PCI-BASE1000

PCI-Multifunction Measuring Card for MAD/MDA/MDIO/MCAN Modules

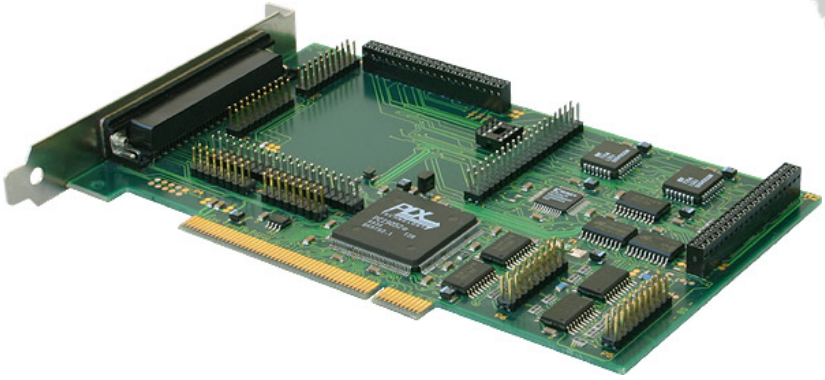
bmc messsysteme gmbh

Features

- 2 slots for plug-on modules (series: MAD, MDA, MDIO, MCAN) => up to 32 analog channels
- FIFO for fast data acquisition
- PCI bus compatible (short PCI!)
- 32 digital channels

Applications

- acquisition of analog signals
- analog controls
- acquisition of digital events
- digital controls
- use in the automotive field



BMC Messsysteme GmbH proudly presents the

... PCI multi-function measuring card ...

with a highly integrated and modular concept at an unbeatable price which allows the user to tackle any measuring task by assembling his individual measuring card.

With the analog input modules of the MAD series, for example, up to

... 32 analog inputs ...

with 12 or 16 bit resolution are available and total sampling rates of

... max. 1 MHz ... .

can be reached. Combined with a CAN interface module, analog measurements and via the CAN interface are sampled time synchronously.
The recorded data can be displayed and stored simultaneously to hard disk.
The switch-over from one measuring range to another is defined for each channel separately and does not influence the sampling rate.

... 16 digital inputs and outputs each ...

are available on the **PCI-BASE** plate so that the base plate without any analog modules itself represents a digital I/O card.
Additional digital channels with galvanic isolation are provided by the modules of the MDIO series.

Included as accessory is the hardware independent ActiveX control **LibadX** for programming under Windows® 2000/XP/Vista.

Included as accessory is the hardware independent ActiveX control **LibadX** for programming under Windows® 2000/XP/Vista.

In addition, the **PCI-BASE1000** can be used under Windows® 2000/XP/Vista together with our powerful software for acquisition and processing of measuring data

... NextView® 4 ... .

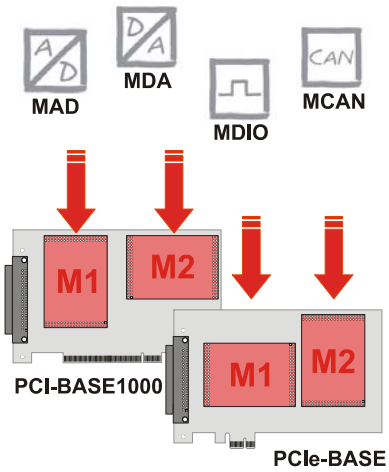
It is available as "Professional", "Lite" or "Client/Server" version.
The free version **NextView® 4 Live!** is included with delivery.

With **NextView® 4 Live!**, the entire functional range of the **PCI-BASE1000** can be tested.

In order to access the analog inputs 17..32, a PC card bracket with an additional 37-pole Sub-D female connector plus connecting cable (*ZUKA16*) is available as accessory.

For further information and software updates, please visit our website at:

http://www.bmcm.de



1 Module concept

1.1 Overview

The following PCB view shows the module slots M1 and M2, which can be assembled with analog data acquisition modules (MAD series), analog control modules (MDA series), digital I/O modules (MDIO series) or a CAN interface module (MCAN). They can be used in any combination.

