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Technical description

ADDINUM PA 200

Digital output board

5th edition 10/2004

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.
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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.

Figures

Tables

1 DEFINITION OF APPLICATION

1.1 Intended use

The board **PA 200** must be inserted in a PC with ISA slots, which is used as electrical equipment for measurement, control and laboratory pursuant to the norm IEC 61010-1.

1.2 Usage restrictions

The PA 200 board must not to be used as safety related part for securing emergency stop functions.

The PA 200 board must not be used in potentially explosive atmospheres.

1.3 General description of the board

Data exchange between the **PA 200** board and the peripheral is to occur through a shielded cable. This cable must be connected to the 37-pin SUB-D male connector of the **PA 200** board

The board has 32 output channels for processing digital 24 V signals.

An external 24 V supply voltage is necessary to run the output channels.
The screw terminal board **PX 901** and the relay board **PX 8500** allow to connect the 24 V supply voltage through a shielded cable

The connection with our standard cable ST010 complies with the following specifications:
- metallized plastic hoods
- shielded cable
- cable shield folded back and firmly screwed to the connector housing.

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 of the cable prior to putting the device into operation.

The use of the board according to its intended purpose includes observing all advises given in this manual and in the safety leaflet.

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 its protective blister pack **until it is used**.

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

2 USER

2.1 Qualification

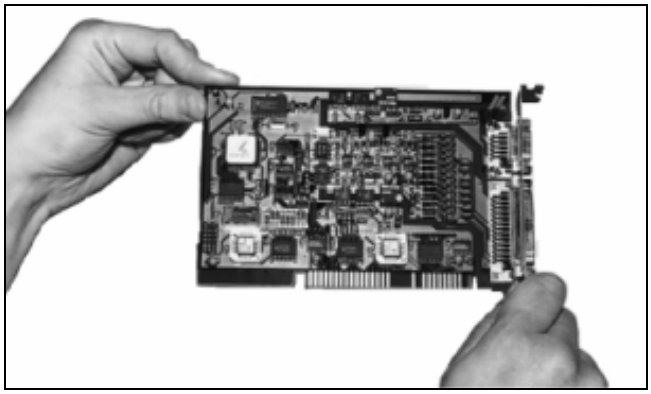
Only persons trained in electronics are entitled to perform the following works:
- installation
- use,
- maintenance.

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.

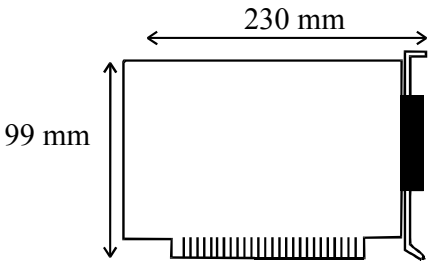
The board has been subjected to EMC tests in an accredited laboratory. The board complies with the limit values set by the norms IEC61326 as follows:

	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:



Installation in: ..... XT/AT slot
Connection to the peripheral: ..... 37-pin SUB-D male connector
Accessories[1]:
Standard cable: ST010
Screw terminal board: ..... PX 901
Relay output board: ..... PX 8500

