DIN EN ISO 9001
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CE

Technical description

CPCI-7500

4-port serial interface

Edition: 03.04 - 09/2006

Product information

This manual contains the technical installation and important instructions for correct commissioning and usage, as well as production information according to the current status before printing.
The content of this manual and the technical product data may be changed without prior notice.
ADDI-DATA GmbH reserves the right to make changes to the technical data and the materials included herein.

Warranty and liability

The user is not permitted to make changes to the product beyond the intended use, or to interfere with the product in any other way.
ADDI-DATA shall not be liable for obvious printing and phrasing errors. In addition, ADDI DATA, if legally permissible, shall not be liable for personal injury or damage to materials caused by improper installation and/or commissioning of the board by the user or improper use, for example, if the board is operated despite faulty safety and protection devices, or if notes in the operating instructions regarding transport, storage, installation, commissioning, operation, thresholds, etc. are not taken into consideration. Liability is further excluded if the operator changes the board or the source code files without authorisation and/or if the operator is guilty of not monitoring the permanent operational capability of working parts and this has led to damage.

Copyright

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Please read this licence carefully before using the standard software. The customer is only granted the right to use this software if he/she agrees with the conditions of this licence.
The software must only be used to set up the ADDI-DATA boards.
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Trademarks

WARNING

In case of wrong uses and if the board is not used for the purpose it is intended:

- **people may be injured**

- **the board, PC and peripheral may be destroyed**

- **the environment may be polluted**

- **Protect yourself, the others and the environment!**
- **Read carefully the safety precautions (yellow leaflet).**

  If this leaflet is not with the documentation, please contact us and ask for it.

- **Observe the instructions of the manual.**

  Make sure that you do not forget or skip any step. We are not liable for damages resulting from a wrong use of the board.

- **Used symbols:**

IMPORTANT!
designates hints and other useful information.

WARNING!
It designates a possibly dangerous situation.
If the instructions are ignored the board, PC and/or peripheral may be destroyed.

Figures

Tables

1 INTENDED PURPOSE OF THE BOARD

The **CPCI-7500** board provides the computer with a 4-port asynchronous serial interface for the communication with external devices. The operating mode of the interface depends on the MX modules installed.
The board is to be used in a free **CompactPCI** slot (5 V/ 32-bit). The computer is to comply with the EU directive 89/336/EWG and the specifications for EMC protection.

Products complying with these specifications bear the CE mark.

Uses beyond these specifications are not allowed. The manufacturer is not liable for any damages which would result from the non-observance of this clause.

The board supports serial communication through four asynchronous serial ports. The intended purpose of the board depends on the operating mode used, as the following table shows.

Table 1: Intended purpose depending on the operating mode

Module[1]	Operating mode	Port configuration	Distance between transmitter and receiver [2]	Environment
MX232	RS232	Modem control signals externally connected	30 m	industry
MX232-G	RS232	Modem control signals internally connected	30 m	noisy industrial environment
MXTTY	20 mA Current loop	current flows in rest state	1 km	very noisy industrial environment
MX422	RS422		1.2 km	noisy industrial environment
MX422-G	RS422		1.2 km	very noisy industrial environment
MX485	RS485	Automatic transmitter control	200 m	industry
		transmitter control DTR, RTS	1.2 km	noisy industrial environment
MX485-G	RS485	Automatic transmitter control	200 m	industry
		transmitter control DTR, RTS	1.2 km	very noisy industrial environment

1 **MXxxx-G**: ex. MX232-G means module for the mode RS 232 with option G (optical isolation)
MXTTY means module for the mode 20 mA current loop. It is optically isolated as a standard.

2 The max. lenghts are for standard interface cables

1.1 Limits of use

If the **CPCI-7500** is used with optically isolated and not optically isolated MX modules, the safety built by the creeping distance of 3.2 mm is not ensured anymore.

The use of the board in a computer could change the computer features regarding noise emission and immunity. Increased noise emission or decreased noise immunity could result in the system not being conform anymore.

Check the shielding capacity of the PC housing and of the cable prior to putting the device into operation.

Make sure that the board remains in the protective blister pack **until it is used**. Do not remove or alter the identification numbers of the board. If you do, the guarantee expires.

Operating mode RS232: the signal lines are to be twisted in pairs with GND.

The housing of the peripheral connector
- is to be firmly screwed together with the shield of the cable
- is to assure a low-resistance connection (< 100 mΩ) between the shield and the housing of the computer.

The shield of the cable is to be earthed on both ends.

2 USER

2.1 Qualification

Only persons trained in electronics are entitled to perform the following tasks:

- installation
- putting into operation
- use
- maintenance

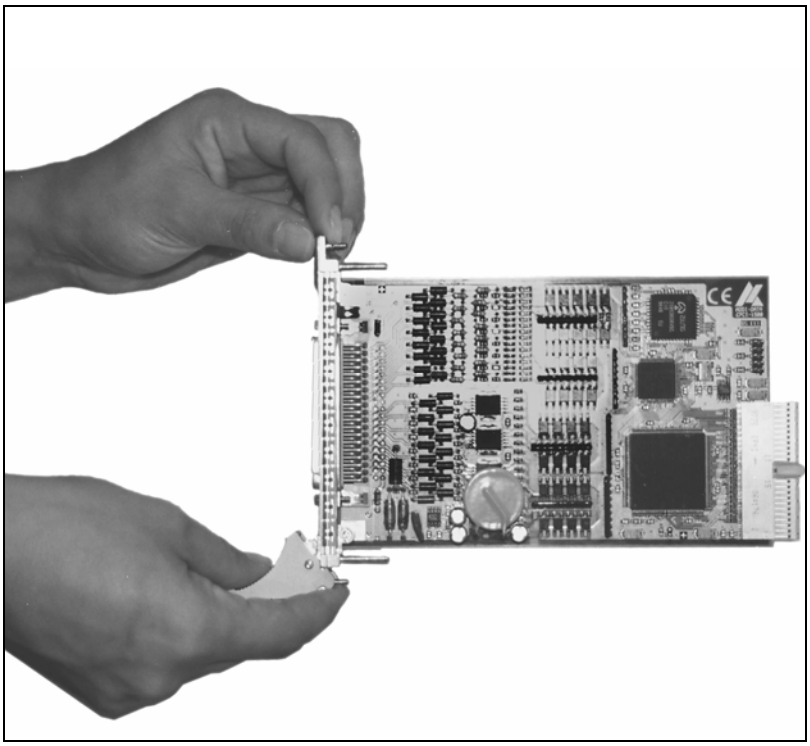
2.2 Personal protection

Consider the country-specific regulations about

- the prevention of accidents
- electrical and mechanical installations
- radio interference suppression

3 HANDLING THE BOARD

Fig. 3-1: Correct handling



4 TECHNICAL DATA

4.1 Electromagnetic compatibility (EMC)

The board has been subjected to EMC tests in an accredited laboratory in accordance with the norms EN50082-2, EN55011, EN55022.
The board complies with the limit values set by the norm EN50082-2 as follows:

	True value	Set value
ESD	4 kV	4 kV
Fields	10 V/m	10 V/m
Burst	4 kV	2 kV
Conducted radio interferences	10 V	10 V
Noise emissions	B-class	

WARNING!
The EMC tests have been carried out in a specific appliance configuration. We guarantee these limit values **only** in this configuration

Consider the following aspects:
- your test program must be able to detect operation errors.
- **your system must be set up** so that you can find out what caused errors.

4.2 Physical set-up of the board

The board is assembled on a 4-layer printed circuit card.

Format:	3U bracket
Breadth:	4TE
Weight:	156 g
Installation in:	**CompactPCI** 5V/32-bit slot
Connection to the peripheral	37-pin SUB-D male connector

4.3 Option

Option URS-7500	CPCI-7500 board with 6U bracket

4.4 Limit values

Operating temperature: ..... 0 to 60°C
Storage temperature: ..... -25 to 70°C
Relative humidity: ..... 30% to 99% non condensing

Minimum computer requirements:
- Operating system ..... PCI BIOS 1.0 or higher
  MS DOS 3.3 or higher
  Windows 3.1 or higher
- Bus speed ..... max. 33 MHz

Energy requirements:
- operating voltage of the computer: ..... 5V ± 5%
- current consumption in mA (without load): .. typ. See table ± 10%

	CPCI-7500
+ 5 V from computer	192 mA❶

❶ Add to this data the current consumption of the used modules according to the following table

	MXxxx[1]	**MXxxx-G**
RS 232	10 mA	86 mA
RS 422	10 mA	46 mA
RS 485	10 mA	58 mA
20 mA	75 mA	-
MX422-PEP[2]	66 mA	-

1 The module **MXTTY (20 mA)** is optically isolated as a standard.

2 Software-Handshake (Modem control signals: RTS, CTS)

MX232	CCITT recommendation:	V.24
	US norm EIA:	RS 232
	Max. transfer rate:	115.2 kBd
	Max. transfer rate on request ❷	1.152 MBd
	ESD protection:	15 kV
	Protection against short-circuit	
MX232-G	CCITT recommendation:	V.24
	US norm EIA:	RS232
	Max. transfer rate:	115.2 kBd
	Max. transfer rate on request ❷	1.152 MBd
	ESD protection:	15 kV
	Protection against short-circuit	
	Creeping distance:	3.2 mm
	Test voltage:	1000 VAC
MX422, MX485	CCITT recommendation:	V.11
	US norm EIA:	RS422, RS485
	Max. transfer rate:	115.2 kBd
	Max. transfer rate on request ❷	1.152 MBd
	ESD protection:	15 kV
	Protection against short-circuit	
MX422-G, MX485-G	CITT recommendation:	V.11
	US norm EIA:	RS422. RS485
	max. transfer rate:	115.2 kBd
	max. transfer rate on request ❷	1.152 MBd
	ESD protection:	15 kV
	Protection against short-circuit	
	Creeping distance:	3.2 mm
	Test voltage:	1000 VAC

❷ The standard basic board operates with standard drivers at a transfer rate of 115.2 kBd. If you wish to transmit at 1.152 MBaud, contact our services to receive the ADDI-DATA High-Speed Driver.

