

WITIO-PCI168 EXTENDED

EDP No.: A-425500

168 TTL Inputs/Outputs
3 * 16Bit Counter - interrupt capable

wasco[®]

user's guide

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- Programmable Timer IC 8254
- Programmable I/O IC 8255

1. Introduction

WITIO-PCI168_{EXTENDED} features 168 digital TTL compatible input/output channels. This board is suitable for all I/O applications which may not need galvanic isolation. The 168 input/output channels are programmable in groups of eight channels each. It is also possible to group every third port into two groups with four channels each to be input or output. Internal data bus works with 8 bit, every access of writing or reading is done byte-wise. A Timer IC combined with a quartz oscillator triggers the interrupts time dependently. You can connect periphery over a 37-pin Sub-D jack with slot brackets on the board which are led to the 24 input/output channels and to the timer connections. Furthermore you can connect three 50-pin box headers with each 48 channels. The pin assignment of all jacks and plugs are identical to the assignments of ISA Bus Board WITIO-168_{EXTENDED}, thus you can switch to PCI very easily.

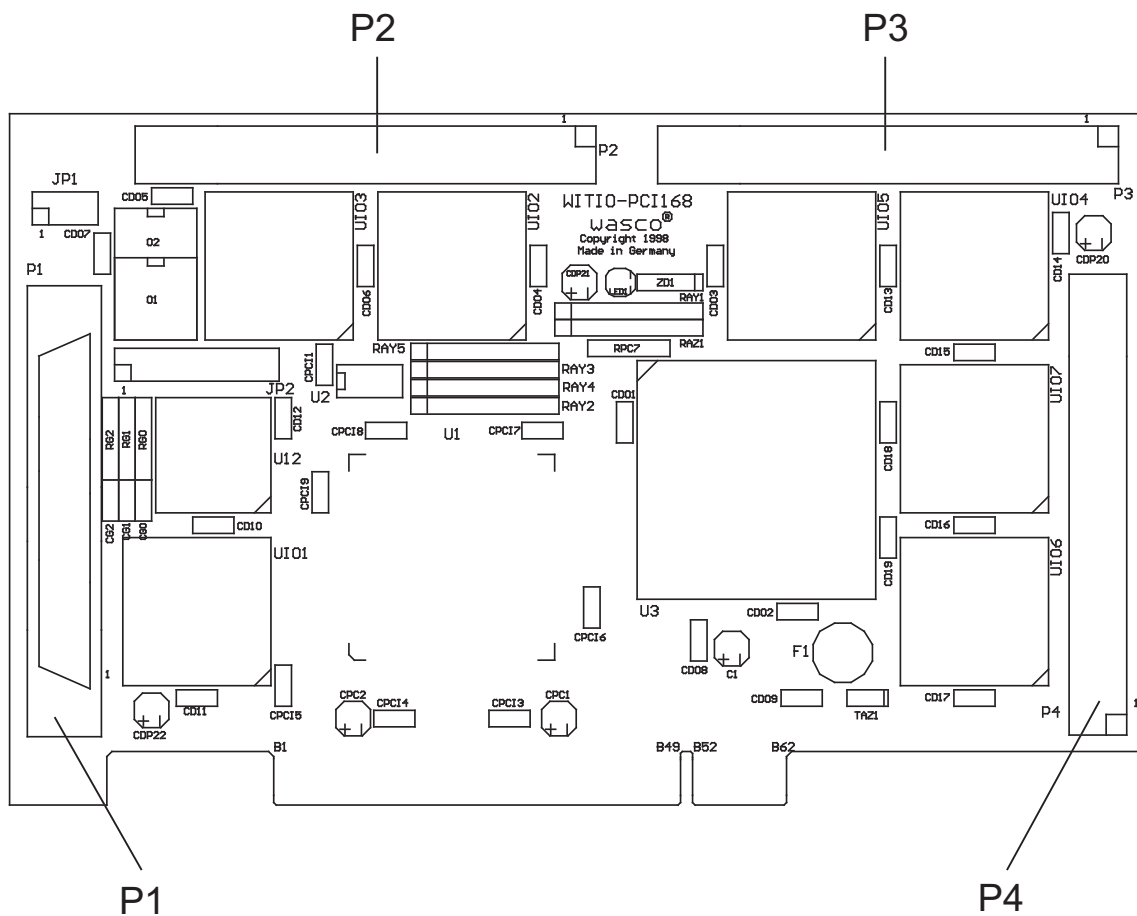
2. Installation of the WITIO-PCI168_{EXTENDED}

2.1 How to Install the Card into your System

Before you insert the WITIO-PCI168 unplug the power plug or at least turn off the computer to make sure, there is no current to/in the computer. Inserting the interface card in a running system may cause damaging or destroying the WITIO-PCI168 and even other previously installed cards. Select an empty PCI slot of your computer to insert the card. Please refer to the computer's manual for support. Secure the WITIO-PCI168 from loss of connection by screwing the mounting bracket to the casing of the computer.

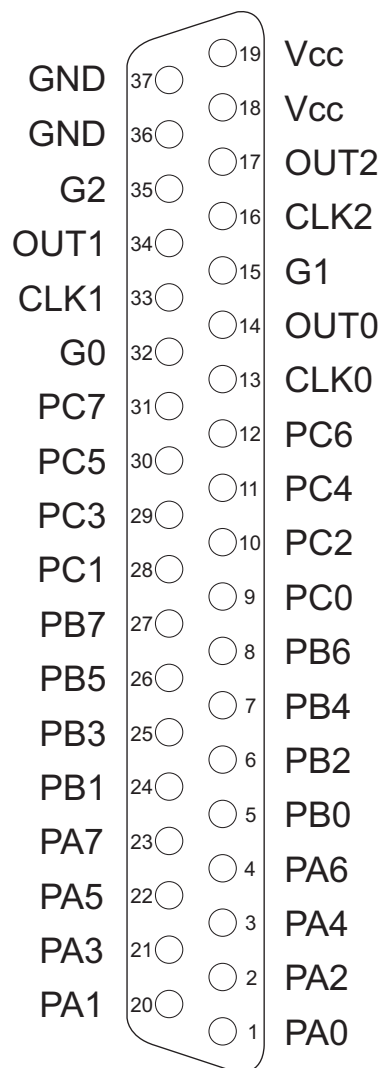
3. Connectors

3.1 Position of the Connector Plugs



- P1: 24 TTL-I/O PIO#1, Signals of the Timer
- P2: 48 TTL-I/O PIO#2 and PIO#3
- P3: 48 TTL-I/O PIO#4 and PIO#5
- P4: 48 TTL-I/O PIO#6 and PIO#7

3.2 Pin assignment of P1



Vcc:

Connector for internal voltage power supply (+ 5V). **Never apply an external voltage across this pin.**

GND:

Ground connection

3.3 Pin assignment of P2, P3 and P4

The box headers P2, P3 und P4 are mounted directly on the board. The 24 inputs/outputs of PIO IC #2 and Plo IC #3 are fed to P2. The 48 inputs/outputs of PIO IC #4 and Plo IC #5 are fed to box header P3. The 48 inputs/outputs of PIO IC #6 and PIO IC #7 are fed to P4.