1 Not included in the standard delivery.

4.3 Limit values

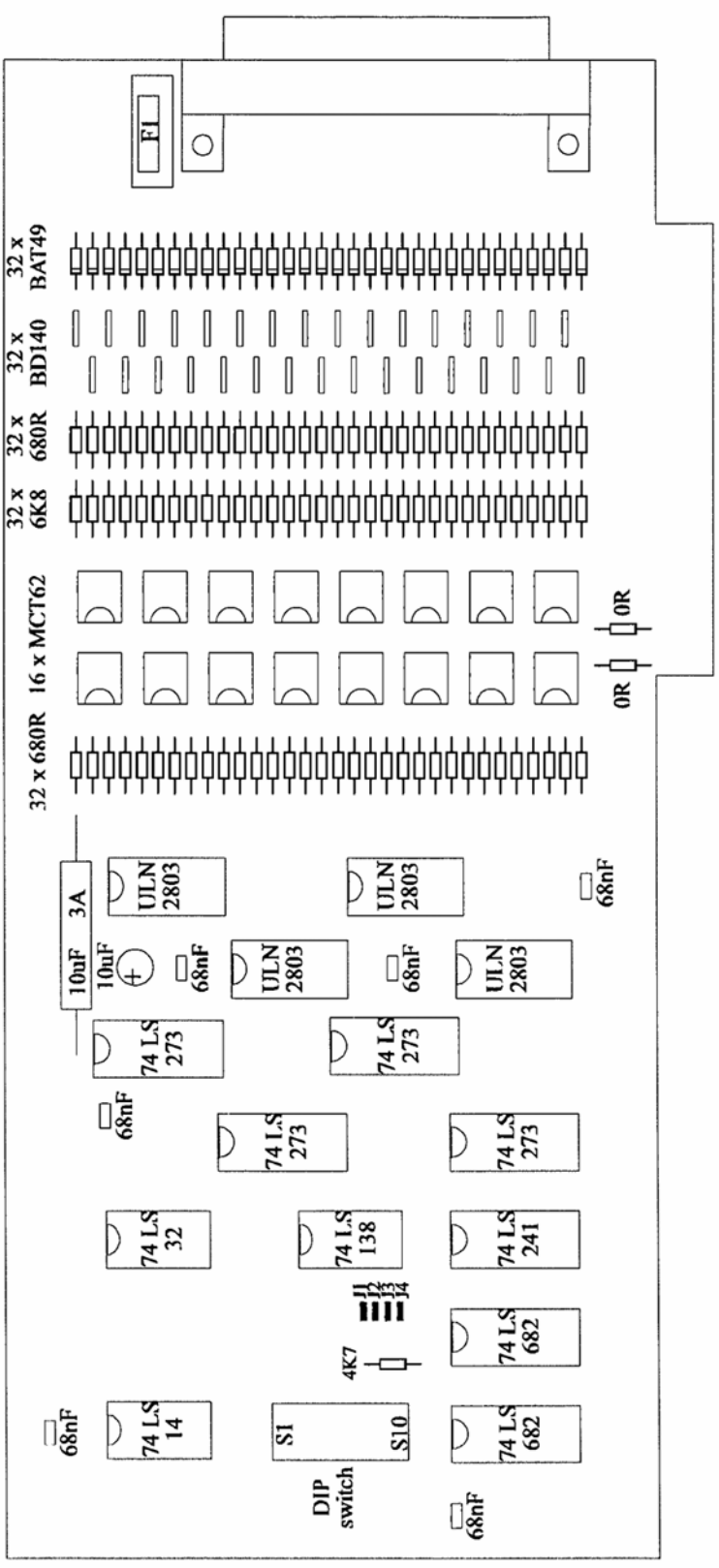
Max. altitude: ..... 2000 m
Operating temperature: ..... 0 to 60°C
Storage temperature: ..... -25 to 70°C
Relative humidity: ..... 30% to 99% non condensing

Minimum PC requirements:
PCI BIOS from Version 1.0
ISA bus interface: ..... 8 MHz
Operating system: ..... MS-Dos, Windows NT, 98, 95

Output current (logic "1"):..... 200 mA
Signal delay ..... 35 µs, nominal
Output current limit: ..... 1 A (< 1s)
Maximum authorized total current 1,6A
Voltage drop at the output transistor
at 200 mA : ..... <= 0.5 V
Limit of the operating voltage
switched by the output:..... 30 V
Test voltage of individual outputs
against PC side: ..... 0.5 V
Fuse: ..... slow 1.6A

4.4 Component scheme

Fig. 4-1: Component scheme



5 SETTINGS OF THE BOARDS

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

5.1 Setting the base address through DIP switches

WARNING!
If the base address set is wrong, the board and/or the PC may be destroyed

At delivery the base address is set to 0390H.

- **Check if the base address is free on your PC.**
- **Check if the required address range is not already used by the PC or by another inserted board.**

5.1.1 Windows NT

To check it, open Start/Programs/Administrative tools (common)/Windows NT diagnostics. Click on "I/O Port".

5.1.2 Windows XP/2000/9x

To check it, start the device manager under Start/Settings/Control Panel/ System/Hardware. Set the view to "resources by type".

If the set base address is not displayed, it is then free. If it is occupied by another device, you have to set a new base address through the block of DIP switches of the board.

5.1.3 Decoding the base address

In

Switch	J4*	J3*	J2*	J1*	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1
Address bit	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2

Table 5-1 the address 0390H is decoded. (Settings at delivery).
The adjustment of the board occurs over a block of 10 DIP switches. The switches designated S1 to S10 can be switched "ON" or "OFF".
Caution ! A switch in "ON" position is equivalent to logic "0"
A switch in "OFF" position is equivalent to logic "1"

Switch	J4*	J3*	J2*	J1*	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1
Address bit	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2

