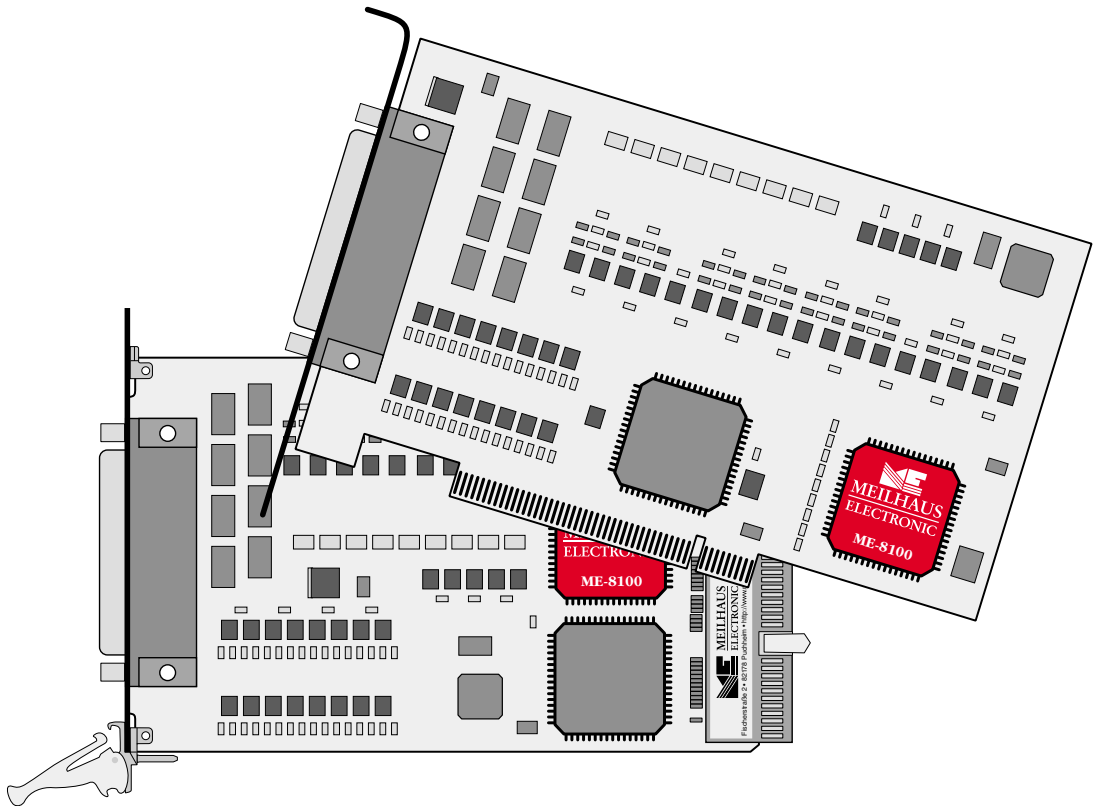


Meilhaus Electronic Manual

ME-8100 2.1E

PCI- and CompactPCI-Versions



**Opto isolated I/O-Board with Bit Pattern Comparator
and optional Counter**

Imprint

Manual ME-8100

Revision 2.1E

Revised: 1. Oktober 2009

Meilhaus Electronic GmbH
Fischerstraße 2
D-82178 Puchheim/Munich
Germany
<http://www.meilhaus.com>

© Copyright 2009 Meilhaus Electronic GmbH

All rights reserved. No part of this publication may be reproduced or distributed in any form whether photocopied, printed, put on microfilm or be stored in any electronic media without the expressed written consent of Meilhaus Electronic GmbH.

Important note:

The information contained in this manual has been reviewed with great care and is believed to be complete and accurate. Meilhaus Electronic assumes no responsibility for its use, any infringements of patents or other rights of third parties which may result from use of this manual or the product. Meilhaus Electronic assumes no responsibility for any problems or damage which may result from errors or omissions. Specifications and instructions are subject to change without notice.

Borland Delphi is a trademark of Borland International Inc.

Turbo/Borland C is a trademark of Borland International Inc.

Visual C++ and Visual Basic are trademarks of the Microsoft Corporation.

VEE Pro and VEE OneLab are trademarks of Agilent Technologies.

ME-VEC and ME-FoXX are trademarks of Meilhaus Electronic.

Other company names and product names found in the text of this manual are also trademarks of the companies involved.



Table of Contents

1	Introduction.....	5
1.1	Important Notes	5
1.1.1	Usage in accordance with the requirements	5
1.1.2	Specialadverse Usage	6
1.1.3	Unforeseeable Misapplication	6
1.1.4	Warning	6
1.2	Package contents	7
1.3	Performance Notes.....	7
1.4	System Requirements.....	8
1.5	Software Support.....	8
2	Starting up.....	9
2.1	Software-Installation.....	9
2.2	Test Program	9
3	Hardware	11
3.1	Block Diagram	11
3.2	Digital-I/O	13
3.2.1	Opto-isolated Inputs	13
3.2.2	Opto-isolated Outputs	14
	3.2.2.1 Sink Driver:	14
	3.2.2.2 Source Driver:	15
3.3	Counter	16
3.3.1	Counter Chip	16
	3.3.1.1 Wiring Counter Inputs	17
	3.3.1.2 Wiring Counter Outputs	17
	3.3.1.3 Cascading the Counters	18
4	Programming.....	19
4.1	Digital-I/O-Section	20
4.1.1	Simple Input/Output	20
4.1.2	Bit-Pattern Recognition	20
	4.1.2.1 Bit-Pattern Match	20
	4.1.2.2 Bit-Pattern Change	21
	4.1.2.3 Order of Operation.....	22

- 4.2 Counter 23**
 - 4.2.1 Standard Operation Modes..... 23
- Appendix..... 25**
 - A Specifications..... 25**
 - B Pinout..... 28**
 - B1 ME-8100A/B PCI and cPCI..... 28
 - C Accessories..... 29**
 - D Technical Questions 30**
 - D1 Hotline 30
 - D2 Service address 30
 - D3 Driver Update..... 30
 - E Index 31**

1 Introduction

Valued customer,

Thank you for purchasing this device from Meilhaus Electronic. You have chosen an innovative high technology product that left our premises in a fully functional and new condition.

Take the time to carefully examine the contents of the package for any loss or damage that may have occurred during shipping. If there are any items missing or if an item is damaged, contact us immediately.

Before you install the board in your computer, we recommend to read this manual carefully, especially the chapter describing board installation.

1.1 Important Notes

1.1.1 Usage in accordance with the requirements

The PC boards of the ME-8100 series are designed for acquisition and output of analog and digital signals with a PC. Depending on type the models of the ME-8100 series:

- ... have to be installed into a free PCI slot (ME-8100A/B PCI) or
- ... have to be installed into a free CompactPCI slot (ME-8100A/B cPCI)

For installing a plug-in board please read the manual of your PC.