1.152 MBd configuration: The 1.152 MBd transfer rate can only be programmed with the device drivers delivered with the board.

MXTTY	20mA current loop	
	max. transfer rate:	19200 Bd
	Transorb diodes	
	Absorption power 1ms:	300 W
	Protection against overvoltage	
	Breakdown voltage:	< 0 and > 26 V
	Creeping distance:	3.2 mm
	Test voltage:	1000 VAC
	Load resistance:	500 Ω
	Voltage reversal protection	

4.5 Component scheme

Fig. 4-1: Component scheme (basic board without modules)

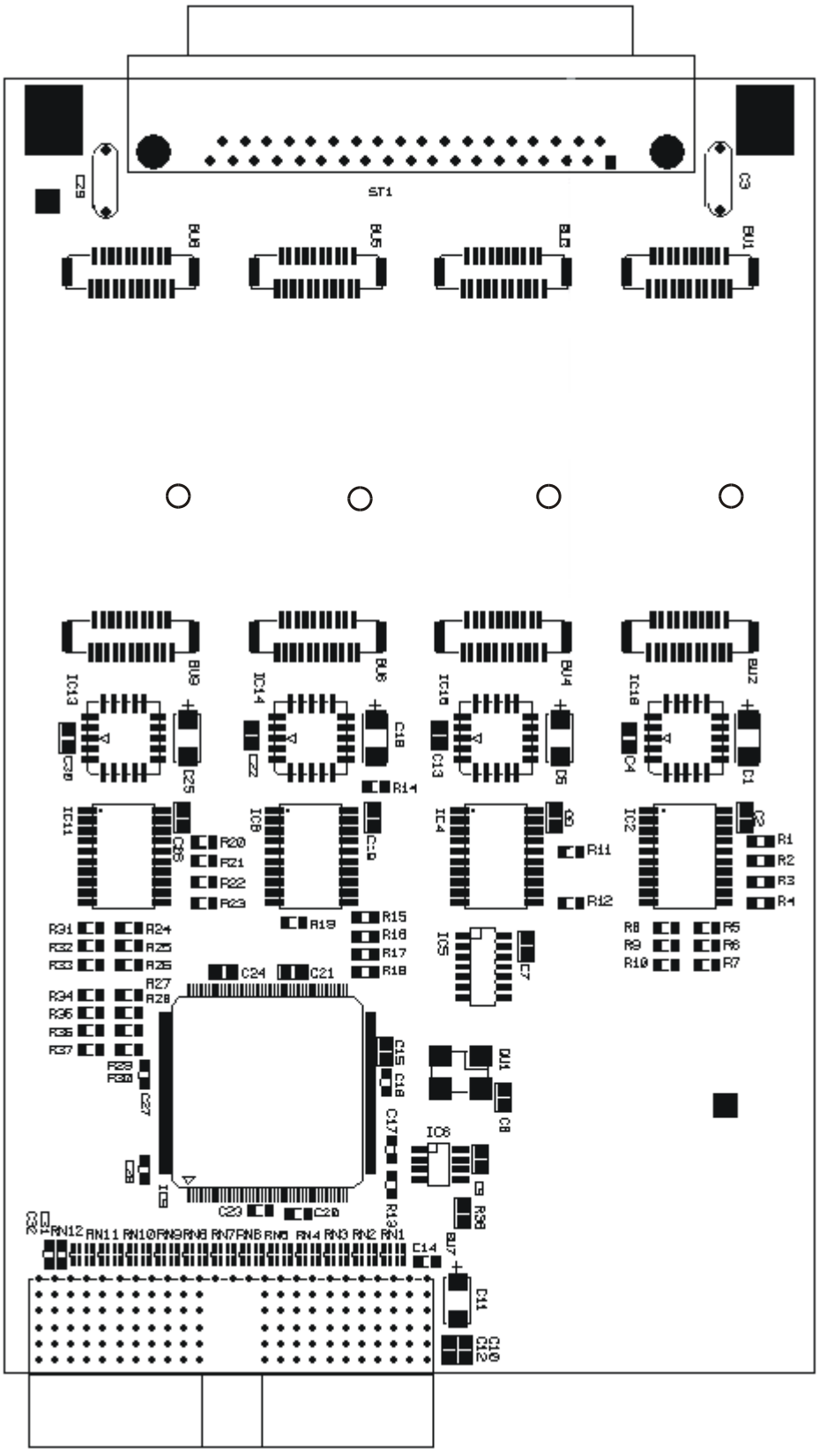
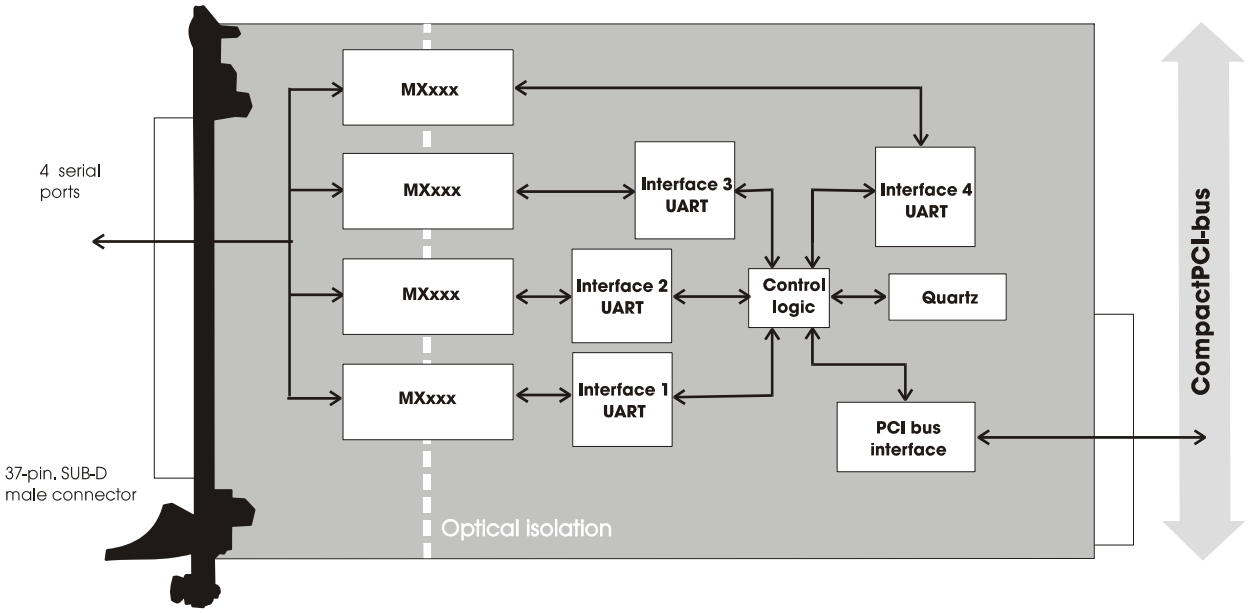


Fig. 4-2: Simplified block diagram of the CPCI-7500



5 INSTALLATION

The interrupt lines and the base address of the board are set per software through the BIOS of the computer system. Therefore, there are no settings to be made before inserting the board.

IMPORTANT!
If you want to install simultaneously **several** ADDI-DATA boards, consider the following procedure.

- **Install and configure** the boards one after the other.
  You will thus avoid configuration errors.

1. Switch off the **CompactPCI** computer
2. Install the **first** board
3. Start the computer
4. Install the software (only once)
5. Configure the board

6. Switch off the computer
7. Install the **second** board
8. Start the computer
9. Configure the board

etc

You will find additional information to these different steps in the sections 5.1 to 5.4.

