**DIN EN ISO 9001:2000**
**certified**

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*Preliminary version*

**Technical description**

**ADDICOM APCI-7300-2, APCI-7420-2,**
**APCI-7500-2(/4C)**

**1-port, 2-port, 4-port serial interface,**
**for the PCI bus, 3.3 V**

1st edition 07/2004

# WARNING

**The following risks result from improper implementation and from use of the board contrary to the regulations:**

- ♦ **Personal injury**

- ♦ **Damage to the MSX-Box, PC and peripherals**

- ♦ **Pollution of the environment**

♦ **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.

# Contents

## Figures

## Tables

# 1    DEFINITION OF APPLICATION

## 1.1    Intended use

The board **APCI-7xx-2[1]** must be inserted in a PC with PCI 3.3 V/32-bit slots, which is used as electrical equipment for measurement, control and laboratory pursuant to the norm IEC 61010-1.

## 1.2    Usage restrictions

The APCI-7xx-2 board must not to be used as safety related part for securing emergency stop functions.

The board must not be used in potentially explosive atmospheres.

## 1.3    General description of the board

The board **APCI-7xx-2** provides the personal computer (PC) with 1-port (APCI-7300-2), a 2-port (APCI-7420-2) or a 4-port (APCI-7500-2 and APCI-7500-2/4C) 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 connected to the peripheral through a shielded cable, which shielding should be grounded on both ends.

Minimum specifications of the connection cable:
- metallized plastic hoods
- shielded cable
- cable shield folded back and firmly screwed to the connector housing.

The board supports serial communication through 1, 2 or 4 asynchronous serial ports. The use of the board depends on the following parameters (See Table 1-1).

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[1] Common designation in the manaul for the boards APCI-7300-2, APCI-7420-2, APCI-7500-2, APCI-7500-2/4C

**Table 1-1: Different communication operating modes**

| Module[1] | Operating mode | Port configuration | Distance between transmitter and receiver[2] | Environment |
|---|---|---|---|---|
| MX232 | RS232 | modem control signals connected on the board (through ADDIREG) or externally to the connector | 30 m | industry |
| MX232-G | RS232 | modem control signals connected on the board (through ADDIREG) or externally to the connector | 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 or data bit | 1.2 km | noisy industrial environment |
| MX485-G | RS485 | automatic transmitter control | 200 m | industry |
| | | transmitter control DTR, RTS or data bit | 1.2 km | very noisy industrial environment |

If the basic board **APCI-7xx-2** is used with optically isolated modules and non isolated modules, then the safety built by the creeping distance of 3.2 mm is not ensured for the non isolated modules.

The use of the board in a PC could change the PC 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 cable prior to putting the device into operation.

The use of the board includes observing all advises given in this manual and in the safety leaflet.

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[1] MXxxx-G: ex. PM232-G: module for the mode RS 232 with option G (optical isolation)
  MXTTY: module for the mode 20 mA current loop. It is optically isolated as a standard.
[2] The max. lengths are for standard interface cables

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.

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.

**For all operating modes**, the signal lines are to be twisted in pairs with GND.
Use exclusively connection cable with twisted pairs.

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 ($< 100$ m$\Omega$) between the shield and the housing of the PC.

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

Do not remove or alter the identification numbers of the board.
If you do, the guarantee expires.

# 2    USER

## 2.1    Qualification

Only persons trained in electronics are entitled to perform the following works:
- installation
- 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 OF THE BOARD

**Fig. 3-1: Correct handling**
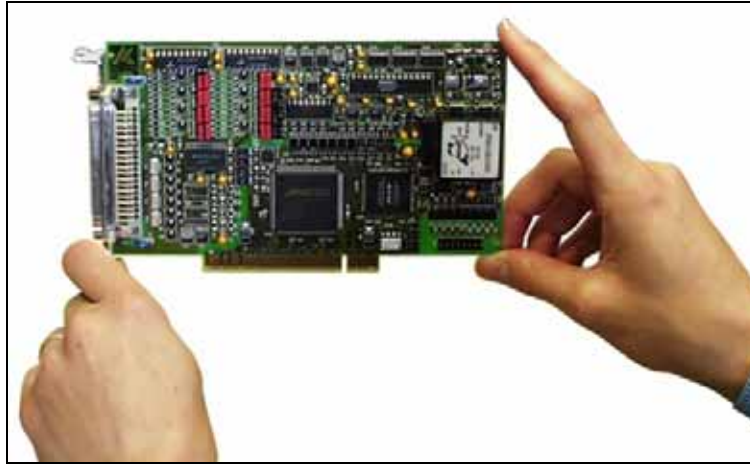
# 4  TECHNICAL DATA

## 4.1  Electromagnetic compatibility (EMC)

The PC is to comply with the norm IEC61326 for measurement, control and laboratory use and with the specifications for EMC protection.

The board has been subjected to EMC tests in an accredited laboratory. The board complies with the limit values set by the norms IEC61326 as follows:

|                                          | True value | Set value |
|------------------------------------------|------------|-----------|
| ESD (Discharge by contact/air) ..........| 4/8 kV     | 4/8 kV    |
| Fields ...................................| 10 V/m     | 10 V/m    |
| Burst ....................................| 4 kV       | 2 kV      |
| Conducted radio interferences ...........| 10 V       | 10 V      |

## 4.2  Physical set-up of the board

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

**Dimensions:**
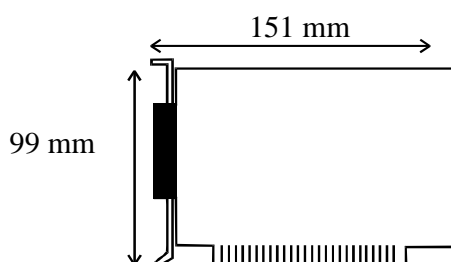


| Weight: ..................................... | approx. 160 g |
| Installation in: ........................... | 32/64-bit PCI slot 3.3 V |

Connection to the peripheral:
| APCI-7300-2: ........................... | 9-pin SUB-D male connector |
| APCI-7420-2: ........................... | 2 x 9-pin male SUD-D male connector |
| APCI-7500-2: ........................... | 37-pin SUB-D male connector |
| APCI-7500-2/4C: ..................... | 4 x 9-pin SUB-D male connector |

Connection cables for the APCI-7500-2[1]:
**ST074:**
37-pin SUB-D female connector to 4 x 25-pin SUB-D male connector
**ST075:**
37-pin SUB-D female connector to 4 x 9-pin SUB-D male connector

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[1] Not included in the standard delivery.

# 4.3    Limit values

Max. altitude: ........................................... 2000 m
Operating temperature: ............................ 0 to 60°C
Storage temperature: ................................ -25 to 70°C
Relative humidity: ................................... 30% to 99% non condensing

**Minimum PC requirements:**
**PCI BIOS from Version 1.0**
Bus speed: ............................................... < 33 MHz
Operating system: ................................... Windows 2000, XP

**Energy requirements:**
- Operating voltage of the PC: ................. 5 V ± 5%
- Current consumption (without load): ..... typ. see table ± 10%

|                    | **APCI-7300-2** | **APCI-7400-2** | **APCI-7500-2** |
|--------------------|-----------------|-----------------|-----------------|
| + 5 V from the PC  | 160 mA          | 160 mA          | 160 mA          |

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

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

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[1] mit Software-Handshake (RTS CTS Version)

### 4.3.1 RS232

CCITT-Empfehlung: ................................. V.24
US-Norm EIA: ....................................... RS 232

**Without optical isolation (MX232)**

Max. transfer rate: ................................... 1 Mbaud
Transfer rate on request........................... up to 2.5 MBaud
ESD protection ...................................... 15 kV

**With optical isolation (MX232-G)**

Max. transfer rate: ................................. 1 Mbaud
Transfer rate on request........................... up to 2.5 MBaud
ESD protection ...................................... 15 kV
Creeping distance: ................................. 3.2 mm
Test voltage:......................................... 1000 VAC
Short-circuit protection

### 4.3.2 RS422, RS485

CCITT recommendation: ......................... V.11
US norm EIA: ........................................ RS422, RS485

**Without optical isolation (MX422, MX485)**

Max. transfer rate: ................................... 1 Mbaud
Transfer rate on request........................... up to 2.5 MBaud
ESD protection ...................................... 15 kV
Transorb diodes

**With optical isolation (MX422-G, MX485-G)**

Max. transfer rate: ................................... 1 Mbaud
Transfer rate on request............................ up to 2.5 MBaud
ESD protection ....................................... 15 kV
Creeping distance: ................................... 3.2 mm
Test voltage:............................................ 1000 VAC
Short-circuit protection

### 4.3.3  20mA current loop (MXTTY)

Max. Baudrate: ....................................... 19.2 kBaud
Transorb diodes:  ................................... 400 W
Absorption power
Creeping distance:  ................................ 3.2 mm
Test voltage: ......................................... 1000 VAC
Load:..................................................... 500 $\Omega$
Voltage reversal and short-circuit protection through Transorb diodes

❶ Basic board and 1MBd configuration (Option): Please check if the quartz
frequency is correctly set in ADDIREG or in the device manager of your
operating system. See 6.1 for Windows XP/2000.
The 1MBaud transfer rate can only be programmed with the device drivers
delivered with the board.