Please follow the notes and the specifications from page 25 on:

- Ensure a sufficient heat conductance from the board in the PC housing.
- All unused inputs should be connected to the ground reference of the appropriate functional group. This avoids cross talk between the input lines. We recommend using shielded cables.
- The opto-isolated inputs and outputs achieve an electrical isolation of the application relative to PC ground.

- Note, that the computer must be powered up, prior connecting signals to the board by the external wiring.
- The external connections to the board should only be made or removed in a powered down state of all components.
- Ensure that no static discharge occurs when handling the board or when connecting/disconnecting the external cable.
- Ensure that the connection cable is properly connected. It must be seated firmly on the D-Sub connector and must be tightened with the both screws, otherwise proper operation of the board can not be guaranteed!

1.1.2 **Specialadverse Usage**

PC plug-in boards for PCI resp. CompactPCI bus may not taken into operation outside of a PC system. Never connect the devices with live parts, especially not with supply.

Make sure, that no contact with live parts can happen by the external wiring. All connections to the board should only be made or removed in a powered down state.

1.1.3 **Unforeseeable Misapplication**

The device may not be used as children´s toy, in the household or with adverse environment conditions (e.g. outside). Appropriate precautions to avoid unforeseeable misapplication have to be taken by the user.

1.1.4 **Warning**



The device was developed and produced in accordance to the EMC low voltage directive 73/23/EWG. When putting the device into operation especially with voltages greater than 42 V please follow the appropriate standards, installation instructions and national safty standards. Meilhaus Electronic GmbH assumes no responsibility for damage in case of faulty installation, operation or handling.

1.2 Package contents

We take great care to make sure that the package is complete in every way. We do ask that you take the time to examine the contents of the box. Your box should consist of:

- Electrically isolated Digital-I/O board of the board family ME-8100 for PCI- or CompactPCI bus.
- Manual in PDF format on CD/DVD (optional as printed version)
- Driver software on CD/DVD
- ME-8100 PCI/cPCI: 78pin D-Sub male connector

1.3 Performance Notes

Model Overview

Model	Opto isolated Digital-I/Os	Counter
ME-8100A PCI ME-8100A cPCI	16 inputs and 16 outputs (24 V)	3 x 16 bit (24 V)
ME-8100B PCI ME-8100B cPCI	32 inputs and 32 outputs (24 V)	3 x 16 bit (24 V)

Table 1: Model overview ME-8100 family

The boards of the ME-8100 series come with digital input and output ports and with three 16 bit counters. The digital ports and the counter signals are optically isolated and are designed for control applications requiring 24 V voltage level.

The **ME-8100A** board has 16 inputs, 16 outputs and a 16 bit wide bit pattern comparator. The **ME-8100B** has 32 inputs, 32 outputs and two bit pattern comparators each 16 bits. All boards have three 16-bit counters available.

The ME-8100 models offer the option of switching from “source” drivers to “sink” drivers by software. This guarantees an individu-

al adaption to your needs. First the outputs of all models are in a high impedance state if the PC is off or after power up. That means the voltage level at the output pin depends on your external wiring. After a „1“ is set on the output there is current.

As a special feature the ME-8100 offers the operation modes „bit pattern match“ and „bit pattern change“. If the bit pattern at the inputs matches a defined pattern or when a bit toggles from a defined bit, an interrupt occurs.

1.4 System Requirements

The ME-8100 can be installed into any PC with Intel® Pentium® processor or compatible computers with a free standard PCI resp. CompactPCI slot (32 bit, 33MHz, 5V). The board is supported by the Meilhaus Intelligent Driver System (ME-iDS) under Windows 2000 or higher and Linux kernel 2.6 or higher.

1.5 Software Support

The ME-8100 is supported by the Meilhaus Intelligent Driver System (ME-iDS). The ME-iDS is a unique driver system covering different devices and operating systems. It supports Windows 2000/XP/Vista and Windows 7 as well as Linux systems with kernel 2.6 and contains an universal function library (API) for all common programming languages.

A detailed description of the functions can be found in the ME-iDS manual on the CD/DVD enclosed.

Please read also the notes in the appropriate read-me files.

2 Starting up

Please read your computer manual instructions on how to install new hardware components **before installing the board**.

2.1 Software-Installation

- **Installation under Windows**

The following basic procedure should be used:

If you have received the driver software as an archive file please un-pack the software **before installing the board**. First choose a directory on your computer (e. g. C:\Meilhaus).

We recommend to operate your new data acquisition hardware using the Meilhaus Intelligent Driver System (ME-iDS). For installation and operation of the driver system please follow the documentation in electronic form included with the software package.

If you want to operate the hardware with the older single driver for the appropriate device family, first plug-in the board into your computer and install the driver software second. This order of operation is important to guarantee the Plug&Play operation under Windows 95*/98/Me/2000/XP. Windows 95 and NT 4.0 need an analogous order of operation however the installation procedure differs slightly.

**If the Windows version is supported by the appropriate board type (see readme files).*

- **Installation under Linux**

Note the installation instructions included with archive file of the appropriate driver.

2.2 Test Program

For simple testing of the board use the appropriate test program provided with the ME-iDS.

