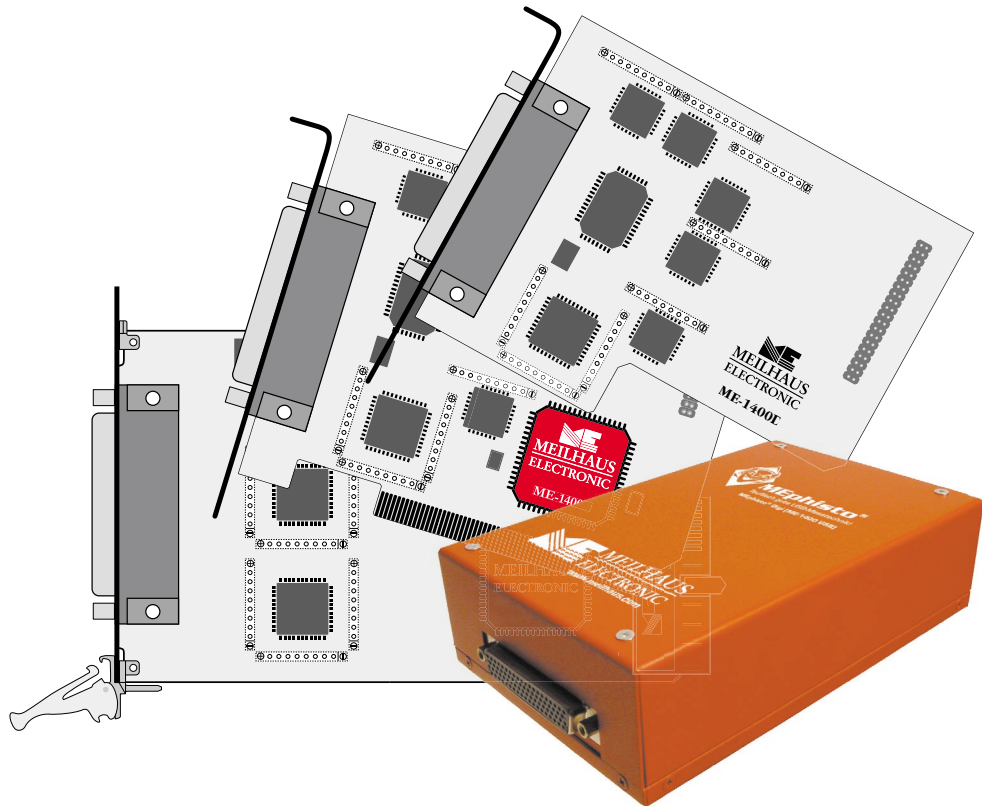


Meilhaus Electronic Manual

ME-1400 2.1E

PCI, CompactPCI and USB Versions



TTL Digital-I/O- and Counter Boards

Imprint

Manual for the ME-1400

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	7
1.2	Package contents	7
1.3	Features	8
1.4	System Requirements.....	9
1.5	Software Support.....	9
2	Installation.....	11
2.1	Software-Installation.....	11
2.2	Power Supply for USB Models.....	12
3	Hardware	13
3.1	Block Diagram ME-1400/A/B/E/EA/EB	13
3.2	Block Diagram ME-1400C/D	14
3.3	Connection of USB models.....	15
3.4	Digital-I/O Section	16
3.5	Counter (8254)	17
3.5.1	Cascading the Counter.....	18
3.5.2	Clock Output and Interrupt Control	18
3.5.3	Pulse Width Modulation	20
3.5.4	Pull-Up/Pull-Down Resistors	21
4	Programming.....	25
4.1	Digital-I/O	25
4.1.1	Simple Input/Output	26
4.2	Counter	27
4.2.1	Standard Operation Modes.....	27
4.2.2	Clock Source.....	27
4.2.3	Cascading	28
4.2.4	Pulse Width Modulation	29
4.3	External Interrupt	29

Appendix..... 31

- A Specifications..... 31**
- B Pinout 34**
 - B1 ME-1400/A/B 34
 - B2 ME-1400C/D 35
 - B3 Special Cable for ME-1400C/D 36
 - B4 ME-1400E/EA/EB..... 38
 - B5 IDC Connector for B-Versions (ST2)..... 39
 - B6 Additional Mounting Bracket..... 40
- C Accessories..... 41**
- D Technical Questions 42**
 - D1 Hotline 42
 - D2 Service address 42
 - D3 Driver Update..... 42
- E Index 43**

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.

The descriptions in this manual concern PCI, CompactPCI and USB versions of the ME-1400 series if not otherwise noted.

1.1 Important Notes

1.1.1 Usage in accordance with the requirements

The PC boards resp. external boxes of the ME-1400 series are designed for input and output of digital signals optional with counters via PC. Depending on type the models of the ME-1400 series:

... have to be installed into a free PCI slot or

... have to be installed into a free CompactPCI slot or

... have to be connected with an USB port (MEphisto Digi)

For installing a plug-in board resp. connecting an USB device please read the manual of your PC.

Please follow the notes and the specifications from page 31 on:

- Ensure a sufficient heat conductance from the board in the PC housing resp. the USB box.

- 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 of up to 500V.
- Note, that the computer must be powered up, prior connecting signals to the board by the external switching.
- 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. For voltage supply of the USB models use authorized power adapters only.

Make sure, that no contact with live parts can happen by the external switching. 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 safety 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:

- Digital-I/O and counter board of the ME-1400 series for PCI or CompactPCI bus resp. USB box.
- Manual in PDF format on CD/DVD (optional as printed version)
- Driver software on CD/DVD.
- ME-1400E/EA/EB: D-sub 37pin male connector
- ME-1400/A/B/C/D: D-sub 78pin male connector
- ME-1400EB: ribbon cable from IDC connector to 37pin D-Sub female connector mounted on additional mounting bracket.
- USB models: USB 1.1 connection cable (Plug type A to plug type B, 1,8 m)

1.3 Features

The **ME-1400 series** is provided as a digital-I/O and counter board for PCI resp. CompactPCI bus or as USB box (USB 1.1, USB 2.0 compatible).

Model Overview

Model	Connector	TTL-IOs	Counter	IRQ
ME-1400 PCI/cPCI	78pin D-sub	24	—	—
ME-1400A PCI/cPCI	78pin D-sub	24	3 x 16 bit	✓
ME-1400B PCI/cPCI	78pin D-sub	48	6 x 16 bit	✓
ME-1400C PCI	78pin D-sub	24	15 x 16 bit	✓
ME-1400D EXP (Expansion board for ME-1400C)	78pin D-sub	24	15 x 16 bit	✓
ME-1400E PCI (connector compatible with ME-14)	37pin D-sub	24	—	—
ME-1400EA PCI (connector comp. with ME-14A)	37pin D-sub	24	3 x 16 bit	✓
ME-1400EB PCI (connector comp. with ME-14B)	37pin D-sub	48	6 x 16 bit	✓
ME-1400 USB	78pin D-sub	24	—	—
ME-1400A USB	78pin D-sub	24	3 x 16 bit	—
ME-1400B USB	78pin D-sub	48	6 x 16 bit	—

Table 1: Model overview ME-1400 family

The boards resp. boxes of the ME-1400 series provide 24 or 48 TTL-compatible digital-I/O lines (8 bit ports) and up to 30 independent programmable 16 bit counters (8254 compatible), depending on model.

All models with counters provide a 10 MHz oscillator which is independent from the system clock of the PC. The frequency can

be set to 1 MHz by software. The boards have an external interrupt line available with exception of the models ME-1400/E and the USB models.

The external connections to the board are realised with a 37pin D-Sub (ME-1400E versions) resp. a 78pin D-Sub connector (ME-1400/A/B/C/D). The ME-1400EB has an extra IDC connector on the board to enable access to the expanded signals for the second digital-I/O and counter units of the board. A flat ribbon cable and an extra mounting bracket with a 37pin D-Sub female connector are included with the package.