- Discharge yourself from electrostatic charges.

- Take the board out of its protective pack.

5.1 Inserting the board

IMPORTANT!
Do observe the *safety instructions.*

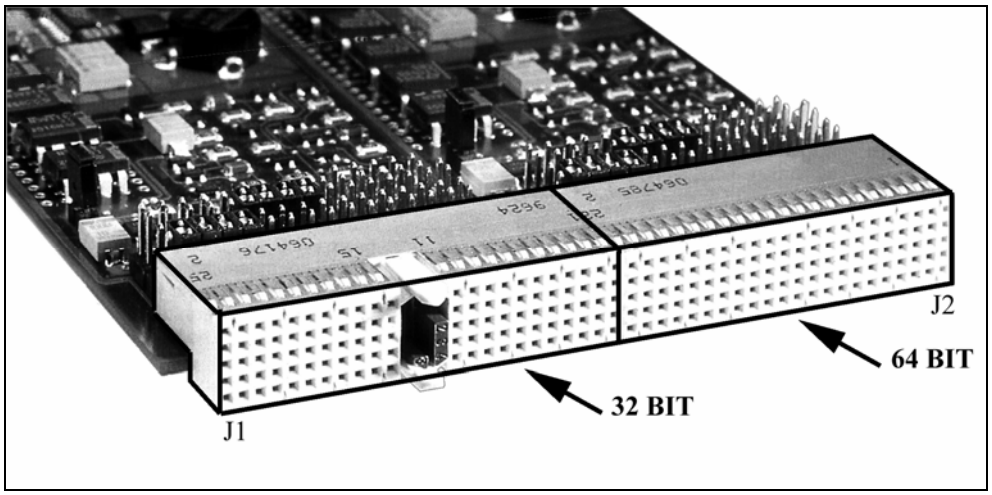
5.1.1 Opening the computer

- Switch off your **CompactPCI** computer and all units connected to the computer.
- Pull the computer mains plug from the socket.
- Open your computer as described in the manual of the **CompactPCI** computer manufacturer.

5.1.2 Selecting a free slot

The following **CompactPCI** slot types are available for 5V systems:
CPCI-5V (32-bit) and ***CPCI***-5V (64-bit)

Fig. 5-2: Types of slots

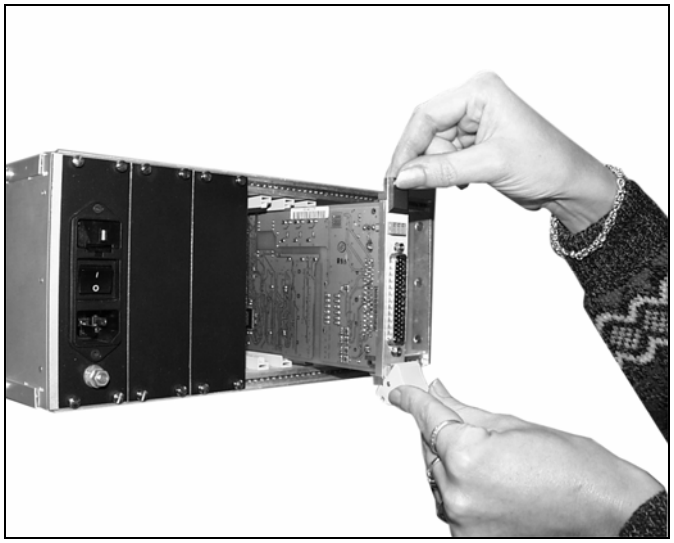


- **Remove the front cover of the selected slot** according to the instructions of the computer manufacturer. Keep the front cover. You will need it if you remove the board.
- **Discharge yourself from electrostatic charges**
- **Hold the board at its grip** (See handling of the board in chapter 3).

5.1.3 Plugging the board into the slot

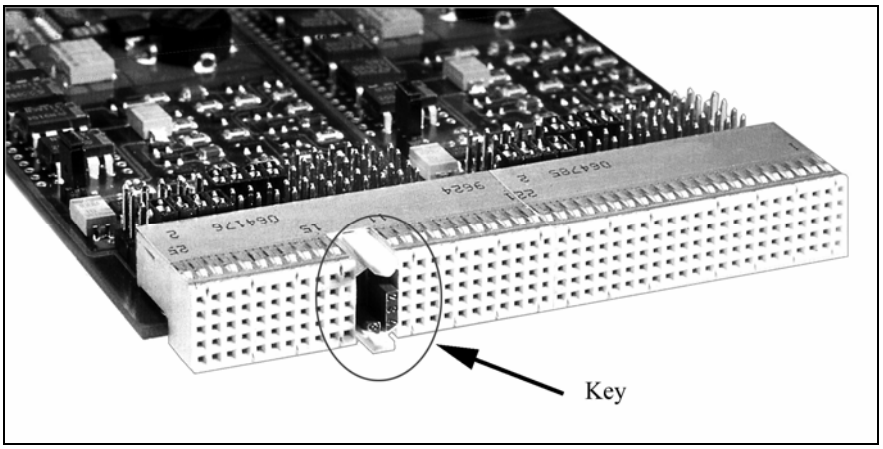
- Insert the board into the guiding rails and push it to the back cover of the rack. **In order to fully insert the board, a small resistance has to be overcome.**

Fig. 5-3: Pushing a CPCI board into a rack



- Make sure that the board is correctly connected by connecting the key of the board to the key of the backplane.
  (blue connector key if the board operates in 5 V).

Fig. 5-4: Connector keying



- If there is a screw at the upper part of the front plate, use this screw to fasten the board.

Note:

In order to pull the board out of the rack, pull it to the front at its grip. In some cases the grip has to be tilted upwards first.

5.2 Installing the software

The board is supplied with a CD-ROM.
The CD contains:
- ADDIREG for Windows NT 4.0 and Windows 95,
  You can also download the ADDIREG program from Internet.
- Standard software for the ADDI-DATA boards:
  - 32-bit for Windows NT/95/98

5.2.1 Installation under MS-DOS and Windows 3.11

To install the board under MS-DOS, the "ADDICOM ADDIDATA software driver" is available on request.

5.2.2 Installation under Windows NT

- Select the directory APCI7500\32bit\Disk1.
- Start the set-up program "setup.exe" (double click)
- Select one of the 3 parameters
  1- typical
  2- compact
  3- custom

Proceed as indicated on the screen and read attentively the "Software License" and "Readme".
In "custom", you can select your operating system.

Remark: The **CPCI-7500** board is compatible with the **APCI-7500** board regarding the standard software installation. The program ADDIREG will thus make no difference between the systems (PCI board or **CompactPCI** board).

5.2.3 Installation under Windows 95/98

After installing your ADDI-DATA board **you have to reboot your PC.**
Once rebooted, a **message** appears on the screen.

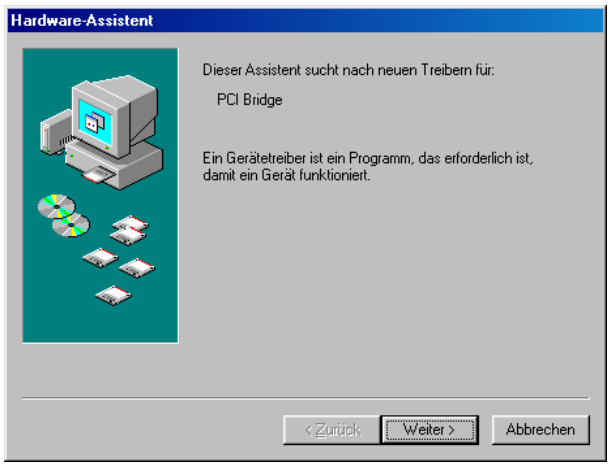
The PC requires information included in the ***.inf* files** and asks for the path where they are saved. The .inf files contains:

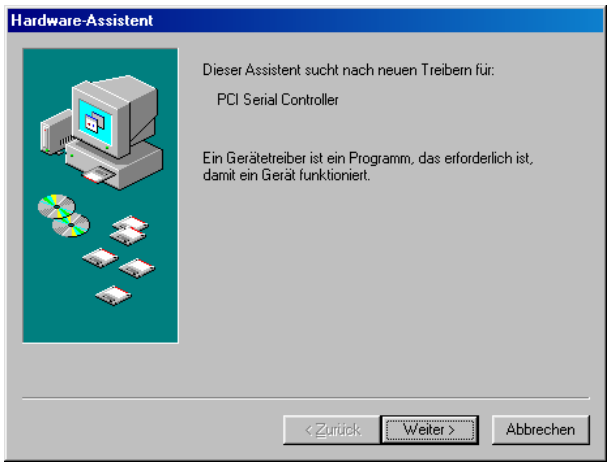
– the name of the board
– the name of the manufacturer
– the hardware type of the board (all ADDI-DATA boards are considered as multifunction boards)

You can download the *inf* files from the Internet:
http://www.addi-data.com

For the communication boards there are two files:
- PCI Bridge
- Serial controller

Fig. 5-5: Inquiry of the .inf files (here in the German version)





5.2.3 Installation under Windows XP/2000/Server 2003

IMPORTANT!
Further information for installing and uninstalling the different drivers is to be found in the delivered description **"Installation instructions for the PCI and ISA bus".**

A link to the corresponding PDF file is available in the navigation panel (Bookmarks) of Acrobat Reader.

