ADDI-DATA®

Technical support:

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CE

Technical description

ADDINUM PA 110

64 digital input channels

5th edition 03/2000

Guarantee and responsibility

Basically are effective our "general terms of delivery and payment". The manager receives them at the latest with the invoice. Claims for guarantee and responsibility in case of injuries and material damages are excluded, if they are due to one or some of the following causes:

- if the board has not been used for the intended purpose
- improper installation, operation and maintenance of the board
- if the board has been operated with defective safety devices or with not appropriate or non-functioning safety equipment
- nonobservance of the instructions concerning: transport, storage, inserting the board, use, limit values, maintenance, device drivers
- altering the board at the user's own initiative
- altering the source files at the user's own initiative
- not checking properly the parts which are subject to wear
- disasters caused by the intrusion of foreign bodies and by influence beyond the user's control.

Licence for ADDI-DATA software products

Read carefully this licence before using the standard software. The right for using this software is given to the customer, if he/she agrees to the conditions of this licence.
- this software can only be used for configuring ADDI-DATA boards.
- copying the software is forbidden (except for archiving/ saving data and for replacing defective data carriers).
- deassembling, decompiling, decoding and reverse engineering of the software are forbidden.
- this licence and the software can be transferred to a third party, so far as this party has purchased a board, declares to agree to all the clauses of this licence contract and the preceding owner has not kept copies of the software.

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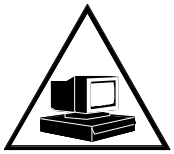
The original version of this manual is in German. You can obtain it on request.

WARNING

In case of improper handling and if the board is not used for the purpose it is intended for:

people may be injured



the board, PC and peripheral may be damaged

the environment may be polluted

★★★ Protect yourself, other people and the environment★★★

· **Do read the safety leaflet!**

If this leaflet is not with the manual, please contact us.

· **Observe the instructions in the manual!**

Make sure that you have not forgotten any step. We are not liable for damage resulting from a wrong use of the board.

· **Symbols used**

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

IMPORTANT!
designates hints and other useful information.

· **Do you have any question?**

Our technical support is always glad to help you.

CE

Declaration of Conformity

This declaration is valid for the following product:

ADDINUM PA 110
64 digital inputs, 24 V, optoisolated,

It is made by

ADDI-DATA GmbH
Meß- und Steuerungstechnik
Dieselstraße 3
D-77833 Ottersweier

in sole responsibility and is valid on the understanding that the product is competently installed, used and maintained, according to the respective security regulations as well as to the manufacturer's instructions regarding its intended use.

This declaration states that the product complies with following EC Directives:

- **EWGRL 336/89 of 3.05.1989**
- **EWGRL 31/92 of 28.04.1992**
- **EWGRL 68/93 of 22.07.1993**

This declaration is valid for all units manufactured according to the manufacturing references listed in the form TD110.020.

Following norms have been applied to test the product regarding electromagnetic compatibility:

- **EN55011/03.91**
- **EN55022/08.94**
- **EN50082-2/03.95**

We point out that

- the conformity and herewith the permission of use expire if the user alters the product without consulting with the manufacturer.
- non-skilled users are to have the operational area of the product and the requirements resulting from it checked prior to putting into operation.
- by using this product in appliances coming under the EC EMC Directive, the user is to make sure they are conform to its regulations prior to putting into operation.
- by using this product in machines / installations coming under the EU Machine Directive, the user is to make sure they are conform to its regulations prior to putting into operation.

A copy of the EMC tests is at your disposal on request.

15th October 1995 Legally valid signature of the manufacturer

Figures

Tables

1 INTENDED PURPOSE OF THE BOARD

The board **PA 110** is the interface between an industrial process and a personal computer (PC).
It is to be used in a free ISA slot. The PC is to comply with the EU directive 89/336/EEC and the specifications for EMC protection.

Products complying with these specifications bear the CE mark.

Data exchange between the board **PA 110** and the peripheral is to occur through a shielded cable. It has to be connected to the 37-pin SUB-D male connector of the board **PA 110**.