1.4 System Requirements

The PCI models require a PC with a free standard PCI resp. CompactPCI slot (32 Bit, 33MHz, 5V). The USB models need a free USB port (USB 1.1/2.0). The according software requirements must be achieved. 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-14/1400 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 Power Supply for USB Models

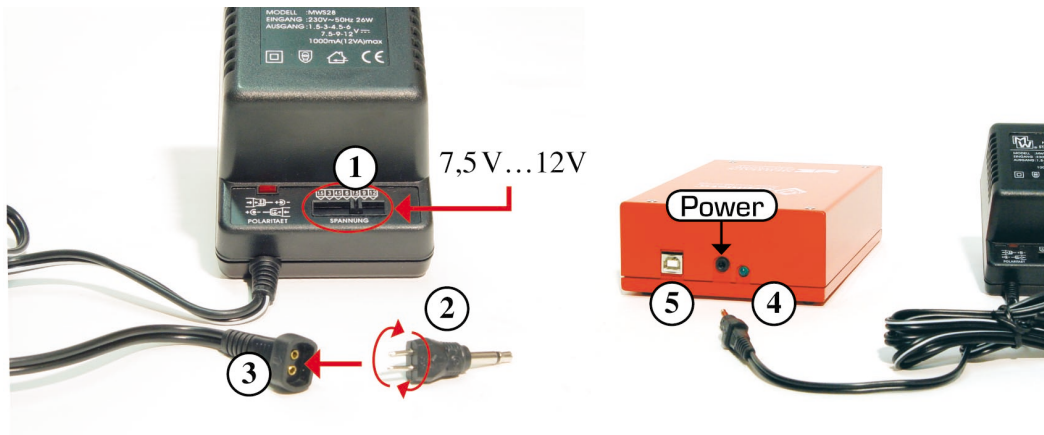


Diagram 1: Power supply for USB models

For starting up your USB box of the MEphisto series please note the following items:

1. Set the slide switch ① of the included power supply between 7,5 V and 12 V.
2. Plug the adapter of type „3,5 mm male jack“ ② into the twin-contact connector ③ of the power supply cable. The polarity doesn't matter because of the power supply input of the USB box („Power“) provides a rectifier.
3. Plug the 3,5 mm male jack into the female „Power“ jack of the USB box ④.
4. Plug the USB connector (type B) into the USB jack ⑤ of the USB box.
5. If the ME-iDS driver system is not yet installed proceed with the driver installation before you connect the USB cable with the PC.
6. Connect the other edge of the USB cable with a free USB port of your computer (we recommend to use an USB port directly).

3 Hardware

3.1 Block Diagram ME-1400/A/B/E/EA/EB

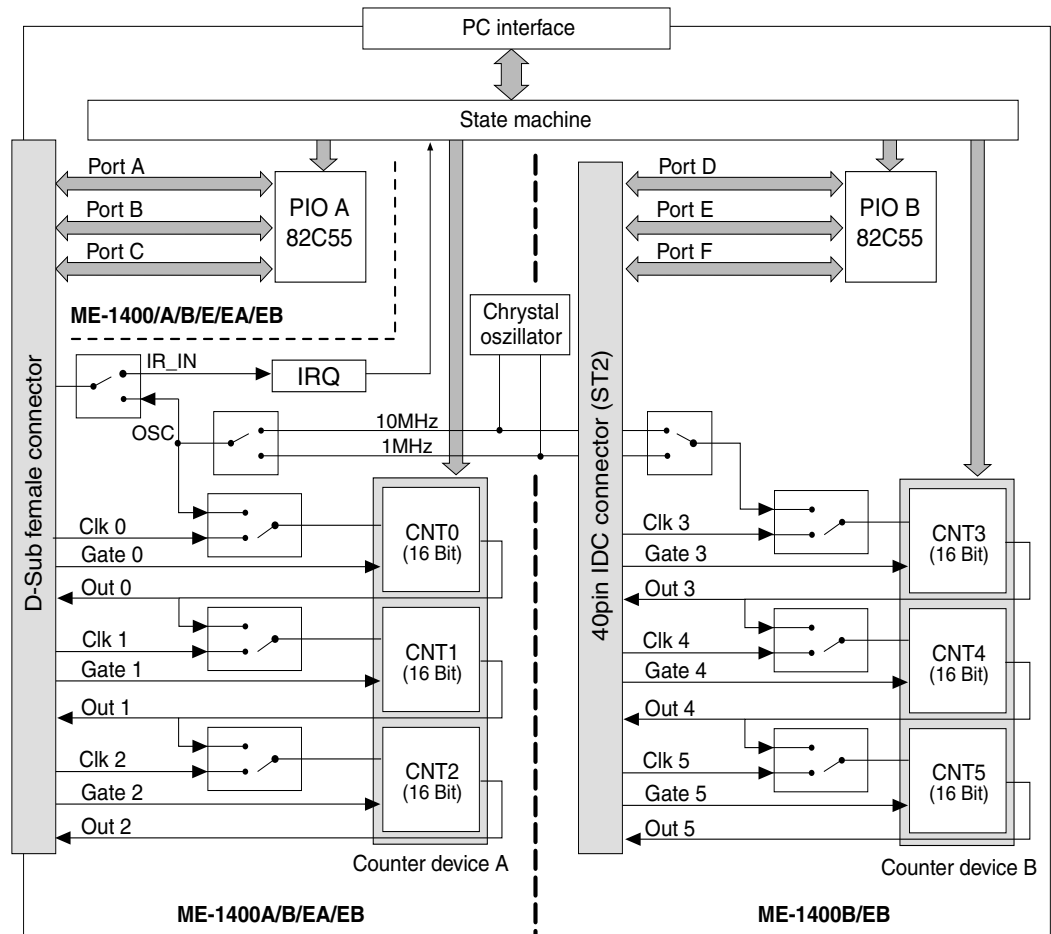


Diagram 2: Block diagram of ME-1400/A/B/E/EA/EB

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

ME-1400/E: 24 digital-I/Os (PIO A) without oscillator and interrupt input.

ME-1400A/EA: 24 digital-I/Os (PIO A), 3 x 16 bit counters (CNT0...2), interrupt input.

ME-1400B/EB: 48 digital-I/Os (PIO A, B), 6 x 16 bit counters (CNT0...5), interrupt input.

USB models: see above, however without interrupt input.

3.2 Block Diagram ME-1400C/D

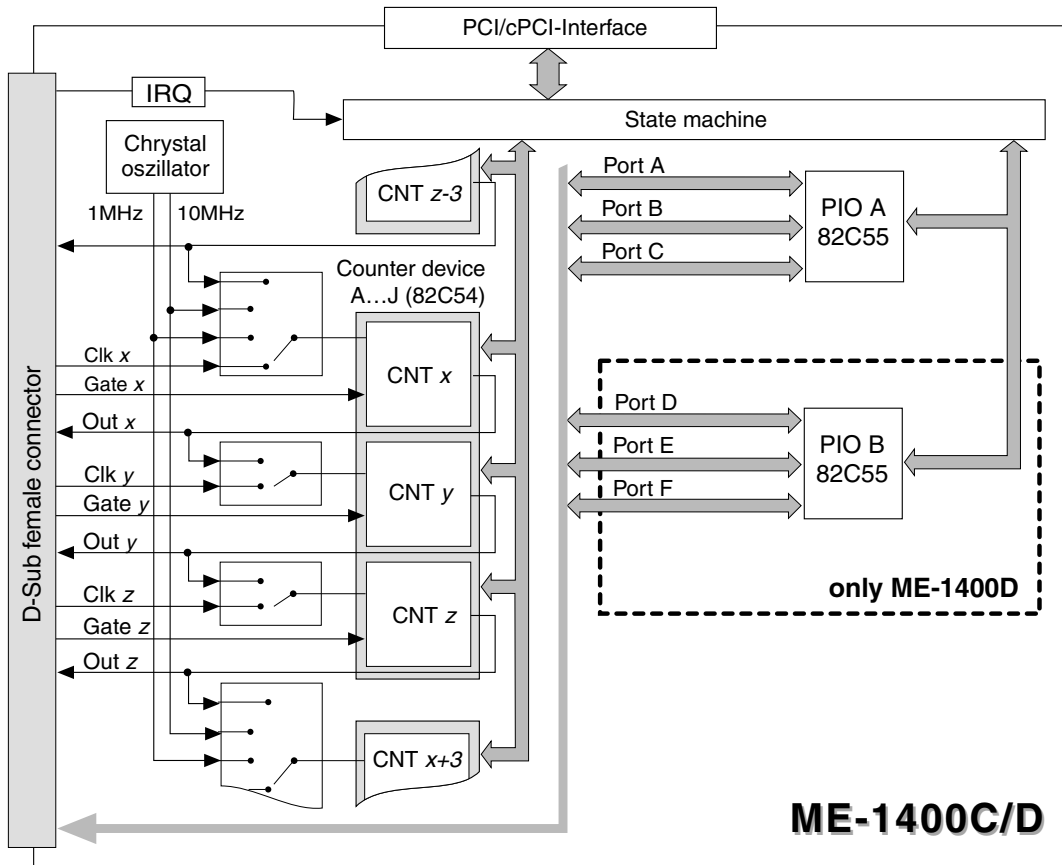


Diagram 3: Block diagram of ME-1400C/D

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

ME-1400C: 24 digital-I/Os (PIO A), 15 x 16 bit counters (CNT0...14) and an interrupt input.

ME-1400D: Expansion board with 24 digital-I/Os (PIO B) and 15 x 16 bit counters (CNT0...14).