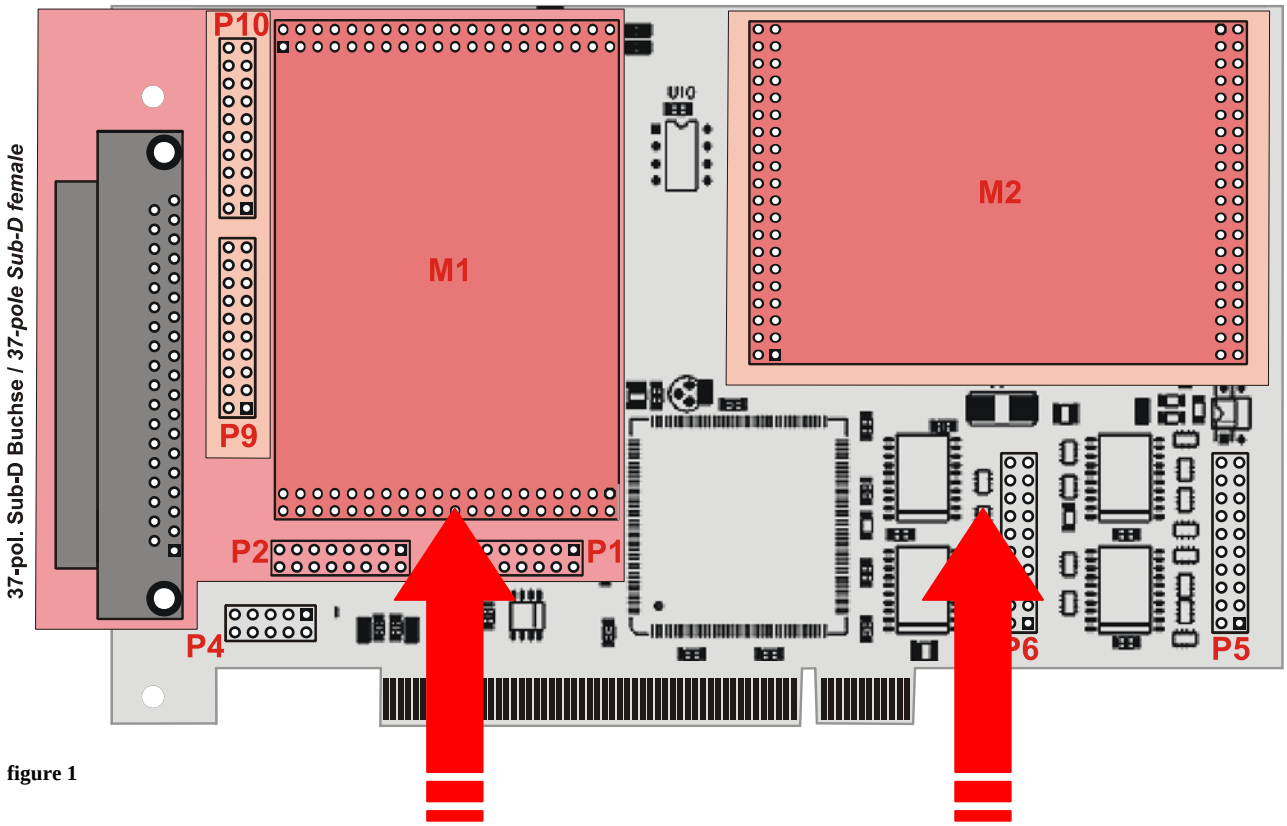


figure 1

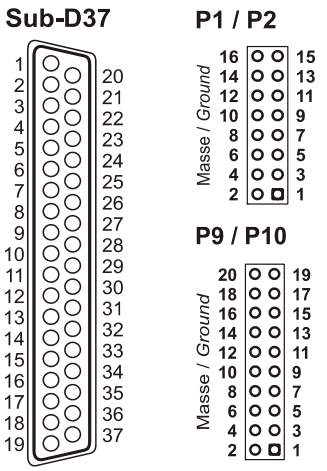
- **MAD16f**
  16 AIn, 500kHz, 16 bit
- **MAD16a**
  16 AIn, 100kHz, 16 bit
- **MAD12a**
  16 AIn, 100kHz, 12 bit

- **MDA16**
  2 AOut, 10µs, 16 bit
- **MDA16-4i**
  4 AOut (isol.), 10µs, 16 bit
- **MDA12**
  2 AOut, 10µs, 12 bit
- **MDA12-4**
  4 AOut, 10µs, 12 bit

- **MDIO**
  32 Digital I/O
  counter function
- **MDIOi**
  16 DIn (isolated),
  16 DOut (isolated),
  counter function