The board has 64 input channels for processing digital 24 V signals.

The use of the board **PA 110** in combination with external screw terminal boards is to occur in a closed switch cabinet; the installation is to be effected competently.

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

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

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

1.1 Limits of use

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.

Our boards are not to be used for securing emergency stop functions.

The emergency stop functions are to be secured separately.
This securing must not be influenced by the board or the PC.

Make sure that the board remains in the protective blister packing **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 THE BOARD

Fig. 3-1: Wrong handling

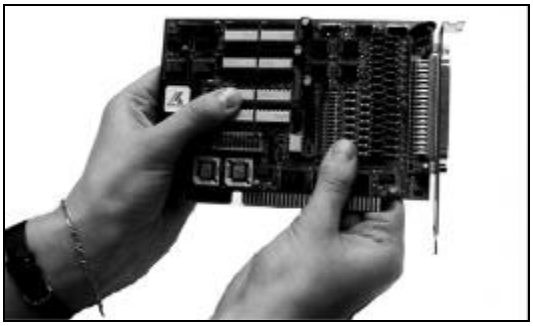
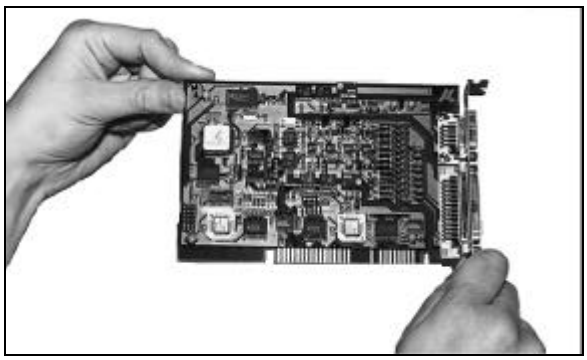


Fig. 3-2: Correct handling



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 as follows with the limit values set by the norm EN50082-2:

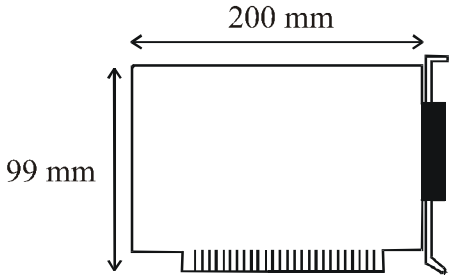
	True value	Set value
ESD	4 kV	4 kV
Fields	10 V/m	10 V/m
Burst	4 kV	2 kV
Conducted radio interferences	10 V	10 V
Noise emission	B class	

WARNING!
The EMC tests have been carried out in a specific appliance configuration. We guarantee these limit values **only** in this configuration[1)] .

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 2-layer printed circuit card.



Weight:	150 g
Weight of the supplied cable:	50 g
Installation in:	XT / AT slot
Connection to the peripheral:	37-pin SUB-D male connector
	Cables: standard cable ST010, ST011
	Screw terminal boards: PX 901-D, PX 901-DG or PX 9000

See Fig 7-4: Connection to screw terminal boards

[1)] We transmit our appliance configuration on request.

4.3 Limit values

Operating temperature: ..... 0 to 60°C
Storage temperature: ..... -25 to 70°C
Relative humidity: ..... 30% to 95% non condensing

Minimum PC requirements:
ISA bus interface
Bus speed: ..... 8 MHz

Energy requirements:
Operating voltage: ..... 5 V ± 5%
Current consumption (+ 5 V of the PC): ..... 136 mA ± 15 mA

24 V digital input channels
Input type: ..... Common ground in accordance
..... with IEC1131-2
Number of input channels: 64
Nominal voltage: ..... 24 VDC
Input current at nominal voltage: ..... 15 mA
Logic input level: ..... U_H[1)] max.: 28 V
U_H min.: 16 V
U_L[2)] max.: 12 V
U_L min.: 0 V
Signal delay: ..... 65 µs (at nominal voltage)
Maximum input frequency: ..... 5 kHz (at nominal voltage)