The counters can be cascaded by software. The first counter of every device can be sourced by the crystal oszillator. For each of the 3 counters (CNT x , y , z) per counter device (A...J) use the following indices. See Table 2:

	ME-1400C					ME-1400D				
Counter device →	A	B	C	D	E	F	G	H	I	J
Counter No. CNT x	0	3	6	9	12	15	18	21	24	27
CNT y	1	4	7	10	13	16	19	22	25	28
CNT z	2	5	8	11	14	17	20	23	26	29

Table 2: Counter indices

3.3 Connection of USB models

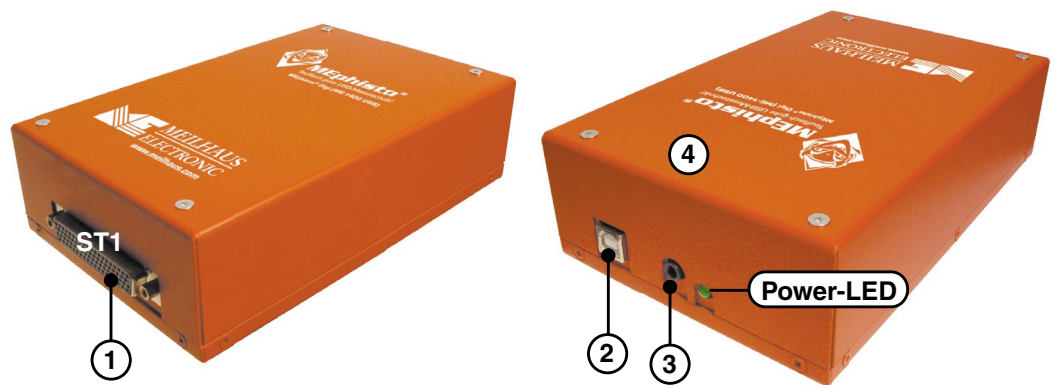


Diagram 4: ME-1400/A/B USB

- ① 78pin D-Sub female connector ST1 for digital ports (PA...F) and counters (Pinout see page 34).
- ② USB connector (Type B)
- ③ 3.5 mm jack for optional external power supply ($U_{in} = +7,5$ VDC with protection against confusing the poles). Suitable power adapter included with the USB box.
- ④ Fuse F1 (see specifications); the fuse is socketed and can be changed after opening the box (4 screws). However, we recommend to renew the fuse by our service department.

3.4 Digital-I/O Section

For the programmable input/output component (PIO) the standard component 82C55 (fully compatible CMOS version of the 8255A) is used. This component has 3 x 8 bit wide programmable I/O-ports and is TTL/CMOS compatible.

The 8 bit wide digital-I/O ports can be configured independently as input or output. After power-up all ports are configured as input. Make sure that the voltage levels of the I/Os keeps within the TTL level limits (see specifications on page 31) and that a reference to PC ground (GND) must be done. The maximum output current is $I_{Out} = I_{OL} = I_{OH} = 2.5 \text{ mA}$

For programming the digital I/O section please read chapter 4.1 "Digital-I/O" on page 25.

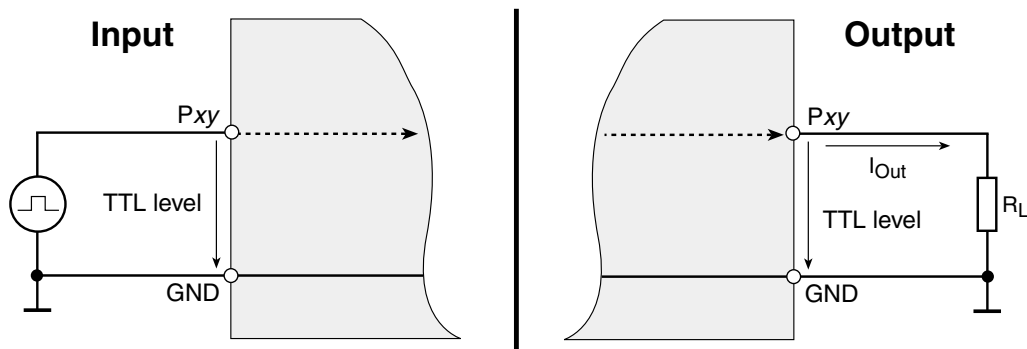


Diagram 5: Switching of the digital I/Os

3.5 Counter (8254)

The counter component is the standard type 82C54. This flexible device has 3 independent 16 bit (down) counters. All counter signals are available on the D-sub connector. After the GATE signal has been properly set (5V) the counter counts down on every falling edge.

The counter clock can be sourced alternatively by the internal oscillator (1 MHz/10 MHz), externally (10 MHz max.) or by cascading. The internal oscillator can be set separately for each counter component from 1 MHz (default) to 10 MHz. The settings are done by software. After power up or after reset all counters are configured for an external clock source. See also chapter programming and the block diagrams from page 13 up

The counter signals work with TTL level (see specifications on page 31) and require a reference to PC ground (PC_GND). The maximum output current is $I_{Out} = 2.5\text{mA}$.

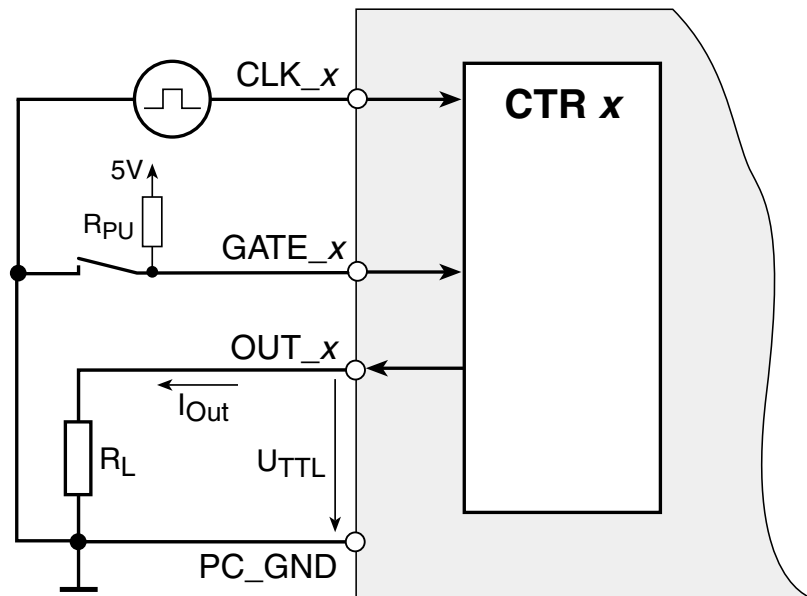


Diagram 6: Wiring the counters

The GATE and OUT lines of the 82C54 are directly connected with the corresponding pins of the D-Sub connector. In the CLK lines „multiplexer“ are switched between.

3.5.1 Cascading the Counter

The counters of the same component can be cascaded without external connections. On the ME-1400C and D the cascading is also possible from counter component to counter component (exception: from component E to F). See also block diagrams from page 13 up.

In spite of cascading the outputs of all counters are also available at the D-Sub connector.

Cascading the counters is done by software. For programming please read chapter 4.2 on page 27.

3.5.2 Clock Output and Interrupt Control

Note:

The clock output is not supported by the ME-iDS at the moment!

The pin labelled „OSC/IR_IN“ resp. „IR_IN“ is the interrupt input by default. Alternatively a system independent symmetrical clock generated by the on-board crystal oscillator can be output (1 MHz or 10 MHz).

Exception: On the ME-1400C this pin is only for interrupt control, on the ME-1400, ME-1400D and ME-1400E the pin has no function.

OSC: Oscillator Clock Output - this signal connects the internal oscillator clock signal (1 MHz or 10 MHz) with the D-Sub connector.

This functionality is only supported by the ME-iDS under Linux at the moment!

IR_IN: IRQ Input - a rising edge at this pin will cause an interrupt. If IR_IN is held high or not connected, the IR IN is ignored.

Configuration is done by software. For programming please read chapter 4.2 on page 27.

The interrupt logic is disabled after power-up and must be enabled before using by software.

Model	Function	Default	Setting
ME-1400	n.c.	–	–
ME-1400E	n.c.	–	
ME-1400A	(OSC)/IR_IN	IR_IN	by software
ME-1400EA	(OSC)/IR_IN	IR_IN	
ME-1400B	(OSC)/IR_IN	IR_IN	by software
ME-1400EB	(OSC)/IR_IN	IR_IN	
ME-1400C	IR_IN	IR_IN	input
ME-1400D	not available (please don't connect)		

Table 3: Overview clock output and interrupt control

3.5.3 Pulse Width Modulation

A special application for the counters is the so-called pulse width modulation (PWM). With proper external wiring (see diagram 7) the 3 counters of each counter component can be used together to create an output signal with a variable duty cycle. The duty cycle can be set between 1...99% in 1% steps. The base clock can be sourced either by an external frequency generator (max. 10MHz) or by the internal crystal oscillator (1MHz or 10MHz). This results in an output signal of maximum 50kHz. By using the wiring shown in diagram 7, the functions *meUtilityPWM...* can be used which greatly simplifies programming (see also ME-iDS manual).