GND	50	49	3PC7
3PC6	48	47	3PC5
3PC4	46	45	3PC3
3PC2	44	43	3PC1
3PC0	42	41	3PB7
3PB6	40	39	3PB5
3PB4	38	37	3PB3
3PB2	36	35	3PB1
3PB0	34	33	3PA7
3PA6	32	31	3PA5
3PA4	30	29	3PA3
3PA2	28	27	3PA1
3PA0	26	25	GND
2PC7	24	23	2PC6
2PC5	22	21	2PC4
2PC3	20	19	2PC2
2PC1	18	17	2PC0
2PB7	16	15	2PB6
2PB5	14	13	2PB4
2PB3	12	11	2PB2
2PB1	10	9	2PB0
2PA7	8	7	2PA6
2PA5	6	5	2PA4
2PA3	4	3	2PA2
2PA1	2	1	2PA0

Pin Assignment P2

GND	50	49	5PC7
5PC6	48	47	5PC5
5PC4	46	45	5PC3
5PC2	44	43	5PC1
5PC0	42	41	5PB7
5PB6	40	39	5PB5
5PB4	38	37	5PB3
5PB2	36	35	5PB1
5PB0	34	33	5PA7
5PA6	32	31	5PA5
5PA4	30	29	5PA3
5PA2	28	27	5PA1
5PA0	26	25	GND
4PC7	24	23	4PC6
4PC5	22	21	4PC4
4PC3	20	19	4PC2
4PC1	18	17	4PC0
4PB7	16	15	4PB6
4PB5	14	13	4PB4
4PB3	12	11	4PB2
4PB1	10	9	4PB0
4PA7	8	7	4PA6
4PA5	6	5	4PA4
4PA3	4	3	4PA2
4PA1	2	1	4PA0

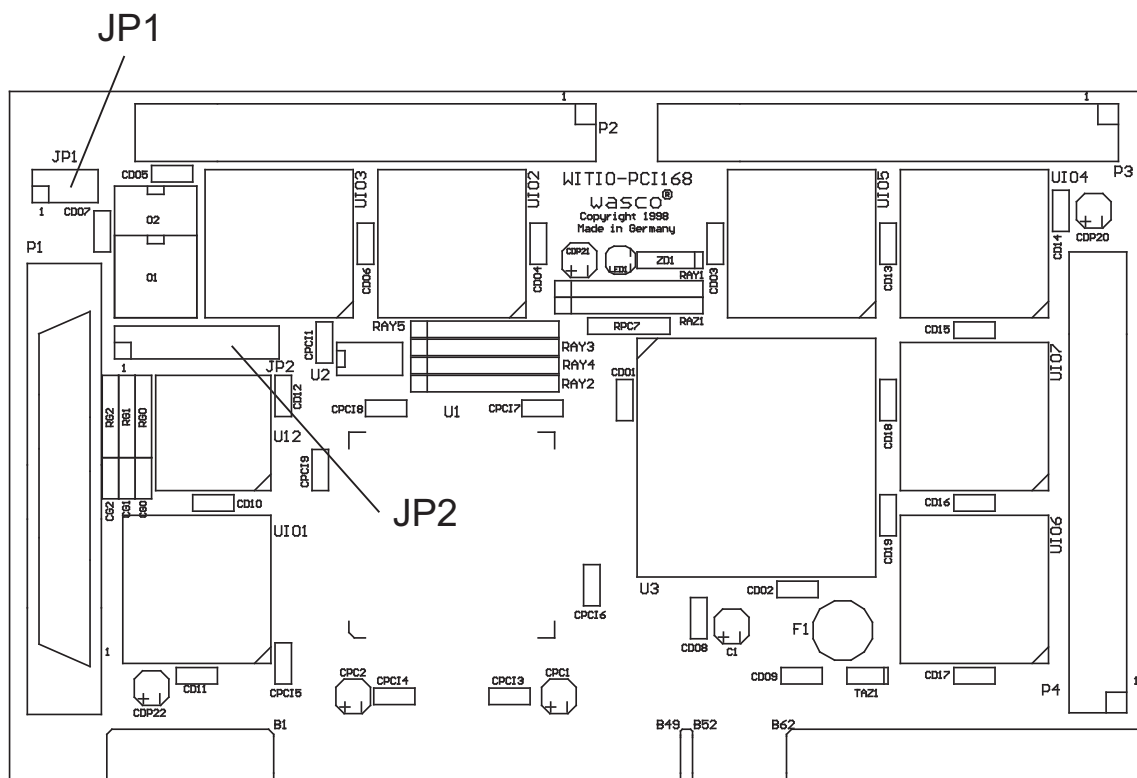
Pin Assignment P3

GND	50	49	7PC7
7PC6	48	47	7PC5
7PC4	46	45	7PC3
7PC2	44	43	7PC1
7PC0	42	41	7PB7
7PB6	40	39	7PB5
7PB4	38	37	7PB3
7PB2	36	35	7PB1
7PB0	34	33	7PA7
7PA6	32	31	7PA5
7PA4	30	29	7PA3
7PA2	28	27	7PA1
7PA0	26	25	GND
6PC7	24	23	6PC6
6PC5	22	21	6PC4
6PC3	20	19	6PC2
6PC1	18	17	6PC0
6PB7	16	15	6PB6
6PB5	14	13	6PB4
6PB3	12	11	6PB2
6PB1	10	9	6PB0
6PA7	8	7	6PA6
6PA5	6	5	6PA4
6PA3	4	3	6PA2
6PA1	2	1	6PA0