5.3 Board configuration with ADDIREG

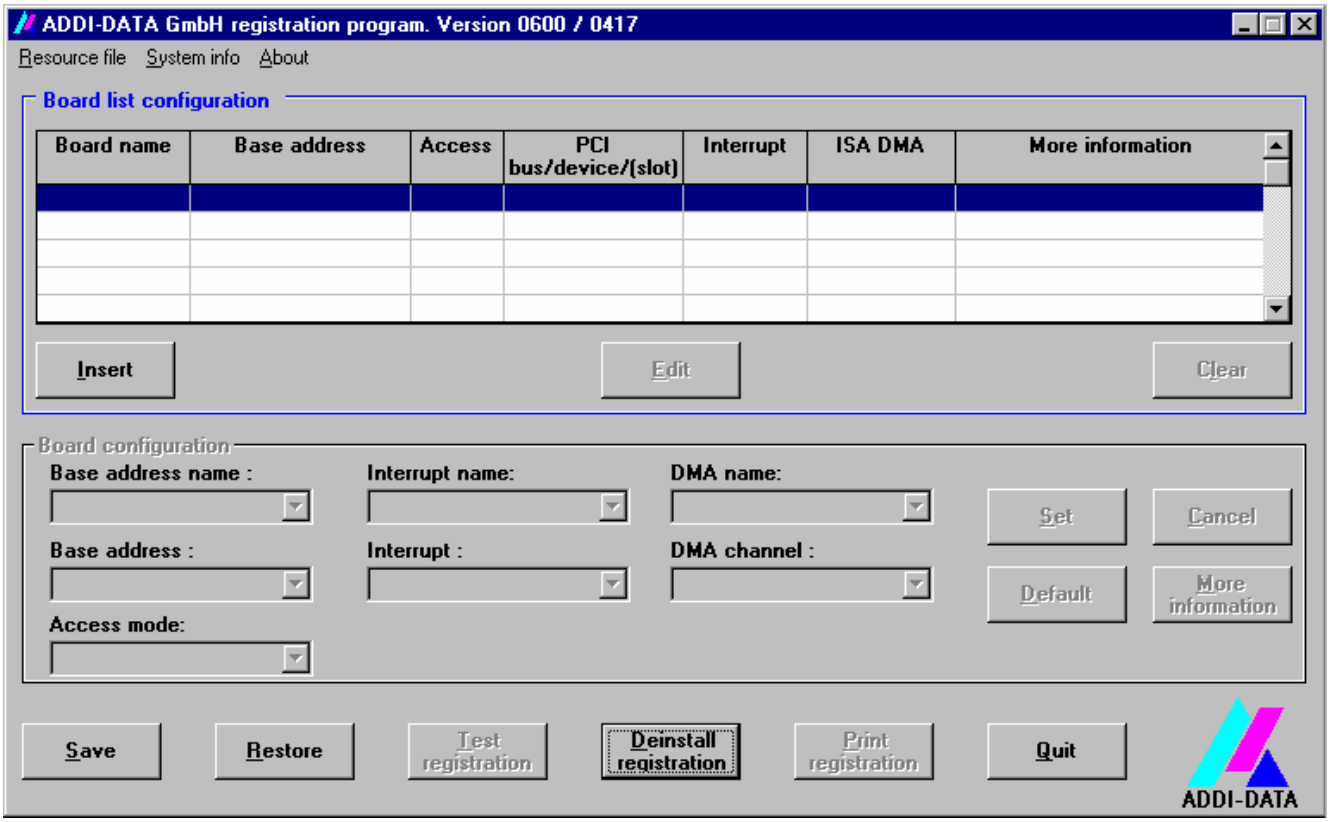
The ADDIREG registration program is a 32-bit program for Windows NT 4.0 and Windows 95/98. With this program, the user can register all hardware information which are necessary for the management of ADDI-DATA PC-boards.

5.3.1 Program description

IMPORTANT!
Insert the ADDI-DATA boards to be registered before starting the ADDIREG program.

If the board is not inserted, the user cannot test the registration.
Once the program is called up, the following dialog box appears.

Fig. 5-6: ADDIREG registration program



Screen explanation:

Table:

The table in the middle lists the registered boards and their respective parameters.

Board name:
Names of the different registered boards (e.g.: APCI-7800).
When you start the program for the first time, no board is registered in this table.

Base address:
Selected base address of the board.

Access:
Selection of the access mode for the ADDI-DATA digital boards.
Access in 8-bit or 16-bit.

PCI bus/device/(slot):
Used PCI slot. If the board is no PCI board, the message "NO" is displayed.

Interrupt:
Used interrupt of the board. If the board uses no interrupt, the message "Not available" is displayed.

ISA DMA:
Indicates the selected DMA channel or "Not available" if the board uses no DMA.

More information:
Additional information like the identifier string (eg.: PCI1500-50) or the installed COM interfaces.

Text boxes:

Under the table you will find 6 text boxes in which you can change the parameters of the board.

Base address name:
When the board operates with several base addresses (One for port 1, one for port 2, etc.) you can select which base address is to be changed.

Base address:
In this box you can select the base addresses of your PC board. The free base addresses are listed. The used base addresses do not appear in this box.

Interrupt name:
When the board must support different interrupt lines (common or single interrupts), you can select them in this box.

Interrupt:
Selection of the interrupt number which the board uses.

DMA name:
When the board supports 2 DMA channels, you can select which DMA channel is to be changed.

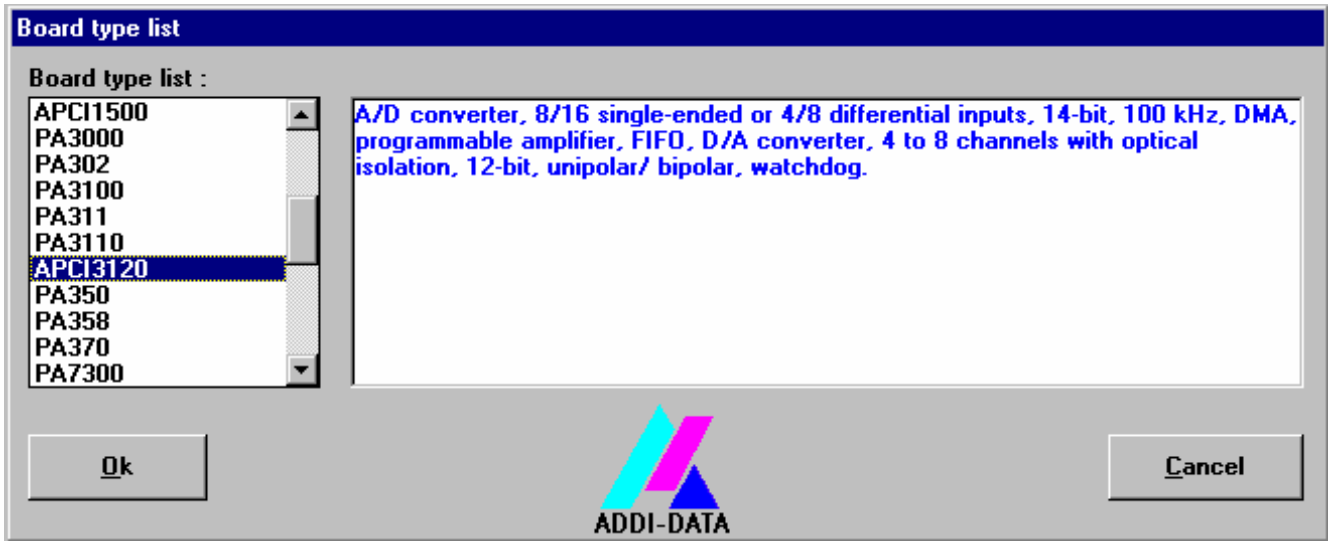
DMA channel:
Selection of the used DMA channel.

Buttons:

Edit [3]**:**
Selection of the highlighted board with the different parameters set in the text boxes. Click on "Edit" to activate the data or click twice on the selected board.

Insert:
When you want to insert a new board, click on "Insert". The following dialog window appears:

Fig. 5-7: Configuring a new board



All boards you can register are listed on the left. Select the wished board. (The corresponding line is highlighted).
On the right you can read technical information about the board(s).
Activate with "OK"; You come back to the former screen.

Clear:
You can delete the registration of a board. Select the board to be deleted and click on "Clear".