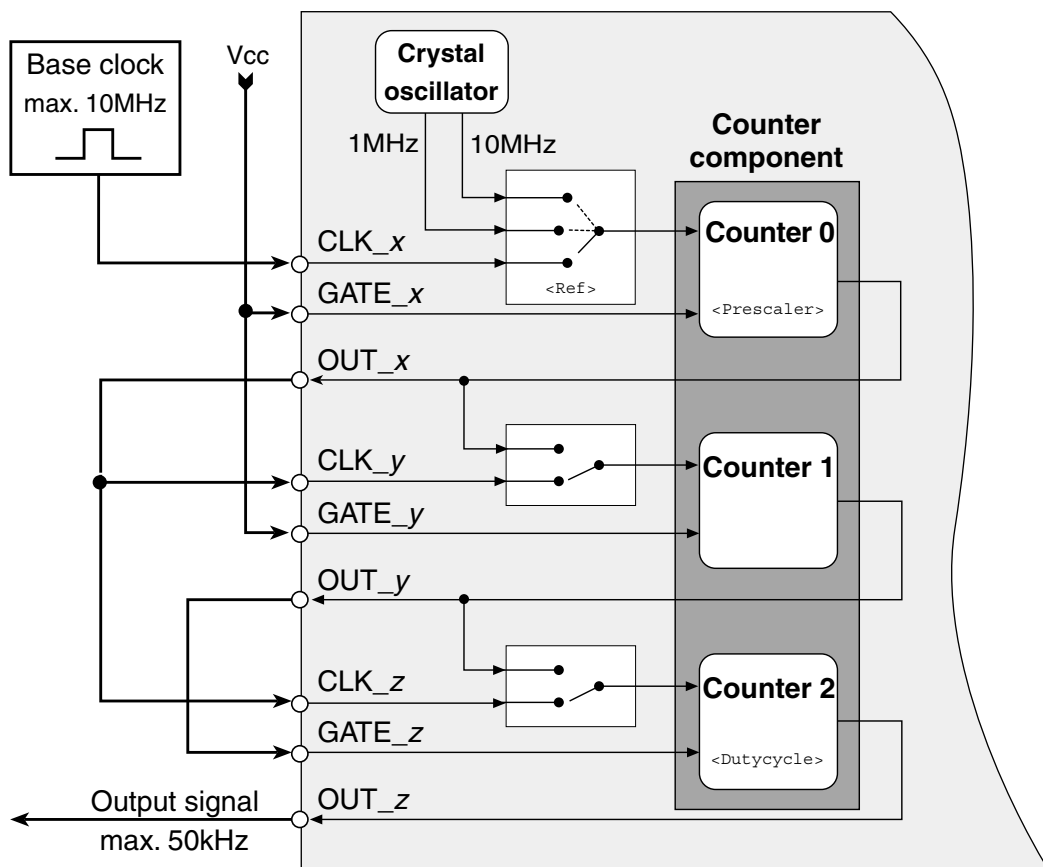


Diagram 7: Wiring pulse width modulation

The output signal is always available at the output of the third counter of each counter component (OUT_2, OUT_5 ...).

3.5.4 Pull-Up/Pull-Down Resistors

On a power up, all digital ports are set to input. Because of this the corresponding input lines are all set to high impedance (without external wiring). Depending on the application, it may be desirable to have the digital lines in a defined state on power up. The ME-1400 series allows the user to add pull-up or pull-down resistors to the circuit board directly. Appropriate resistor arrays can be used (4.7 k Ω recommended) port by port. Note, that by using pull-up resistors, the output current is decreased accordingly (e. g. with $R_{up}=4.7\text{ k}\Omega$, $I_{max}=1.6\text{ mA}$).

Depending on how the resistor arrays are placed on the board, the pull-up or pull-down state is selected. For pull-up, the end pin of the array must go to the “+” pin and for pull-down, the end pin must go to the “-“ pin (see diagram 8 to 13).

Note:

Make sure to ground yourself before inserting the arrays to avoid a static discharge.