- **MCAN**
  2 CAN (isolated),
  max. 1Mbit

1.2 Module slots M1 and M2

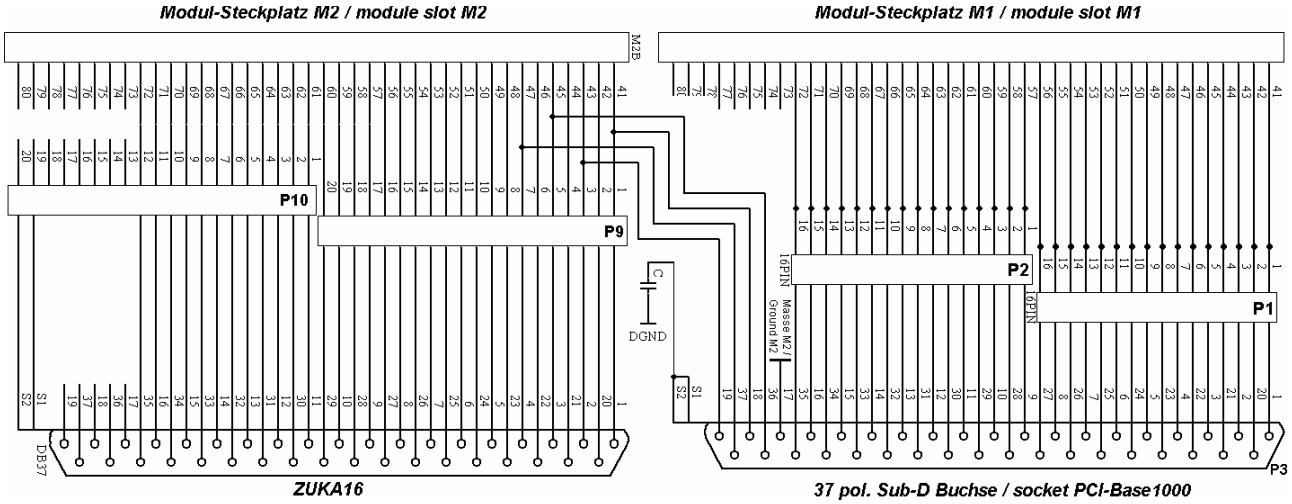


The channels of the module slot M1 are available at the 37-pole Sub-D connector as well as at the pin connectors P1, P2.

The connections of the second module slot M2 are accessible at the pin connectors P9, P10.

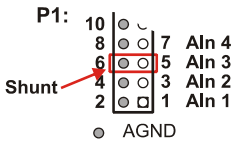
With the optional accessory *ZUKA16* (see chapter 2.1.1), the channels of the module slot M2 are lead out to an additional 37-pole Sub-D female connector (connect line 1 (colored) of *ZUKA16* with pin 1 of the pin connector K3 (square pad), attach 2. connector in parallel to K4).

The figure below shows the pin assignment of the module slots M1 and M2 of the **PCI-BASE1000**:



1.2.1. Current measurement

Analog input modules (MAD) installed on module slot M1 can be also used for current measurement. To install current shunts (e.g. *ZU-CS250R*) at the 20-pole pin connectors P1 and P2, connect the pin of the relating analog input with the opposite ground pin by a resistor (current shunt).



1.2.2. Lead analog outputs from M2 to Sub-D37

If an analog output module MDA12, MDA16 or MDA12-4 is mounted on slot M2, these analog outputs are led out to the free pins of the 37-pole Sub-D female of the **PCI-BASE1000** to be available from the outside.

Leitung M2	MDA12	MDA 12-4	MDA 16	Pin P2	Sub-D37 Buchse
41	AOut1	AOut1	AOut1	15	18
43	AOut2	AOut2	AOut2	17	19
45	-	AOut3	-	14	36
47	-	AOut4	-	16	37
42, 44, 46, 48	AGND	AGND	AGND	13	17

- **The corresponding ground pin for the analog channels of the M2 module slot is exclusively available at pin 17 of the Sub-D37.**
- **The channels of the analog output module MDA16-4i are not led out to the Sub-D37 female of the PCI-BASE1000.**

1.3 Pin assignments of the module slots

Analog inputs of a MAD module can be operated both in single-ended (se) and differential (diff.) mode.