**RS 485**: transfer at 1 MBaud only works when the transmitter is controlled
through DTR, RTS or data bit.

## 4.4   Component scheme and block diagrams

**Fig. 4-1: Component scheme of the APCI-7xx-2**
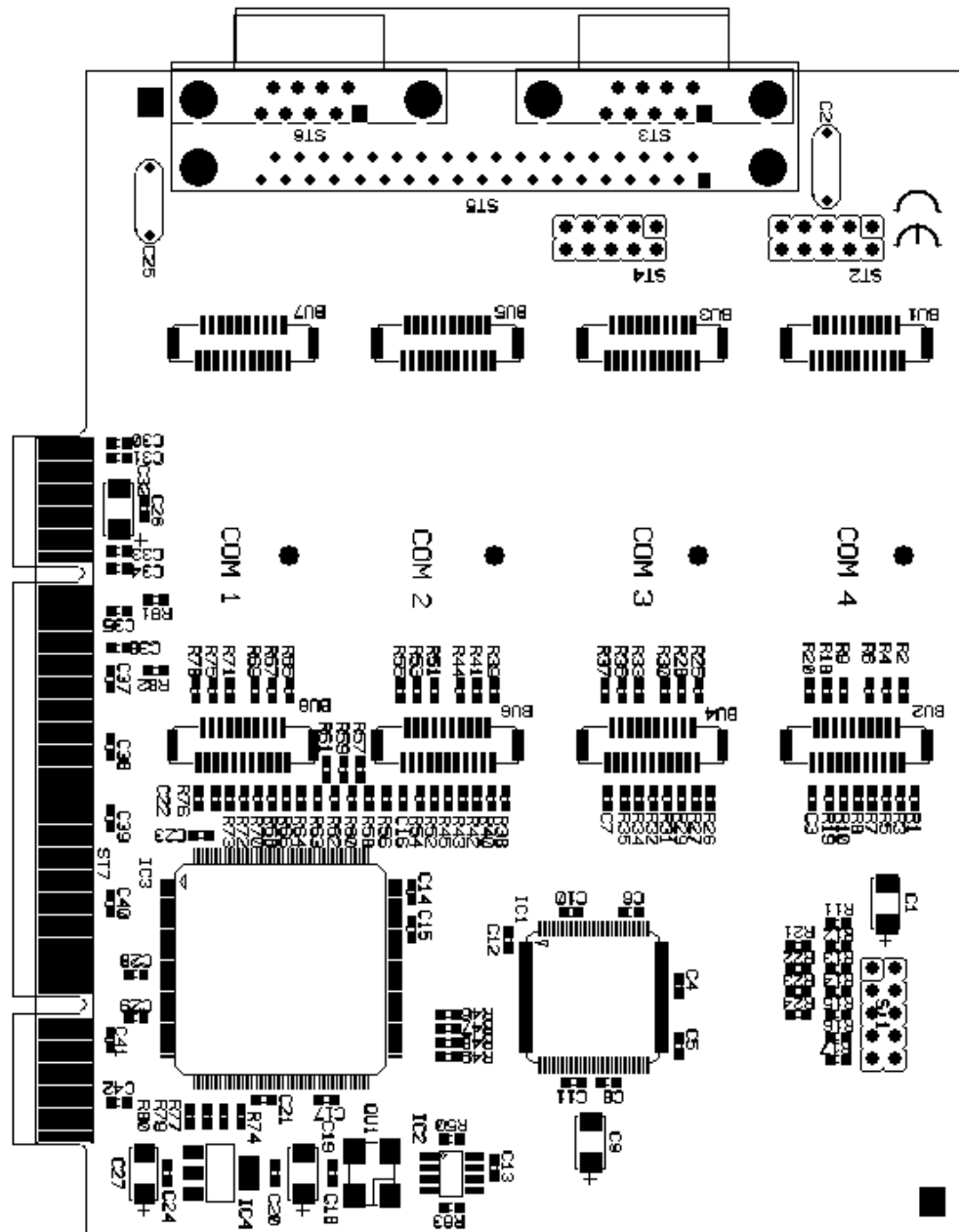
**Fig. 4-2: Block diagram of the APCI-7300-2**
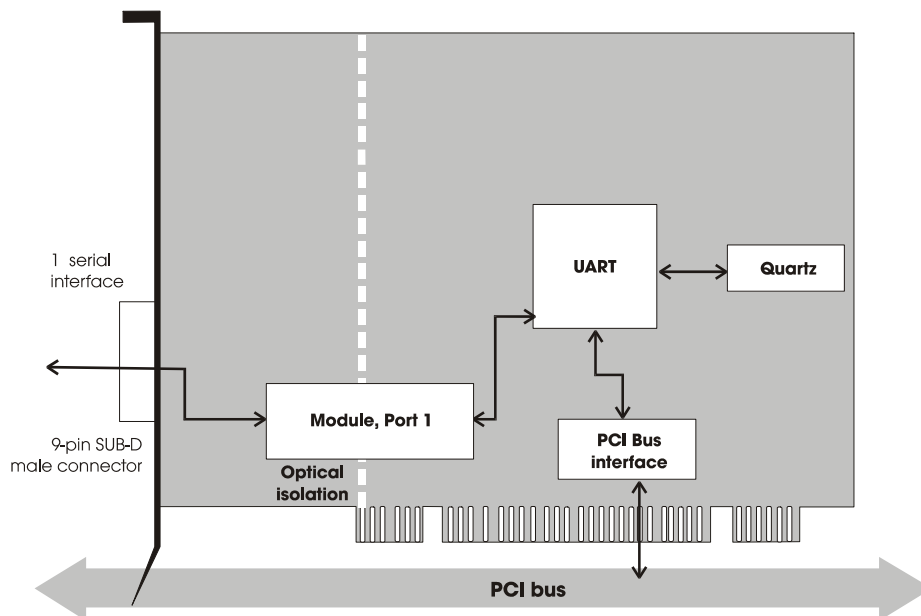


**Fig. 4-3: Block diagram of the APCI-7420-2**
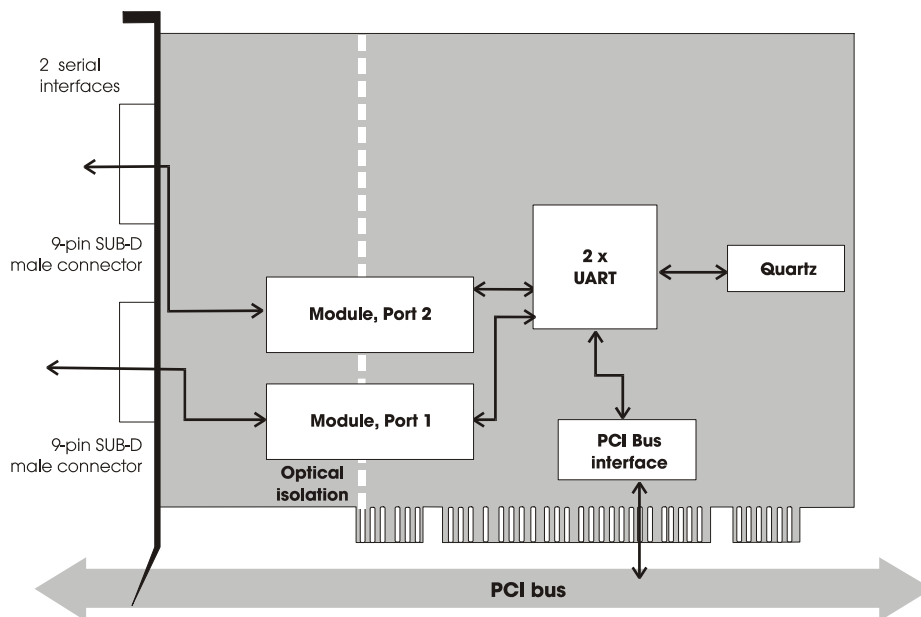
**Fig. 4-4: Block diagram of the APCI-7500-2**
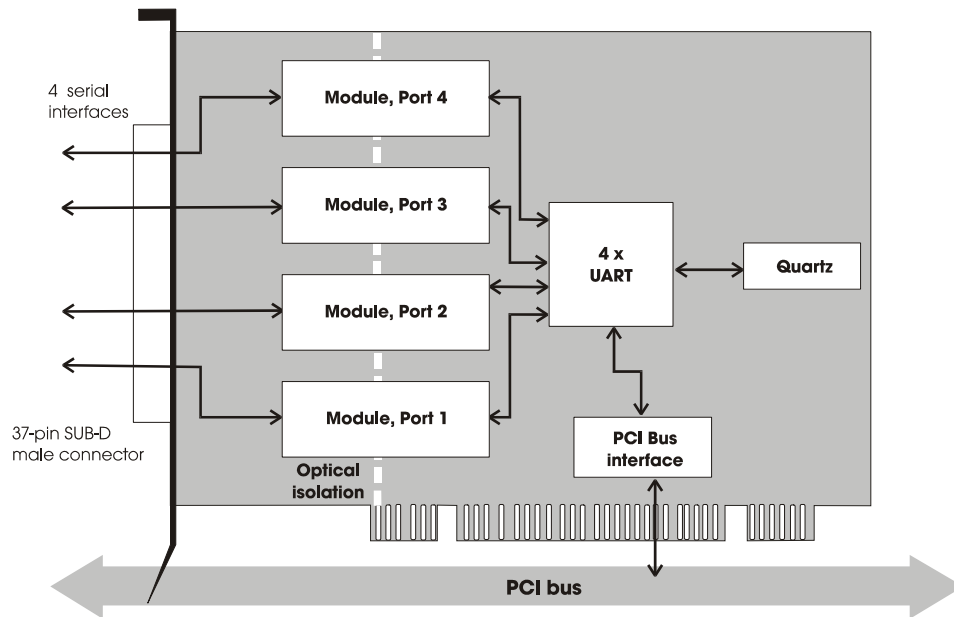


**Fig. 4-5: Block diagram of the APCI-7500-2/4C**
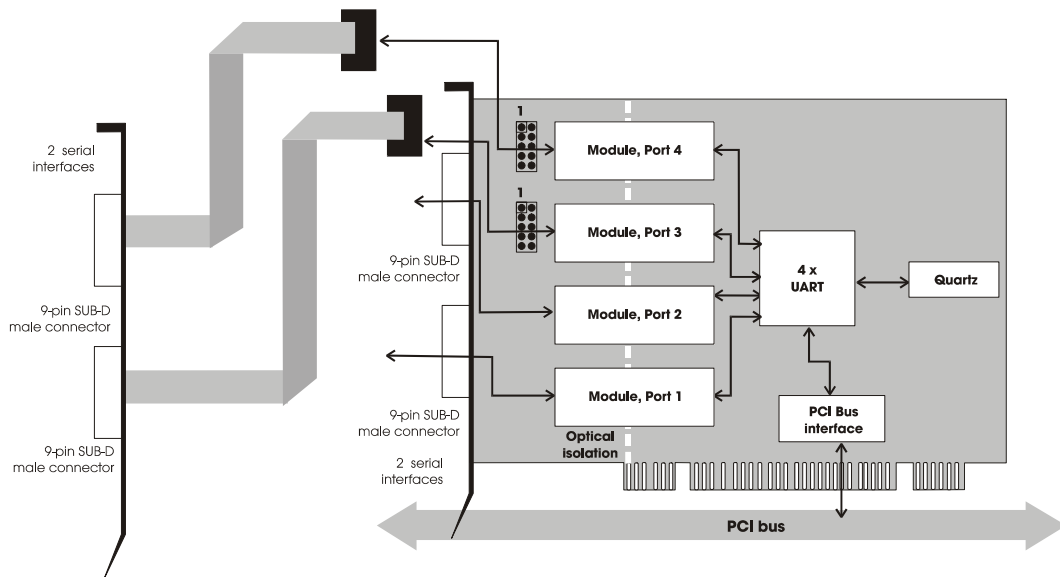
# 5    INSTALLATION OF THE BOARD

The interrupt lines and base address of the baord are allocated by the BIOS of the PC syste through software. No setting is then required before inserting the board.


**i**    **IMPORTANT!**
Do observe the safety precautions (yellow leaflet)!


## 5.1    Opening the PC

♦ **Switch off your PC and all the units connected to the PC**

♦ **Pull the PC mains plug from the socket.**

♦ **Open your PC as described in the manual of the PC manufacturer.**

## 5.2    Selecting a free slot

Insert the board in a free PCI-3.3V slot (32/64-bit).