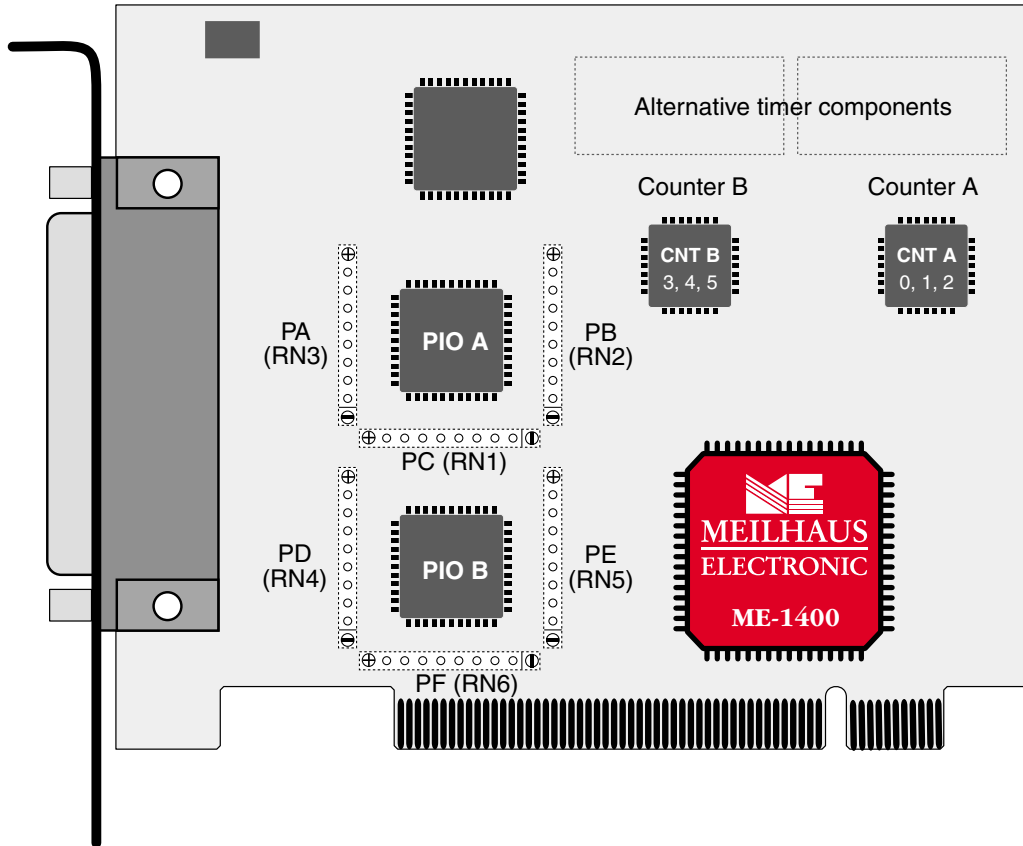


Diagram 8: Location of resistor arrays ME-1400/A/B PCI

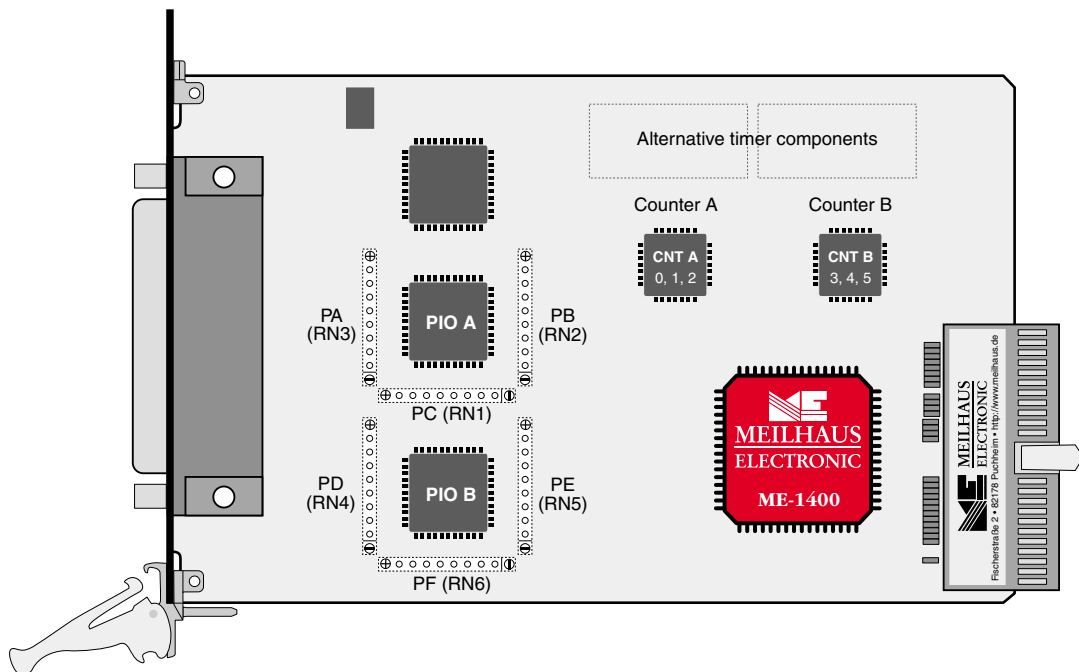


Diagram 9: Location of resistor arrays ME-1400/A/B cPCI

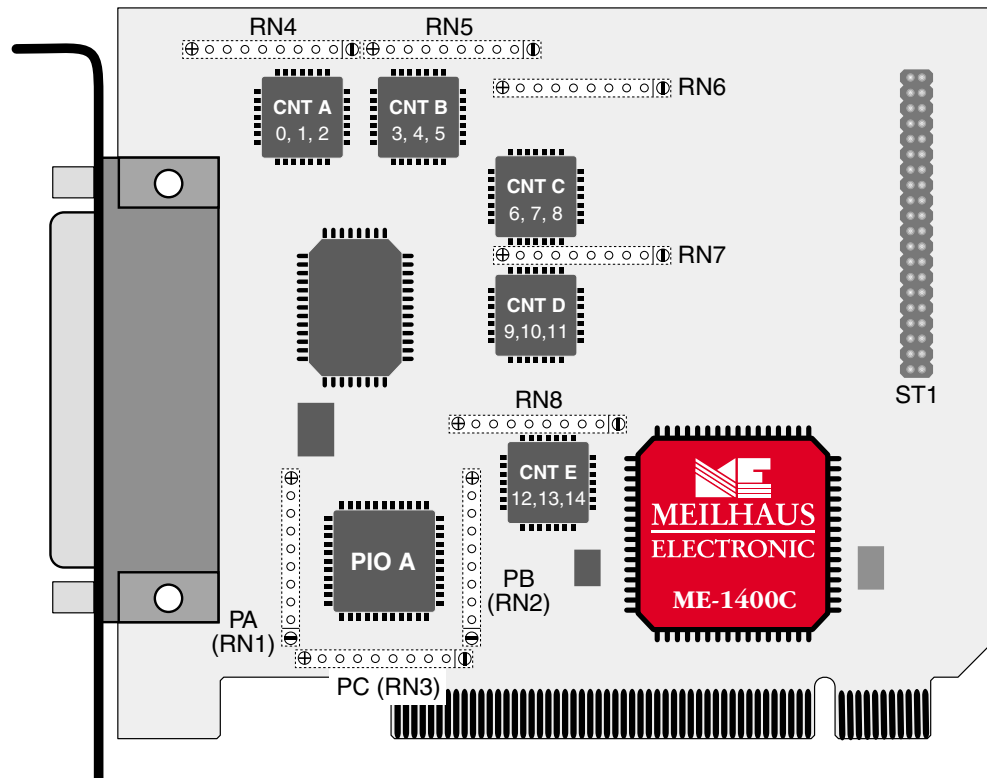


Diagram 10: Location of resistor arrays ME-1400C PCI

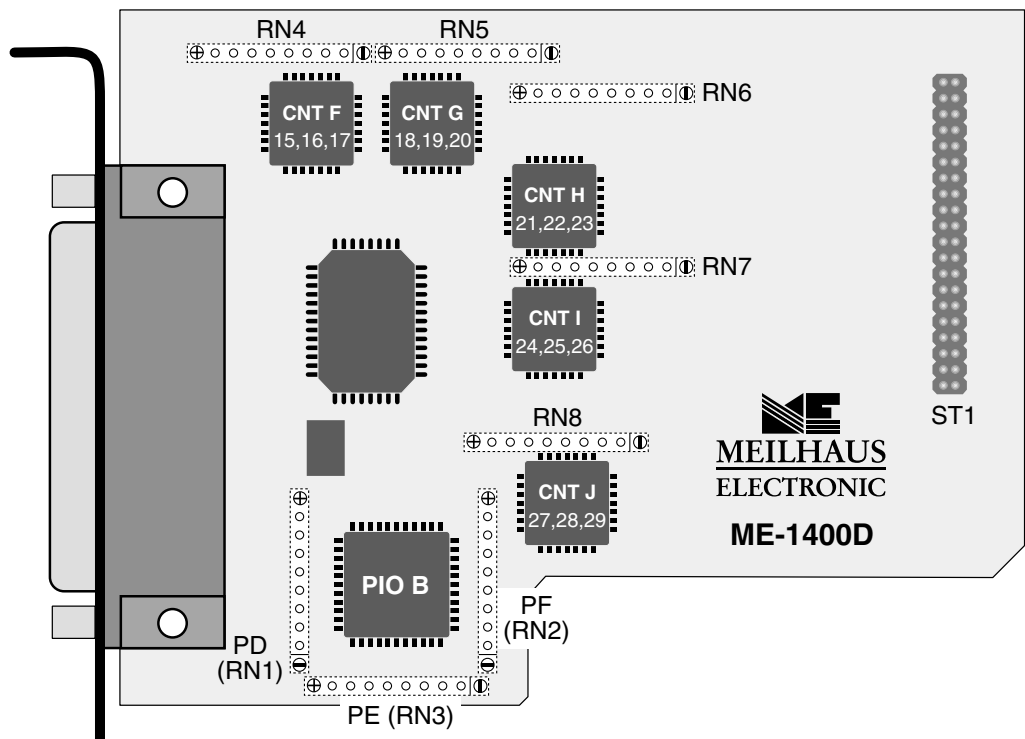


Diagram 11: Location of resistor arrays ME-1400D EXP

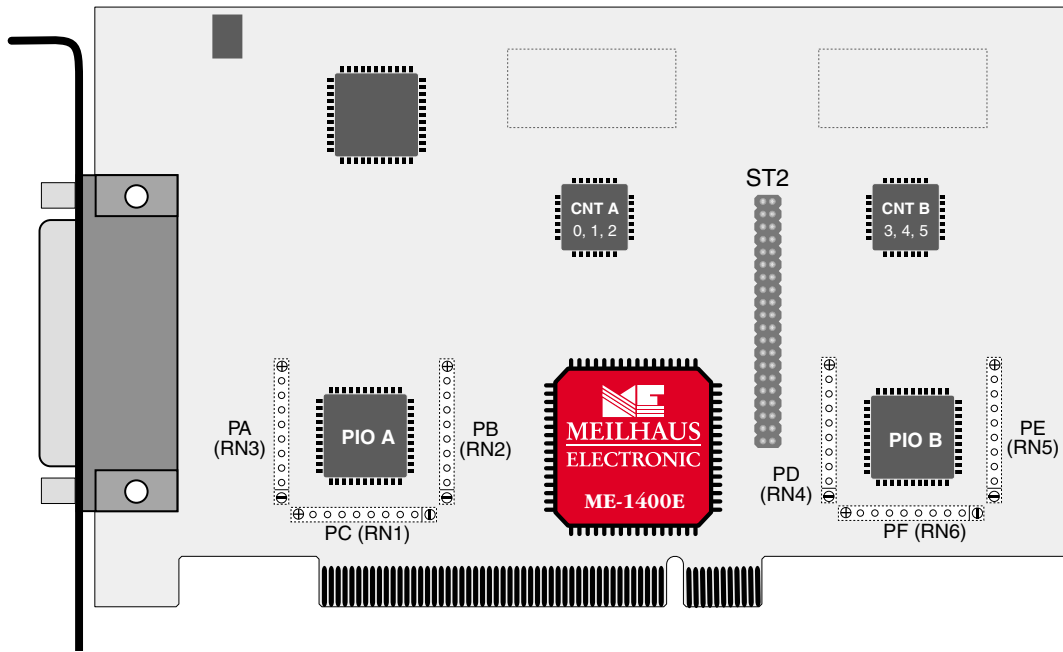


Diagram 12: Location of resistor arrays ME-1400E/EA/EB

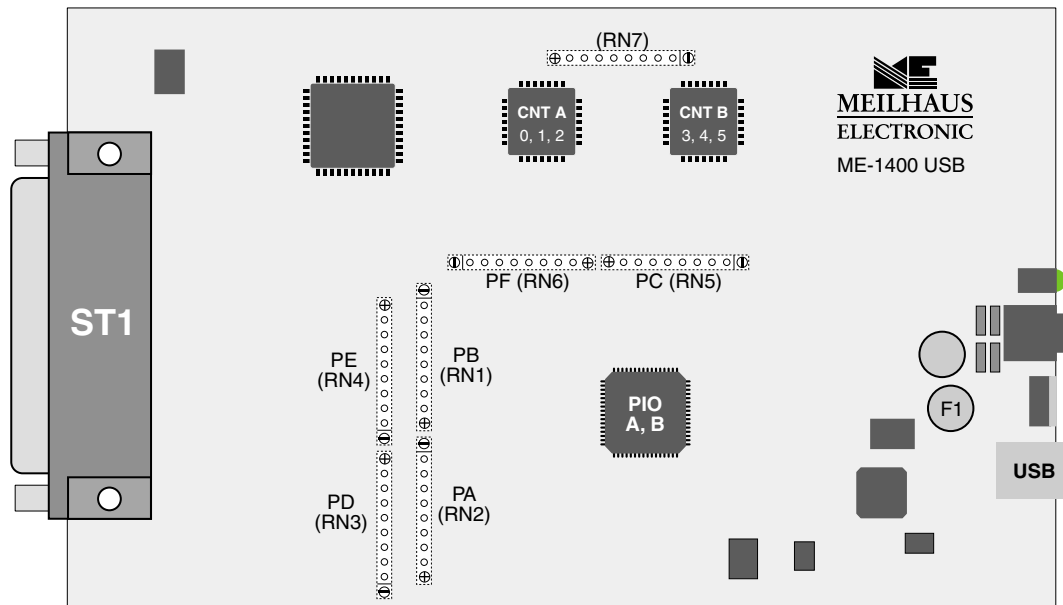


Diagram 13: Location of resistor arrays ME-1400/A/B USB

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-1400 manual Rev. 1.91 (see: www.meilhaus.com). Please note, that we cannot support this driver anymore.

4.1 Digital-I/O

Each digital port of the ME-1400 series is considered to be an independent functional group (subdevice) in the Meilhaus Intelligent Driver System (ME-iDS). 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 I/O ports please read chapter 3.4 on page 16.

The following operation modes are available:

4.1.1 Simple Input/Output

ME-1400 ME-1400E	ME-1400A ME-1400EA	ME-1400B ME-1400EB	ME-1400C	ME-1400D
3 ports	3 ports	6 ports	3 ports	3 ports

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_DIO, 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 *meIO-SingleConfig()* and *meIOSingle()*:

- Determine subdevice with *meQuery...* functions.
- Port direction: input or output.
- Port width: bit or byte operation (8 bit).

After power-up the bi-directional ports are configured for input.

4.2 Counter

ME-1400 ME-1400E	ME-1400A ME-1400EA	ME-1400B ME-1400EB	ME-1400C	ME-1400D
–	3 counters	6 counters	15 counters	15 counters

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.

After power-up or after reset all counters are sourced by the external clock.

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

4.2.2 Clock Source

With the parameter <i>Ref> of the function *meIOSingleConfig()* you can define the clock source (CLK) for the single counters resp. counter components (see also the block diagrams from page 13 up)

- ME_REF_CTR_INTERNAL_PREVIOUS
Clock source is the output of previous counter within a counter component. On the ME-1400C/D cascading is also possible from component to component (exception: counter 14 with 15).

- **ME_REF_CTR_INTERNAL_1MHZ**
Clock source is the internal 1 MHz crystal oscillator (setting for each counter component possible).
- **ME_REF_CTR_INTERNAL_10MHZ**
Clock source is the internal 10 MHz crystal oscillator (setting for each counter component possible).
- **ME_REF_CTR_EXTERNAL**
Clock source is an external oscillator (setting for each single counter possible).

4.2.3 Cascading

To cascade the counters, the clock input (CLK) of a counter can be connected to the counter output (OUT) of the previous counter without external wiring (only within the same component). On the ME-1400C and D the cascading is also possible from component to component (exception: counter 14 with 15). See block diagrams on page 13ff.

For example: The counters 0, 1 and 2 should be cascaded and counter 0 should be sourced externally. In the parameter `<iRef>` of the function `meIOSingleConfig()` the following constants have to be passed:

- **ME_REF_CTR_EXTERNAL**: Connect the clock input of counter 0 (CLK 0) with the external clock input.
- **ME_REF_CTR_INTERNAL_PREVIOUS**: Connect the clock input of counter 1 (CLK 1) with the output of counter 0 (OUT 0).