MODULE SLOT M1		DATA ACQUISITION and CONTROL MODULES							MODULE SLOT M2	
Sub-D37 (PCI-BASE)	Plug / Pin	MAD (se)	MAD (diff.)	MDA 12/16	MDA 12-4/16-4i	MDIO (Port/Line)	MDIOi	MCAN	Sub-D37 (ZUKA16)	Plug / Pin
1	P1 / 1	AIn 1	+ AIn 1	AOut 1	AOut 1	B/1	DOut 1	-	1	P9 / 1
2	P1 / 3	AIn 2	+ AIn 2	AOut 2	AOut 2	B/3	DOut 3	CAN1 L	2	P9 / 3
3	P1 / 5	AIn 3	+ AIn 3	-	AOut 3	B/5	DOut 5	CAN1 GND	3	P9 / 5
4	P1 / 7	AIn 4	+ AIn 4	-	AOut 4	B/7	DOut 7	-	4	P9 / 7
5	P1 / 9	AIn 5	+ AIn 5	-	-	B/9	DOut 9	-	5	P9 / 9
6	P1 / 11	AIn 6	+ AIn 6	-	-	B/11	DOut 11	-	6	P9 / 11
7	P1 / 13	AIn 7	+ AIn 7	-	-	B/13	DOut 13	CAN2 H	7	P9 / 13
8	P1 / 15	AIn 8	+ AIn 8	-	-	B/15	DOut 15	-	8	P9 / 15
9	P2 / 1	AIn 9	- AIn 1	-	-	5V	-	CAN2 5V	9	P9 / 17
10	P2 / 3	AIn 10	- AIn 2	-	-	DGND	DGND	-	10	P9 / 19
11	P2 / 5	AIn 11	- AIn 3	-	-	A/1	DIn 1	-	11	P10/ 1
12	P2 / 7	AIn 12	- AIn 4	-	-	A/3	DIn 3	-	12	P10/ 3
13	P2 / 9	AIn 13	- AIn 5	-	-	A/5	DIn 5	-	13	P10/ 5
14	P2 / 11	AIn 14	- AIn 6	-	-	A/7	DIn 7	-	14	P10/ 7
15	P2 / 13	AIn 15	- AIn 7	-	-	A/9	DIn 9	-	15	P10/ 9
16	P2 / 15	AIn 16	- AIn 8	-	-	A/11	DIn 11	-	16	P10/ 11
17*	-	-	-	-	-	A/13	DIn 13	-	17	-
18*	-	-	-	-	-	A/15	DIn 15	-	18	-
19*	-	-	-	-	-	DGND	DGND	-	19	-
20	P1 / 2	AGND	-	AGND	AGND	B/2	DOut 2	-	20	P9 / 2
21	P1 / 4	AGND	-	AGND	AGND	B/4	DOut 4	CAN1 H	21	P9 / 4
22	P1 / 6	AGND	-	-	AGND	B/6	DOut 6	-	22	P9 / 6
23	P1 / 8	AGND	-	-	AGND	B/8	DOut 8	CAN1 5V	23	P9 / 8
24	P1 / 10	AGND	-	-	-	B/10	DOut 10	-	24	P9 / 10
25	P1 / 12	AGND	-	-	-	B/12	DOut 12	CAN2 L	25	P9 / 12
26	P1 / 14	AGND	-	-	-	B/14	DOut 14	CAN2 GND	26	P9 / 14
27	P1 / 16	AGND	-	-	-	B/16	DOut 16	-	27	P9 / 16
28	P2 / 2	AGND	-	-	-	5V	-	-	28	P9 / 18
29	P2 / 4	AGND	-	-	-	DGND	DGND	-	29	P9 / 20
30	P2 / 6	AGND	-	-	-	A/2	DIn 2	-	30	P10/ 2
31	P2 / 8	AGND	-	-	-	A/4	DIn 4	-	31	P10/ 4
32	P2 / 10	AGND	-	-	-	A/6	DIn 6	-	32	P10/ 6
33	P2 / 12	AGND	-	-	-	A/8	DIn 8	-	33	P10/ 8
34	P2 / 14	AGND	-	-	-	A/10	DIn 10	-	34	P10/ 10
35	P2 / 16	AGND	-	-	-	A/12	DIn 12	-	35	P10/ 12
36*	-	-	-	-	-	A/14	DIn 14	-	36	-
37*	-	-	-	-	-	A/16	DIn 16	-	37	-

*** different assignment, if analog output channels of the2nd module slot are lead through (see chapter 1.2.2)**

- **4 digital lines of the MDIO modules and one ground pin are not available with the PCI-BASE1000!**
- **The modules of the MDIO series can only be installed in slot M1.**