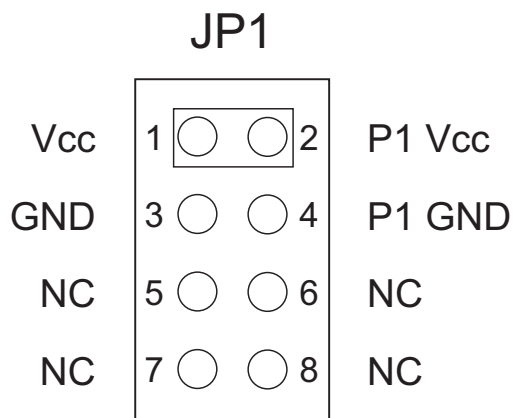
Pin Assignment P4

4. Jumper Blocks

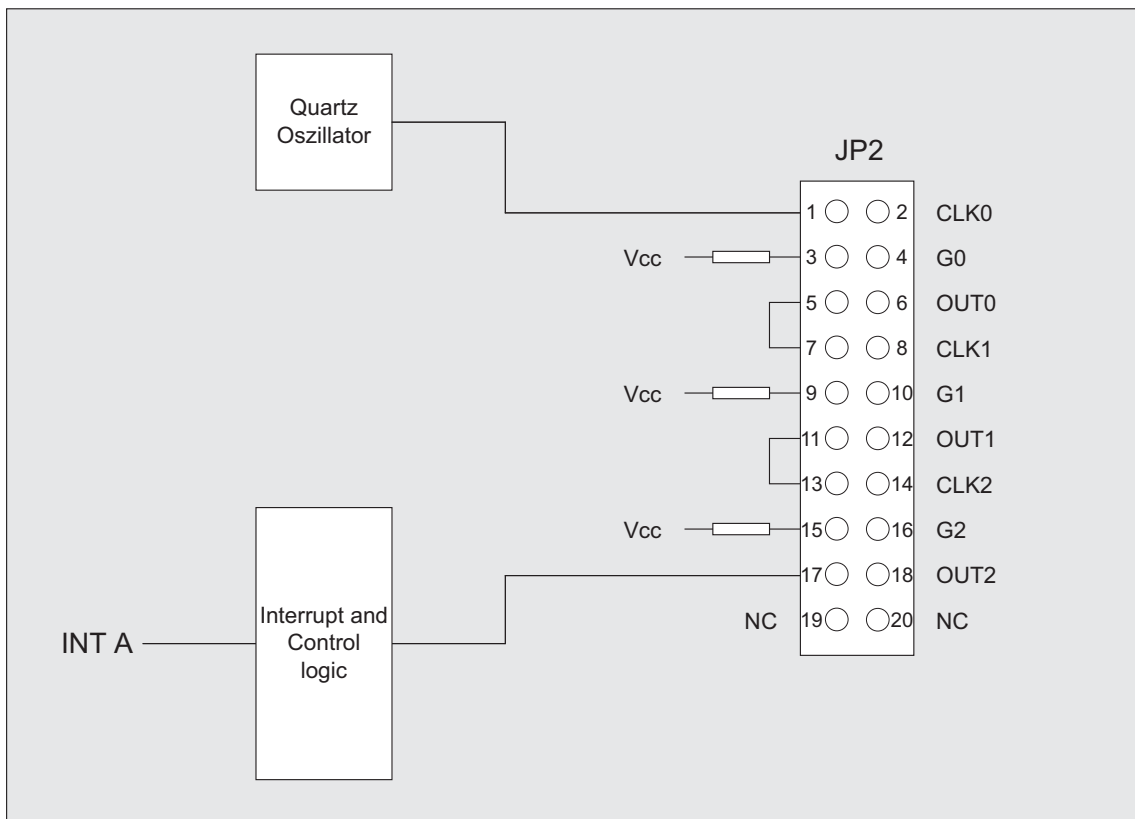
4.1 Position of the jumper on the board



4.2 Jumper block assignment JP1



4.3 Jumper block assignment JP2

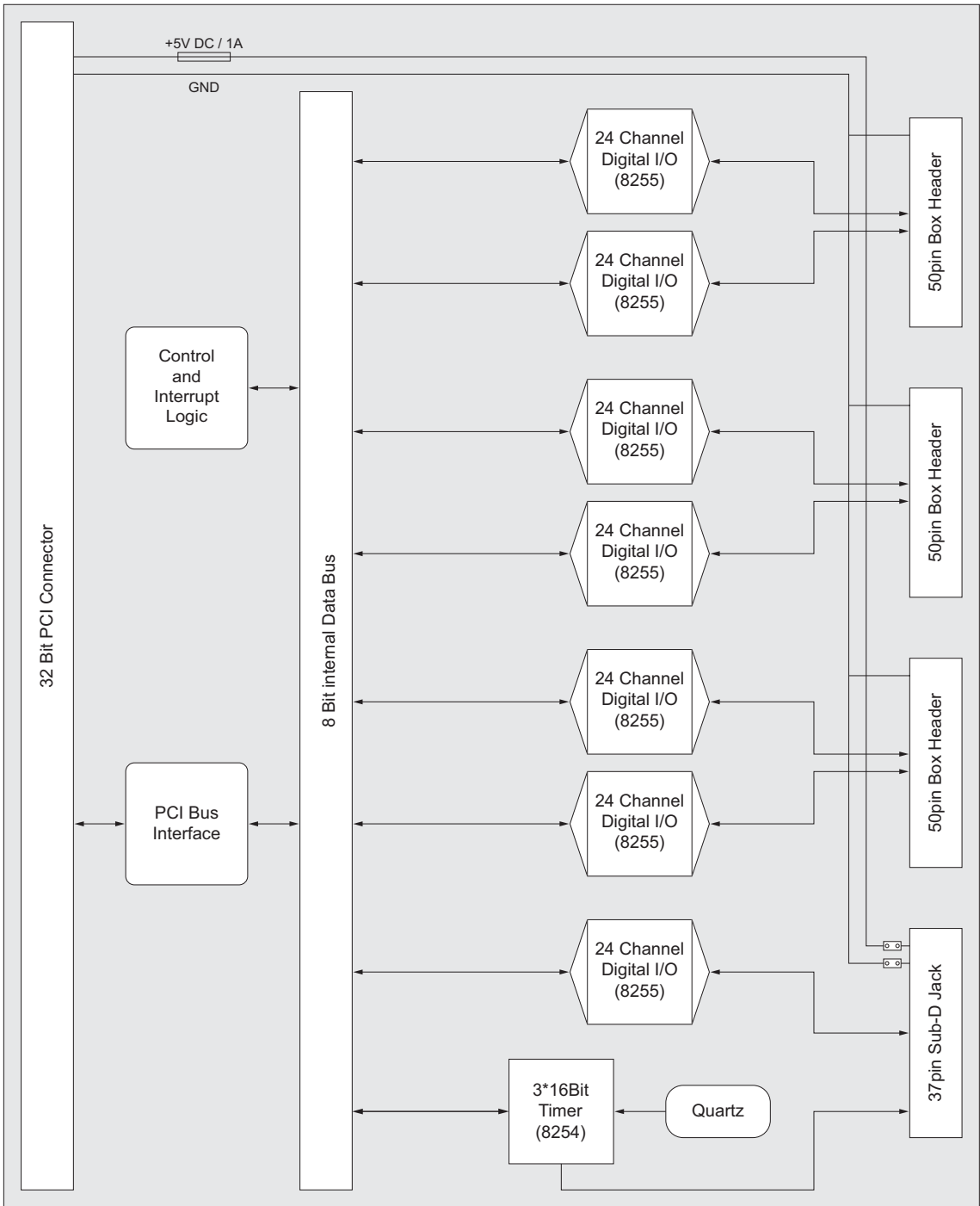


Please note:

For an external use of the timer the connections of the counter IC 8254 are led to the Sub-D jack P1. When you want to apply external signals to the timer the related jumpers are to be unplugged. Jumper 19/20 on JP2 is not assigned.