- **ME_REF_CTR_INTERNAL_PREVIOUS**: Connect the clock input of counter 2 (CLK 2) with the output of counter 1 (OUT 1).
- Additionally the gate inputs of the counters must be connected with +5V to release the counters.
- The output of counter 2 (OUT 2) provides the cascaded counter signal.

4.2.4 Pulse Width Modulation

Using the wiring shown in diagram 7 you can greatly simplify programming of this operation mode with the functions *meUtilityPWM...* (see also ME-iDS manual).

4.3 External Interrupt

ME-1400 ME-1400E	ME-1400A ME-1400EA	ME-1400B ME-1400EB	ME-1400C	ME-1400D
–	✓	✓	✓	–

At the external interrupt input (IR_IN) you can initiate an interrupt by a proper edge, which is sent to the PCI bus directly.

Programming is done by the *meIOIrq...* functions. The Interrupt is considered to be a independent subdevice of type ME_TYPE_EXT_IRQ. After enabling the external interrupt by the function *meIOIrqStart* an interrupt can be triggered by a rising edge. Note the order of operation as described in the ME-iDS manual.

Appendix

A Specifications

PC-Interface (ME-1400/A/B/C/D/E/EA/EB)

Bus system (depends on model)	Standard PCI (32 Bit, 33 MHz); CompactPCI (32 bit, 33 MHz) USB 1.1 (USB 2.0 compatible)
Plug&Play functionality	Automatic assignment of resources

Digital I/O

Number	ME-1400/A/C/E/EA: 24, TTL compatible ME-1400B/D/EB: 48, TTL compatible
Input voltage	Low: -0.5 V...+0,8 V ($I_{ILmax} = \pm 10 \mu A$) High: +2.0 V...+5,5 V ($I_{IHmax} = \pm 10 \mu A$)
Output voltage	Low: max. +0.45 V ($I_{OL} = +2.5 \text{ mA}$) High: min. +2.4 V ($I_{OH} = -2.5 \text{ mA}$)

Counter

Number	ME-1400A/EA: 3 independent ME-1400B/EB: 6 independent ME-1400C: 15 independent ME-1400D: 15 additionally to ME-1400C
Type	82(C)54
Resolution	16 bit
Input voltage	Low: -0.5 V...+0.8 V ($I_{ILmax} = \pm 10 \mu A$) High: +2.2 V...+6 V ($I_{IHmax} = \pm 10 \mu A$)
Output voltage	Low: max. +0.45 V ($I_{OL} = +2.5 \text{ mA}$) High: min. +2.4 V ($I_{OH} = -2.5 \text{ mA}$)

Crystal oscillator

Frequency	1 MHz or 10 MHz selectable (by software)
Accuracy	$\pm 100 \text{ ppm}$ ($\pm 0.01\%$)
Output level	LS-TTL

General Information

PCI/cPCI models:

Power consumption at +5 V (without load)	ME-1400: typ. 200 mA ME-1400A: typ. 220 mA ME-1400B: typ. 400 mA ME-1400C: typ. 1 A ME-1400D: typ. 800 mA ME-1400E: typ. 200 mA ME-1400EA: typ. 220 mA ME-1400EB: typ. 400 mA
Physical size (without mounting bracket and connector)	ME-1400/A/B: 132 x 99 mm ME-1400C/D: 129 x 99 mm ME-1400E/EA/EB: 175 x 99 mm cPCI models: 100 x 160 mm

Connectors

ME-1400E/EA/EB:

37pin D-Sub female connector at the mounting bracket of the board

additional for ME-1400EB:

40pin IDC-connector to a 37pin D-Sub female connector on an additional mounting bracket (for pinout see D-Sub at the mounting bracket of the board)

ME-1400/A/B/C/D:

78pin D-Sub female connector at the mounting bracket of the board

USB models:

External power supply	Power adapter (7.5 V/800 mA)
Power consumption at +7.5 V (without load)	ME-1400 USB: typ. 110 mA ME-1400A USB: typ. 130 mA ME-1400B USB: typ. 150 mA
Physical size (with connector)	185 x 114 x 54 mm (L x B x H)
Connectors	37pin D-Sub female connector ST1; USB connector (Typ B); 3.5 mm jack for power supply
Fuse F1	Fuse socketed (only USB models), type: Littelfuse TR5/370 1AT

Common Data

VCC loading at the D-Sub connector:	200 mA
Operating temperature	0...70 °C
Storage temperature	-40...100 °C
Relative humidity	20...55% (not condensing)