2 Digital inputs and outputs

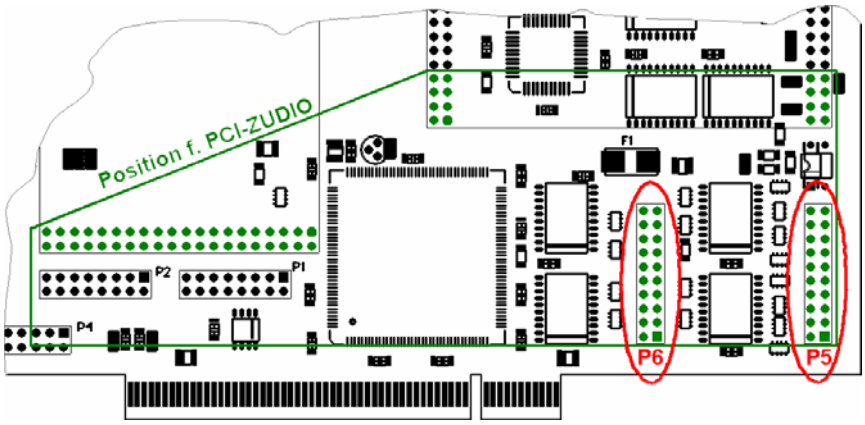


fig. 1

The **PCI-BASE1000** provides for two digital channels with 16 input and 16 output lines. The direction of the digital interface is hard-wired. The connections for the digital inputs and outputs are designed as two 20-pole connectors (male) on the board.

- Pin connector P5 => Input channels 1..16
- Pin connector P6 => Output channels 1..16

The digital in-/ outputs are protected by serial resistors!

2.1 Additional options for the digital channels of the PCI-BASE1000

Two additional options make the digital channels externally available: the connection cable ZUKA16 and the digital I/O adapter PCI-ZUDIO. For detailed informationen see the corresponding data sheet or visit www.bmcm.de.

2.1.1. Connection cable ZUKA16

Via a flat ribbon cable, the optionally available connection cable *ZUKA16* leads out the channels provided at two 20-pole pin connectors each to a 37-pole Sub-D female connector with bracket, which is mounted at a free PC slot.

The line of the flat ribbon cable leading to pin 1 of the Sub-D37 is colored.

With the *ZUKA16*, the channels provided by module slot M2 (see chapter 1.2) and the digital lines of the **PCI-BASE1000** (connect line 1 (colored) of *ZUKA16* with pin 1 of the pin connector P6 (square pad), attach 2. connector in parallel to K5) can be reached externally.

2.1.2. Digital I/O adapter PCI-ZUDIO

With the PCI-ZUDIO you can lead out the digital channels provided at the pin connectors P5, P6 to the 37-pole Sub-D socket of the **PCI-BASE1000** if using the **PCI-BASE1000** as a digital PCI interface card (PCI-PIO).

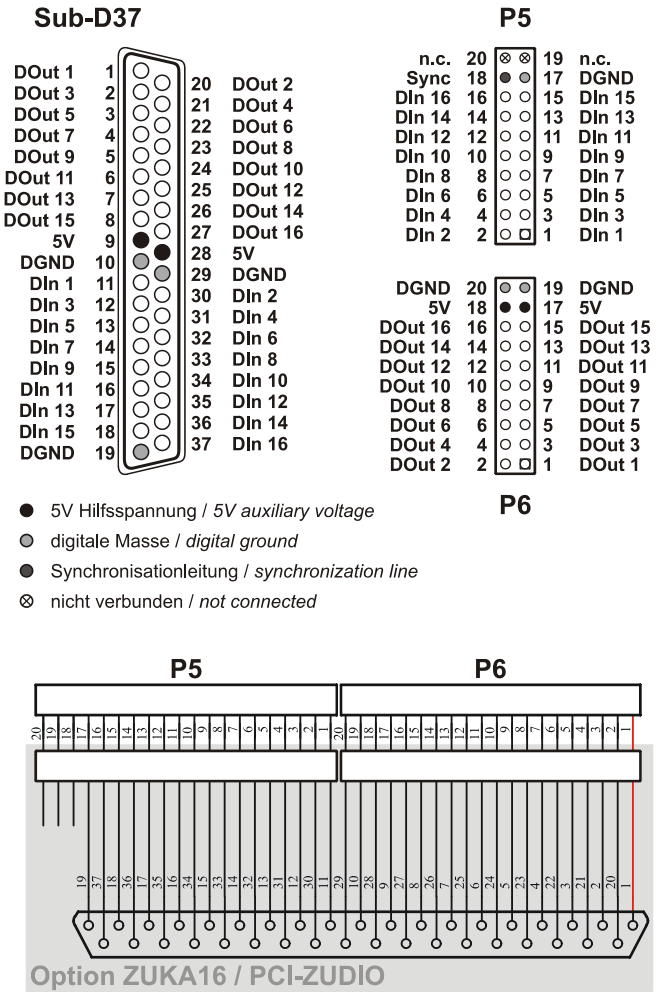
Therefore plug the pin connectors of the PCI-ZUDIO onto the connectors of the **PCI-BASE1000** as shown fig. 1 (pins marked in green).