3 Hardware

3.1 Block Diagram

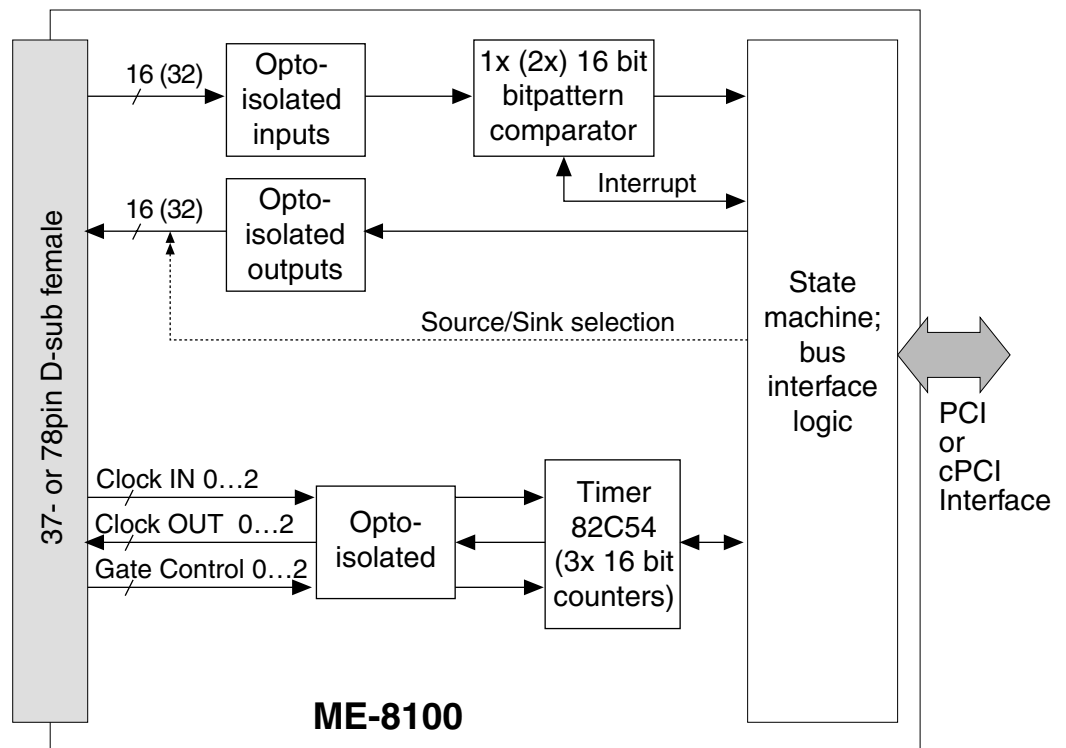


Diagram 1: Block diagram of ME-8100

Depending on the version not all functional groups included in the block diagram above are available:

ME-8100A: 16 inputs and 16 outputs, 1 x 16 bit wide bitpattern comparator, 3 x 16 bit counters.

ME-8100B: 32 inputs and 32 outputs, 2 x 16 bit wide bitpattern comparator, 3 x 16 bit counters.

PCI-/cPCI models: 78pin D-Sub female connector.

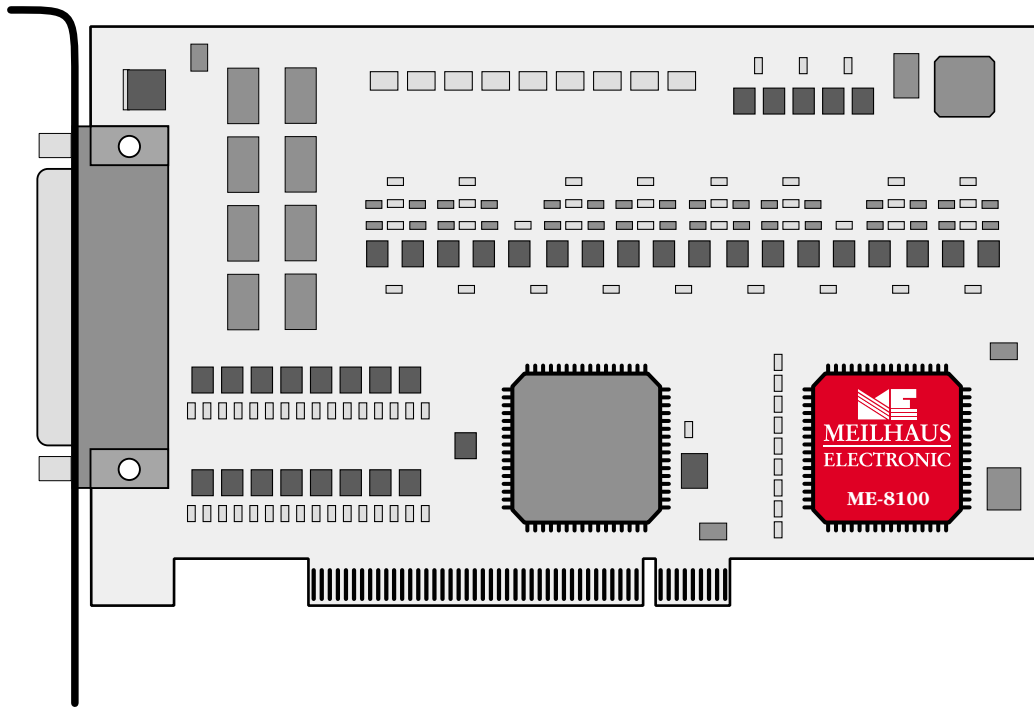


Diagram 2: ME-8100 PCI

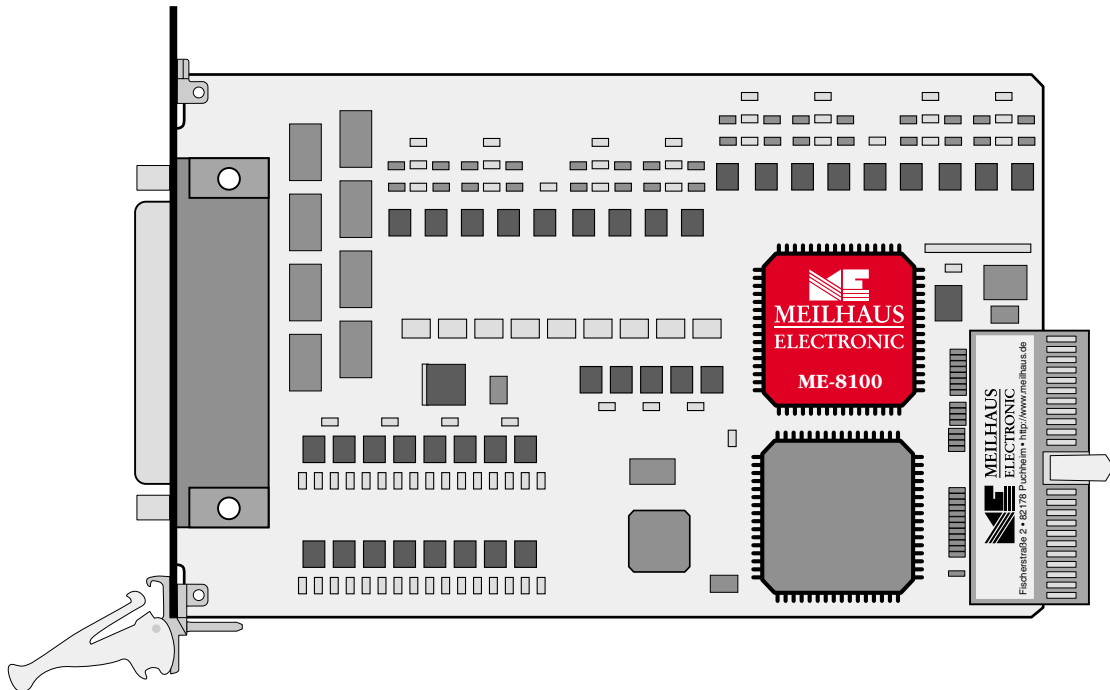


Diagram 3: ME-8100 cPCI

3.2 Digital-I/O

The opto-isolated inputs and opto-isolated outputs of the ME-8100 series are designed for control applications requiring 24 V voltage level.