Safety
Optical isolation: ..... 500 V

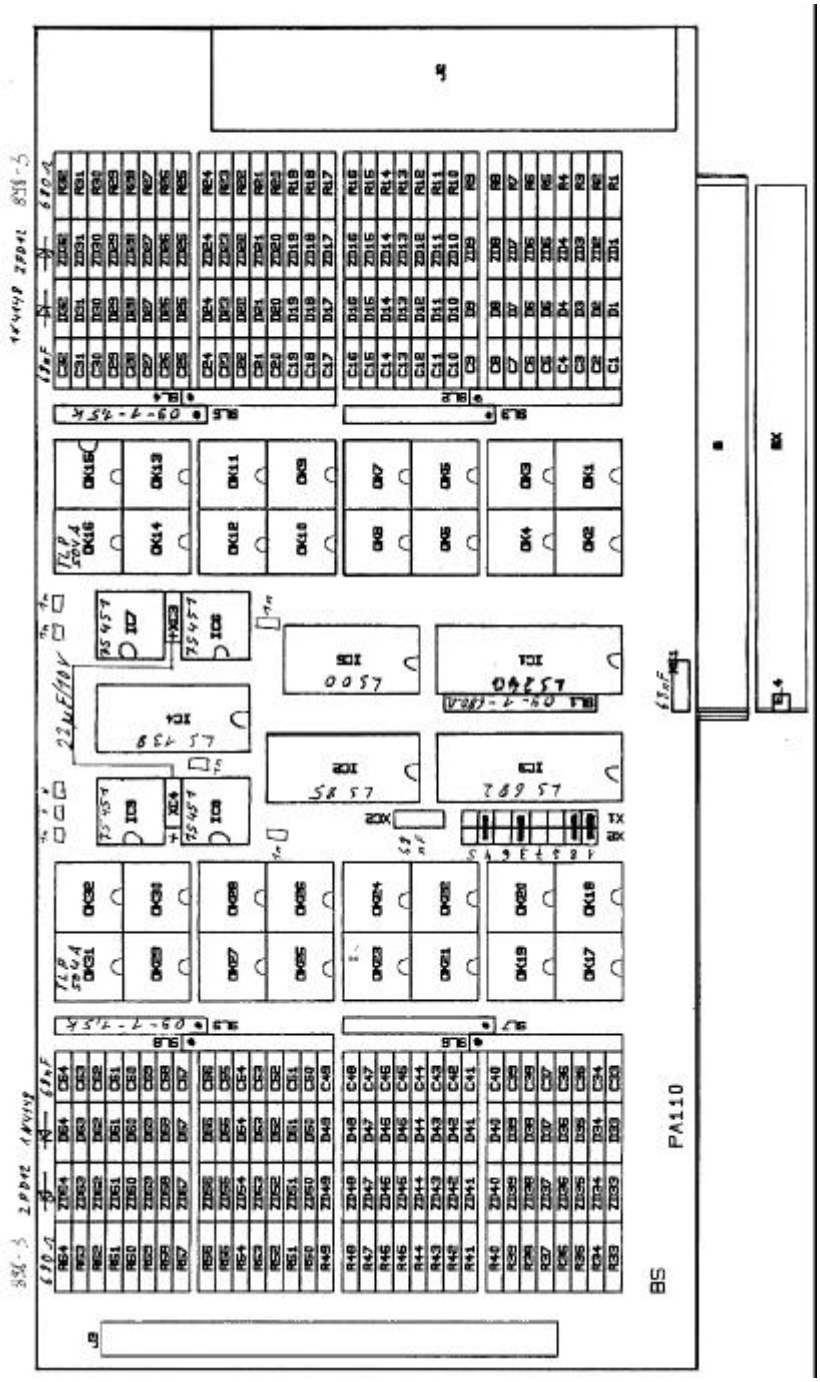
[1] U_H: input voltage which corresponds to logic "1"
[2] U_L: input voltage which corresponds to logic "0"