If using the PCI-ZUDIO the module slots M1 and M2 are not provided!

2.2 Pin assignment

The following table shows the pin assignment of the pin connectors P5 and P6 as well as of the 37-pole Sub-D female connector, which the digital lines are accessible at if using *ZUKA16* or *PCI-ZUDIO*:

Function	Sub-D 37	Pin connector / Pin
DOut 1	1	P6 / 1
DOut 2	20	P6 / 2
DOut 3	2	P6 / 3
DOut 4	21	P6 / 4
DOut 5	3	P6 / 5
DOut 6	22	P6 / 6
DOut 7	4	P6 / 7
DOut 8	23	P6 / 8
DOut 9	5	P6 / 9
DOut 10	24	P6 / 10
DOut 11	6	P6 / 11
DOut 12	25	P6 / 12
DOut 13	7	P6 / 13
DOut 14	26	P6 / 14
DOut 15	8	P6 / 15
DOut 16	27	P6 / 16
+5V	9	P6 / 17
+5V	28	P6 / 18
DGND	10	P6 / 19
DGND	29	P6 / 20
DIn 1	11	P5 / 1
DIn 2	30	P5 / 2
DIn 3	12	P5 / 3
DIn 4	31	P5 / 4
DIn 5	13	P5 / 5
DIn 6	32	P5 / 6
DIn 7	14	P5 / 7
DIn 8	33	P5 / 8
DIn 9	15	P5 / 9
DIn 10	34	P5 / 10
DIn 11	16	P5 / 11
DIn 12	35	P5 / 12
DIn 13	17	P5 / 13
DIn 14	36	P5 / 14
DIn 15	18	P5 / 15
DIn 16	37	P5 / 16
DGND	19	P5 / 17
Sync	-	P5 / 18
n.c.	-	P5 / 19
n.c.	-	P5 / 20

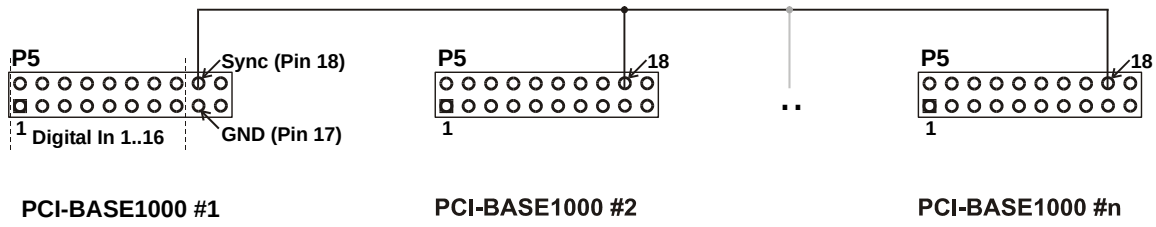


2.3 5V Auxiliary voltage

The **PCI-BASE1000** provides an auxiliary voltage (e.g. for sensor supply) at pin 17, 18 of the pin connector P6. The 5V DC output (100mA) is protected by a fuse (multifuse). In case of overload, it is sufficient to interrupt the power supply (turn off PC or disconnect the consumer load). After app. 1 min. the multifuse is regenerated.

3 Synchronization

When using several **PCI-BASE1000** they can be synchronized with each other, so that measurements on channels of different cards match together in time. The connection for the synchronization line is located at pin 18 of the 20-pole pin connector P5 (see fig. 1) and is done as illustrated in the following figure.



Synchronization of the previous versions PCI-BASE50/300 and MAD12/MAD12f/MAD16 is not possible!

4 Software installation

All the software for Windows® 2000/XP/Vista and documentation available for the **PCI-BASE1000** is integrated on the "Software Collection"-CD included with delivery. When inserting the CD a CD starter opens automatically (otherwise: start `setup.exe`).


PCI-BASE1000

Change to the product page of the **PCI-BASE1000** by selecting the entry "Products" in the CD starter and then the hardware ("PCI-BASE1000") listed under the interface "PCI".

For detailed information about installing or operating the software please see the corresponding manuals. To open the documentation in PDF format the Adobe Acrobat Reader is required.

You can run any installation directly from CD. If your browser prevents this first save the setup program to hard disc before running it separately afterwards.