For programming please read chapter 4.1 "Digital-I/O-Section" on page 20:

3.2.1 Opto-isolated Inputs

The 16 resp. 32 opto-isolated input channels (DI_A 0...15/ DI_B 0...15) of the ME-8100A/B are connected to the opto-couplers through resistors R_V . These resistors are sized for inputs of typical 24 V ($R_V = 2,2k\Omega$). For over voltage protection of the opto-couplers a protection diode (26 V) was assembled. If required, the resistors R_V and the protection diode can be sized for TTL signal level inputs. The digital lines must be referenced to the external ground (ext. GND).

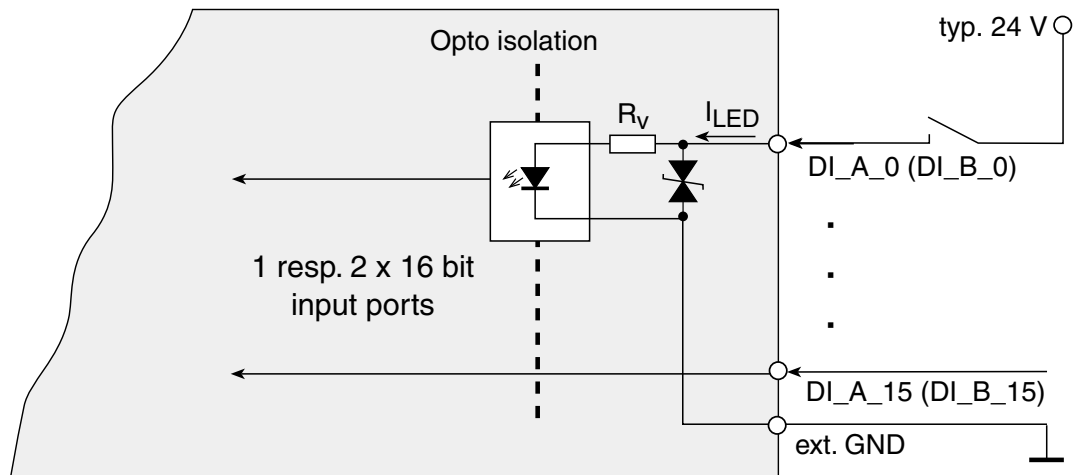


Diagram 4: Input wiring of ME-8100

3.2.2 Opto-isolated Outputs

The 16 resp. 32 opto-isolated output channels (DO_A 0...15/ DO_B 0...15) of the ME-8100A/B are assembled with special output driver chips. Depending on the application, the user can set the outputs as active low (sink driver chip ULN2803; default) or active high (source driver chip UDN2982). Additionally the outputs can be set to a high-impedance state by port. A reference to external ground (ext. GND) must be done.

3.2.2.1 Sink Driver:

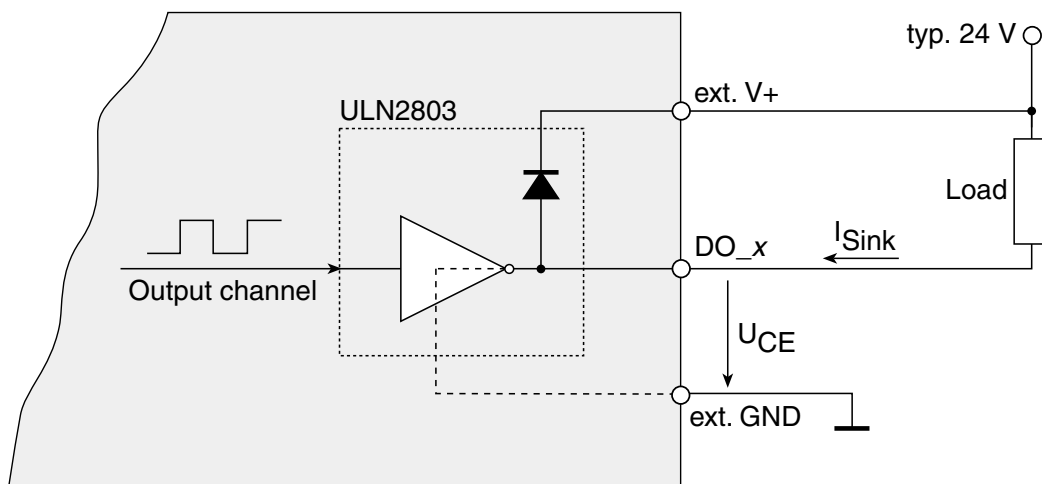


Diagram 5: Outputs of the ME-8100 with sink drivers

The maximum current ($I_C = I_{\text{Sink}}$) depends on the saturation voltage U_{CE} and is limited by the power dissipation of the sum of the channels to $P_{\text{tot}} = 1 \text{ W}$ per chip (DO_x 0...7 = chip 1, DO_x 8...15 = chip 2, ...), see Diagram 6: "Saturation voltage ULN2803".

$$P_{\text{tot}} = P_0 + \dots + P_7 \leq 1 \text{ W (per chip at } 70^\circ\text{C)}$$