Set:
Sets the parametered board configuration. The configuration should be set before you save it.

Cancel:
Reactivates the former parameters of the saved configuration.

Default:
Sets the standard parameters of the board.

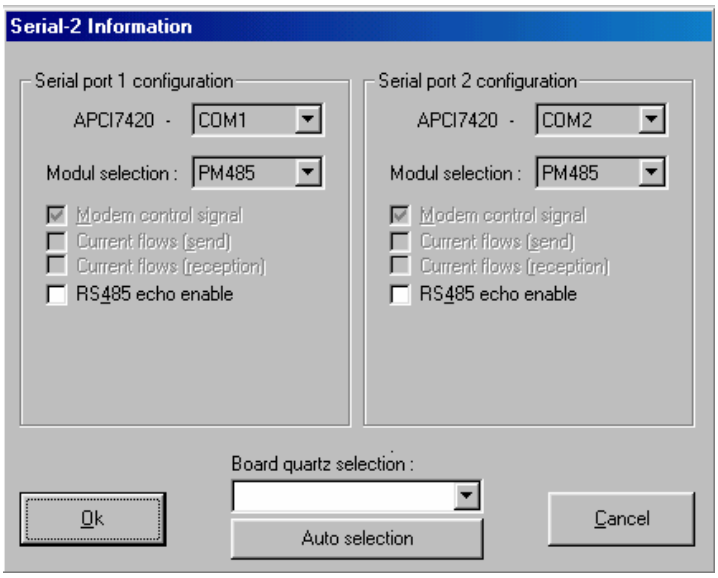
More information:
You can change the board specific parameters like the identifier string, the COM number, the operating mode of a communication board, etc...
If your board does not support these information, you cannot activate this button.

3 "x": Keyboard shortcuts; e.g. "Alt + e" for Edit

Communication boards:
The following figure is the example of 2 serial interfaces.

If you use the standard driver for Windows, you can select the COM number. Several options like "Module selection" and the different parameters can only be activated if the functions are available.

Fig. 5-8: Communication board



In the field "Board quartz selection" you can adapt the quartz frequency (in Hz). The ADDI-DATA boards are set with a standard quartz frequency of 1843200 Hz.

Save:
Saves the parameters and registers the board.

Restore:
Reactivates the last saved parameters and registration.

Test registration:
Controls if there is a conflict between the board and other devices.
A message indicates the parameter which has generated the conflict. If there is no conflict, "OK" is displayed.

Deinstall registration:
Deinstalls the registrations of all board listed in the table.

Print registration:
Prints the registration parameter on your standard printer.

Quit:
Quits the ADDIREG program.

5.3.2 Registering a new board

IMPORTANT!
To register a new board, you must have administrator rights.
Only an administrator is allowed to register a new board or change a registration.

- Call up the ADDIREG program. The figure 5-6 is displayed on the screen. Click on "Insert". Select the wished board.
- Click on "OK". The default address, interrupt, and the other parameters are automatically set in the lower fields. The parameters are listed in the lower fields. If the parameters are not automatically set by the BIOS, you can change them. Click on the wished scroll function(s) and choose a new value.
  Activate your selection with a click.
- Once the wished configuration is set, click on "Set".
- Save the configuration with "Save".
- You can test if the registration is "OK".
  This test controls if the registration is right and if the board is present.
  If the test has been successfully completed you can quit the ADDIREG program.
  The board is initialised with the set parameters and can now be operated.
  In case the registration data is to be modified, it is necessary to boot your PC again. A message asks you to do so. When it is not necessary you can quit the ADDIREG program and directly begin with your application.

5.3.3 Changing the registration of a board

IMPORTANT!
To change the registration of a board, you must have administrator rights.
Only an administrator is allowed to register a new board or change a registration.

- Call up the ADDIREG program. Select the board to be changed.
  The board parameters (Base address, DMA channel, ..) are listed in the lower fields.
- Click on the parameter(s) you want to set and open the scroll function(s).
- Select a new value. Activate it with a click.
  Repeat the operation for each parameter to be modified.
- Once the wished configuration is set, click on "Set".
- Save the configuration with "Savy".
- You can test if the registration is "OK".
  This test controls if the registration is right and if the board is present.
  If the test has been successfully completed you can quit the ADDIREG program.
  The board is initialised with the set parameters and can now be operated.

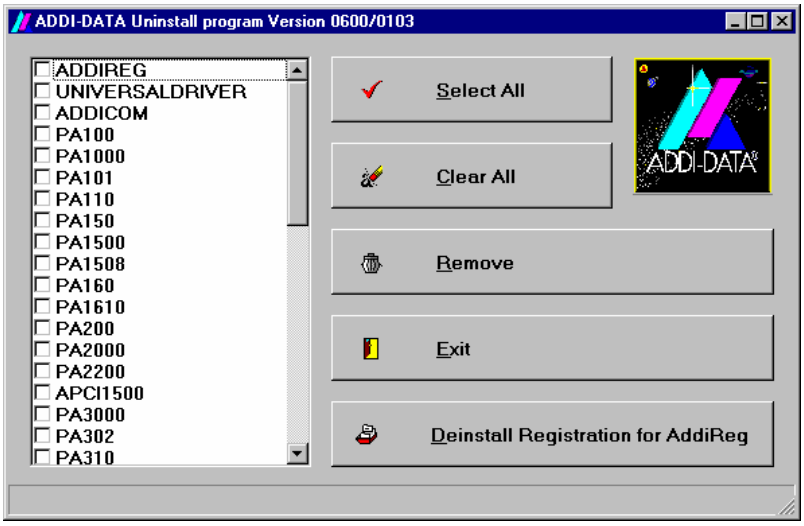
In case the registration data is to be modified, it is necessary to boot your PC again. A message asks you to do so. When it is not necessary you can quit the ADDIREG program and directly begin with your application.

5.3.4 Removing the ADDIREG program

The ADDI_UNINSTALL program is delivered on the CD-ROM.

- Start the ADDI_UNINSTALL program

Fig. 5-9: The ADDI_UNINSTALL program



- Start the ADDIREG program and click on "Deinstall registration for AddiReg"
- Proceed as indicated until the complete removing of ADDIREG.

You can also download the program from Internet.

5.4 Software downloads from the Internet

If you have any questions, do not hesitate to send us an e-mail to:
info@addi-data.de or **hotline@addi-data.com**
You can download the latest version of the device driver for the **CPCI-7500** board**.**
http://www.addi-data.com

IMPORTANT!
Before using the board or in case of malfunction during operation, check if there is an update of the product (technical description, driver). The current version can be found on the internet or contact us directly.