Software	Software product	Notes	Documentation
Device driver	BMCM-DR (driver package)	1. install driver package to hard disc 2. Windows® Plug&Play installation	BMCM-DR-IG (driver installation manual)
Programming	STR-LIBADX	ActiveX control for hardware independent programming	STR-LIBADX-IG (installation / programming manual)
	STR-LIBADX-EX	example programs for LIBADX ActiveX control	-
	STR-PCI	easy-to-use ActiveX control for programming with Visual Basic®, Delphi®, Visual C++™	STR-PCI-Base-IG (installation / programming manual)
	STR-PCI-EX	example programs for STR-PCI ActiveX control	-
Operating program	NV4-LIVE	free online version of NextView®4 for testing the functional range of the hardware	NV4-IG (installation Stand-alone version) IG-NV4-CS (inst. Client/Server version) NV4-UM (user manual) "First steps" in the NextView®4 demo project (displayed at first start of the software)
	NV4	measuring software NextView®4 (requires license number, no freeware!)	
	NV4-SERV NV4-WORK	Client/Server version of NV4 consisting of NextView®4 Server and NextView®4 Workstation	

4.1 Driver installation

For the **PCI-BASE1000** a driver installation is always required. Only then additional software can be installed. To make sure that the installation is done correctly, please follow the instructions in the order as described below.

4.1.1. Install driver package

The prior installation of the bmcm driver package BMCM-DR to the hard disc of your PC makes the driver search for Windows® much easier. Especially in case of driver updates only the new driver package has to be installed, the hardware automatically uses the new version. The link to install the driver package is located on the **PCI-BASE1000** product page of the "Software Collection"-CD.

4.1.2. Plug&Play installation

Mount the **PCI-BASE1000** into a free PCI card slot of the off-state PC. At the next start of the PCs the system announces the new hardware. Start the automatic hardware detection by selecting the following option:

- **Windows® XP**: "Install the software automatically" (SP2: do not connect with Windows® Update!)
- **Windows® 2000**: "Search for a suitable driver for my device"

Under Windows® Vista no selections have to be made. The driver is found and installed automatically upon connection of the hardware, because the driver package has been installed on hard disc before. For the same reason no additional location needs to be entered for the driver search under Windows® 2000.

4.1.3. Check installation

In the Windows® Device Manager the entry "Data Acquisition (BMC Messsysteme GmbH)" is included after successful installation displaying the installed bmcm hardware. To open the Device Manager proceed as follows:

- **Windows® Vista**: Start / Control Panel/ System / "Device Manager"
- **Windows® XP**: Start / Control Panel / System / TAB "Hardware" / button "Device Manager"
- **Windows® 2000**: Start / Settings / Control Panel / System / TAB "Hardware" / button "Device Manager"

Double click the **PCI-BASE1000** to open its properties. For general information, any existing device conflicts and possible sources of error see TAB "General".

4.2 Programming

Programming the **PCI-BASE1000** under Windows® 2000/XP/Vista with Visual Basic®, Delphi®, Visual C++™ is possible with the hardware independent STR-LIBADX ActiveX control or with the Libad4 SDK (SDK-LIBAD). They are available on the **PCI-BASE1000** product page of the "Software Collection"-CD. After installation, the ActiveX control must be loaded into the respective programming environment.

- **Visual Basic®**: menu "Project / Components", entry "LIBADX Object Library 4.0"
- **Delphi®**: menu "Components / Import ActiveX", entry "LIBADX Object Library 4.0"

The easy-to-use, product specific ActiveX controls STR-PCI are located on the on the **PCI-BASE1000** product page of the "Software Collection"-CD. Checkmark "PCI-Base ActiveX Controls 1.2" to load the card into the programming environment.

If you select the entry STR-LIBADX-EX listed directly under the installation program of the corresponding ActiveX control, you can install example programs (incl. source code) demonstrating how to apply the ActiveX control.

- **Using the 4 SDK requires advanced programming experience!**
- **An MCAN module on the data acquisition card can only be programmed with the Libad 4 SDK.**
- **All other modules on the PCI-BASE1000 can be addressed with the LibadX ActiveX control. However, both the counter function of the MDIO modules and the generator function of the MDA16-4i are only available with the Libad 4 SDK.**

4.3 Using the PCI-BASE1000 with NextView®4

Install the "Live!" version of the professional software NextView®4 for measurement data acquisition and processing to test the features and functions of the **PCI-BASE1000** directly. The setup program NV4-LIVE is available in the section "NextView® 4.x". Select your measuring system (**PCI-BASE1000**) by pressing the button "Add" in the dialog "Device Setup" of the installation program.

When you open the software you get first instructions about how to operate the program. For detailed information an online help is provided.

With NextView®4 Live!, signals cannot be stored. The full version NextView®4 is no freeware and requires a license number!