5 SETTINGS

5.1 Settings at delivery

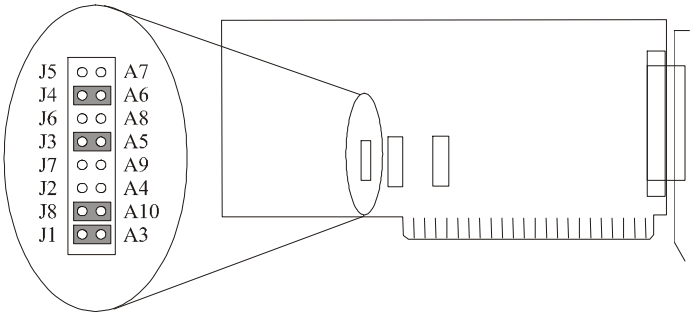
5.1.1 Component scheme

Fig. 5-1: Component scheme



5.1.2 Jumper location and settings at delivery

Fig. 5-2: Jumper location on the PA 110



The base address is 0390H

5.1.3 Base address setting through jumpers

The base address of the board is set through 8 jumpers marked 1 to 8.
The board requires 8 I/O addresses.
The jumpers correspond to the address bits as follows:

Jumper:	J8	J7	J6	J5	J4	J3	J2	J1
Address bit:	A10	A9	A8	A7	A6	A5	A4	A3

The board is delivered with the following configuration: I/O address 0390H

IMPORTANT!
A jumper which is set meant logical 0
A jumper which is not set means logical 1

Jumper:	J8	J7	J6	J5	J4	J3	J2	J1
Logical state:	0	1	1	1	0	0	1	0

6 INSTALLATION

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 PC
2. Install the **first** board
3. Start the PC
4. Install the software (once is enough)
5. Configure the board

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

etc

IMPORTANT!
You have installed already **one or more** ADDI-DATA boards in your PC, and you wish to install **an additional** board?

Proceed as if you wished to install one single board.

6.1 Inserting the board

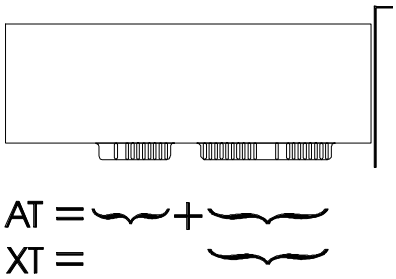
IMPORTANT!
Do observe the *safety instructions.*

6.1.1 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.

1. Select a free ISA slot

Fig. 6-1: Types of slots



The board can be inserted either in a slot XT or AT. It can also be inserted in EISA slots with respect of certain conditions.

2. 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.

3. Discharge yourself from electrostatic charges

4. Take the board from its protective blister packing.

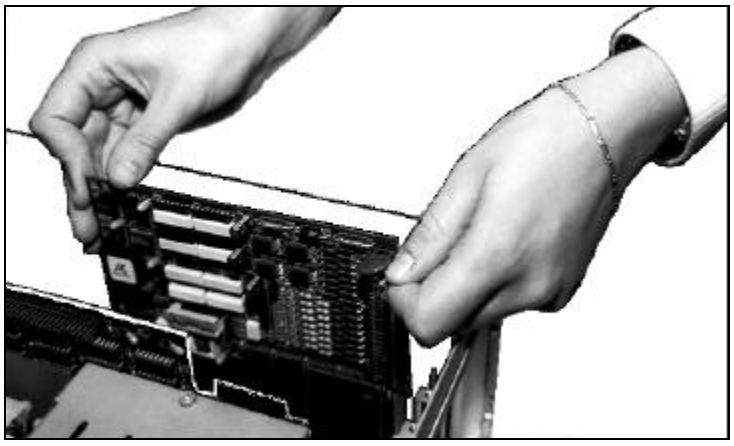
Fig. 6-2: Opening the protective packing