$$\text{with } P_0 = I_{\text{C0}} \cdot U_{\text{CE0}}$$

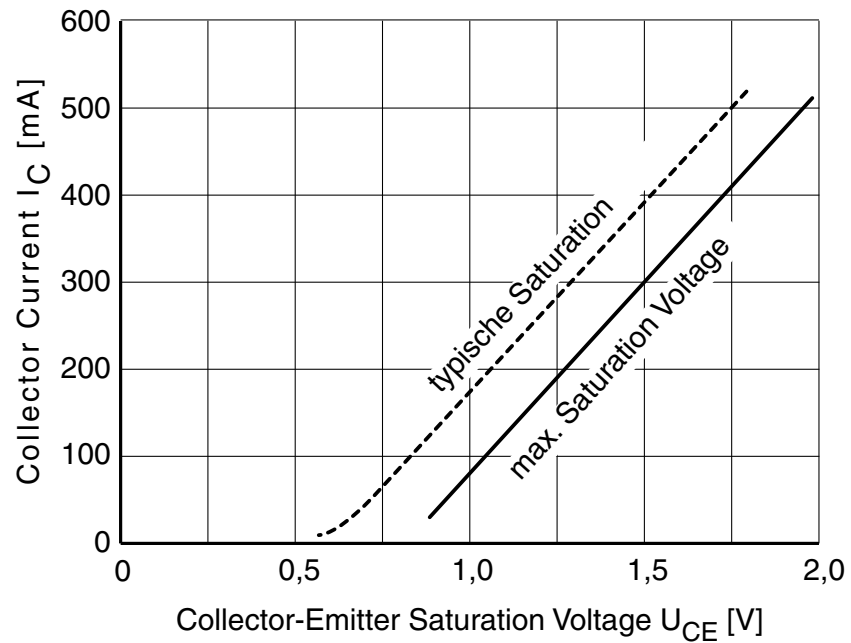


Diagram 6: Saturation voltage ULN2803

3.2.2.2 Source Driver:

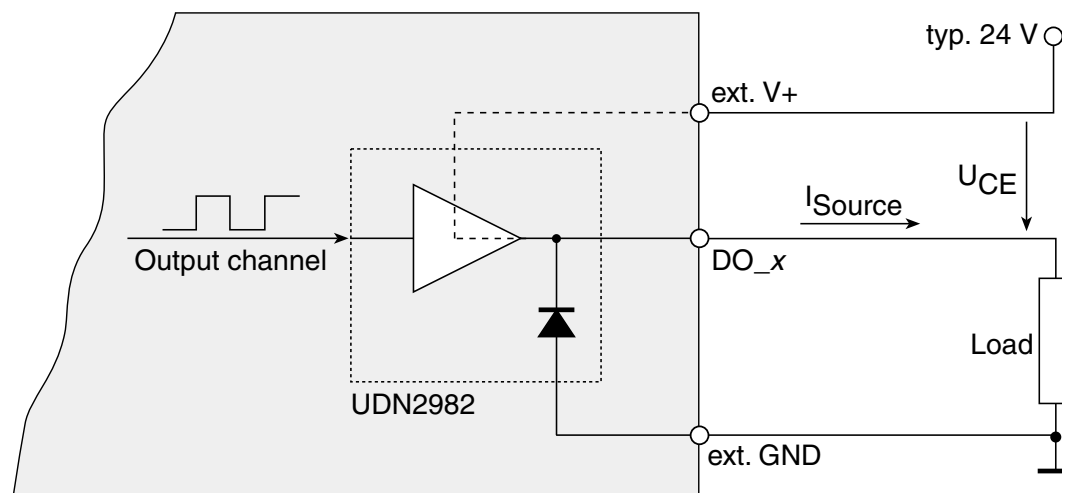


Diagram 7: Outputs of the ME-8100 with source drivers

Please see the following table for the maximum current per output ($I_C = I_{Source}$). The power dissipation of the sum of channels may not exceed $P_{tot} = 0,7 \text{ W}$ per chip ($DO_x 0...7 = \text{chip 1}$, $DO_x 8...15 = \text{chip 2}$, ...).

$$P_{\text{tot}} = P_0 + \dots + P_7 \leq 0,7 \text{ W (per chip at } 70^\circ\text{C)}$$

$$\text{with } P_0 = I_{\text{CO}} \cdot U_{\text{CE0}} \text{ and } U_{\text{CE}} = \text{typ. } 1,8 \text{ V}$$

Number of used channels								
	1	2	3	4	5	6	7	8
I_{Cmax} [mA]	350	175	115	85	70	55	50	40

Table 2: Max. current of the source drivers

3.3 Counter

3.3.1 Counter Chip

The counter component is the standard 82C54 chip. This flexible component has 3 independent down counters, each 16 bit.

The **ME-8100 series** boards use the standard counter chip of type 82C54. This flexible component has 3 independent 16 bit (down) counters. All counter signals are available on the external D-sub connector. After the GATE signal has been properly set (0V) the counter counts down on every falling edge. The clock (CLK) sourcing the counter must be supplied externally and can have a maximum frequency of 1 MHz. The counters can be cascaded by making the proper external connections.

The “Clk”, “Gate” and “Out” pins on the ME-8100 are opto-isolated. The counter outputs have pull up resistors ($R_{\text{UP}} = 2,2\text{k}\Omega$). All the counter signals are designed for control applications requiring 24 V ($R_v = 2,2\text{k}\Omega$) voltage level. All counter signals require a reference to counter ground (ext. GND).

For programming the counters please read chapter 4.2 on page 23.