5 Important notes for using the PCI-BASE1000

- The **PCI-BASE1000** is only suitable for extra-low voltages - please observe the relevant regulations!
- The **PCI-BASE1000** must only be used in closed PC housings (for reasons relating to EMC).
- All accessible pins are electrostatic sensitive devices. Provide for a conductive work place connected to ground.
- For CE reasons use well shielded cables, connect shield at one end only. Close open inputs, if possible. Close open inputs if necessary. ESD voltages at open lines may cause malfunction.
- The **PCI-BASE1000** ground is electrically connected to the chassis of the PC, which is usually also connected to ground. Be sure to avoid ground loops since they will cause measuring errors!
- For cleaning use water and mild detergent only. The modules are designed to be maintenance-free.
- The device must not be used for safety-relevant tasks. With the use of the product the customer becomes manufacturer by law and is therefore fully responsible for the proper installation and use of the product. In the case of improper use and/or unauthorized interference our warranty ceases and any warranty claim is excluded.
- Improper installation of the modules on the **PCI-BASE1000** may damage the modules and/or the **PCI-BASE1000**. When removing the modules use only blunt tools! Exposing the card to strong vibrations requires additional protection of the modules.
- When connecting internal ribbon cables to the **PCI-BASE1000**, please observe that the modules are well ventilated to prevent excess heating. Also observe the temperature ranges of the PC.
- In case of overload interrupt the power supply (turn off PC), so that the multifuse on the board regenerates. After app. 1 min. the fuse is ready for use.

Do not dispose of the product in the domestic waste or at any waste collection places. It has to be either duly disposed according to the WEEE directive or can be returned to bmcm at your own expense.

6 Technical Data PCI-BASE1000 (typical at 20°C and 5V supply)

- **Sampling parameters (in connection with measuring and analysis software NextView®4)**

Max. total sampling rate*:	dep. on the modules used, max. 1 MHz with 2x MAD16f
FIFO:	4kByte
Memory depth:	depending on the RAM or HD space available (up to 4GByte)

*** The total sampling rate is the sum of the sampling rates of the individual used channels (e.g. from 5 channels scanned with 10kHz results an total sampling rate of 50kHz).**

- **Digital in-/ outputs**

Digital input channels:	16x TTL
Digital output channels:	16x TTL
Level:	CMOS/TTL-level (0 = 0.0V..0.5V; 1 > 2.6V..5.0V)
Digital IN R_i:	1MΩ
Digital IN surge resistant to:	20V DC, max. ±20mA in total of all input channels!
Digital OUT R_i // Output current:	1kΩ // 1mA

- **Signal connection**

Analog in-/ outputs (of MAD/MDA modules):	All channels are accessible at a 37-pole Sub-D socket at the PC-card bracket or via pin connectors.
Digital channels:	2x20-pole pin connectors on the board; the ZUKA16 (optional) leads out the digital to a 37-pole Sub-D socket, the PCI-ZUDIO (optional) to the 37-pole Sub-D socket of the PCI-BASE1000

- **General data**

Power supply:	+4.5V..+5.5V from PCI-Bus, max. 200mA + power of the modules
Bus connection:	PCI-Bus
CE standards:	EN61000-6-1, EN61000-6-3, EN61010-1; for decl. of conformity (PDF) visit www.bmcm.de
ElektroG // ear registration:	RoHS and WEEE compliant // WEEE Reg.-No. DE75472248
Max. permissible potentials:	**60V DC acc. to VDE**, max. 2kV ESD on the lines
Temperature ranges:	operating temp. –25°C..+50°C, storage temp. –25°C..+70°C
Relative humidity:	0–90% (not condensing)
Size:	178 x 103 x 13,5 mm^3
Delivery:	product, PC bracket, "Software Collection" CD with drivers and documentation, description
Available accessories:	cable with PC-bracket for internal connection ZUKA16, digital I/O adapter PCI-ZUDIO, 37-pole Sub-D plug ZUST37, connecting cables ZUKA37SB, ZUKA37SS, optocoupler board OI16-PC, connector panels ZU37BB/-CB/-CO, current shunt ZU-CS250R, modules of the series MAD/MCAN/MDA
Guarantee:	2 years with effect from sales date, damages at product resulting from improper use excluded

- **Software**

Software on CD (included):	ActiveX Controls LibadX (hardware independent) and STR-PCI for programming under Windows® 2000/XP/Vista; measuring program NextView®4 Live! to test and operate the hardware
NextView®4 (optional):	professional software (versions: Professional, Lite, Client/Server) for the acquisition and analysis of measurement data under Windows® 2000/XP/Vista

Manufacturer: BMC Messsysteme GmbH. Subject to change due to technical improvements. Errors and printing errors excepted. Rev. 6.2 08/31/2009