6 CONNECTING THE PERIPHERAL

6.1 Connector pin assignment

Fig. 6-1: 37-pin SUB-D male connector

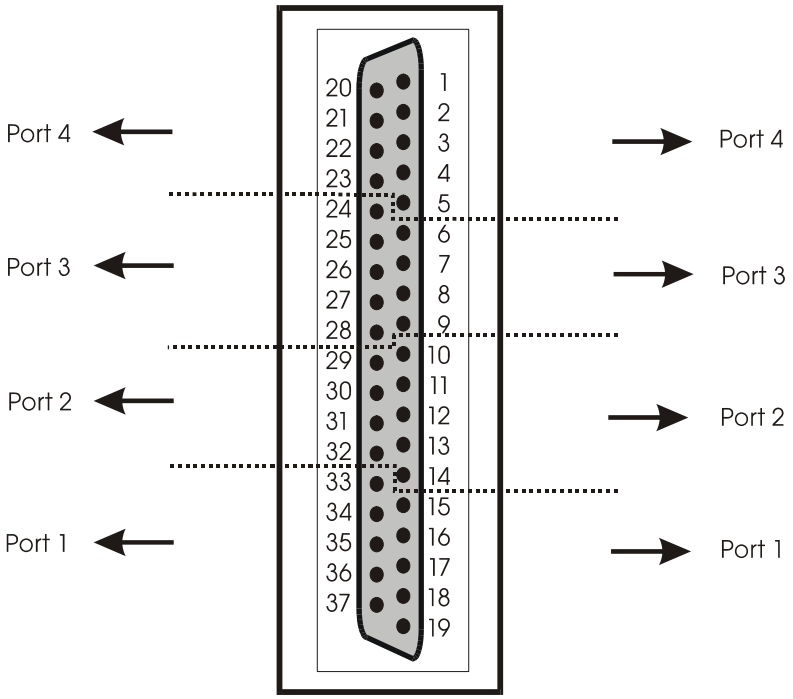


Table 2: Pin assignment

RS485	RS422	Current Loop	RS232	Pin	Pin	RS232	Current Loop	RS422	RS485	
				19	37	GND	GND	GND		
Tx/Rx-	RB	-RCV-CL-DATA	RI	18	36	DTR		Rab *2		**Port 1**
		Rsource	CTS	17	35	TxD	+RCV-CL-DATA	RA	Tx/Rx+	
		Tsource	RTS	16	34	RxD	-XMIT-CL-DATA	TB		
120 Ω	100 Ω		DSR	15	33	CD	+XMIT-CL-DATA	TA		
	GND	GND	GND	14	32	RI	-RCV-CL-DATA	RB	Tx/Rx-	
Rab *2			DTR	13	31	CTS	Rsource			**Port 2**
Tx/Rx+	RA	+RCV-CL-DATA	TxD	12	30	RTS	Tsource			
	TB	-XMIT-CL-DATA	RxD	11	29	DSR		100 Ω	120 Ω	
	TA	+XMIT-CL-DATA	CD	10	28	GND	GND	GND		
Tx/Rx-	RB	-RCV-CL-DATA	RI	9	27	DTR		Rab *2		**Port 3**
		Rsource	CTS	8	26	TxD	+RCV-CL-DATA	RA	Tx/Rx+	
		Tsource	RTS	7	25	RxD	-XMIT-CL-DATA	TB		
120 Ω	100 Ω		DSR	6	24	CD	+XMIT-CL-DATA	TA		
	GND	GND	GND	5	23	RI	-RCV-CL-DATA	RB	Tx/Rx-	
Rab *2			DTR	4	22	CTS	Rsource			**Port 4**
Tx/Rx+	RA	+RCV-CL-DATA	TxD	3	21	RTS	Tsource			
	TB	-XMIT-CL-DATA	RxD	2	20	DSR		100 Ω	120 Ω	
	TA	+XMIT-CL-DATA	CD	1						

TA: Tx422+ TB: Tx422-
RA: Rx422+ RB: Rx422-
Rab: Connection to terminal resistor

6.2 Pin assignment: RS 422 with handshake signals

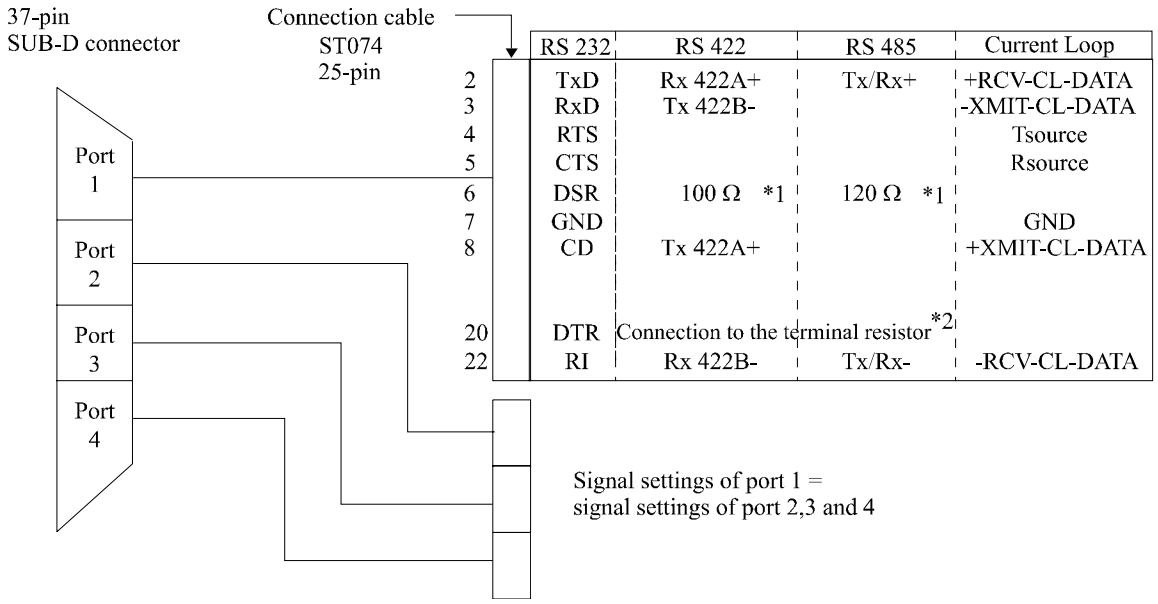
With the module MX422-PEP you can use the modem control signals RTS and CTS.

Table 3: Pin assignment of the 37-pin connector: RS422 with handshake signals

	RS422	Pin	Pin	RS422	
	CTS+	20	1	Tx422+	
Port 4	RTS-	21	2	Tx422-	Port 4
	RTS+	22	3	Rx422+	
	Rx422-	23	4	CTS-	
	Tx422+	24	5	GND	
	Tx422-	25	6	CTS+	
Port 3	Rx422+	26	7	RTS-	Port 3
	CTS-	27	8	RTS+	
	GND	28	9	Rx422-	
	CTS+	29	10	Tx422+	
Port 2	RTS-	30	11	Tx422-	Port 2
	RTS+	31	12	Rx422+	
	Rx422-	32	13	CTS-	
	Tx422+	33	14	GND	
	Rx422-	34	15	CTS+	
Port 1	Rx422+	35	16	RTS-	Port 1
	CTS-	36	17	RTS+	
	GND	37	18	Rx422-	
			19		

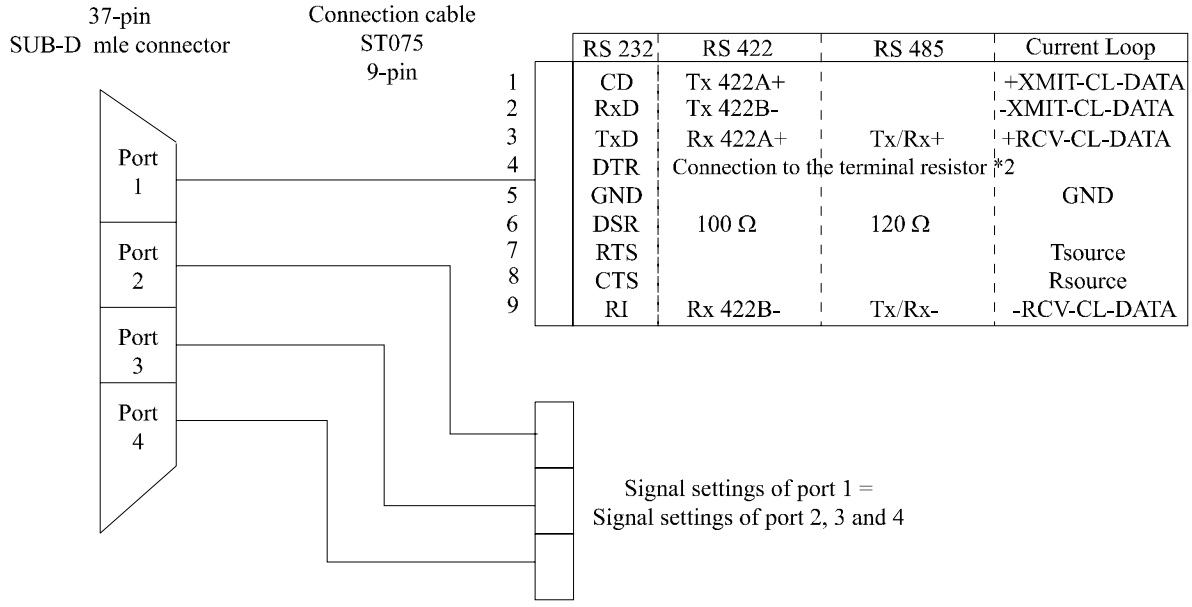
6.3 Connection cable

Fig. 6-2: Connection cable ST074 (4 x 25-pin)



* 1 Resistor integrated on the SI-Module
* 2 Cable connection to 100 Ω / 120 Ω terminates the RS 422 / 485 lines with 100 Ω/ 120 Ω resistor.