**Fig. 5-1: Slot types**
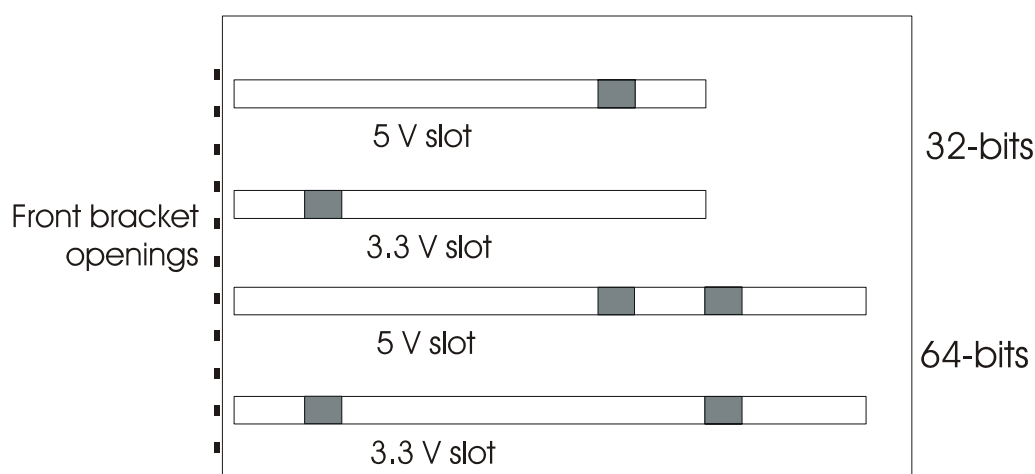


♦ **Remove the back cover of the selected slot according to the instructions of the PC manufacturer.**

Keep the back cover. You will need it if you remove the board

♦ **Discharge yourself from electrostatic charges.**

♦ **Take the board out of its protective blister pack.**

**Fig. 5-2: Opening the blister pack**
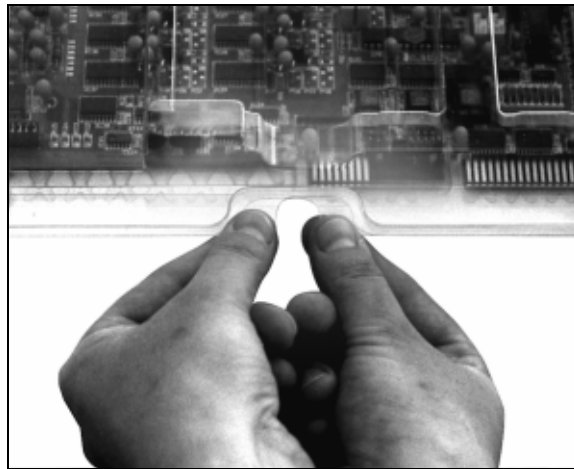


## 5.3    Plugging the board into the slot

♦ Insert the board **vertically into the chosen slot.**

**Fig. 5-3: Inserting the board**
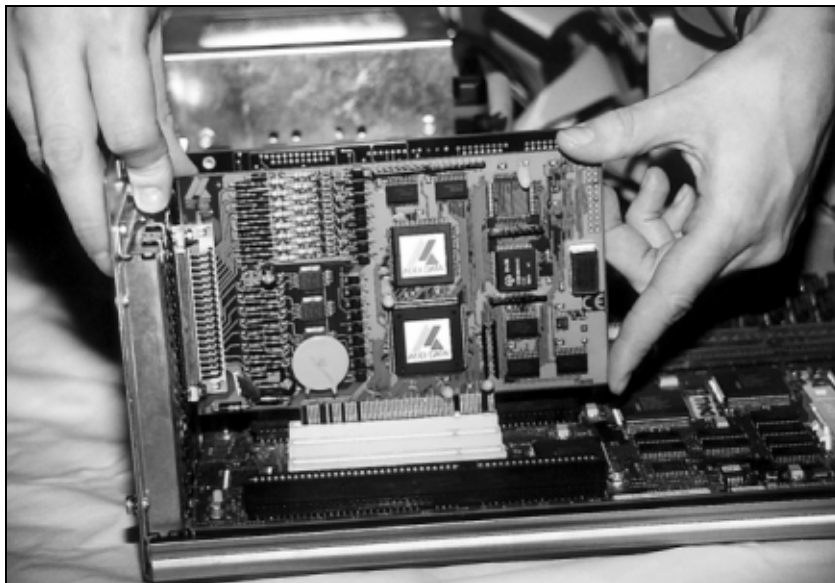
♦ Fasten the board **to the rear of the PC housing with the screw which was fixed on the back cover.**

**Fig. 5-4: Fastening the board at the back cover**
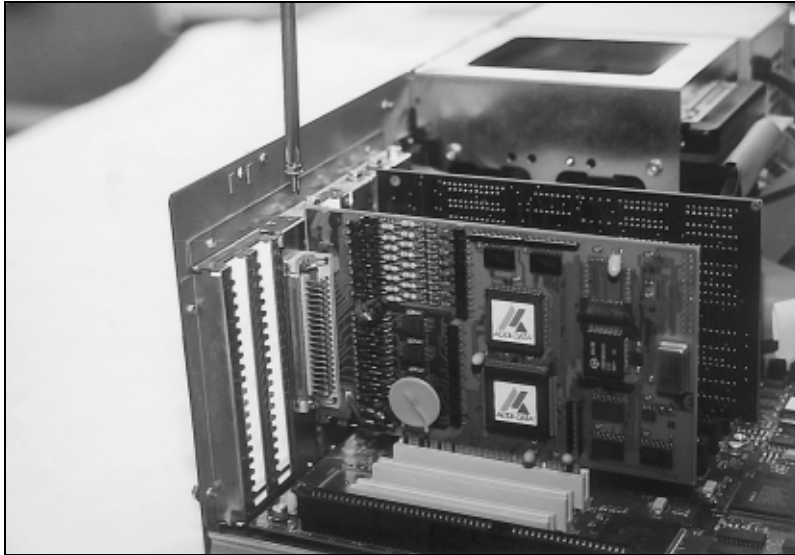


♦ **Tighten all the loosen screws.**

## 5.4    Closing the PC

♦ **Close your PC as described in the manual of the PC manufacturer.**

# 6    BOARD CONFIGURATION

In this chapter you will find a description of the delivered software and its possible applications.

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

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

The board is supplied with a driver CD-ROM (CD1) containing:
- ADDICOM software samples with API function for the ADDI-DATA boards in 32-bits

**i**     **IMPORTANT!**
**The board can only be run under Windows XP/2000.**

# 6.1    Configuration under Windows XP/2000

In the Windows device manager you can set the different interfaces according to your requirements through double clic.

Start the device manager of your operating system under Start/(Settings)/Control panel/System

In the "FIFO" register the following settings are possible:

### Fig. 6-1: FIFO settings with the Device Manager



PCI bus and device number

Management of the transmitter and receiver buffer

Data flow control

Reset the standard settings
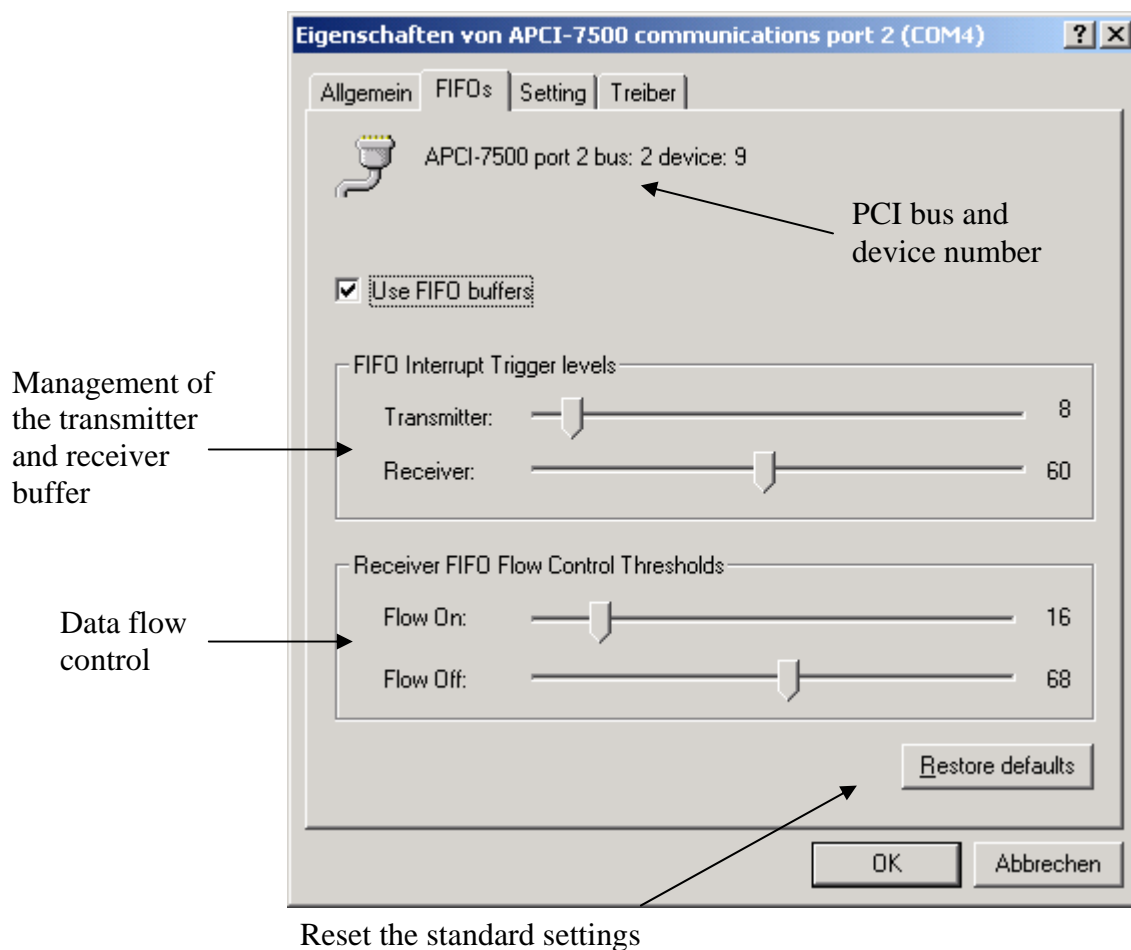
In "Setting" you adapt the operating mode to the used interface.

You can select the quartz frequency for example and decide whether the modem control signals for RS232 are internally connected.

**Fig. 6-2: Setting example with the Device Manager: RS485**
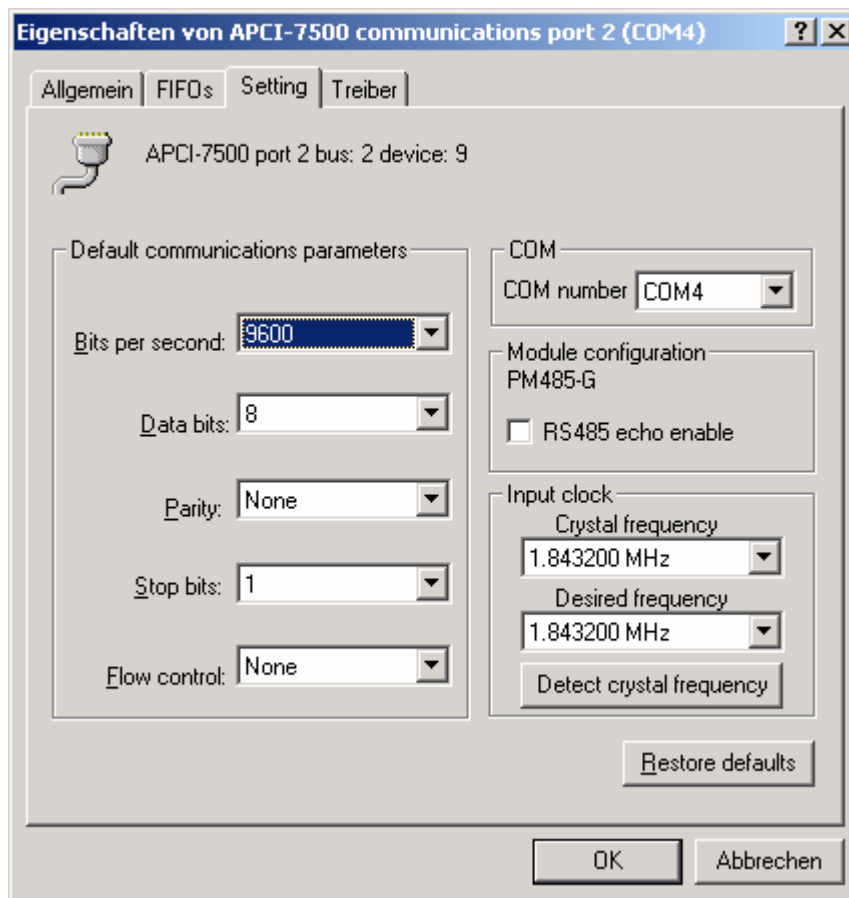


## 6.2   Board test

You can test if you board is not correctly installed with a shorting plug and the test software MTTTY.