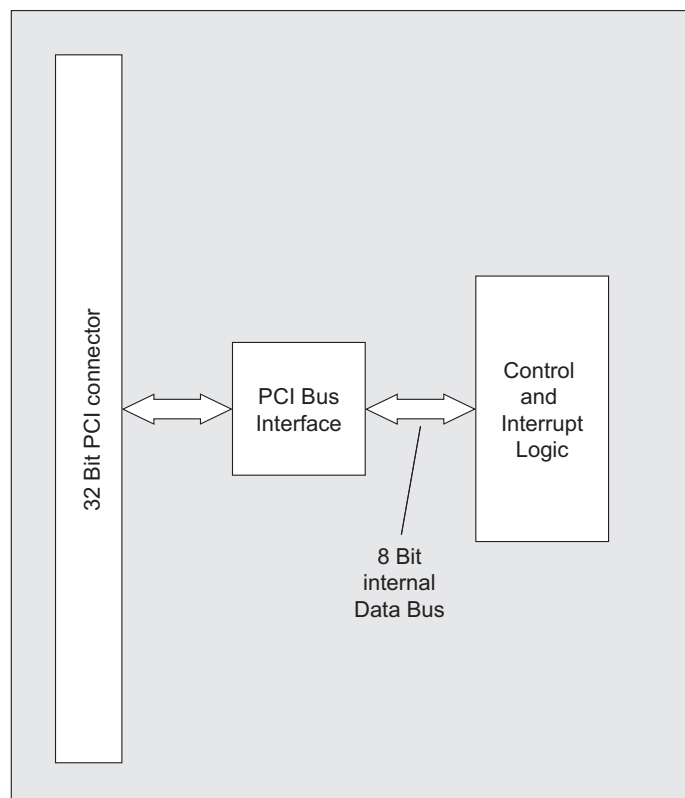
5. Sytem Components

5.1 Block diagram



5.2 Access to the system components

WITIO-PCI168 hardware components access by reading or writing in port addresses via library functions. The relevant port addresses for the WITIO-PCI168 result from the basic address, which is assigned by the PCI BIOS. The port access of the WITIO-PCI168 works exclusively in byte access (8 Bit), word and double-word accesses are not applicable. (Please find more details in the chapter „programming“ and the sample programs on the enclosed CD).



6. 168 TTL Inputs / Outputs (PIO 8255)

WITIO-PCI168_{EXTENDED} features seven interface IC's Typ 8255 for digital input and output processing.

PIO IC 8255 is a programmable multifunctional input/output chip. It has 24 connectors for I/O, programmable in two groups of 12 connectors, and mainly can be used in three kinds of operation modes. The first operation mode (mode 0) enables to program each group of 12 I/O connectors in portions of either eight or four connections to be input or output. The second operation mode (mode 1) enables to program eight lines of each group to be input or output. Three out of the four remaining connections are in use for response exchange and interrupt signals. The third operation mode (mode 2) may be called two-way bus operation mode. In this mode eight lines are used for a bidirectional bus. In this case for response exchange five lines are used, one of which is belonging to another group. Furthermore you can set and reset single bits.

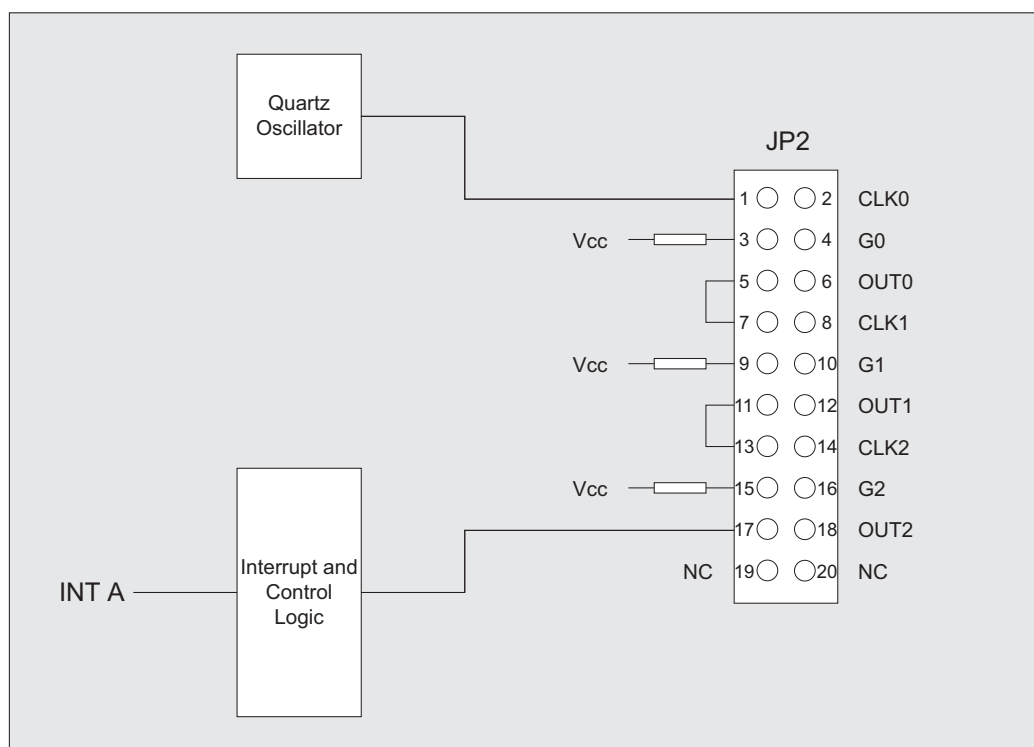
Find more information about programming the PIO IC 8255 in the manual's annex B.

7. 3 * 16 Bit Counter (Timer 8254)

WITIO-PCI168 generates time dependent interrupt triggers using a combination of 8254 timer IC and quartz oscillator. All interrupt requests are forwarded to one of the computer's IRQs via the PCI bus INT A. The PCI-PNP-BIOS of the computer creates a relating IRQ number by itself.

If you want the timer to generate time dependent interrupt triggers, you have to set the relating jumpers on jumper block JP2. So please close all jumper connections 1-2 through 17-18 on JP2.

If you program the counter appropriately you can generate the signal for interrupt triggering (output OUT2 of counter 2) and forward it to the interrupt logic. A switch of logic level HIGH to logic level LOW at OUT2 induces interrupt requests.