Fig. 6-3: Connection cable ST075 (4 x 9-pin)



6.4 Connection examples

Fig. 6-4: RS 232 cabling

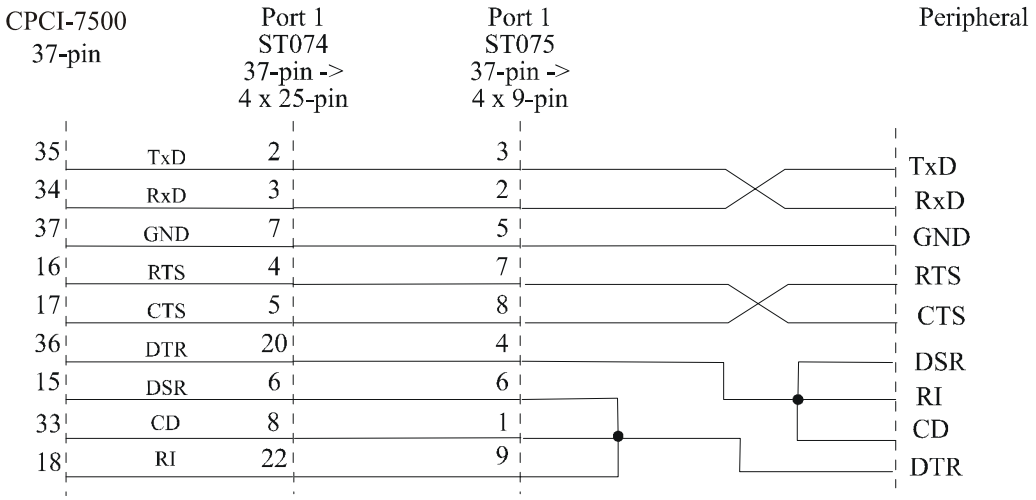


Fig. 6-5: Cabling RS 422

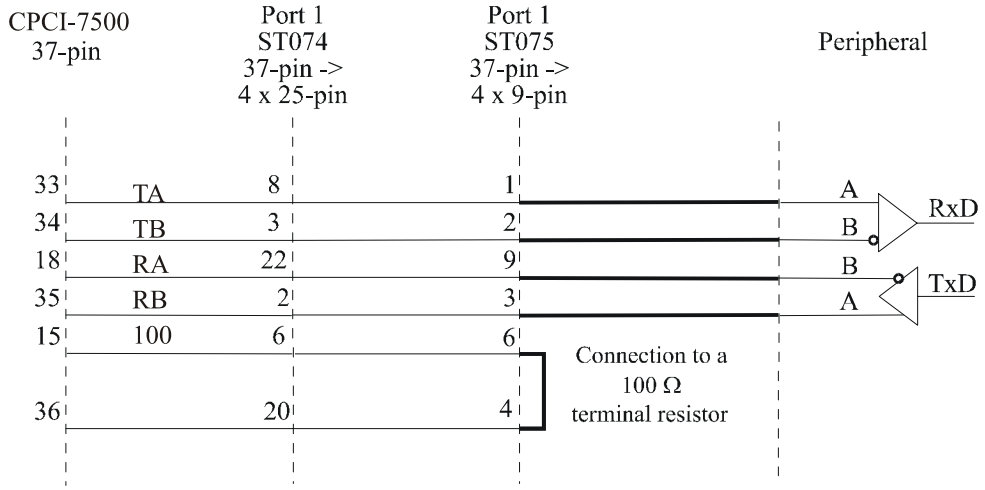


Fig. 6-6: Cabling RS422-PEP

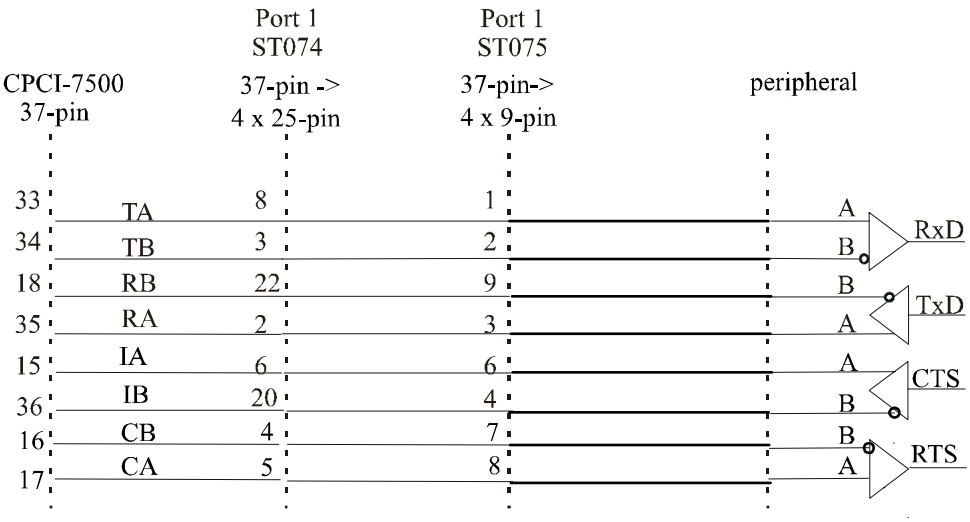
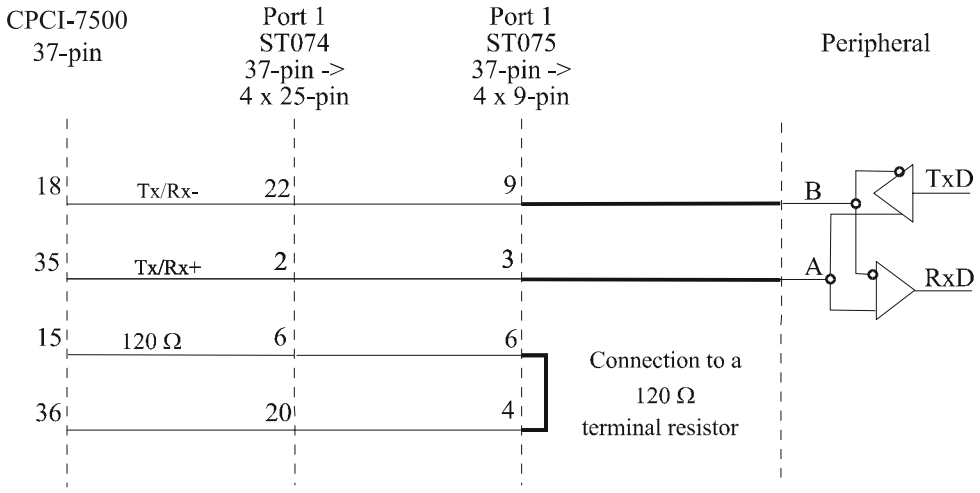


Fig. 6-7: Cabling RS 485



Cabling Current Loop - 20 mA

Active / passive : When a transmitter and a receiver communicate, one of them has to supply the necessary current. If the transmitter supplies the current, it is active. The receiver is passive.
In reverse, if the receiver supplies the current, it is active.