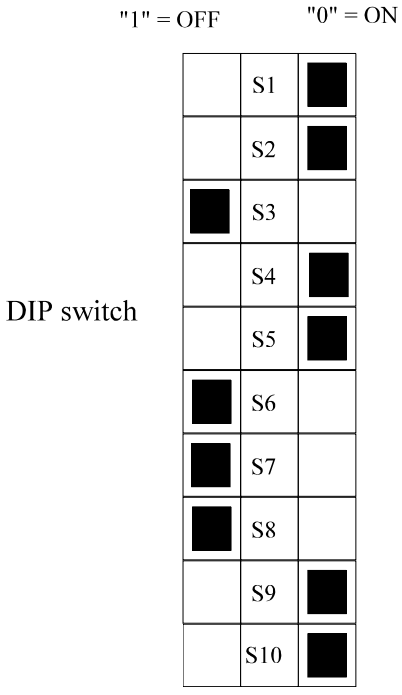
Table 5-1: Decoding table (0390H)

Switch	J4*	J3*	J2*	J1*	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1
State	0	0	0	0	0	0	1	1	1	0	0	1	0	0

* Solder straps permanently coded at "0".

Fig. 5-1: Block of DIP switches S1

IMPORTANT!
You will find the switch **s1 on the left** of the DIP switches!



6 INSTALLATION OF THE BOARD

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

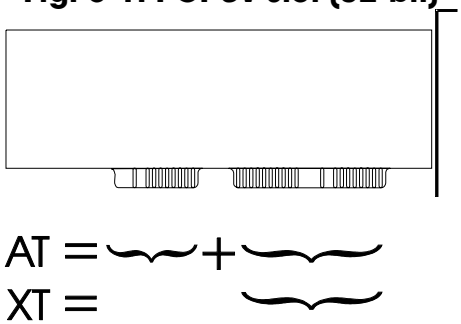
6.1 Opening the PC

- **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.**

6.2 Selecting a free slot

Insert the board in a free ISA XT/AT slot.

Fig. 6-1: PCI-5V slot (32-bit)

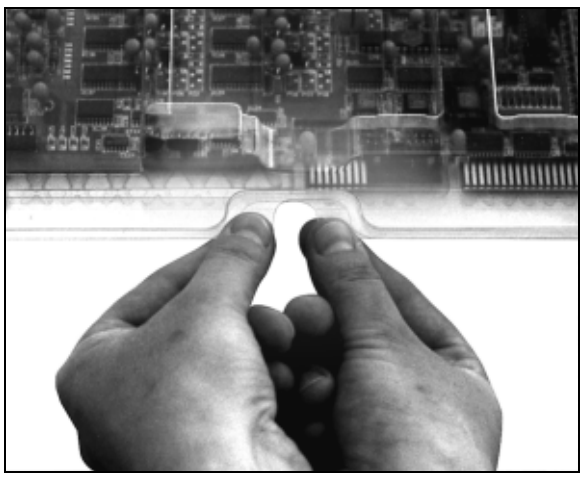


Remove the back cover of the selected slot according to the instructions of the PC manufacturer. Keep the back cover. You will need it if you remove the board

Discharge yourself from electrostatic charges.

Take the board out of its protective blister pack.

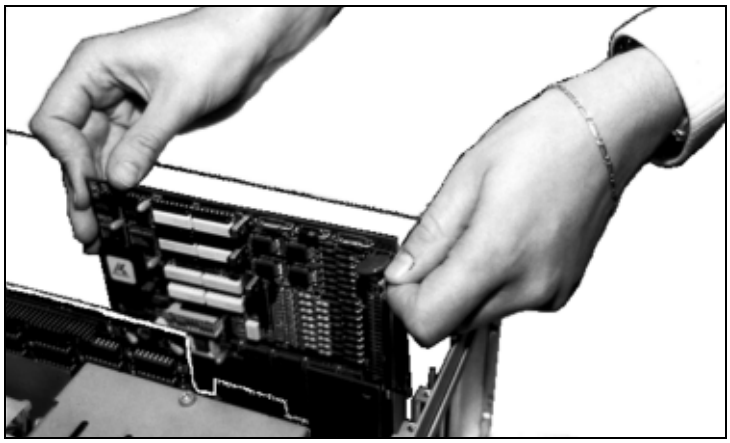
Fig. 6-2: Opening the blister pack



6.3 Plugging the board into the slot

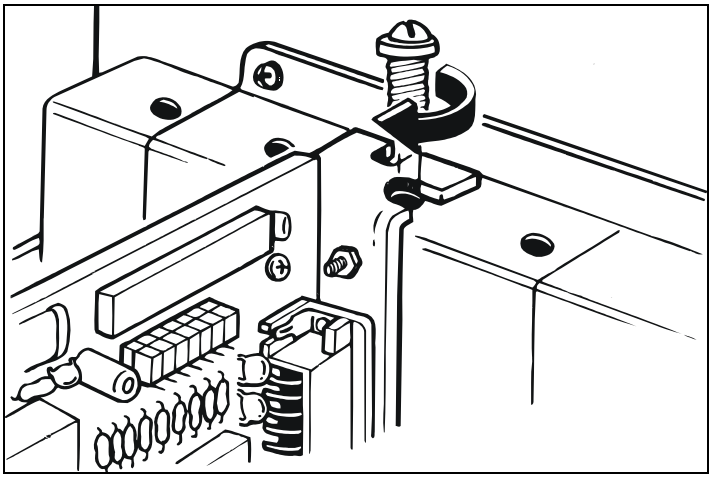
♦ Insert the board **vertically into the chosen slot.**