3.3.1.1 Wiring Counter Inputs

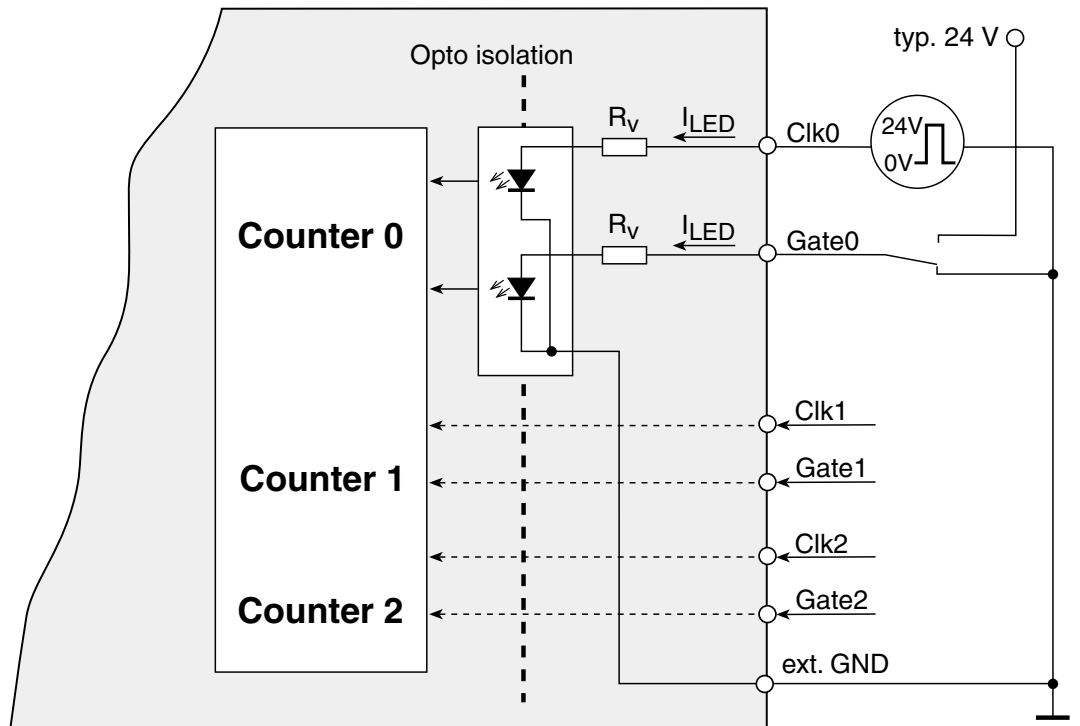


Diagram 8: Wiring of counter inputs ME-8100A/B

3.3.1.2 Wiring Counter Outputs

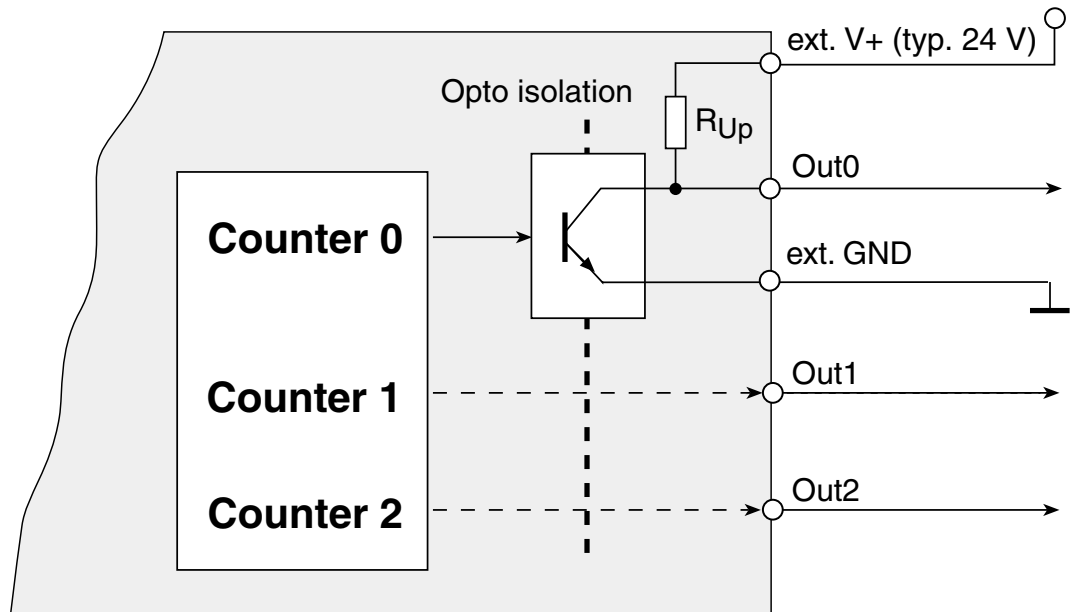


Diagram 9: Wiring of counter outputs ME-8100A/B

3.3.1.3 Cascading the Counters

The outputs of the counter(s) can be cascaded in line by making the proper external connections. The following example explains how to cascade counters 0...2:

- The clock input of counter 0 (Clk 0) is connected to the source clock
- The output of counter 0 (Out 0) is connected to the clock input of counter 1 (Clk 1)
- The output of counter 1 (Out 1) is connected to the clock input of counter 2 (Clk 2)
- For enabling the counters the gate inputs (Gate 0...2) must be connected to 0 V
- At the output of counter 2 (Out 2) is the cascaded counter signal

4 Programming

For programming the device you find the Meilhaus Intelligent Driver System (ME-iDS) included with your package. The ME-iDS is a unique driver system covering different devices and operating systems. It supports Windows 2000 and higher as well as Linux systems with kernel 2.6 and higher and contains an universal function library (API) for all common programming languages (the extent of the current software support can be found in the readme files of the ME-iDS).

A detailed description of the functions can be found in the ME-iDS manual (see CD/DVD enclosed or online under: www.meilhaus.com/download). Further details regarding to the assignment of the subdevices and device specific arguments can be found in the help file (help file format under Windows, *.chm) which can be called via the „ME-iDS Control Center“ in the info area of the task bar (as a rule in the lower right corner of the screen) or via the Windows start menu.

If you don't want to program your board with the ME-iDS you find the last revision of the old function reference in the ME-8100 manual Rev. 1.6 (see: www.meilhaus.com). Please note, that we cannot support this driver anymore.

4.1 Digital-I/O-Section

Each digital port of the ME-8100 series is considered to be an independent functional group (subdevice) in the Meilhaus Intelligent Driver System (ME-iDS). These subdevices of a device are numbered always starting with „0“. Because of the different model versions with a various number of ports the counting of subdevices differs. The assignment of the ports to the subdevices can be found in the ME-iDS help file (see ME-iDS Control Center).

For wiring the digital ports please read chapter 3.2 on page 13.

The following operation modes are possible:

4.1.1 Simple Input/Output

The input/output of single digital values is done in operation mode „**Single**“. Each digital port is accessed as a unique subdevice of type ME_TYPE_DI (port DI_A, DI_B) resp. ME_TYPE_DO (port DO_A, DO_B), subtype ME_SUBTYPE_SINGLE. Note the order of operation as described in the ME-iDS manual. The following parameters can be configured by the functions *meIOSingleConfig()* and *meIOSingle()*:

- Determine Subdevice with *meQuery...* functions.
- Port direction: input or output, if not fixed by opto-isolation.
- Port width: bit, byte or word operation.

4.1.2 Bit-Pattern Recognition

As a special feature the ME-8100 series offers the operation modes „bit-pattern match“ and „bit-pattern change“.

4.1.2.1 Bit-Pattern Match

In the „bit-pattern match“ mode, a bit-pattern written to the comparison register is compared to the bit-pattern on the corresponding input port. An interrupt is initiated when bit-pattern is matching (see diagram 10).

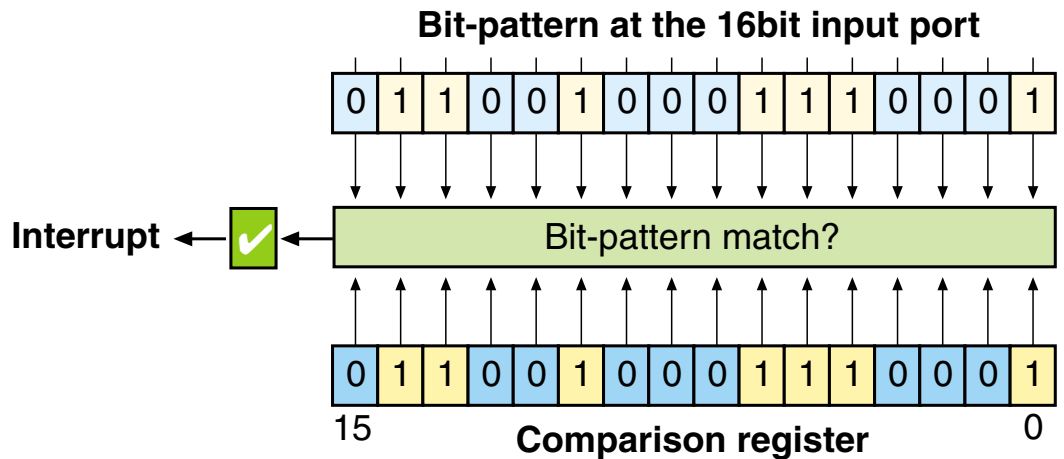


Diagram 10: Bit-pattern match

4.1.2.2 Bit-Pattern Change

In the „bit-pattern change“ mode, one or more input lines can be defined which should be monitored on toggling a bit. The respective bits of the corresponding mask register serve as a reference. If toggling (0 → 1 or 1 → 0) of at least one bit, masked with „1“, an interrupt occurs (see diagram 11).