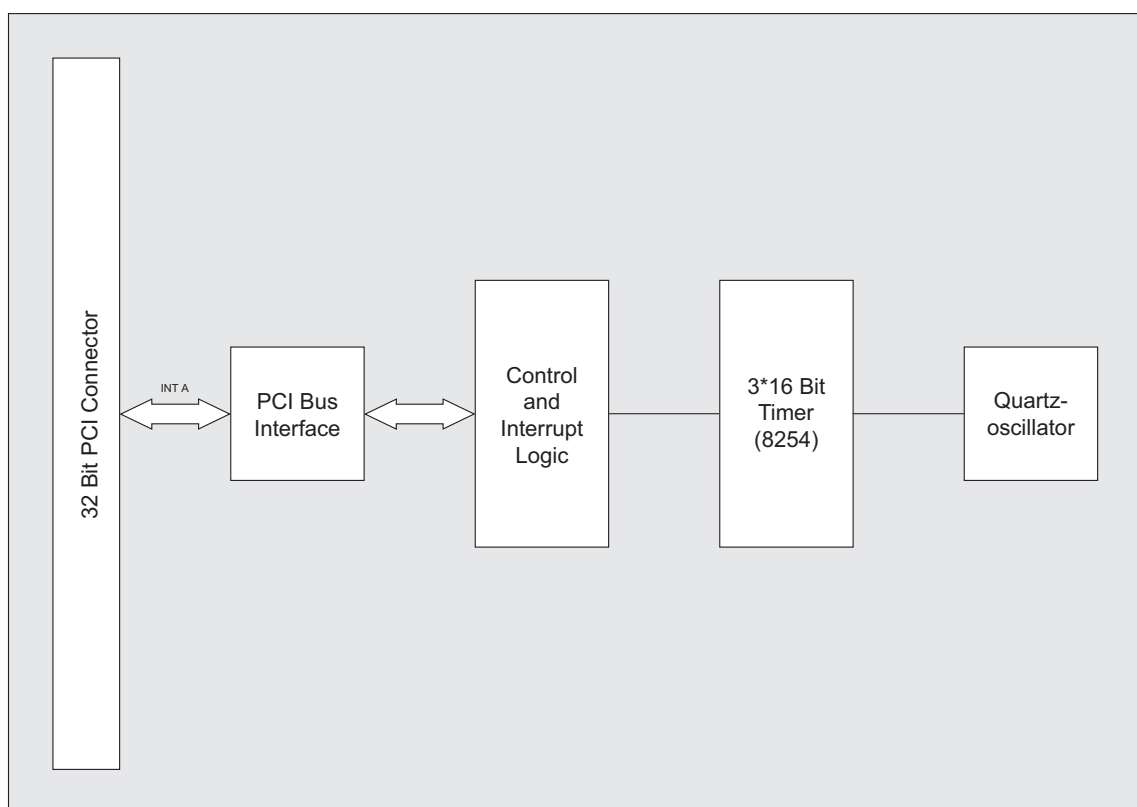


8. Interrupt

8.1 Interrupt requests

WITIO-PCI168 generates time dependent interrupt triggers using a combination of 8254 timer IC and quartz oscillator. All interrupt requests are forwarded to one of the computer's IRQs via the PCI bus INT A. The PCI-PNP-BIOS of the computer creates a relating IRQ number by itself.

Following block diagram illustrates the communication between the interrupt inputs of the WITIO-PCI168 and your computer:



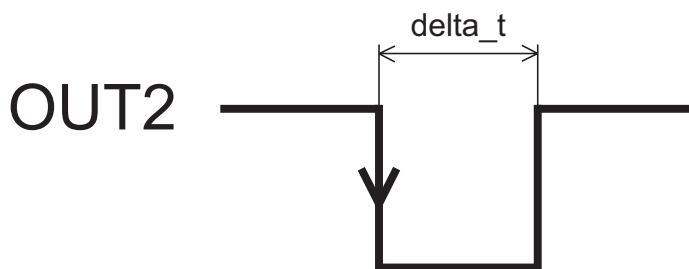
8.2 Time dependent interrupt triggering

Interrupt block:

[Timer/Quartz oscillator]

-> A switch of logic level HIGH to logic level LOW at OUT2 induces interrupt requests.

This application requires a software release in the timer-interrupt's control register!



Interrupt at switch High ---> LOW of OUT2
recommended: $\Delta t = 5 \mu\text{s}$

An interrupt service routine handles the interrupt requests. Reading the interrupt status register determines the interrupt source. Interrupt requests remain unchanged until they are reset by reading a reset address.

8.3 Interrupt Register

Following control registers, read or reset registers of the WITIO-PCI168 manage the interrupt programming:

Please find more details for interrupt programming in the examples for DOS programming on the enclosed CD.

timer_int_contr (Port address BA + \$22, write access):

Function: lock or release of the timer interrupt by writing 0 or 1 to the register

0 = Lock

1 = Release

timer_int_reset (Port address BA + \$28, read access):

Function: Reset of the timer interrupt by reading this register

wit_int_status (Port address LC + \$4C, read access):

Function: Determination of the interrupt source (optoin_int or tim_int resp.) by reading this register.

For determination please link the read byte and \$20 or \$04 with an „AND“ operation.

--> read byte "AND" \$20 = \$20 --> Timer Interrupt

9. Programming in DOS[®]

9.1 Programming of the WITIO-PCI168

You can find library functions and program examples for access to the WITIO-PCI168 in DOS[®] on the enclosed CD. You can program the hardware components of the WITIO-PCI168 by access to port addresses. These depend upon the I/O basic address (and LC address) issued by the PC BIOS. You can determine either the I/O basic address or LC address, as well as the actual port addresses with help of initialisation routines. Additionally you can access to further information such as IRQ number, the card's localisation in the bus system or the card's version.

If you work with a programming language not (yet) providing library functions you can determine the PCI parameters of the WITIO-PCI168 with the help of the program "W168SCAN" (-> in directory UTIL).

PCI Parameter:

- I/O Basic Address
- IRQ Number
- LC Basic Address
- Bus Number
- Device Number
- Number of Function
- Version of WITIO

PCI Identification:

Device-ID	=	\$9050
Vendor-ID	=	\$10B5
Subsystem-Vendor-ID	=	\$10B5
Subsystem-ID	=	\$114E

9.2 Allocation of the port addresses

The port addresses of each single hardware component depend upon the I/O basic address and the LC basic address as follows:

Port/Register	BA + Offset	RD/WR
PIO_1 Port A	BA + \$0	RD/WR
PIO_1 Port B	BA + \$1	RD/WR
PIO_1 Port C	BA + \$2	RD/WR
PIO_1 Control register	BA + \$3	WR
PIO_2 Port A	BA + \$4	RD/WR
PIO_2 Port B	BA + \$5	RD/WR
PIO_2 Port C	BA + \$6	RD/WR
PIO_2 Control register	BA + \$7	WR
8254-Timer 0	BA + \$8	RD/WR
8254-Timer 1	BA + \$9	RD/WR
8254-Timer 2	BA + \$A	RD/WR
8254-Timer Control register	BA + \$B	RD/WR
PIO_3 Port A	BA + \$C	RD/WR
PIO_3 Port B	BA + \$D	RD/WR
PIO_3 Port C	BA + \$E	RD/WR
PIO_3 Control register	BA + \$F	WR
PIO_4 Port A	BA + \$10	RD/WR
PIO_4 Port B	BA + \$11	RD/WR
PIO_4 Port C	BA + \$12	RD/WR
PIO_4 Control register	BA + \$13	WR
PIO_5 Port A	BA + \$14	RD/WR
PIO_5 Port B	BA + \$15	RD/WR
PIO_5 Port C	BA + \$16	RD/WR
PIO_5 Control register	BA + \$17	WR

Port/Register	BA + Offset	RD/WR
PIO_6 Port A	BA + \$18	RD/WR
PIO_6 Port B	BA + \$19	RD/WR
PIO_6 Port C	BA + \$1A	RD/WR
PIO_6 Control register	BA + \$1B	WR
PIO_7 Port A	BA + \$1C	RD/WR
PIO_7 Port B	BA + \$1D	RD/WR
PIO_7 Port C	BA + \$1E	RD/WR
PIO_7 Control register	BA + \$1F	WR
Timer Interrupt Control register	BA + \$22	WR
Timer Interrupt Reset Register	BA + \$28	RD
PIO_1....PIO_7 Reset	BA + \$2F	WR
Interrupt Status Register	BA + \$4C	RD

Information for users so far applying the WITIO-168 ISA version: The offsets of the components PIO#1 through PIO#7 and 8254 timer correspond to the offsets of the ISA version.