The setup file for the test software MTTTY is supplied on the CD-ROM under CD/MMTTY. The program is described in the chapter 8.

## 6.3   Questions and software downloads on the web

Do not hesitate to e-mail us your questions.
per e-mail:      info@addi-data.de      or
                 hotline@addi-data.de

**Free downloads of standard software**

You can download the latest version of the software for the board **APCI-7xx-2**

http://www.addi-data.de       or
http://www.addi-data.com.

# 7    CONNECTING THE PERIPHERAL

## 7.1    Connector pin assignments: standard delivery

### Fig. 7-1: 37-pin SUB-D male connector
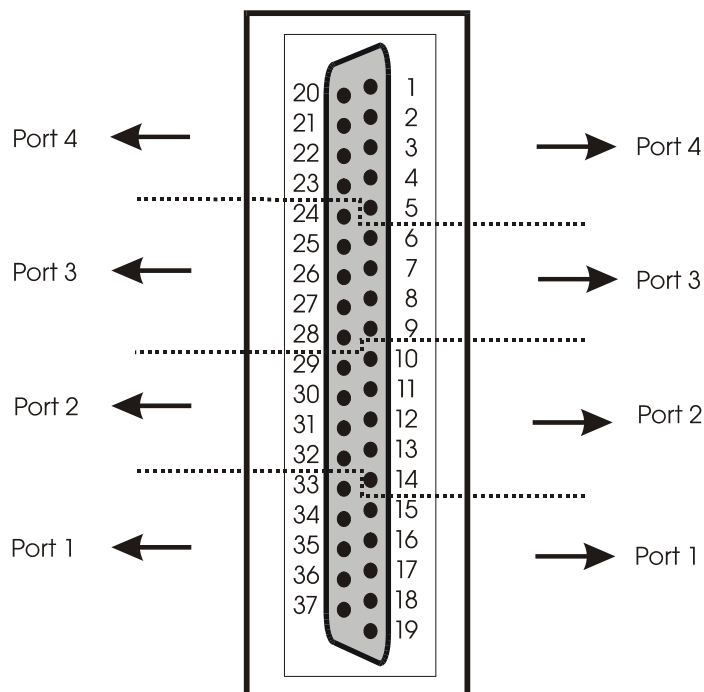


### Table 7-1: Pin assignment of the 37-pin connector

| RS485 | RS422 | Current Loop | RS232 | Pin |
|---|---|---|---|---|
| 120 Ω | 100 Ω | | DSR | 20 |
| | | Tsource | RTS | 21 |
| | | Rsource | CTS | 22 |
| Tx/Rx- | RB | -RCV-CL-DATA | RI | 23 |
| | TA | +XMIT-CL-DATA | CD | 24 |
| | TB | -XMIT-CL-DATA | RxD | 25 |
| Tx/Rx+ | RA | +RCV-CL-DATA | TxD | 26 |
| Rab (1) | | | DTR | 27 |
| GND | GND | GND | GND | 28 |
| 120 Ω | 100 Ω | | DSR | 29 |
| | | Tsource | RTS | 30 |
| | | Rsource | CTS | 31 |
| Tx/Rx- | RB | -RCV-CL-DATA | RI | 32 |
| | TA | +XMIT-CL-DATA | CD | 33 |
| | TB | -XMIT-CL-DATA | RxD | 34 |
| Tx/Rx+ | RA | +RCV-CL-DATA | TxD | 35 |
| Rab (1) | | | DTR | 36 |
| GND | GND | GND | GND | 37 |

| Pin | RS232 | Current Loop | RS422 | RS485 | Port |
|---|---|---|---|---|---|
| 1 | CD | +XMIT-CL-DATA | TA | | |
| 2 | RxD | -XMIT-CL-DATA | TB | | Port 4 |
| 3 | TxD | +RCV-CL-DATA | RA | Tx/Rx+ | |
| 4 | DTR | | Rab (1) | | |
| 5 | GND | GND | GND | GND | |
| 6 | DSR | | 100 Ω | 120 Ω | |
| 7 | RTS | Tsource | | | Port 3 |
| 8 | CTS | Rsource | | | |
| 9 | RI | -RCV-CL-DATA | RB | Tx/Rx- | |
| 10 | CD | +XMIT-CL-DATA | TA | | |
| 11 | RxD | -XMIT-CL-DATA | TB | | Port 2 |
| 12 | TxD | +RCV-CL-DATA | RA | Tx/Rx+ | |
| 13 | DTR | | Rab (1) | | |
| 14 | GND | GND | GND | GND | |
| 15 | DSR | | 100 Ω | 120 Ω | |
| 16 | RTS | Tsource | | | Port 1 |
| 17 | CTS | Rsource | | | |
| 18 | RI | -RCV-CL-DATA | RB | Tx/Rx- | |
| 19 | | | | | |

TA:    Tx422+        RA:    Rx422+
TB:    Tx422-        RB:    Rx422-
Rab:    Connection to a terminal resistor
(1):    Cable connection to 100Ω/120Ω terminates the RS422/RS485 lines
        with the 100Ω/120Ω resitor.

**Fig. 7-2: 9-pin SUB-D male connector**
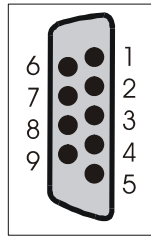


**Table 7-2: Pin assignment of the 9-pin connector**

| RS485 | RS422 | Current Loop | RS232 | Pin | Pin | RS232 | Current Loop | RS422 | RS485 |
|---|---|---|---|---|---|---|---|---|---|
| 120 Ω | 100 Ω | | DSR | 6 | 1 | CD | +XMIT-CL-DATA | TA | |
| | | Tsource | RTS | 7 | 2 | RxD | -XMIT-CL-DATA | TB | |
| | | Rsource | CTS | 8 | 3 | TxD | +RCV-CL-DATA | RA | Tx/Rx+ |
| Tx/Rx- | RB | -RCV-CL-DATA | RI | 9 | 4 | DTR | | Rab (1) | |
| | | | | | 5 | GND | GND | GND | GND |

TA:    Tx422+      RA:    Rx422+
TB:    Tx422-      RB:    Rx422-
Rab:   Connection to a terminal resistor
(1):     Cable connection to 100Ω/120Ω terminates the RS422/RS485 lines
        with the 100Ω/120Ω resitor.

## 7.2   Pin assignment: RS422 with handshake signals

With the module MX422-PEP you can use the modem control signals RTS and CTS in RS422 mode.

**Table 7-3: Pin assignment of the 37-pin connector:**
**RS422 with handshake signals**

| | RS422 | Pin | Pin | RS422 | |
|---|---|---|---|---|---|
| | IA | 20 | 1 | TA | |
| Port 4 | CB | 21 | 2 | TB | Port 4 |
| | CA | 22 | 3 | RA | |
| | RB | 23 | 4 | IB | |
| | TA | 24 | 5 | GND | |
| | TB | 25 | 6 | IA | |
| Port 3 | RA | 26 | 7 | CB | Port 3 |
| | IB | 27 | 8 | CA | |
| | GND | 28 | 9 | RB | |
| | IA | 29 | 10 | TA | |
| Port 2 | CB | 30 | 11 | TB | Port 2 |
| | CA | 31 | 12 | RA | |
| | RB | 32 | 13 | IB | |
| | TA | 33 | 14 | GND | |
| | TB | 34 | 15 | IA | |
| Port 1 | RA | 35 | 16 | CB | Port 1 |
| | IB | 36 | 17 | CA | |
| | GND | 37 | 18 | RB | |
| | | | 19 | | |

TA:    Tx422+      RA:    Rx422+
TB:    Tx422-      RB:    Rx422-

IA:    CTS+       CA:    RTS+
IB:    CTS-       CB:    RTS-

### Table 7-4: Pin assignment of the 9-pin connector:
### RS422 with handshake signals

| RS422 | Pin | Pin | RS422 |
|-------|-----|-----|-------|
| IA | 6 | 1 | TA |
| CB | 7 | 2 | TB |
| CA | 8 | 3 | RA |
| RB | 9 | 4 | IB |
|   |   | 5 | GND |

TA:    Tx422+      RA:    Rx422+
TB:    Tx422-       RB:    Rx422-

IA:    CTS+        CA:    RTS+
IB:    CTS-         CB:    RTS-

# 7.3  Connection cables - APCI-7500-2

### Fig. 7-3: Connection cable ST074 (4 x 25-pin)
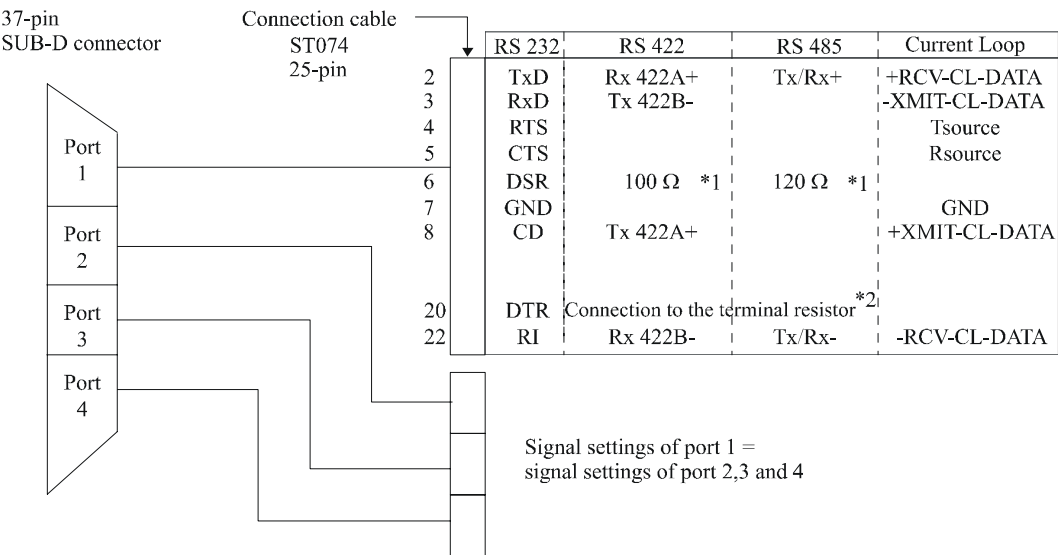
| | RS 232 | RS 422 | RS 485 | Current Loop |
|---|--------|--------|--------|--------------|
| 2 | TxD | Rx 422A+ | Tx/Rx+ | +RCV-CL-DATA |
| 3 | RxD | Tx 422B- | | -XMIT-CL-DATA |
| 4 | RTS | | | Tsource |
| 5 | CTS | | | Rsource |
| 6 | DSR | 100 Ω  *1 | 120 Ω  *1 | |
| 7 | GND | | | GND |
| 8 | CD | Tx 422A+ | | +XMIT-CL-DATA |
| 20 | DTR | Connection to the terminal resistor *2 | | |
| 22 | RI | Rx 422B- | Tx/Rx- | -RCV-CL-DATA |