CE Certification

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

B Pinout

B1 ME-1400/A/B

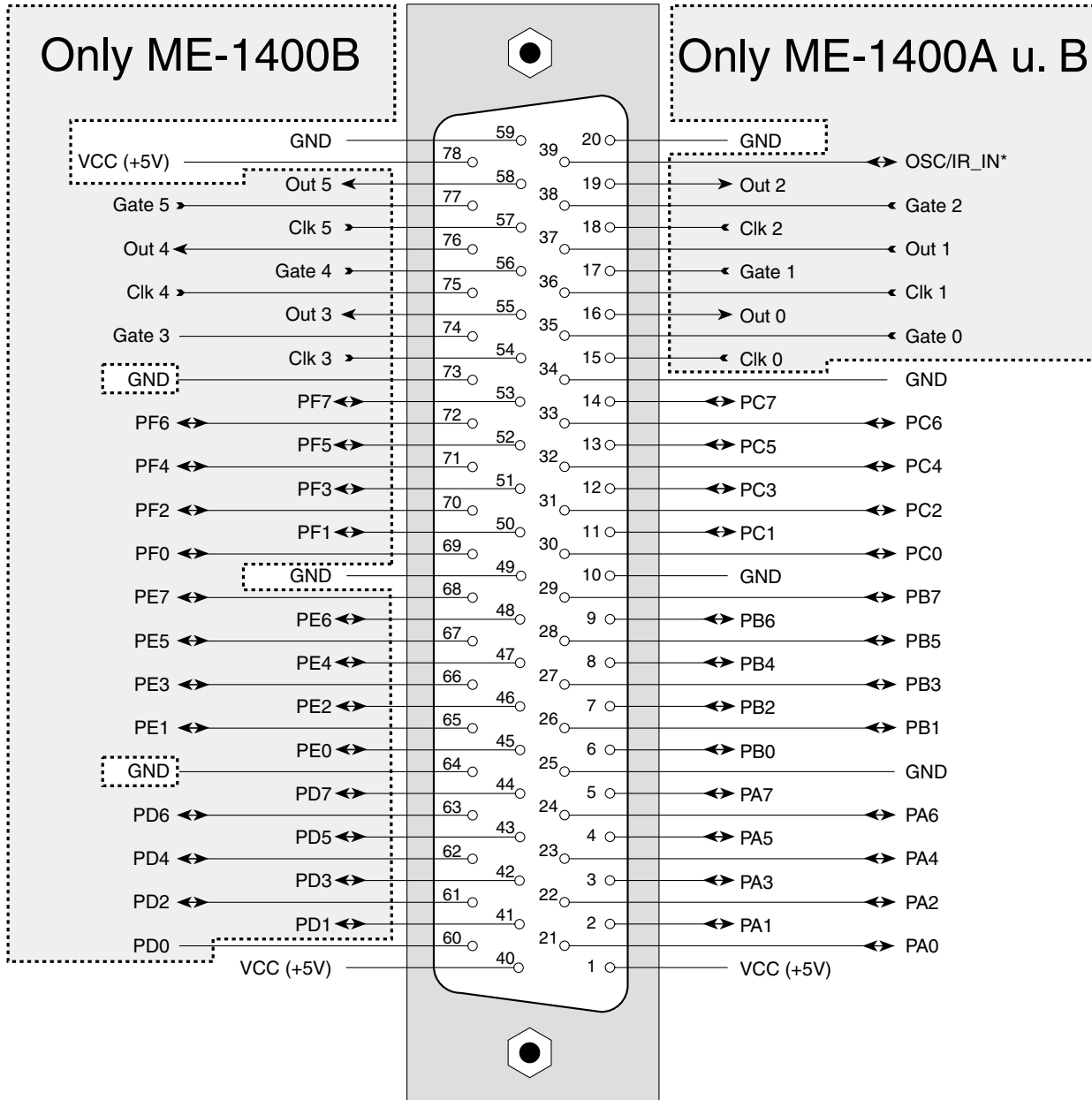


Diagram 14: 78pin female D-Sub connector ME-1400/A/B

*Only in operation on ME-1400/A/B. When programming with the ME-iDS this pin is always an interrupt input.

B3 Special Cable for ME-1400C/D

Ordering code: ME AK-D78/1400CD

Description	Color	Signal	D-Sub Pin	Description	Color	Signal	D-Sub Pin
Counter 0 (T0)	black	Clk 0	15	Counter 9 (T9)	black	Clk 9	64
	brown	Out 0	16		brown	Out 9	65
	red	Gate 0	35		red	Gate 9	45
Counter 1 (T1)	black	Clk 1	36	Counter 10 (T10)	black	Clk 10	46
	brown	Out 1	37		brown	Out 10	47
	red	Gate 1	17		red	Gate 10	66
Counter 2 (T2)	black	Clk 2	18	Counter 11 (T11)	black	Clk 11	67
	brown	Out 2	19		brown	Out 11	68
	red	Gate 2	38		red	Gate 11	48
Counter 3 (T3)	black	Clk 3	54	Counter 12 (T12)	black	Clk 12	40
	brown	Out 3	55		brown	Out 12	41
	red	Gate 3	74		red	Gate 12	60
Counter 4 (T4)	black	Clk 4	75	Counter 13 (T13)	black	Clk 13	61
	brown	Out 4	76		brown	Out 13	62
	red	Gate 4	56		red	Gate 13	42
	Counter 5 (T5)	black	Clk 5	57	Counter 14 (T14)	black	Clk 14
brown		Out 5	58	brown		Out 14	44
red		Gate 5	77	red	Gate 14	63	
Counter 6 (T6)	black	Clk 6	49	IRQ	black	Vcc	78
	brown	Out 6	50		brown	GND	59
	red	Gate 6	69		red	GND	20
Counter 7 (T7)	black	Clk 7	70		orange	IR_IN	39
	brown	Out 7	71				
	red	Gate 7	51				
Counter 8 (T8)	black	Clk 8	52				
	brown	Out 8	53				
	red	Gate 8	72				

(Digital ports see next page)

Table 4: Special cable ME-1400C/D

Special cable ME-1400C/D (continued)

Description	Color	Signal	D-Sub Pin	Description	Color	Signal	D-Sub Pin
DIO	white	PA0	21	DIO (continued)	orange	PC0	30
	white/black	PA1	2		orange/black	PC1	11
	black	PA2	22		orange/white	PC2	31
	black/white	PA3	3		orange/brown	PC3	12
	brown	PA4	23		yellow	PC4	32
	brown/white	PA5	4		yellow/black	PC5	13
	purple	PA6	24		yellow/white	PC6	33
	purple/white	PA7	5		yellow/brown	PC7	14
	red	PB0	6		green	Vcc	1
	red/black	PB1	26		green/black	GND	25
	red/white	PB2	7		green/white	GND	10
	red/brown	PB3	27		green/brown	GND	34
	pink	PB4	8				
	pink/black	PB5	28				
	pink/white	PB6	9				
	pink/brown	PB7	29				

Table 5: Special cable ME-1400C/D (continued)