6.1.2 Plugging the board into the slot

· **Discharge yourself from electrostatic charges**

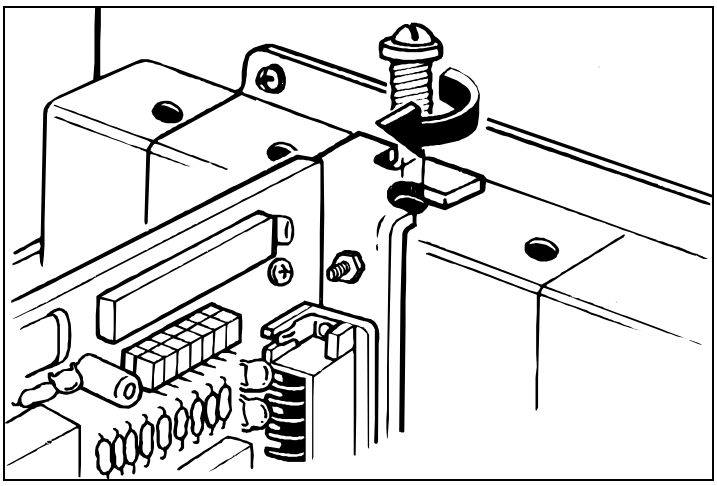
· Insert the board **vertically into the chosen slot.**

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: Securing the board at the back cover



· **Tighten all loosen screws.**

6.1.3 Closing the PC

· Close your PC as described in the manual of the PC manufacturer.

6.2 Software

6.2.1 Installation under DOS or Windows 3.11

The board is delivered with one 3,5" diskette which contains the device driver.
- Insert the diskette in a drive and change to this drive
- Enter <INSTALL>
- The installation program gives you further instructions.

IMPORTANT!
Please read the files README.TXT (update of the device driver).

6.2.2 Programming

For the data exchange between the CPU and the board 8 addresses are assigned, which are differentiated through the 3 lowest address bits.
The higher address bits A3-A10 are compared with the jumper adjustment.
The address bits A11-A15 are pre-decoded with „0“.
The board needs no software initialisation. It can be directly related to its programmed address, for example with the Basic command INP.

Example with the base address 0390H (set at delivery)

The 64 digital input channels are read with these commands:

A = INP (&H0390)	E = INP (&H0394)
B = INP (&H0391)	F = INP (&H0395)
C = INP (&H0392)	G = INP (&H0396)
D = INP (&H0393)	H = INP (&H0397)

The input channel 1 corresponds to bit 0 of INP (&H0390)
The input channel 32 corresponds to bit 7 of INP (&H0393)
The input channel 64 corresponds to bit 7 of INP (&H0397)

Check whether a channel is set or not

Example for channel 4:

```
A = INP (&H0390)
IF ( A AND &H08)  = &H08 THEN       PRINT “INPUT 4 = 1 „ELSE
            PRINT „INPUT 4 = 0“
```

Example for channel 10 and channel 16:

```
B = INP (&H0391)
IF ( B AND &H82)  = &H82 THEN       PRINT “INPUT 10 and 16 = 1„ELSE
            PRINT „INPUT 10 and 16 = 0“
```

6.3 Error analysis per Internet

Do not hesitate to e-mail us your questions:
- e-mail: info@addi-data.de
- per Internet : http://www.addi-data.de. or
  http://www.addi-data.com

7 CONNECTION TO THE PERIPHERAL

7.1 Connector pin assignment

Fig. 7-1: 37-pin SUB-D male connector (front connector)