Fig. 6-3: Inserting the board



♦ Fasten the board **to the rear of the PC housing with the screw which was fixed on the back cover.**

Fig. 6-4: Fastening the board at the back cover



♦ **Tighten all the loosen screws.**

6.4 Closing the PC

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

7 SOFTWARE

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

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

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

The board is supplied with a CD-ROM (CD1) containing
- the driver and software samples for Windows NT 4.0 and Windows XP/2000/98,
- the ADDIREG registration program for Windows NT 4.0 and Windows XP/2000/98.

7.1 Board registration with ADDIREG

The ADDIREG registration program is a 32-bit program for Windows NT XP/2000/NT 4.0/ 9x. The user can register all hardware information necessary to operate the ADDI-DATA PC boards.

IMPORTANT!
If you use one or several resources of the board, you cannot start the ADDIREG program.

7.1.1 Installing a new board

IMPORTANT!
First quit all the applications (programs) which use the board before starting the ADDIREG program.

Fig. 7-1: ADDIREG registration program (example)

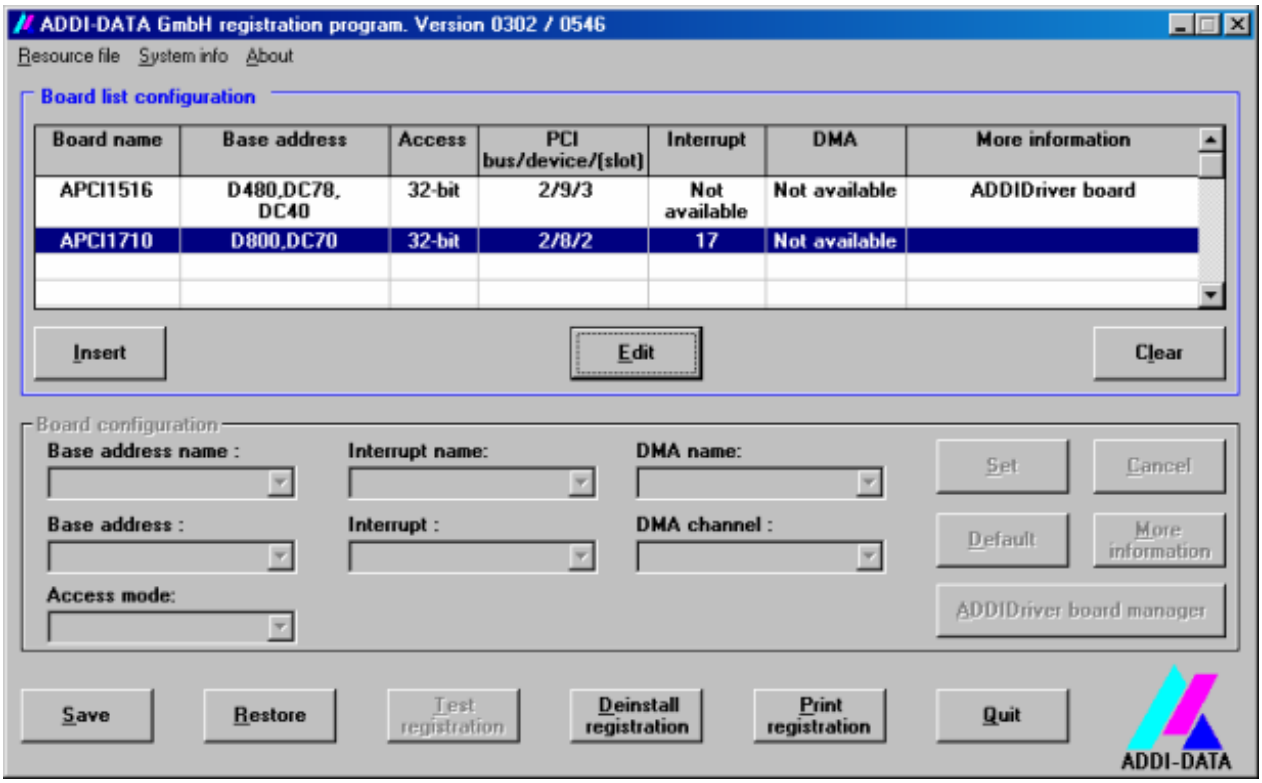


Table:

Board name:
Names of the different registered boards (e.g.: APCI-3200).