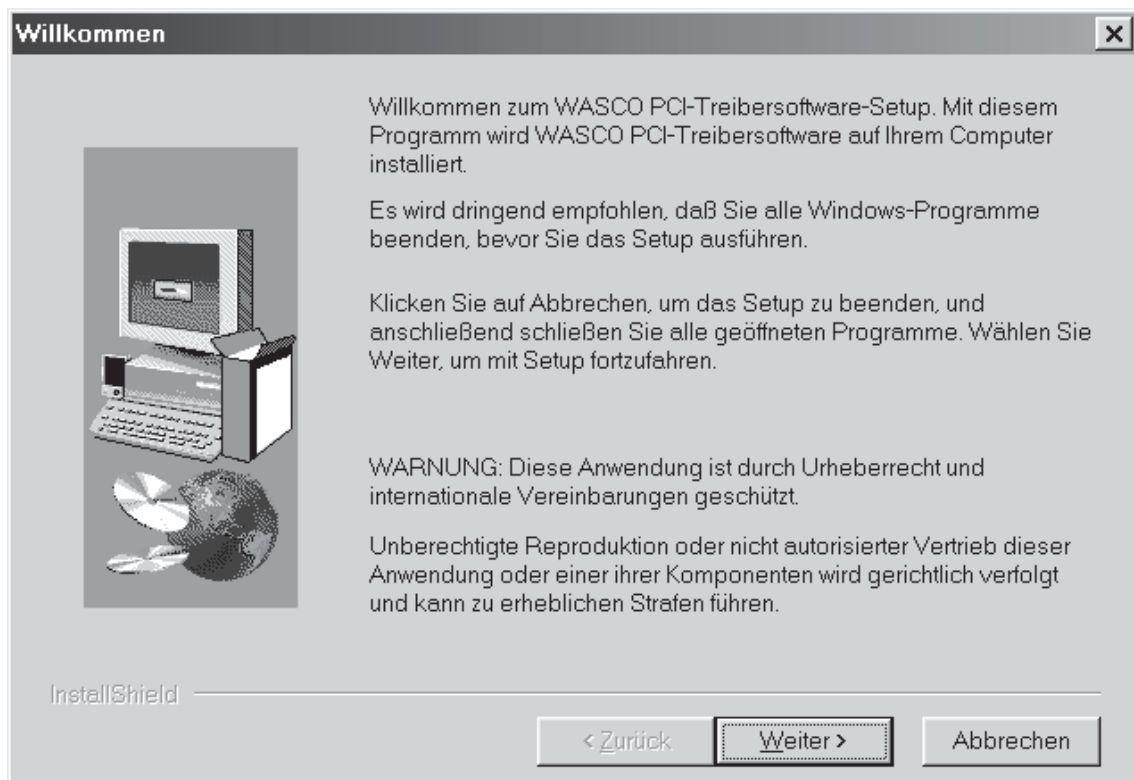
10. Programming in Windows®

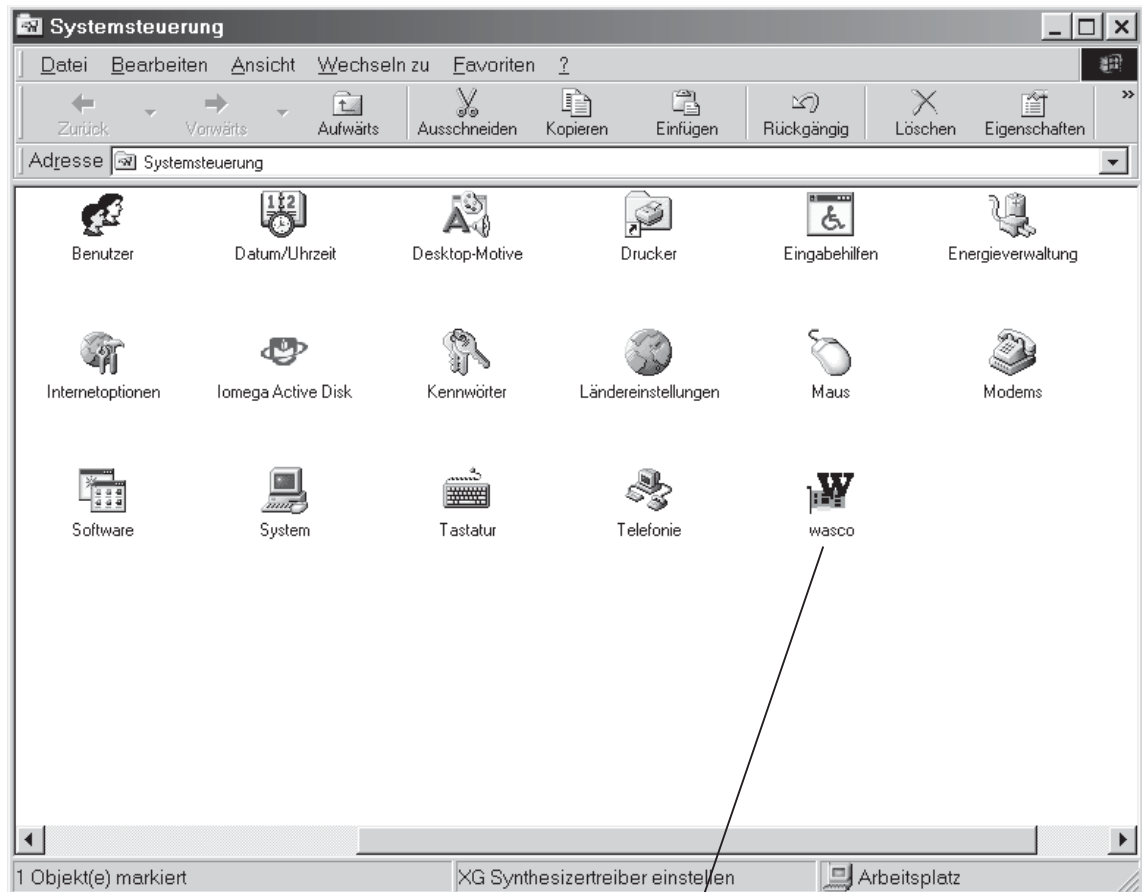
10.1 Programming of the WITIO-PCI168

To access to the card by port addresses when applicated in Windows® it is necessary to install a special enabling driver.