37-pin SUB-D connector

Connection cable ST074 25-pin

Port 1

Port 2

Port 3

Port 4

Signal settings of port 1 = signal settings of port 2,3 and 4

* 1 Resistor integrated on the MX module

* 2 Cable connection to 100Ω/120Ω terminates the RS422/RS485 lines with 100Ω/120Ω resistor. (Wire bridges betweeen pin 20 and 6)

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**Fig. 7-4: Connection cable ST075 (4 x 9-pin)**
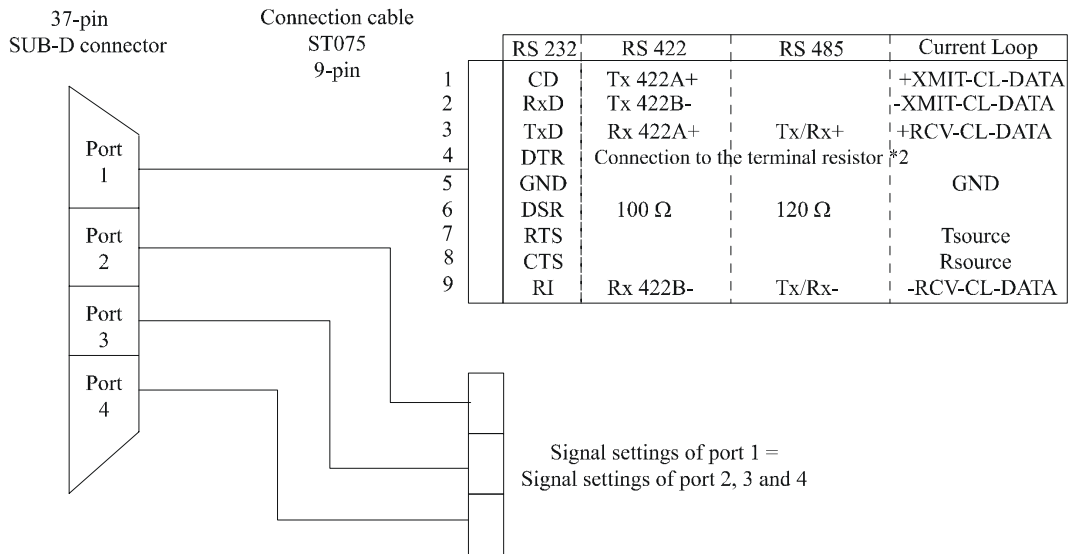


| | RS 232 | RS 422 | RS 485 | Current Loop |
|---|---|---|---|---|
| 1 | CD | Tx 422A+ | | +XMIT-CL-DATA |
| 2 | RxD | Tx 422B- | | -XMIT-CL-DATA |
| 3 | TxD | Rx 422A+ | Tx/Rx+ | +RCV-CL-DATA |
| 4 | DTR | Connection to the terminal resistor *2 | | |
| 5 | GND | | | GND |
| 6 | DSR | 100 Ω | 120 Ω | |
| 7 | RTS | | | Tsource |
| 8 | CTS | | | Rsource |
| 9 | RI | Rx 422B- | Tx/Rx- | -RCV-CL-DATA |

37-pin SUB-D connector — Port 1, Port 2, Port 3, Port 4

Connection cable ST075 9-pin

Signal settings of port 1 =
Signal settings of port 2, 3 and 4

* 1 Resistor integrated on the MX module
* 2 Cable connection to 100Ω/120Ω terminates the RS422/RS485 lines with 100Ω/120Ω resistor. (Wire bridges betweeen pin 20 and 6)

## 7.4 Connection examples

### 7.4.1 APCI-7500-2

**RS232 cabling**

**Fig. 7-5: RS232 cabling - 4-port interface**



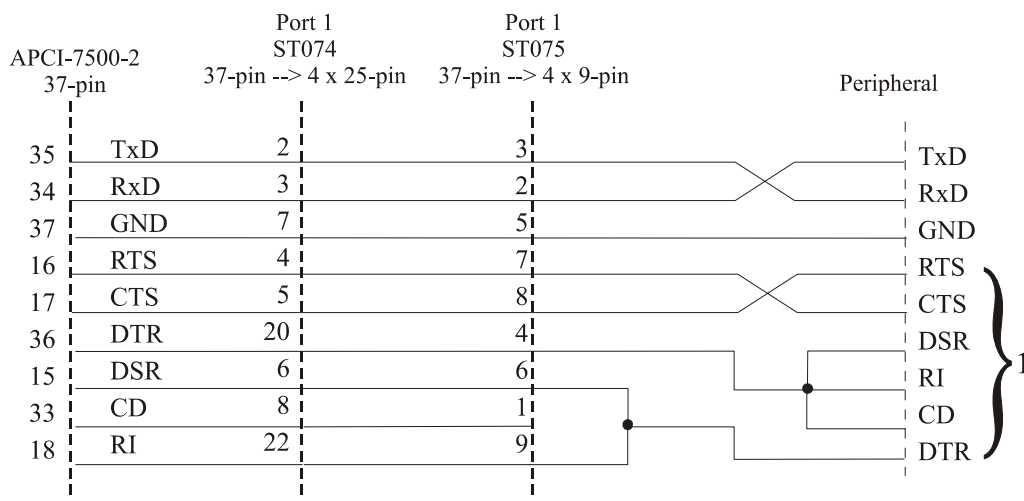| APCI-7500-2 37-pin | | Port 1 ST074 37-pin --> 4 x 25-pin | Port 1 ST075 37-pin --> 4 x 9-pin | Peripheral |
|---|---|---|---|---|
| 35 | TxD | 2 | 3 | TxD |
| 34 | RxD | 3 | 2 | RxD |
| 37 | GND | 7 | 5 | GND |
| 16 | RTS | 4 | 7 | RTS |
| 17 | CTS | 5 | 8 | CTS |
| 36 | DTR | 20 | 4 | DSR |
| 15 | DSR | 6 | 6 | RI |
| 33 | CD | 8 | 1 | CD |
| 18 | RI | 22 | 9 | DTR |

**1** If the modem control signals are not used, they must be either connected on the board or externally driven to the connector via solder bridge.