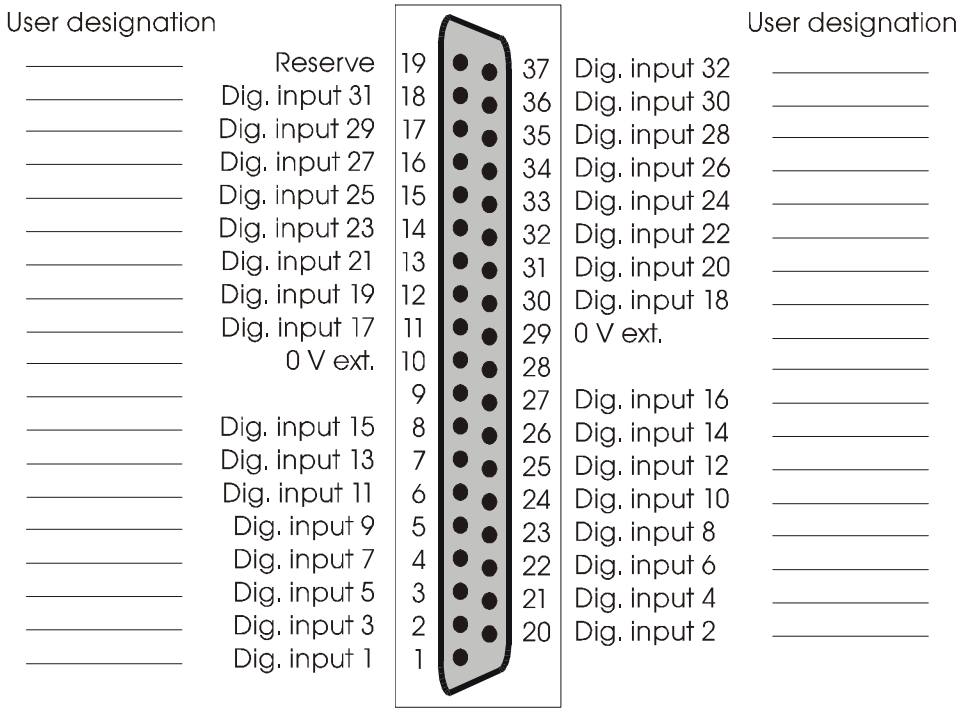
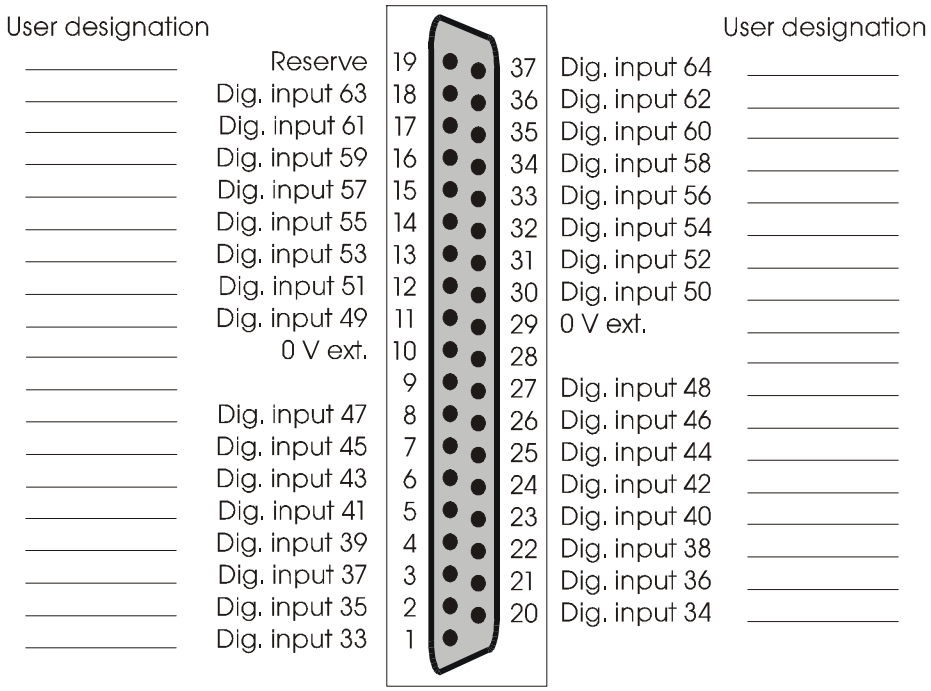
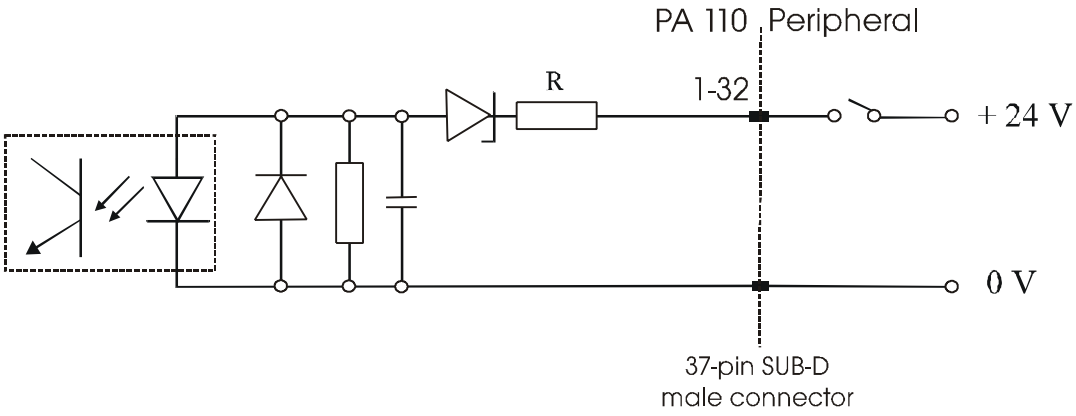