10.2 Installation of the Windows® driver

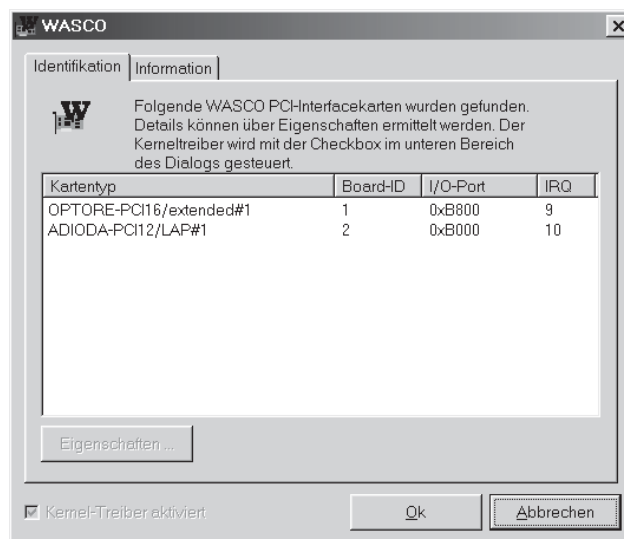
For the Windows® driver's installation please run the file "Setup.Exe" in directory „Treiber“ on the enclosed CD and follow the installation instructions.





Once the driver software has been installed completely, you can find an icon in your computer's system control to determine all of the **wasco®** PCI cards existing in your system.

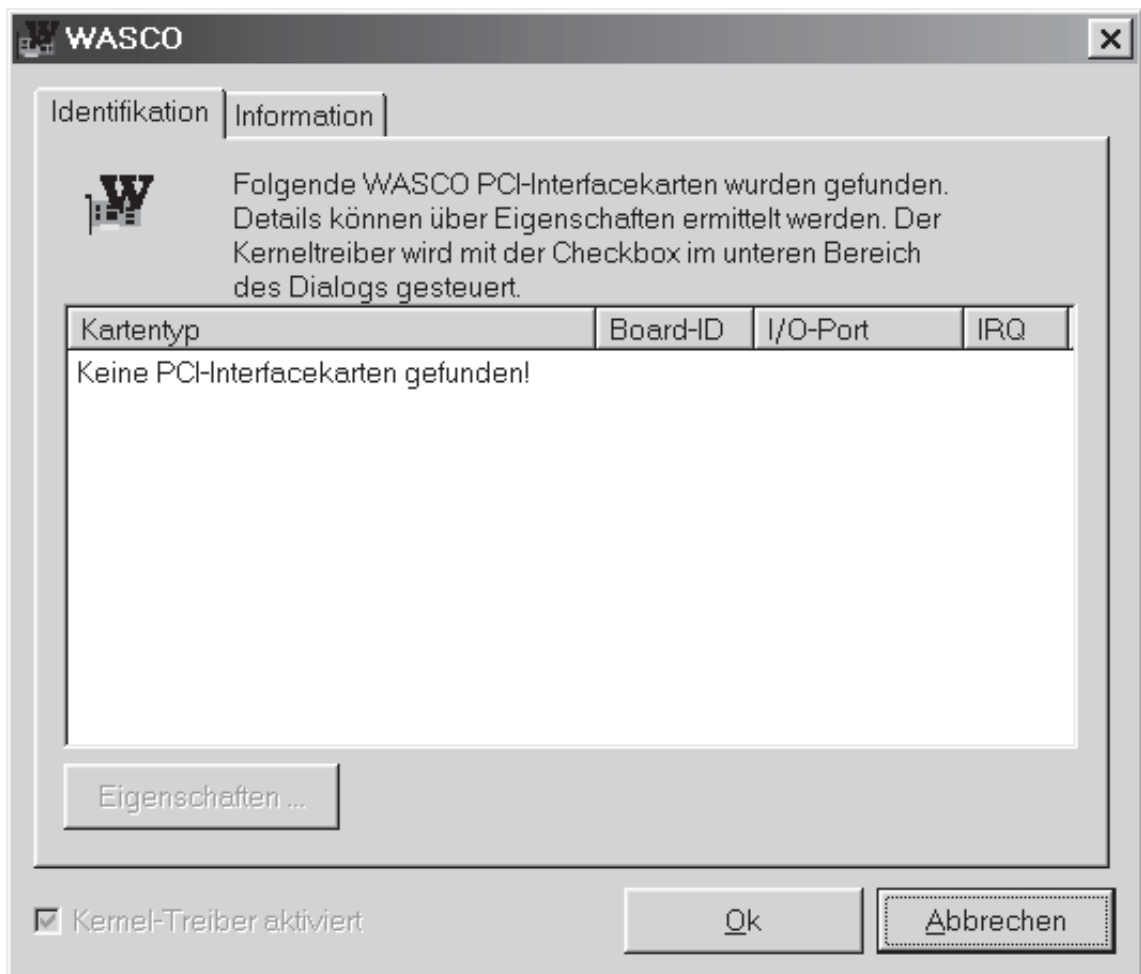
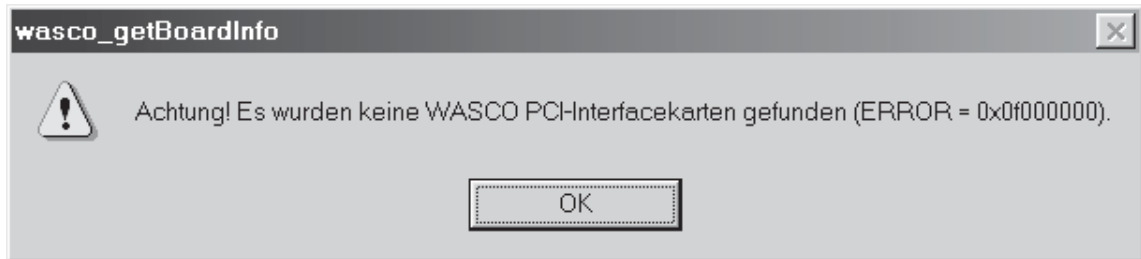
Start the card's monitoring by double-clicking the "**wasco**®" Icon. Following screen pops up (as an example OPTORE-PCI16 and ADIODA-PCI12 may be used):



If your system detected the card this window shows card number, board ID, I/O address and possible interrupt number of each card. Furthermore the tab „Information“ leads to driver version and localisation of the driver file.