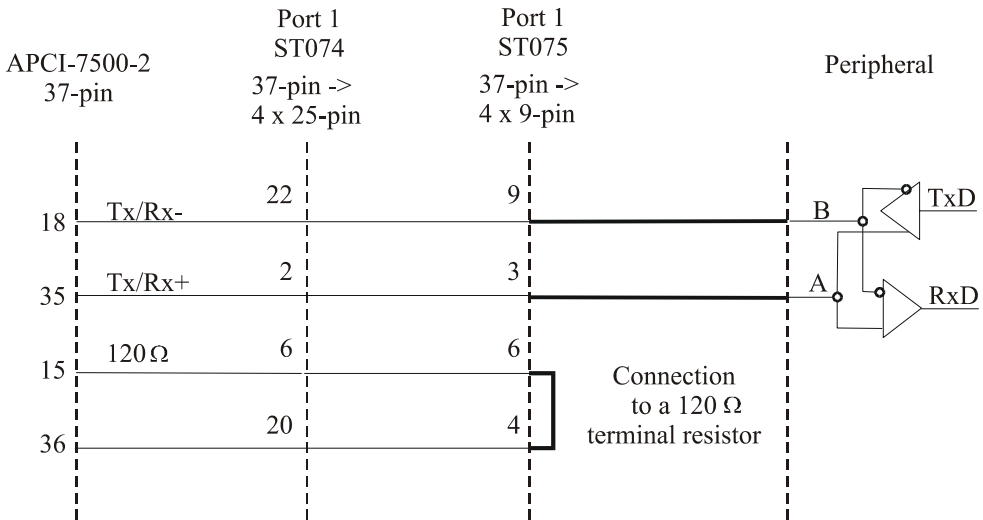**RS422 cabling**

### Fig. 7-6: RS422 cabling - 4-port interface
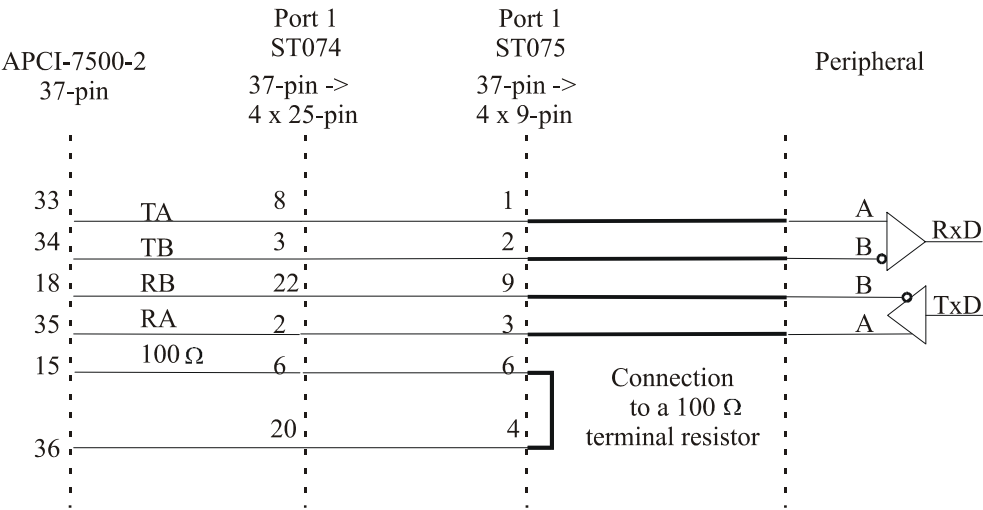


**RS485 cabling**

### Fig. 7-7: RS485 cabling - 4-port interface

## Current loop (20 mA) cabling

**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. 7-8: Current Loop - Active transmission/active reception 4-port serial interface
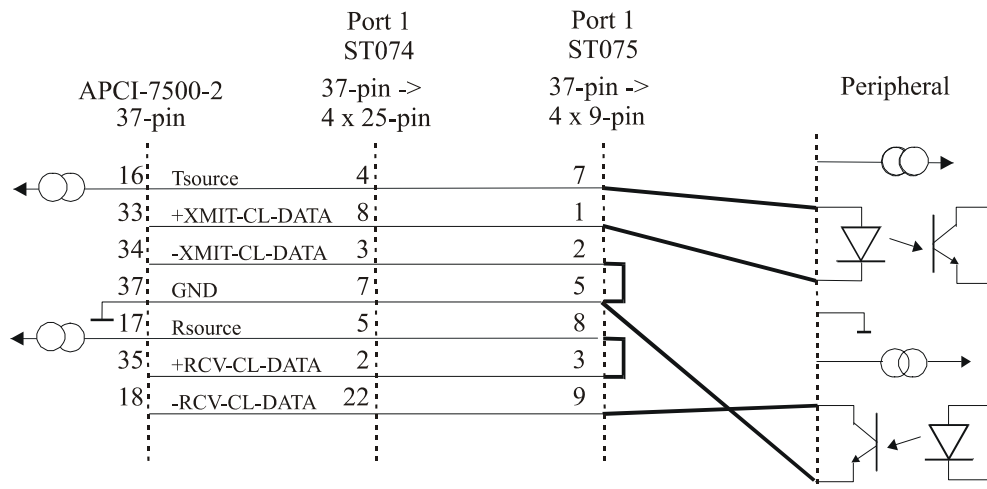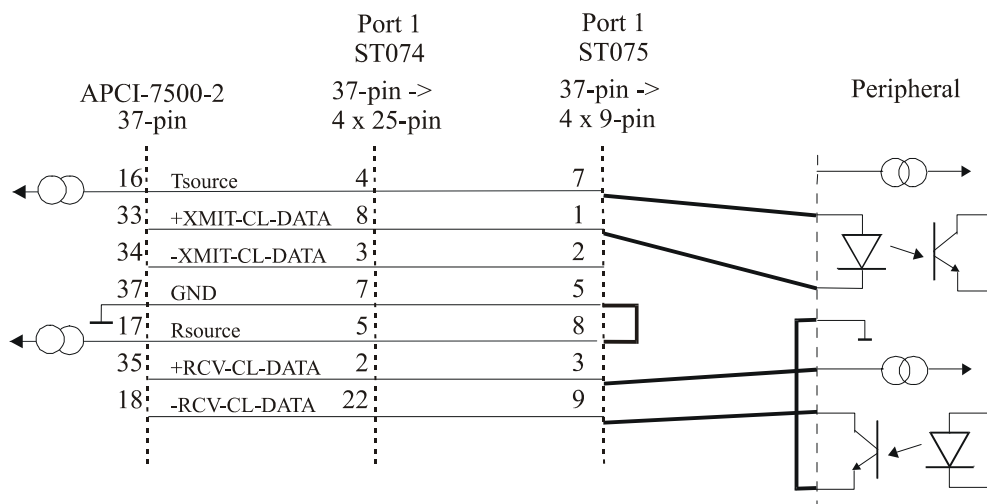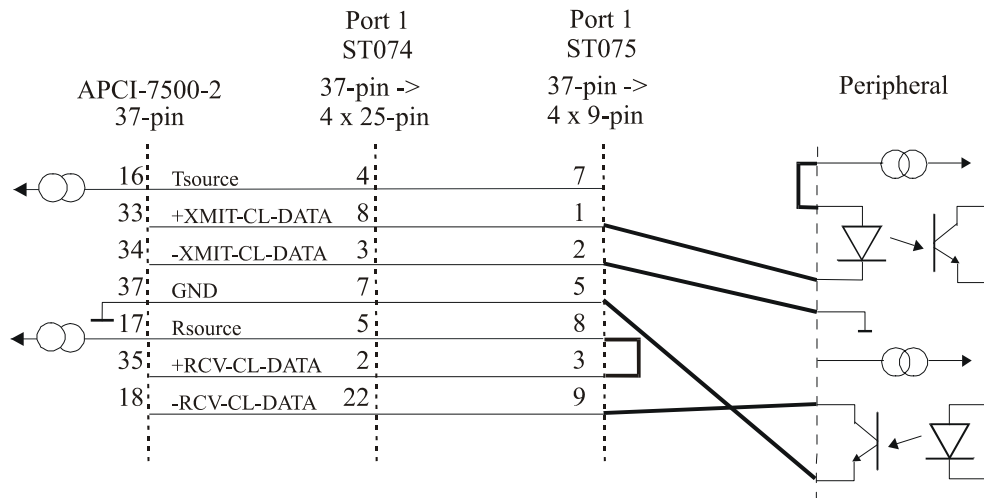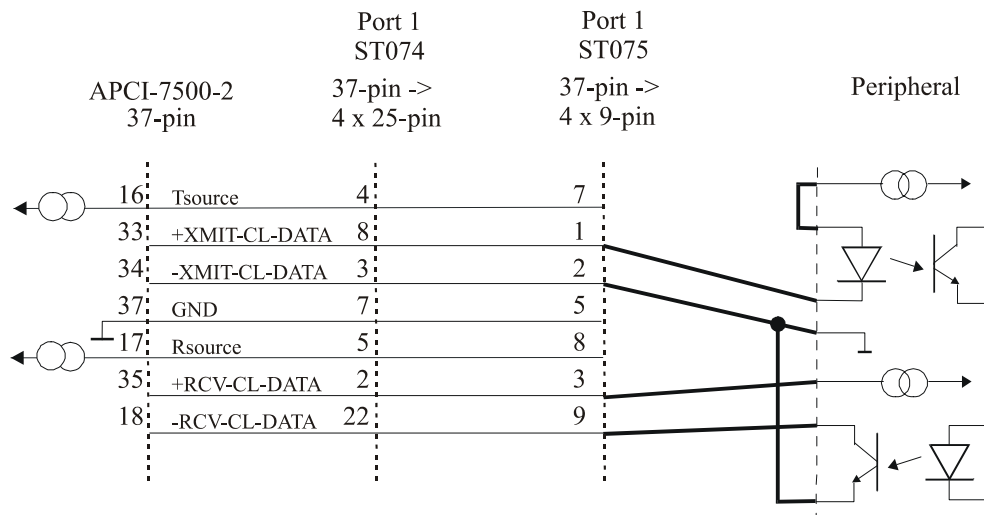


### Fig. 7-9: Current Loop - Active transmission/passive reception 4-port serial interface

**Fig. 7-10: Current Loop - Passive transmission/active reception
4-port serial interface**



**Fig. 7-11: Current Loop - Passive transmission/passive reception
4-port serial interface**

## 7.4.2  APCI-7300-2, APCI-7420-2, APCI-7500-2/4C

**RS232 cabling**

**Fig. 7-12: RS232 cabling - 9-pin connector**
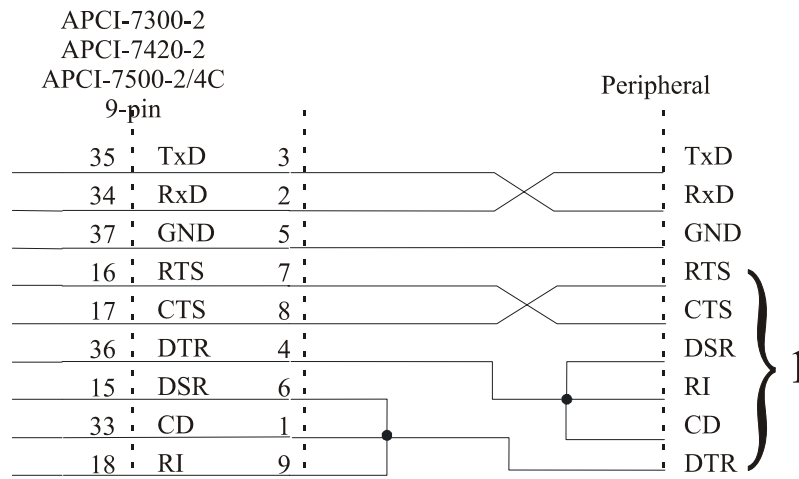
APCI-7300-2
APCI-7420-2
APCI-7500-2/4C
9-pin                                                    Peripheral

| 35 | TxD | 3 | | TxD |
| 34 | RxD | 2 | | RxD |
| 37 | GND | 5 | | GND |
| 16 | RTS | 7 | | RTS |
| 17 | CTS | 8 | | CTS |
| 36 | DTR | 4 | | DSR |
| 15 | DSR | 6 | | RI |
| 33 | CD | 1 | | CD |
| 18 | RI | 9 | | DTR |

**1** If the modem control signals are not used, they must be either connected on the board or externally driven to the connector via solder bridge.

**RS422 cabling**

**Fig. 7-13: RS422 cabling - 9-pin connector**

APCI-7300-2
APCI-7420-2
APCI-7500-2/4C
9 pin                                                    Peripheral

| 1 | TA | | A | RxD |
| 2 | TB | | B | |
| 9 | RB | | B | TxD |
| 3 | RA | | A | |
| 4 | 100 Ω | | | |
| 6 | | | | |

Connection
to a 100 Ω
terminal resistor

33
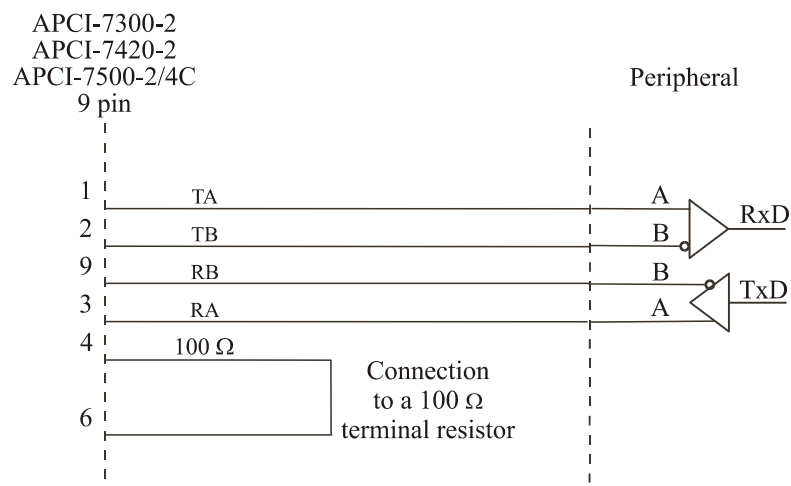
**RS485 cabling**

**Fig. 7-14: RS485 cabling - 9-pin connector**
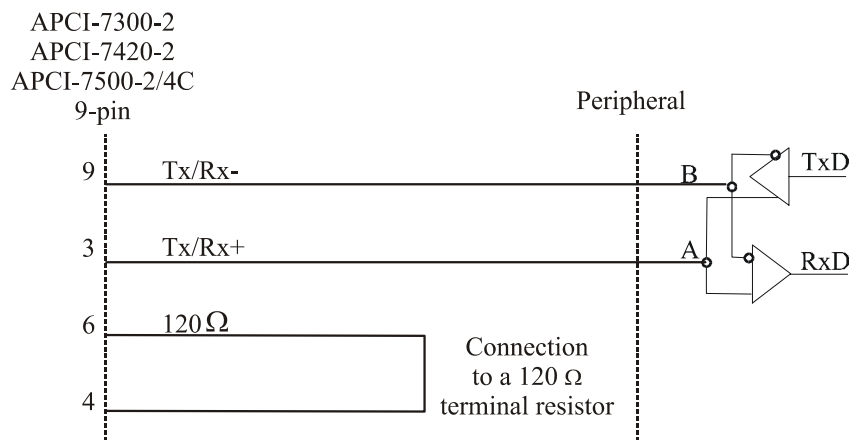
APCI-7300-2
APCI-7420-2
APCI-7500-2/4C
9-pin                                                          Peripheral

9      Tx/Rx-                                              B              TxD

3      Tx/Rx+                                              A              RxD

6      120 Ω
                                          Connection
                                          to a 120 Ω
4                                         terminal resistor