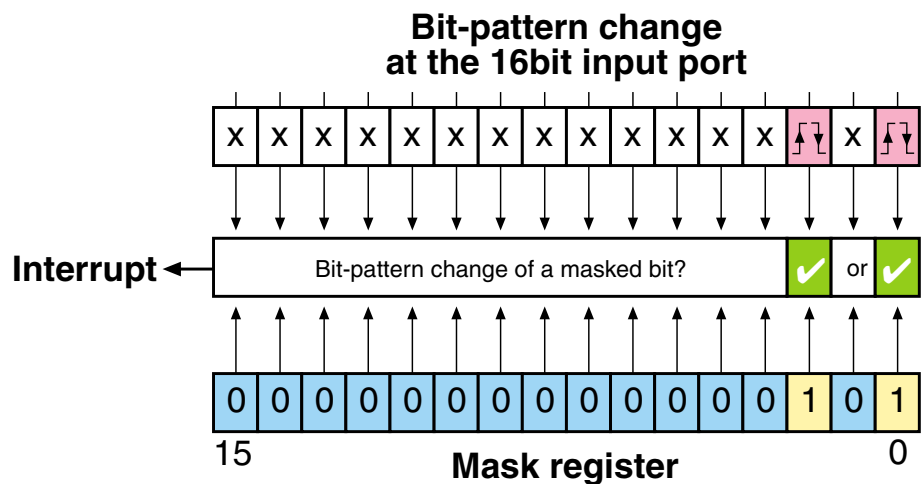


Diagram 11: Bit-pattern change

4.1.2.3 Order of Operation

Programming is done in operation mode „**Interrupt**“. A digital port used for bit-pattern recognition must be of type ME_TYPE_DI. The following parameters can be configured by the functions *meIOIrqStart()* and *meIOIrqWait()*:

- Determine Subdevice with *meQuery...* functions.
- Interrupt channel: always „0“.
- Interrupt source (<iIrqSource>) on bit-pattern match:
 - Bit-pattern match: ME_IRQ_SOURCE_DIO_PATTERN
 - Bit-pattern change: ME_IRQ_SOURCE_DIO_MASK
- Parameter <iIrqEdge> not relevant:
ME_VALUE_NOT_USED.
- In parameter <iIrqArg> the appropriate reference bit-pattern is passed for the comparison register in the operation mode „bit-pattern match“ resp. mask register in the operation mode

Example for bit-pattern change:

When passing the value FFHex in parameter <iIrqArg> of the funktion *meIOIrqStart()* all bits are monitored. If only single bits should be monitored (e. g. <iIrqArg> = 0FHex for the 4 lower significant bits) a transition of a higher significant bit doesn't matter. Only toggling of a bit, which is set to „1“ in parameter <iIrqArg> an interrupt is initiated.

- The width of the reference can be determined by parameter <iFlags>.
- Analyzing the interrupt event is done by the function *meIOIrqWait()*.

Further details for the order of operation can be found in the chapter „interrupt operation“ with and without callback-functio-
nas described in the ME-iDS manual.

4.2 Counter

The programming of the counters is done in operation mode „**Single**“. A counter device of type 82C54 provides three 16 bit counters. Each counter is accessed as a subdevice of type ME_TYPE_CTR, subtype ME_SUBTYPE_CTR_8254. Note the order of operation as described in the ME-iDS manual.

4.2.1 Standard Operation Modes

The counters can be configured independently of each another by the function *meIOSingleConfig()* for the following 6 operation modes (a description of the modes can be found in the ME-iDS manual):

- Mode 0: Change state at zero
- Mode 1: Retriggerable „One Shot“
- Mode 2: Asymmetric divider
- Mode 3: Symmetric divider
- Mode 4: Counter start by software trigger
- Mode 5: Counter start by hardware trigger

Appendix

A Specifications

PC Interface

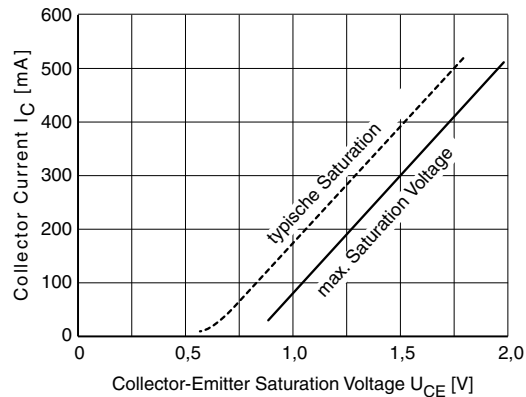
Bus system	Standard PCI (32 Bit, 33 MHz);
(depends on model)	CompactPCI (32 bit, 33 MHz)
Automatic assignment of resources	

Digital input

Number	ME-8100A: 1 x 16 bit port, opto-isolated ME-8100B: 2 x 16 bit ports, opto-isolated
Switching frequency	max. 1 kHz (depends on operating system and application software)
Input level	typ. 24 V \pm 2 V
Input current	10 mA per channel
Operation modes	Simple input; Bit-pattern match Bit-pattern change
Interrupt events	Bit-pattern match or bit-pattern change of a masked bits

Digital output

Number	ME-8100A: 1 x 16 bit port, opto-isolated ME-8100B: 2 x 16 bit ports, opto-isolated
Switching frequency	max. 1 kHz (depends on operating system and application software)
Output level	typ. 24 V (depends on ext. power supply)
Output driver	ME-8100A/B: sink (ULN2803) or source (UDN2982) driver selectable by software port by port
Output current	The max. current per output (I_C) depends on the saturation voltage U_{CE} and is limited by the power dissipation of the sum of channels to $P_{tot} = 1$ W per chip: $P_{tot} = P_0 + \dots + P_7 \leq 1W$ (at 70°C)

ULN2803:**UDN2982:**

Please see the table below for the max. current per output (I_{Source}). The power dissipation of the sum of channels is limited to $P_{\text{tot}} = 0,7 \text{ W}$ per chip:

$$P_{\text{tot}} = P_0 + \dots + P_7 \leq 0,7 \text{ W (at } 70^\circ\text{C)}$$

with $P_0 = I_{\text{C0}} \cdot U_{\text{CE0}}$ and $U_{\text{CE}} = \text{typ. } 1,8 \text{ V}$

Number of channels								
	1	2	3	4	5	6	7	8
I_{Source} [mA]	350	175	115	85	70	55	50	40