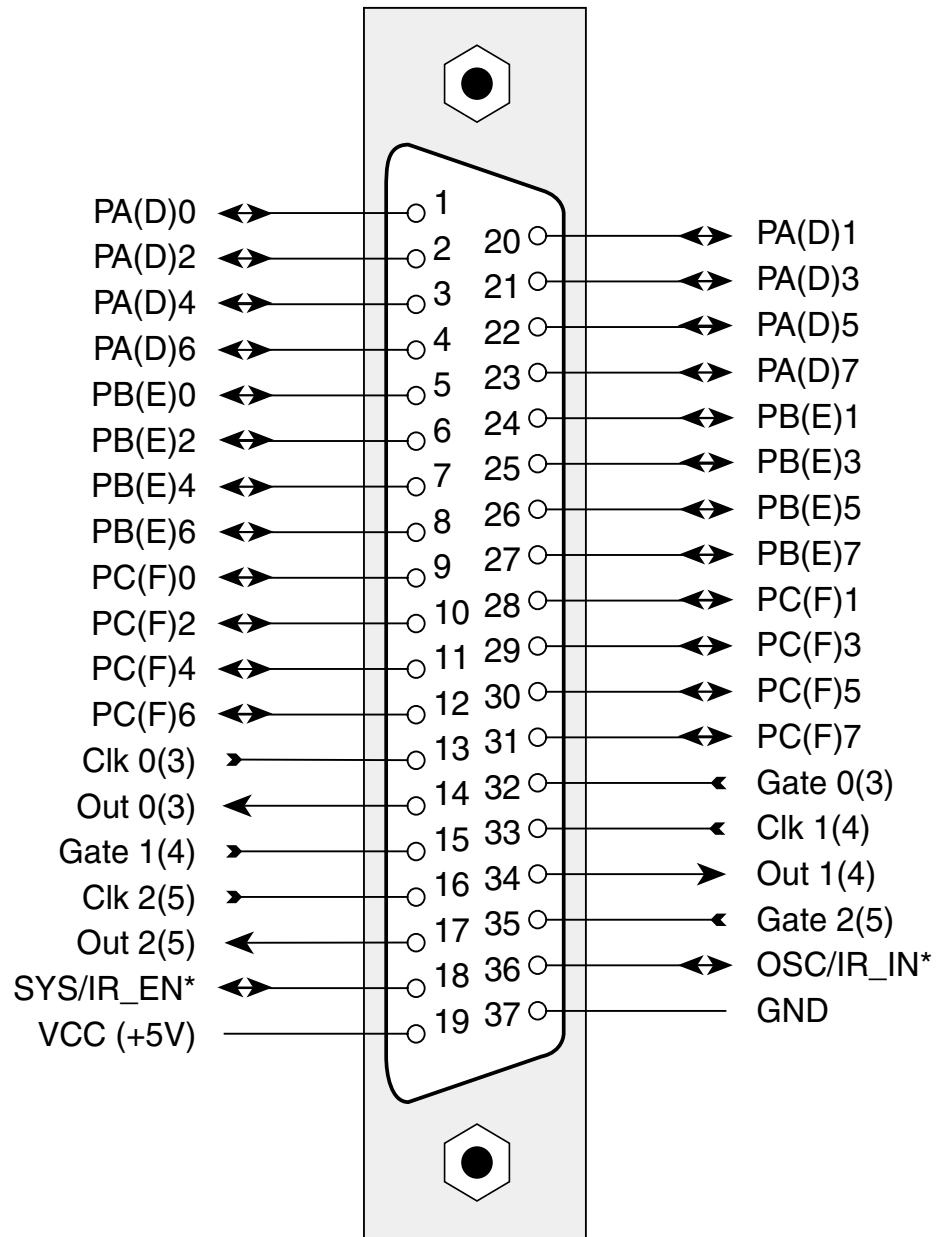
B4 ME-1400E/EA/EB

Diagram 16: Pinout of the 37pin female D-Sub

Note:

Ports D, E and F (in brackets) are only available on B-versions in combination with an additional mounting bracket (included with the package), see also B5 and B6.

* Functional overview see table on the next page.

B5 IDC Connector for B-Versions (ST2)

Port D	PD0	1	•	•	2	PD1
	PD2	3	•	•	4	PD3
	PD4	5	•	•	6	PD5
	PD6	7	•	•	8	PD7
Port E	PE0	9	•	•	10	PE1
	PE2	11	•	•	12	PE3
	PE4	13	•	•	14	PE5
	PE6	15	•	•	16	PE7
Port F	PF0	17	•	•	18	PF1
	PF2	19	•	•	20	PF3
	PF4	21	•	•	22	PF5
	PF6	23	•	•	24	PF7
Timer	Clk 3	25	•	•	26	Gate 3
	Out 3	27	•	•	28	Clk 4
	Gate4	29	•	•	30	Out 4
	Clk 5	31	•	•	32	Gate 5
	Out 5	33	•	•	34	OSC/IR_IN*
	SYS/IR_EN*	35	•	•	36	GND
	+5 V	37	•	•	38	NC
	NC	39	•	•	40	NC

Abb. 17: Pinout of the 40pin IDC-connector

	37pin D-Sub		40pin IDC connector (ST2)	
	SYS/IR_EN (Pin 18)	OSC/IR_IN (Pin 36)	SYS/IR_EN (Pin 35)	OSC/IR_IN (Pin 34)
ME-1400E	n.c.	–	–	–
ME-1400EA	n.c.	–/✓	–	–
ME-1400EB	n.c.	–/✓	n.c.	n.c.

* When programming with the ME-iDS the „OSC“ function is only supported by Linux at the moment.

B6 Additional Mounting Bracket

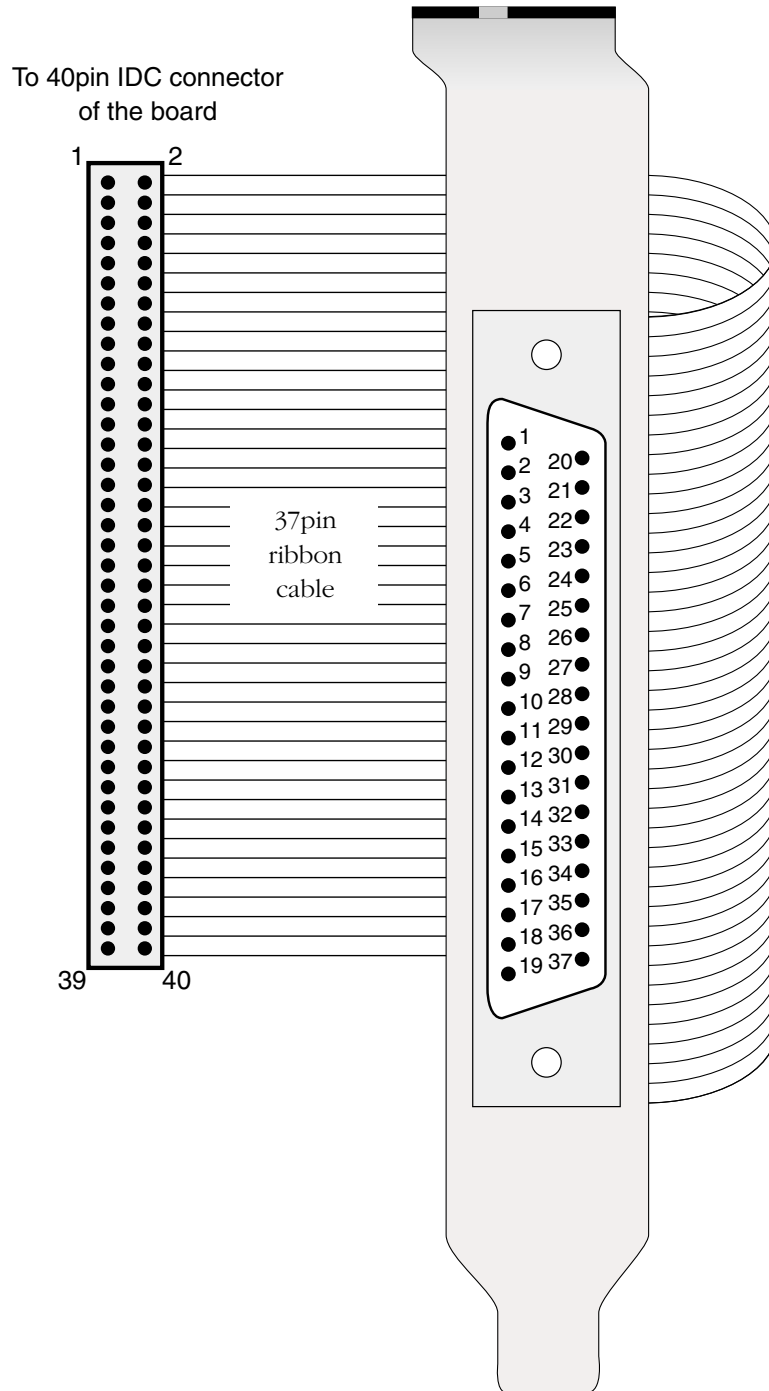


Diagram 18: Mounting bracket with female D-Sub for ME-14B and ME-1400EB (schematic diagram, see Diagram 16: for pinout)

C Accessories

Optionally the following products are available:

ME-63Xtend Series

External relay and digital-I/O boards for direct connect to ME-1400/A/B via an 1:1 cable (e. g. ME AK-D78).

ME-UB Series

External connector, relay and digital-I/O boxes for direct connect to ME-1400/A/B via the special cable ME AK-D7815/1400.

ME AB-D37M

37pin D-Sub connector block (male) for ME-1400E

ME AK-D37

37pin D-Sub cable (male - female), 2 m, for ME-1400E

ME AB-D78M

78pin D-Sub connector block (male) for ME-1400, ME-1400A, ME-1400B, ME-1400C, ME-1400D

ME AK-D78/x

78pin D-Sub cable (male - female) for ME-1400, ME-1400A, ME-1400B, ME-1400C, ME-1400D; different lengths available

ME AK-D78/1400CD

1 m cable. 78-pin D-sub male to open ends. Special cable for ME-1400C and D

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 41

 Cables 41

 Connector block 41

Appendix 31

B

Block diagrams 13

C

Cable ME-1400C/D 36

Cascading the Counters 18

Connectors 34

Counter

 Cascading 28

 Operation Modes 27

 Programming 27

D

Digital-I/O 16

 Programming 25

Driver Update 42

F

Features 8

H

Hardware Description 13

I

Interrupt

 Programming 29

Introduction 5

M

Model Overview 8

O

Operation Modes

 Simple Input/Output 26

P

Pinout 34

Programming

 Counter 27

 Digital-I/O 25

 Interrupt 29

 Pulse Width Modulation 20, 29

S

Service and Support 42

Software Support 9

Specifications 31

System Requirements 9

T

Technical Questions 43

W

Warnings 5