Fig. 7-2: 37-pin SUB-D male connector (cabled to the board)



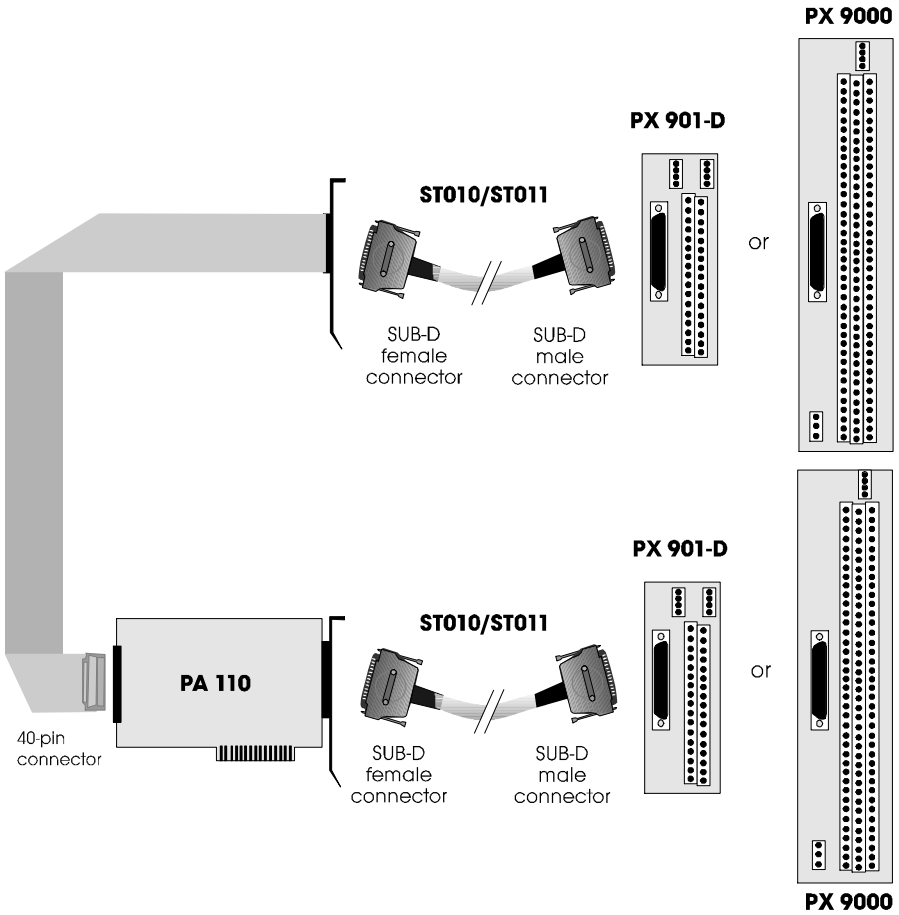
7.2 Connection principle

Fig. 7-3: Connection principle



7.3 Screw terminal boards PX 901 and PX 9000

Fig. 7-4: Connection to the screw terminal boards PX 901 and PX 9000



Our technical support is at your disposal for further information about our cables and screw terminal boards.