Counter/Timer

Number	ME-8100A/B: 3 independent
Type	82C54
Resolution	16 bit
Clock signal (Clk)	opto isolated, input voltage typ. 24 V
Gate signal (Gate)	opto isolated, low-active, input voltage typ. 24 V
Counter output (Out)	opto isolated, output voltage typ. 24 V (depends on ext. power supply)
Counter clock	external up to max. 1 MHz

General Information

Power consumption at +5 V typ. 1,3 A (without ext. load)

Physical size	ME-8100 PCI: 174 mm x 98 mm
(without mounting bracket and connector)	ME-8100 cPCI: 3 HECompactPCI board

Connectors	78pin D-Sub female
Operating temperature	0...70°C
Storage temperature	0...50°C
Relative humidity	20...55% (non condensing)

CE Certification

EMC Directive	89/336/EMC
Emission	EN 55022
Noise immunity	EN 50082-2

B Pinout

B1 ME-8100A/B PCI and cPCI

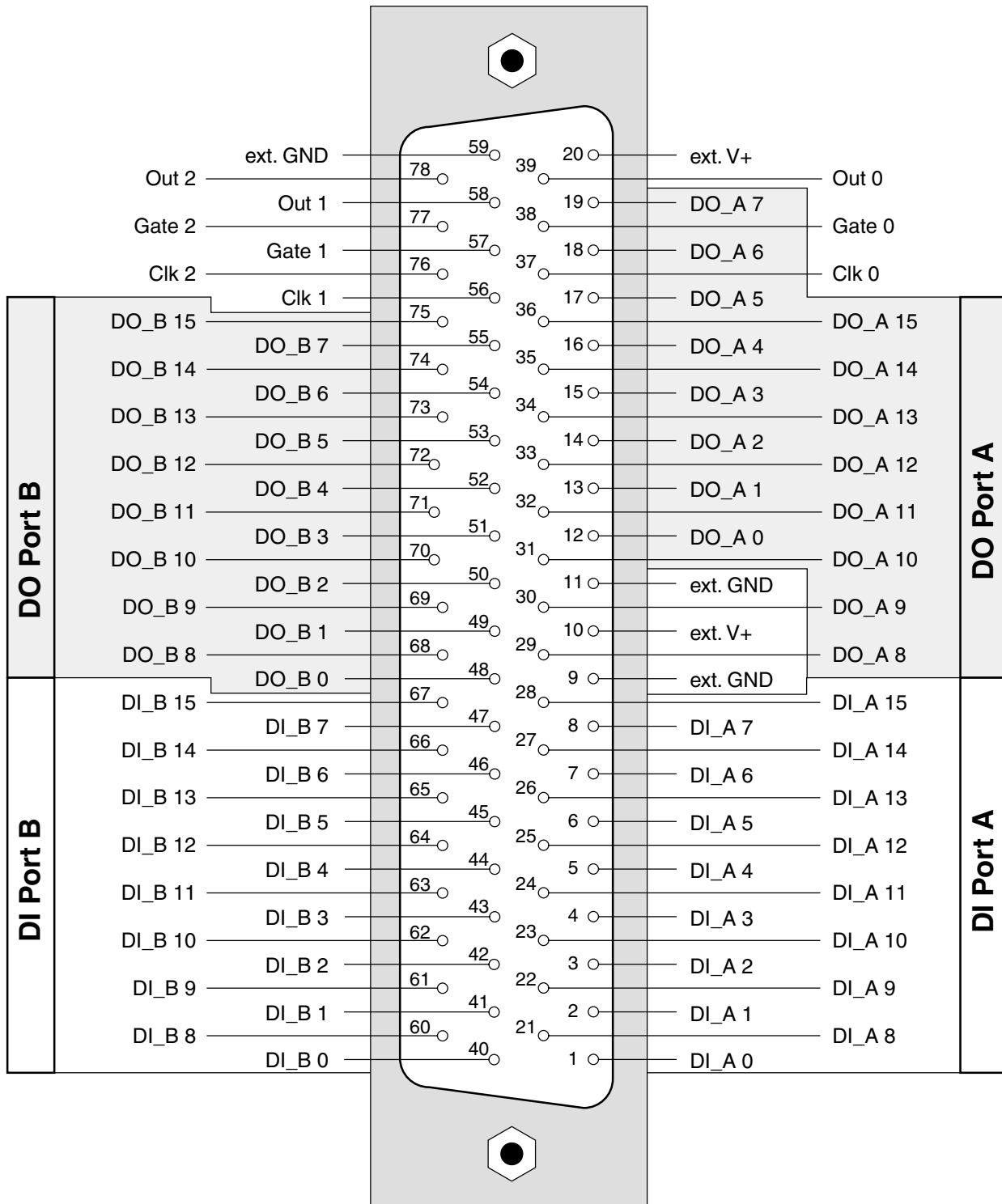


Diagram 12: Pinout of the 78pin female D-Sub on ME-8100A/B

C Accessories

Optionally the following products are available:

ME-AB-D78M

78pin D-Sub connector block (male) for ME-8100A, ME-8100B
PCI and cPCI

ME-AK-D78

78pin D-Sub cable (male - female), 2 m, for ME-8100A, ME-8100B
PCI and cPCI

D Technical Questions

D1 Hotline

If you should have any technical questions or problems that can be put down to your Meilhaus device, please send a fax to our hotline:

Fax hotline: + 49 (0) 89/89 01 66 28

eMail: support@meilhaus.de

Please give a full description of the problems and as much information as possible, including operating system information.

D2 Service address

If a technical error should occur with your device please contact us at the following address:

Meilhaus Electronic GmbH

Service Department

Fischerstraße 2

D-82178 Puchheim/Germany

If you want to send back a device to be repaired it is strictly necessary to request for a RMA number and to follow the notes to deal with the RMA process. Please attach a detailed error description of the problem, including information about operating system and application software!

D3 Driver Update

The current driver versions for Meilhaus devices and our manuals in PDF format are available under www.meilhaus.com.

E **Index**

A

Accessories 29

Appendix 25

B

Bit Pattern Change 21

Bit Pattern Match 20

Block Diagram 11

C

Cascading the Counters 18

Connectors 28

Counter

 Operation Modes 23

 Programming 23

D

Digital-I/O

 Hardware 13

 Programming 20

Driver Update 30

H

Hardware Description 11

I

Introduction 5

M

Model Overview 7

O

Operation Modes

 Bit-Pattern Change 21

 Bit-Pattern Match 20

 Simple Input/Output 20

Opto-isolated Inputs 13

Opto-isolated Outputs 14

P

Package contents 7

Performance Notes 7

Pinout 28

Programming

 Counter 23

 Digital-I/O 20

S

Service and Support 30

Software Support 8

Specifications 25

System Requirements 8

W

Warnings 5

Wiring

 opto-isolated inputs 13

 opto-isolated outputs 14