**Current loop (20 mA) cabling**

**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. 7-15: Current Loop - Active transmission/active reception**
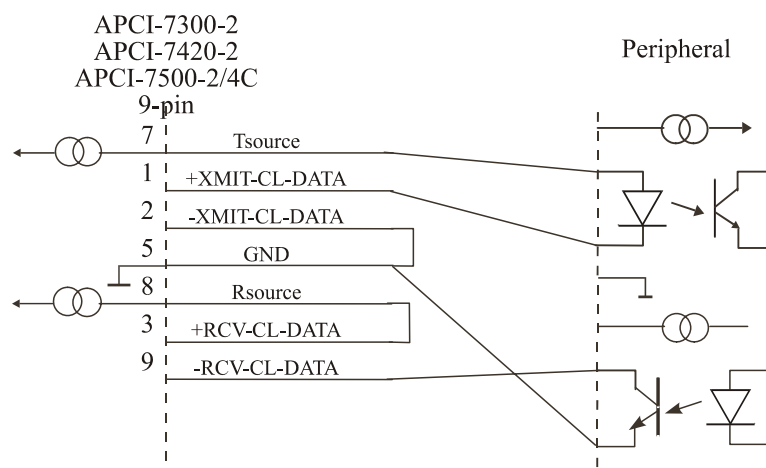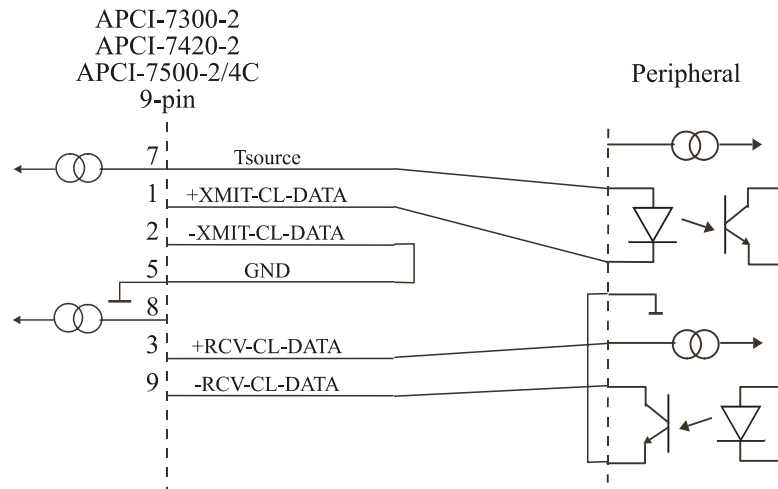**9-pin connector**

APCI-7300-2
APCI-7420-2
APCI-7500-2/4C                                              Peripheral
9-pin

7      Tsource

1      +XMIT-CL-DATA

2      -XMIT-CL-DATA

5      GND

8      Rsource

3      +RCV-CL-DATA

9      -RCV-CL-DATA

**Fig. 7-16: Current Loop - Active transmission/passive reception
9-pin connector**

APCI-7300-2
APCI-7420-2
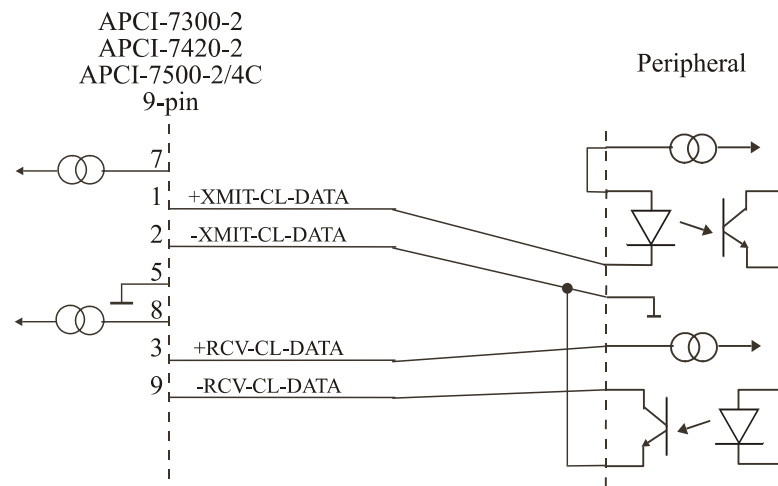APCI-7500-2/4C
9-pin

Peripheral

7  Tsource
1  +XMIT-CL-DATA
2  -XMIT-CL-DATA
5  GND
8
3  +RCV-CL-DATA
9  -RCV-CL-DATA

**Fig. 7-17: Current Loop - Passive transmission/active reception
9-pin connector**

APCI-7300-2
APCI-7420-2
APCI-7500-2/4C
9-pin

Peripheral

7
1  +XMIT-CL-DATA
2  -XMIT-CL-DATA
5  GND
8  Rsource
3  +RCV-CL-DATA
9  -RCV-CL-DATA
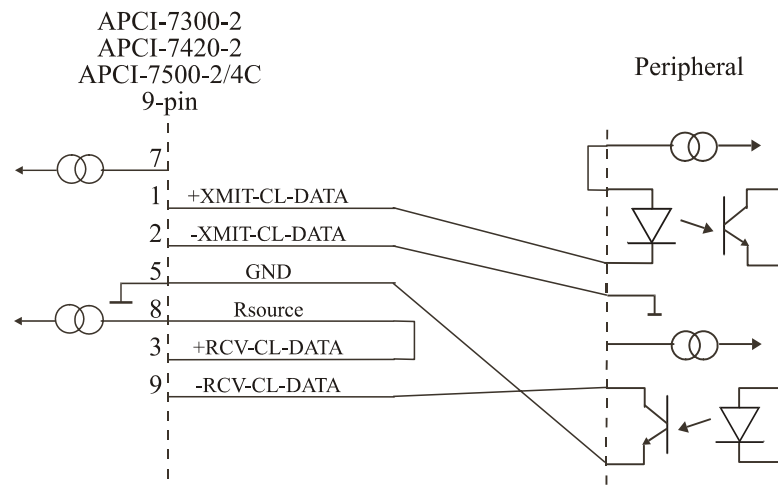
**Fig. 7-18: Current Loop - Passive transmission/passive reception
9-pin connector**

APCI-7300-2
APCI-7420-2
APCI-7500-2/4C
9-pin

Peripheral

7
1  +XMIT-CL-DATA
2  -XMIT-CL-DATA
5
8
3  +RCV-CL-DATA
9  -RCV-CL-DATA

35

# 8    TESTING THE BOARD

## 8.1    Connecting a shorting plug

When using the shorting plug described below and the test program **MTTTY** you can carry out a self-test on the board.

Please note the signal connection of the different ports through the 9-pin shorting plug for the test.

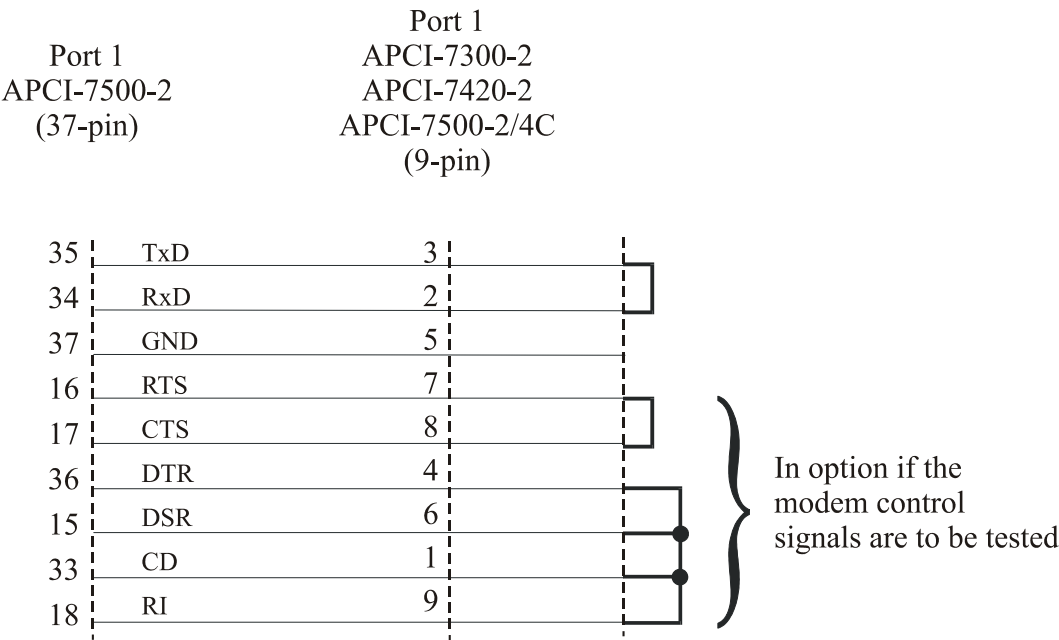### Fig. 8-1: Connection of the shorting plug for the RS232 mode

Port 1
APCI-7500-2
(37-pin)

Port 1
APCI-7300-2
APCI-7420-2
APCI-7500-2/4C
(9-pin)

| 35 | TxD | 3 |
| 34 | RxD | 2 |
| 37 | GND | 5 |
| 16 | RTS | 7 |
| 17 | CTS | 8 |
| 36 | DTR | 4 |
| 15 | DSR | 6 |
| 33 | CD | 1 |
| 18 | RI | 9 |

In option if the
modem control
signals are to be tested

### Fig. 8-2: Connection of the shorting plug for the RS422 mode

Port 1
APCI-7300-2
APCI-7420-2
APCI-7500-2/4C
(9-pin)

Port 1
APCI-7500-2
(37-pin)