Base address:
Selected base address of the board. For PCI boards the base address is allocated through BIOS.

WICHTIG!
The base address set in ADDIREG must correspond to the one set through DIP switches.

Access:
Selection of the access mode for the ADDI-DATA digital boards.
Access in 8-bit or 16-bit or 32-bit mode.

PCI bus/device/(slot):
Number of the used PCI bus, slot, and device. If the board is no PCI board, the message "NO" is displayed.

Interrupt:
Used interrupt of the board. If the board supports no interrupt, the message "Not available" is displayed. **For PCI boards the interrupt is allocated through BIOS.**

DMA (ISA boards only):
Indicates the selected DMA channel or "Not available" if the board uses no DMA or if the board is no ISA board.

More information:
Additional information like the identifier string or the installed COM interfaces. It also displays whether the board is programmed with ADDIDRIVER or if a **PCI DMA** memory is allocated to the board.

Text boxes:

Base address name:
Description of the used base addresses for the board. Select a name through the pull-down menu. The corresponding address range is displayed in the field below (Base address).

Interrupt name:
Description of the used IRQ lines for the board. Select a name through the pull-down menu. The corresponding interrupt line is displayed in the field below (Interrupt).

DMA name (for ISA boards only):
When the board supports 2 DMA channels, you can select which DMA channel is to be changed.

DMA channel (for ISA boards only):
Selection of the used DMA channel.

Buttons:

Edit:
Selection of the highlighted board with the different parameters set in the text boxes.

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 (not available for the boards with ADDIPACK)
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.

ADDIDriver Board Manager (only for the boards with ADDIPACK):
Under Edit/ADDIDriver Board Manager you can check or change the current settings of the board set through the ADDEVICE Manager.
ADDevice Manager starts and displays a list of all resources available for the virtual board.

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.

7.1.2 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.**

Fig. 7-1 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.

7.1.3 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".**

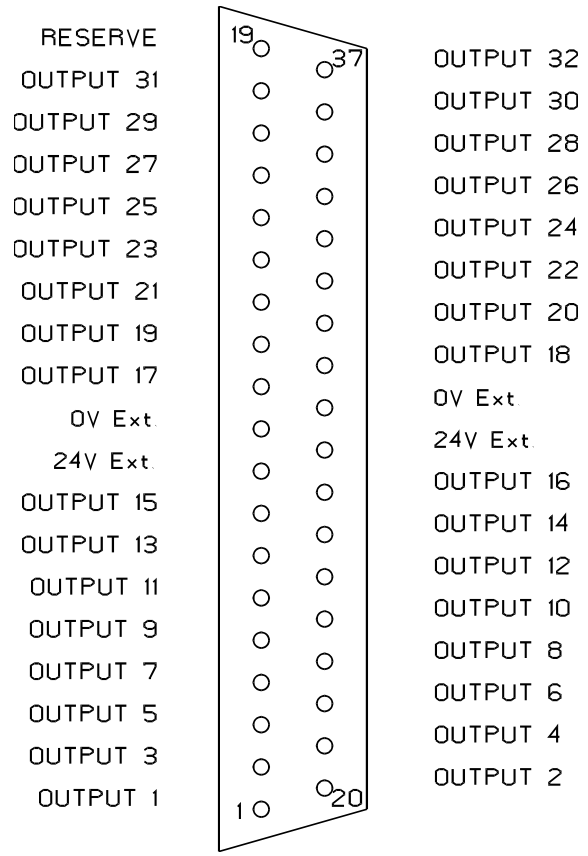
♦ **Save the configuration with "Save".**
You can test if the registration is "OK".
This test controls if the registration is right and if the board is present.
If the test has been successfully completed you can quit the ADDIREG program.
The board is initialised with the set parameters and can now be 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.

