from the PC

By writing any value to an address of the reset range (0100h to 01FFh for the first CAN controller and 0300h to 03FFh for the second CAN controller), a hardware reset is carried out on the corresponding CAN controller.

4.2 Triggering an interrupt on the PC

The CAN controllers can trigger interrupts on the PC. For configuration of the interrupts, see section 3.1.2

5 Notes for programmers

For more details on programming the CAN controller and for example programs, visit the support area of our homepage (www.ixxat.de) or contact us via e-mail (support@ixxat.de).

Appendix

Technical specifications

The following data refer to the version of the PC-I 03 with two Philips SJA1000 CAN controllers and separate bus connections (one of which is galvanically isolated).

Dimensions:	101 x 130 mm (without slotplate), 16 mm overall height
Weight:	approx. 100 g
Operating temperature range:	0 - 50 °C
Voltage supply:	5 V DC ± 5%
Power consumption:	typically mA max. 500 mA
Galvanic isolation:	optional 250 V DC 1min
Propagation delay of Galvanic isolation:	typically 100 ns
EMC test according to:	DIN EN 55022:05.1995 class B DIN EN 55022 A1/12.1995 DIN EN 61000-3-2:03.1996 DIN EN 61000-3-3:03.1996 DIN EN 50082-2:02.96

Factory settings

The factory settings of the switches of the PC-I 03 are listed in the following. With special versions of the interface, individual settings may vary.

Basic address:	D000h	DIP	SW1-1	ON
		DIP	SW1-2	OFF
		DIP	SW1-3	ON
		DIP	SW1-4	ON
		DIP	SW1-5	ON
		DIP	SW1-6	ON
READY line:	switched off	DIP	SW1-7	ON
Interrupt 1. CAN:	IRQ 5			
Interrupt 2. CAN: (only if assembled)	IRQ 10			

References for data sheets

CAN-Controller Philips SJA1000:
http://www.philips-semiconductors.com

CAN-Transceiver Philips PCA82C251:
http://www.philips-semiconductors.com

CAN-Controller Intel 82527:
http://www.intel.com