Peripheral

| 33 | TA | 1 |
| 34 | TB | 2 |
| 18 | RB | 9 |
| 35 | RA | 3 |
| 15 | 100 Ω | 6 |
| 36 |  | 4 |

Connection to
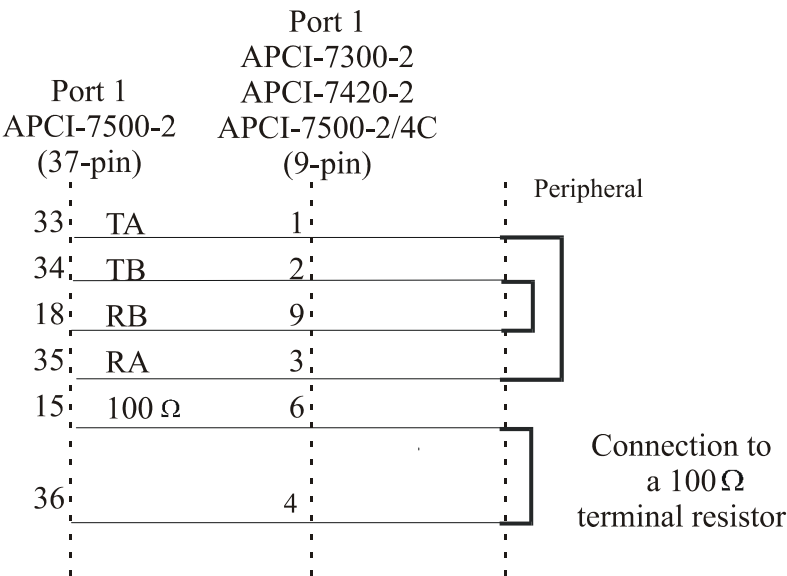a 100 Ω
terminal resistor

**Fig. 8-3: Connection of the shorting plug for the 20 mA current loop active transmission/passive reception**
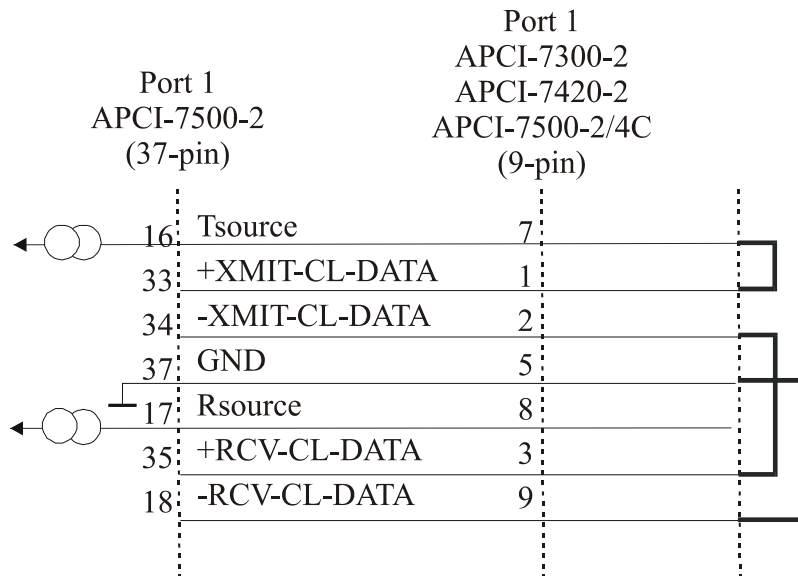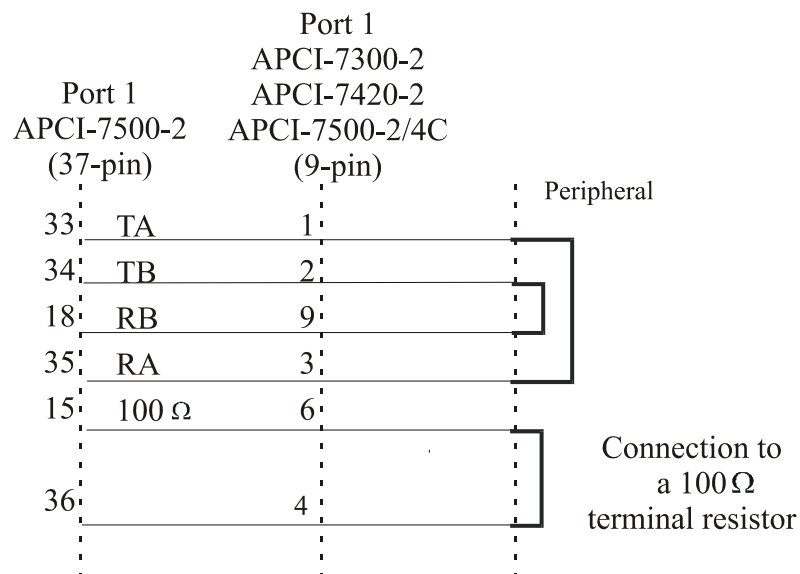


**Fig. 8-4: Connection of the shorting plug for the 20 mA current loop passive transmission/ active reception**

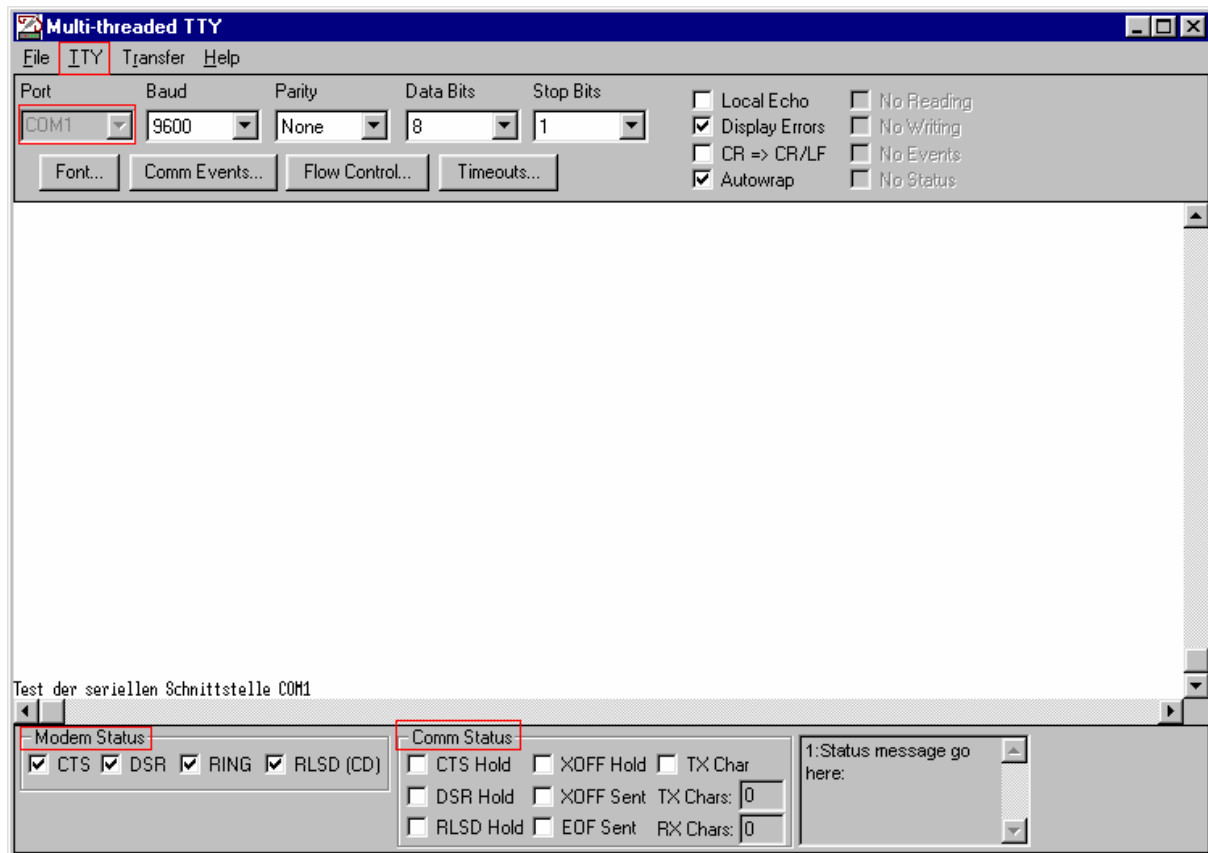## 8.2   Testing the board with the MTTTY program

### RS422, RS232 and 20 mA Current Loop

♦ **Install the program on your PC.**

The program is delivered on the ADDI-DATA driver CD-ROM CD1. Under
CD/MTTTY start the setup.exe file.

The following windows opens.

**Fig. 8-5: The MTTTY program**



♦ **Select the right COM interface under "Port".**

♦ **Connect it with "File/Connect".**

If the shorting plug is connected, each key stroke (= Data transmission) must
result in the corresponding key character displayed on the screen
(= Data reception). If the test is successfully carried out, the board works.

Once the port is initialised the state of the "Modem Control Signals" can be read
in *Modem Status*. If the RTS signal is set, the CTS state is displayed   under
Modem Status. For DTR the 3 other fields are set.

In the above menu under "TTY/Flow Control" you can configure the Handshake of the Modem Control Signals according to your application (See figure below). The settings are displayed in the field "Comm Status".

The field at the bottom right of the main window is a text field for error or state indication messages.

**Fig. 8-6: Handshake configuration for the board test**



**RS485**

**i**
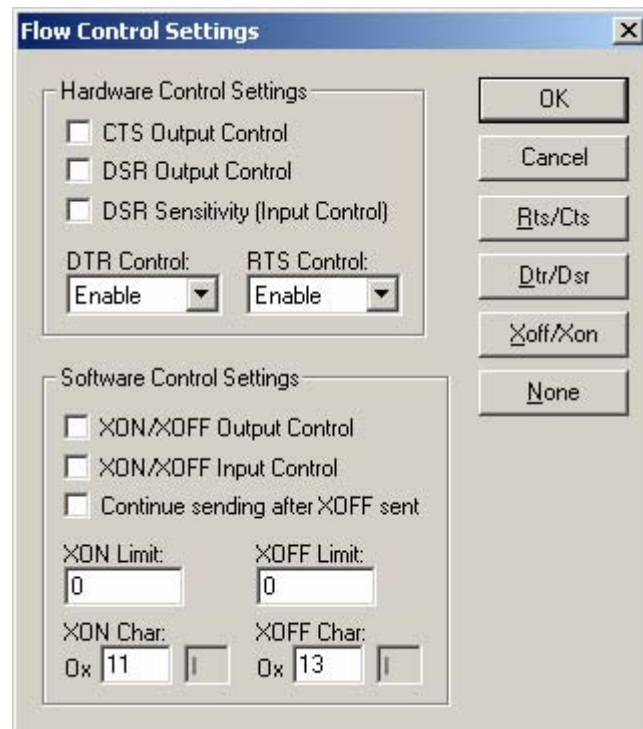
> **IMPORTANT!**
> For testing the RS485 mode, the shorting plug is not used.

This operating mode must be first set in the Device Manager of Windows 2000/XP.

♦ **In Device Manager of Windows 2000 select "RS485 ECHO enable" in the "Setting register" and confirm with "OK".**

Start MTTTY and test through key stroke if the interface works correctly.

# 9    REPLACING THE MODULES

**i**    **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:
- Observe the possible combinations according to the intended purpose of the board.
- Do observe the *Security advises.*
- Insert/remove the module carefully according to the following illustrations.
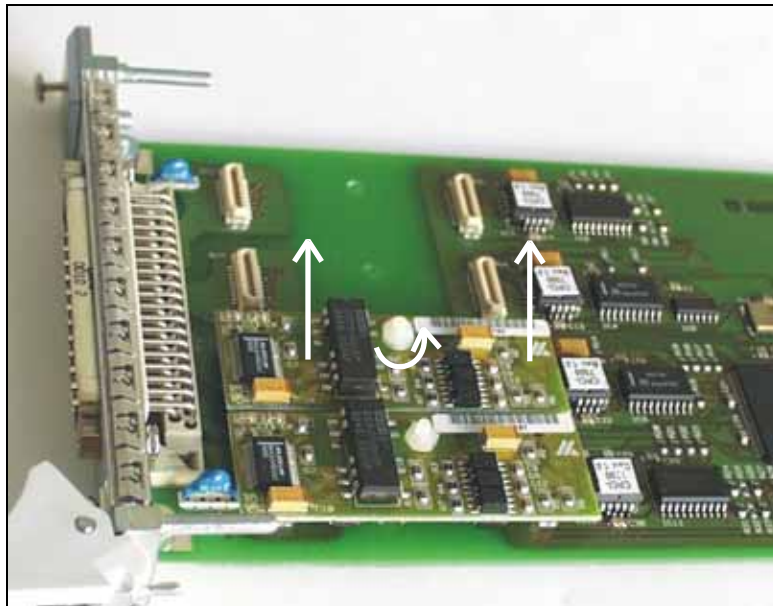
## 9.1    Replacing the MX modules

**Fig. 9-1: Removing the MX module**



**Fig. 9-2: Inserting the MX module**