8 CONNECTING THE PERIPHERAL

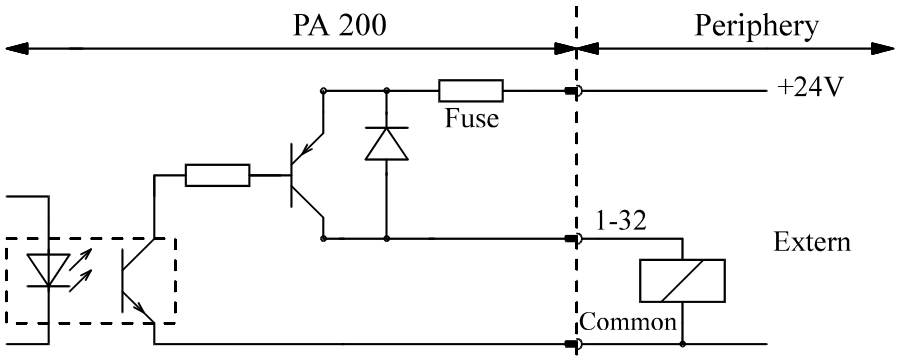
8.1 Connector pin assignment

Fig. 8-1: 37-pin SUB-D male connector

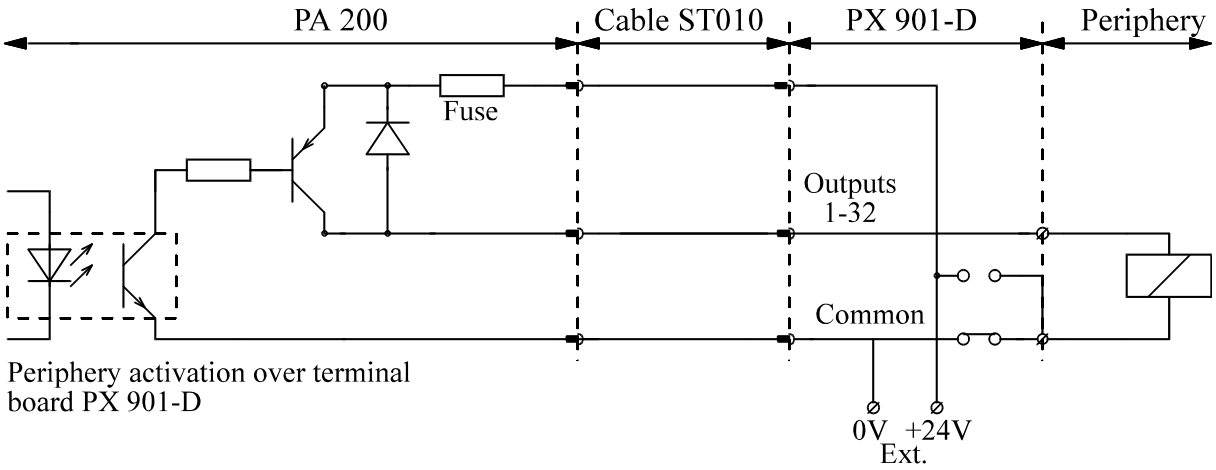


8.2 Connection examples

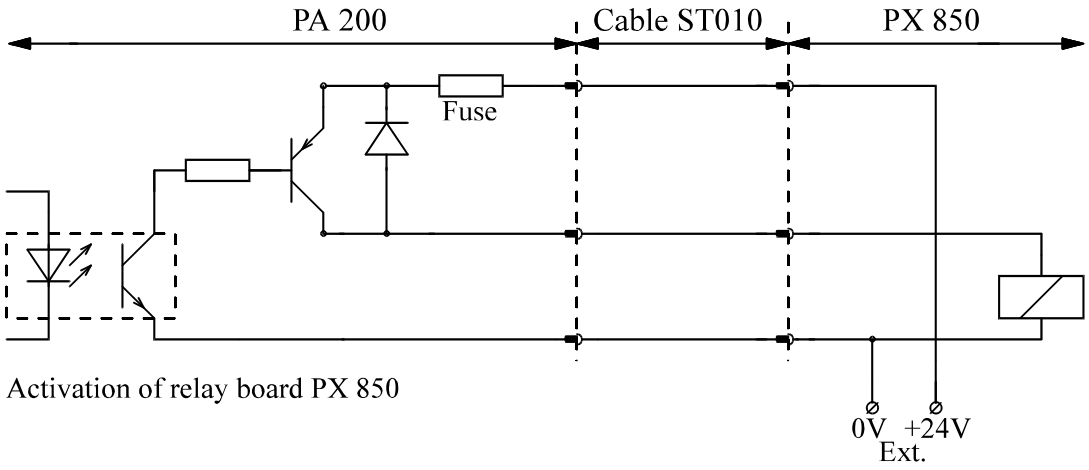
Fig. 8-2: Connection examples



Direct periphery activation



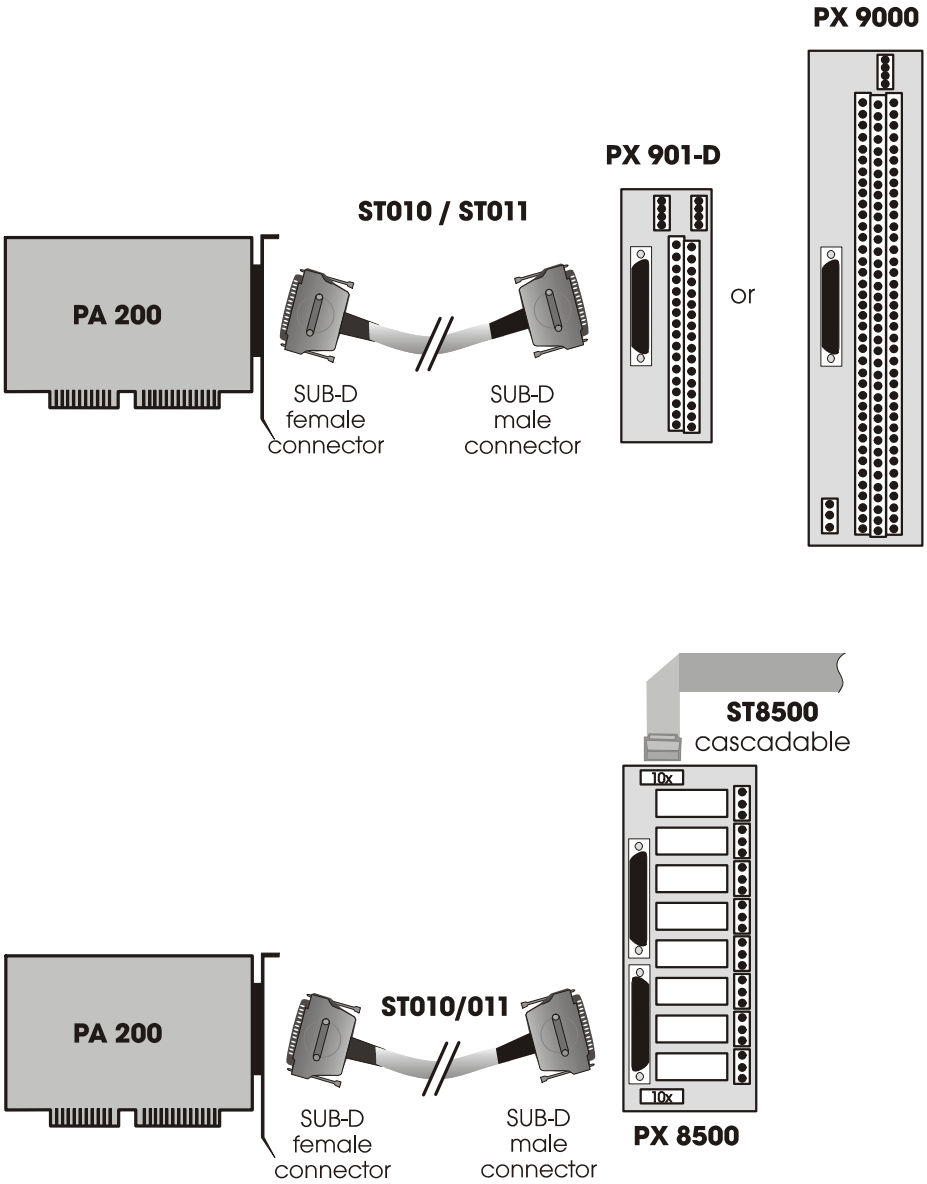
Periphery activation over terminal board PX 901-D



Activation of relay board PX 850

8.3 Connection to the screw terminal boards

Fig. 8-3: Connection to the screw terminal board PX 901Functions of the board



9 FUNCTIONS OF THE BOARD

9.1 Introduction

The **PA 200** requires no initialization. It can be used immediately after power has been turned on and after successful reset of the CPU. The address decoding relates to the 64 KB I/O address area. Both lower address bits are decoded for selecting 4 blocks of 8 outputs. The higher address bits are compared with the on-board adjusted switches ; the board is enabled when they are identical. The control logic takes over coordination between the board and the microcomputer.

The peripheral signals are connected over the front connector and transmitted to the optically decoupled power transistors.

9.2 Programming

For information exchange between the CPU and the board 4 addresses are assigned, which are differentiated through the 2 lowest address bits. The highest address bits A2 - A15 are compared with the DIP switch as described in chapter 7.

The board needs no software initialization. It can be directly selected over its adjusted address with the basic command OUT, for example.

Suppose the address is 0390 hexadecimal.

The 32 digital outputs can be operated directly with the commands :
- OUT &H0390, data
- OUT &H0391, data
- OUT &H0392, data
- OUT &H0393, data.