If your system did not detect the card following error messages pop up:



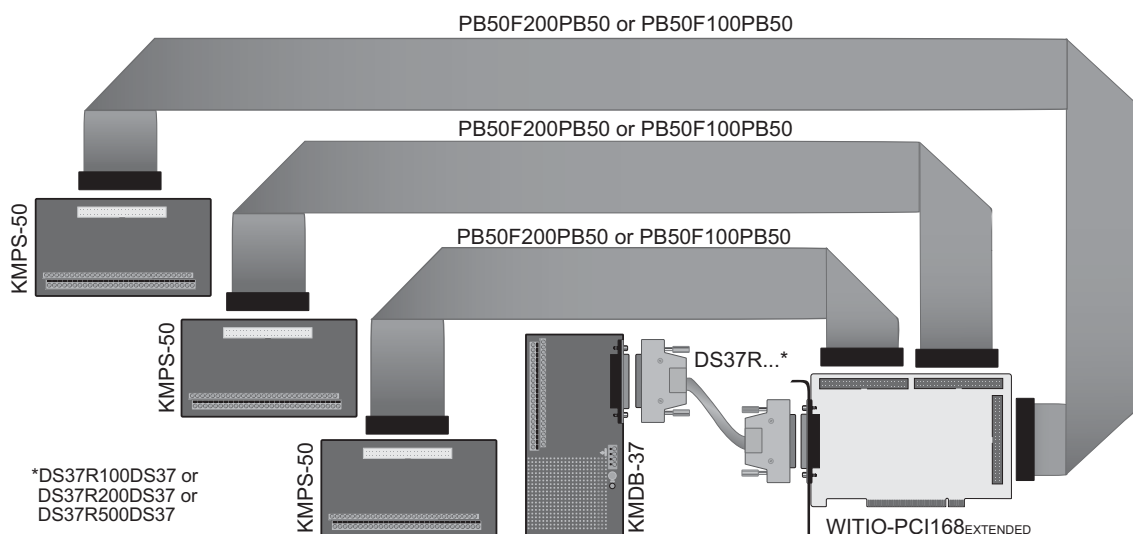
Please find more information for possible causes in chapter Trouble-Shooting .

11. Accessories

11.1 Suitable **wasco®** accessories

Connection Parts	EDP-No.
DS37R100 Connection Line	A-199802
DS37R100DS37 Connection Cable	A-202200
DS37R200DS37 Connection Cable	A-202400
DS37R500DS37 Connection Cable	A-202800
PB50F100PB50 Flat Ribbon Cable	A-2012
PB50F200PB Flat Ribbon Cable	A-2016
KMPS-50 Terminal Block	A-2036
KMDB-37 Terminal Block	A-2046

11.2 Connection Technique (Application Examples)



11.3 Single Components for Customized Assembly

Connecting Parts	EDP No.
Sub-D plug 37-pin for solder connection	A-5506
Junction shell 37-pin plug (solder connection)	A-5586
Sub-D plug 37-pin for flat ribbon cable	A-5526
Sub-D female jack 37-pin for flat ribbon cable	A-5566
Slot bracket with cut-out for 37-pin plug or jack	A-5754
Box header 40-pin for flat ribbon cable	A-5642
flat ribbon cable 37-pin	A-5718
flat ribbon cable 40-pin	A-5720

12. Troubleshooting

Please find below a short compilation of the most frequent known failure causes, which may occur during initialization or operation with WITIO-PCI168_{EXTENDED}. Please check this list before you contact your dealer or distributor:

1. Is the WITIO-PCI168_{EXTENDED} inserted to the PCI slot properly?
2. Are all cable connections all right?
3. Is the fuse F1 blown?
4. Did your system detect the card correctly?
Please therefore check all configurations of your computer or contact your system administrator (As this configurations are part of the BIOS system, we cannot expand on this issue here. We refer to your user's system manual)
5. Did you install the latest driver version of **wasco**[®] driver?
For download updates please visit:

<http://www.messcomp.com>

<http://www.wasco.de>

13. Specifications

TTL Inputs/Outputs

7 * 71055 or 8255

7 * 24 channels, TTL compatible

Issued in Port A, B and C

Port A and Port B are programmable in 8-bit groups to be input or output

Port C is programmable as one 8-bit group or two 4-bit groups to be input or output

Timer

IC: 8254 or 71054

3 * 16-bit downwards counter

Counting frequency max. 8 MHz

Triggering interrupts time-dependent

Takt vom Quarzoszillator

Quartz oscillator

4 MHz

Connection plugs

1 * 37-pin Sub-D socket

3 * 50-pin box header

Bus system

32 Bit PCI Bus (internal data bus 8 Bit)

Fuse

+ 5V 1 A Mini Fuse F1

Power consumption

+ 5V typ. 350mA

14. Product Liability Act

Information for Product Liability

The Product Liability Act (Act on Liability for Defective Products - Prod-HaftG) in Germany regulates the manufacturer's liability for damages caused by defective products.

The obligation to pay compensation can be given, if the product's presentation could cause a misconception of safety to a non-commercial end-user and also if the end-user is expected not to observe the necessary safety instructions handling this product.

It must therefore always be shown, that the non-commercial end-user was made familiar with the safety rules.

In the interest of safety, please always advise your non-commercial customer of the following safety instructions:

Safety instructions

The valid VDE-instructions must be observed, when handling products that come in contact with electrical voltage.

Especially the following instructions must be observed:
VDE100; VDE0550/0551; VDE0700; VDE0711; VDE0860.

The instructions are available from:

Vde-Verlag GmbH
Bismarckstr. 33
10625 Berlin

- * unplug the power cord before you open the unit or make sure, there is no current to/in the unit.
- * You only may start up any components, boards or equipment, if they are installed inside a secure touch-protected casing before. During installation there must be no current to the equipment.
- * Make sure that the device is disconnected from the power supply before using any tools on any components, boards or equipment. Any electric charges saved in components in the device are to be discharged prior.
- * Voltaged cables or wires, which are connected with the unit, the components or the boards, must be tested for insulation defects or breaks. In case of any defect the device must be immediately taken out of operation until the defective cables are replaced.
- * When using components or boards you must strictly comply with the characteristic data for electrical sizes shown in the corresponding description
- * As a non-commercial end-user, if it is not clear whether or not the electrical characteristic data given in the provided description are valid for a component you must consult a specialist.

The compliance with building and safety instructions of all kinds (VDE, TÜV, industrial injuries corporation, etc.) are entirely the responsibility of the user/customer.

15. CE Confirmation

This is to certify, that the product

WITIO-PCI168_{EXTENDED}
EDP-Number A-425500

comply with the requirements of the EC directives. This declaration will lose its validity, if the instructions given in this manual for the intended use of the products are not fully complied with.

EN 5502 Klasse B
IEC 801-2
IEC 801-3
IEC 801-4
EN 50082-1
EN 60555-2
EN 60555-3

The following manufacturer is responsible for this declaration:

Messcomp Datentechnik GmbH
Neudecker Str. 11
83512 Wasserburg

given by

Dipl.Ing.(FH) Hans Schnellhammer

Wasserburg, 30.05.2006



Reference System for Intended Use

The PC extension card is not stand-alone device. The CE-conformity only can be assessed when using additional computer components simultaneously. Thus the CE conformity only can be confirmed when using the following reference system for the intended use of the multi functional modules:

Control Cabinet:	Vero IMRAK 3400	804-530061C 802-563424J 802-561589J
19" Casing:	Vero PC-Casing	145-010108L
19" Casing:	Additional Electronic	519-112111C
Motherboard:	GA-586HX	PIV 1.55
Floppy-Controller:	on Motherboard	
Floppy:	TEAC	FD-235HF
Grafic Card:	Advantech	PCA-6443
PC Card:	WITIO-PCI168 _{EXTENDED}	A-425500