Fig. 6-8: Active transmission / active reception - 4 serial ports

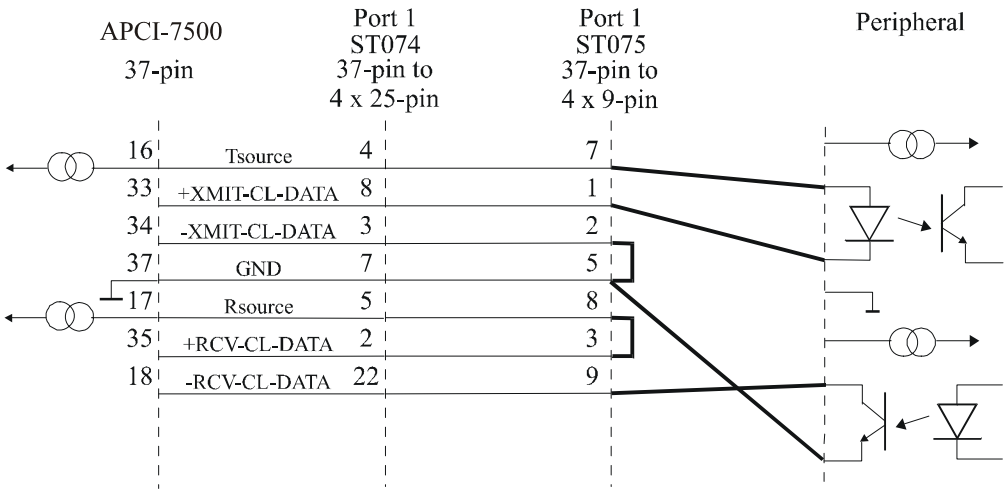


Fig. 6-9: Active transmission / passive reception - 4 serial ports

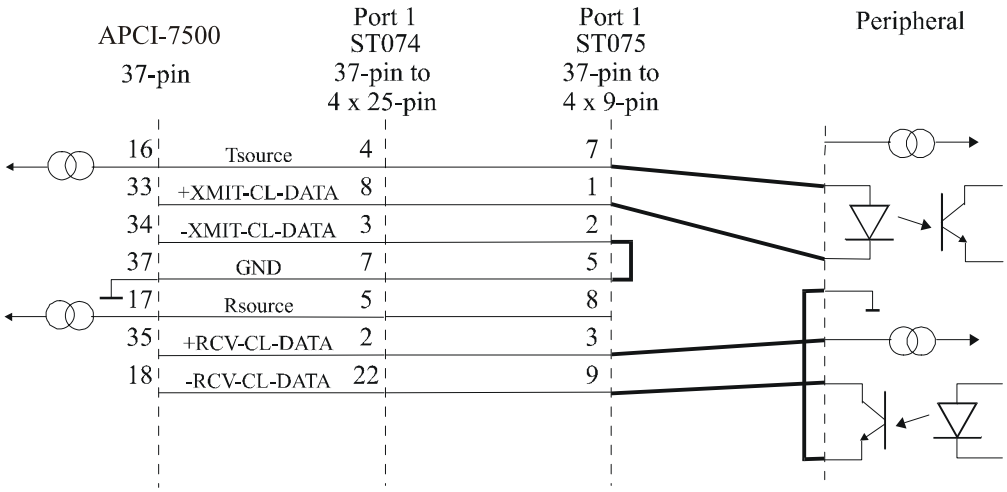


Fig. 6-10: Passive transmission / active reception - 4 serial ports

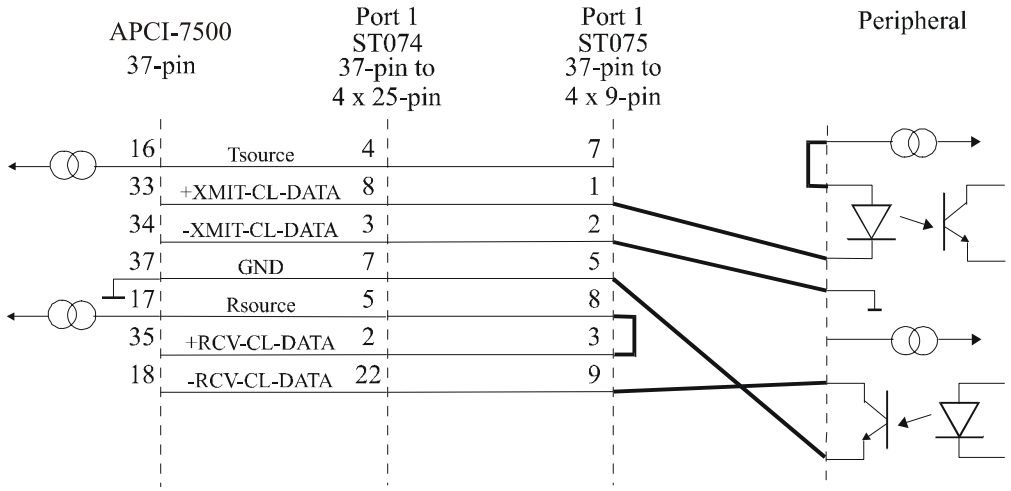
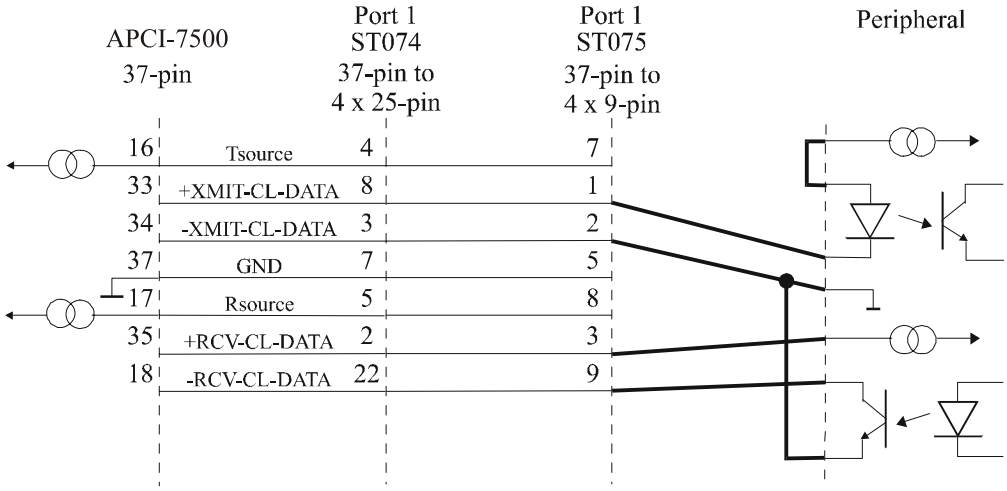


Fig. 6-11: Passive transmission / passive reception - 4 serial ports

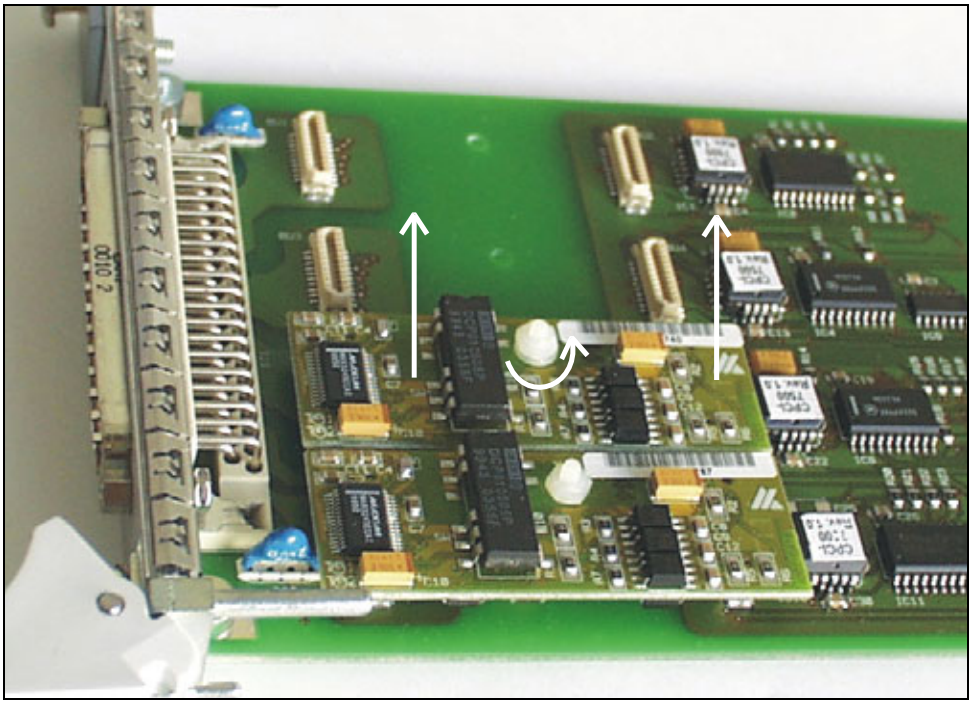


7 REPLACING THE MX MODULES

IMPORTANT!
We advise you to send us the board if a module is to be replaced.
If you wish to effect the replacement yourself, consider the following:

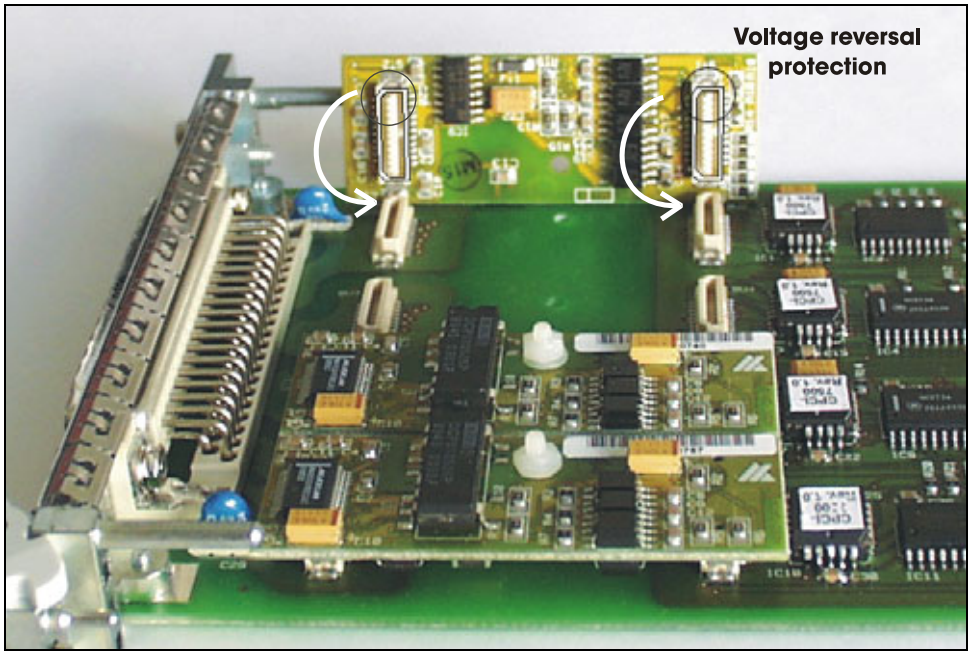
- Do observe the *Security advises*
- Insert/remove the module carefully according to the following illustrations.

Fig. 7-1: Removing a MX module



As a security the modules are fastened to the board with a plastic screw.

Fig. 7-2: Inserting a MX module



8 DEVICE DRIVER

To install the 4 ports of the **CPCI-7500** please use the standard drivers which are delivered with Windows NT 4.0, Windows 95/98, etc. You can read additional information about the Windows API functions for the settings and the use of the serial interfaces in:

"SERIAL COMMUNICATION in WIN32"

Moreover you will find application examples in Delphi 2.0 and VC ++ 5.0.

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