Output 1 corresponds to bit 0 of OUT &H0390. Output 32 corresponds to bit 7 of OUT &H0393.

I.e. : Set outputs 1 and 10 on logical "1"
- OUT (&H0390),&H01
- OUT (&H0391),&H02

The output data remain so long at the respective outputs until they are overwritten by a new output. This occurs also after power ON reset.

9.3 Programming examples in C, Pascal, Assembler, Basic

```
/* TURBO C                                                          */
/* Writes digital outputs of a PA200 board                          */
/* Used compiler: TURBO C version 2.0 mode SMALL                    */


#define Basic_Adr_PA200  0x390          /* Basic address of PA200 board*/

void main (void)                       /*    ***** Main program  ***** */
   {


/* Example 1 :                                                      */
/* Writing occurs in 4 x 8 bits                                     */

   outportb (Basic_Adr_PA200, 0xAA);        /* Bit 0 of value 0xAA on   */
                                            /* digital output number 1  */

   outportb (Basic_Adr_PA200 + 1, 0x55);   * Bit 7 of value 0x55 on     */
                                           /* digital output number 16  */

   outportb (Basic_Adr_PA200 + 2, 0xAA);   /* Bit 0 of value 0xAA on    */
                                          /* digital output number 17   */

   outportb (Basic_Adr_PA200 + 3, 0x55);  /* Bit 7 of value 0x55 on digital
*/
                                         /* output number 32            */
   }
```

```
(* TURBO PASCAL                                                       *)
(* Writes digital outputs of a PA200 board                          *)
(* Used compiler: TURBO PASCAL version 4.0                          *)
PROGRAM  PA200;

USES DOS;

CONST
    Basic_Adr_PA200 = $390;           (* Basic address of PA200 board   *)

BEGIN                                 (*    ****  Main program  ****    *)

(* Example 1 :                                                      *)
(* Writing occurs in 4 x 8 bits                                     *)

   PORT [Basic_Adr_PA200]     := $0AA;      (* Bit 0 of value $0AA      *)
                                  (* on digital output number 1    *)
   PORT [Basic_Adr_PA200 + 1] := $055;      (* Bit 7 of value $055      *)
                                            (* on digital output number
16       *)
   PORT [Basic_Adr_PA200 + 2] := $0AA;      (* Bit 0 of value $0AA      *)
                                            (* on digital output number
17       *)
   PORT [Basic_Adr_PA200 + 3] := $055;  (* Bit 7 of value $055    *)
                                (* on digital output number 32    *)
END.
```

```
; TASM
; Writes digital outputs of a PA200 board
; Used compiler: TASM version 1.0 mode SMALL

Basic_Address_PA200 = 390h              ; Basic address of PA200 board

   DOSSEG
   .MODEL SMALL
   .STACK 100h
   .DATA
   .CODE

   MOV  AX,@DATA
   MOV  DS,AX                                ; Initializes data segment


; Example 1 :
; Reading occurs when 8 bits have been written 4 times

   MOV  DX,Basic_Address_PA200
   MOV  AX,0AA55h
   PUSH AX
   OUT  DX,AL                                ; Bit 0 of value "AL"
                                             ; on digital output number 1
   MOV  AL,AH
   INC  DX
   OUT  DX,AL                                ; Bit 7 of value "AL"
                                             ; on digital output number 16
   POP  AX
   INC  DX
   OUT  DX,AL                                ; Bit 0 of value "AL"
                                             ; on digital output number 17
   MOV  AL,AH
   INC  DX
   OUT  DX,AL                                ; Bit 7 of value "AL"
                                             ; on digital output number 32
   MOV  AH,4CH                               ; Back to DOS
   INT  21H
   END
```

```
' TURBO BASIC
' Writes digital outputs of a PA200 board
' Used compiler: TURBO BASIC version 1.00

Basic_AddressPA200% = &H390              ' Basic address of PA200 board

' Writing value &H0AA on Less Significant Byte   '
' Writing value &H055 on Most Significant Byte   ' 16 Bit LSW
' Writing value &H0AA on Less Significant Byte   '
' Writing value &H055 on Most Significant Byte   ' 16 Bit MSW
' LSW
   out Basic_AddressPA200%, &H0AA              ' Bit 0 of value &H0AA on
                                                ' digital output number 1
   out Basic_AddressPA200% + 1, &H055           ' Bit 7 of value &H055 on
                                               ' digital output number 16
  MSW
   out Basic_AddressPA200% + 2, &H0AA           ' Bit 0 of value &H0AA on
                                               ' digital output number 17
   out Basic_AddressPA200% + 3, &H055           ' Bit 7 of value &H055 on

                                               ' digital output number 32
```