8 FUNCTIONS

8.1 Board description

The board PA 110 is intended for parallel data input through 64 input channels.
The signal inputs are organised into 8 groups of 8 bits.
All input channels comply with the industry norm: + 24 V for logical „1“.

The system sides and the peripheral sides are optically isolated.
All inputs are isolated and filtered through optical couplers.
Each input channel has a go line to the front connector.
All inputs use the same return line.

Through the optical isolation, disturbances from the peripheral side to the system bus side are avoided. In addition, all inputs are filtered through a RC filter.
The optical coupler inputs have a maximum load of 24 mA.
To avoid damage to the optical coupler through voltage reversal, a diode is connected antiparallel to the LED of the optical coupler.
In order to achieve a high dynamic and switching threshold of the input signals, a Z diode is present on each input line.

The board does not require any software initialisation. It can be operated immediately after applying the operating voltage. Data transfer between the CPU and the peripherals occurs through buffers.

The address decoding relates to the 64 kB I/O address space.
The 3 lower address bits are decoded for the selection of 8 blocks of 8 channels.
The higher address bits are compared with the jumper configuration on the board.
If they are identical, the board is enabled.
The control logic takes over the co-ordination between board and PC.

9 STANDARD SOFTWARE

9.1 Introduction

IMPORTANT!
Note the following conventions in the text:

Function: "i_PA110_SetBoardInformation"
Variable *ui_Address*

Table 9-1: Type Declaration for Dos and Windows 3.1X

	Borland C	Microsoft C	Borland Pascal	Microsoft Visual Basic Dos	Microsoft Visual Basic Windows
VOID	void	void	pointer		any
BYTE	unsigned char	unsigned char	byte	integer	integer
INT	int	int	integer	integer	integer
UINT	unsigned int	unsigned int	word	long	long
LONG	long	long	longint	long	long
PBYTE	unsigned char *	unsigned char *	var byte	integer	integer
PINT	int *	int *	var integer	integer	integer
PUINT	unsigned int *	unsigned int *	var word	long	long
PCHAR	char *	char *	var string	string	string

Table 9-2: Type Declaration for Windows 95/NT

	Borland C	Microsoft C	Borland Pascal	Microsoft Visual Basic Dos	Microsoft Visual Basic Windows
VOID	void	void	pointer		any
BYTE	unsigned char	unsigned char	byte	integer	integer
INT	int	int	integer	integer	integer
UINT	unsigned int	unsigned int	long	long	long
LONG	long	long	longint	long	long
PBYTE	unsigned char *	unsigned char *	var byte	integer	integer
PINT	int *	int *	var integer	integer	integer
PUINT	Unsigned int *	unsigned int *	var long	long	long
PCHAR	Char *	char *	var string	string	string

9.2 Software functions

9.2.1 Address

1) i_PA110_SetBoardAddress (...)

Syntax:
<Return value> = i_PA110_SetBoardAddress (UINT_ ui_Address,
PBYTE_ pb_BoardHandle)

Parameters:
- Input:

UINT	ui_Address	Base address of the **PA 110**

- Output:

PBYTE	pb_BoardHandle	Handle[1)] of the **PA 110** to use the functions of the board

Task:
Stores the base address.
A handle is returned to the user which allows him/her to use the following functions. With handles several boards can be operated.

Return value:
0: No error
-1: Base address already used
-2: No handle is available for the board (up to 10 handles can be used)

2) i_PA110_CloseBoardHandle

Syntax:
<Return value> = i_PA110_CloseBoardHandle (BYTE b_BoardHandle)

Parameters:
- Input:

BYTE	b_BoardHandle	Handle of board **PA 110**

- Output:
No output signal has occurred.

Task:
Releases the board handle. Blocks the access to the board.

Return value:
0: No error
-1: The handle parameter of the board is wrong

---

[1] Identification number of the board

9.2.2 Digital input channels

1) i_PA110_Read1DigitalInput (...)

Syntax :
<Return value> = i_PA110_Read1DigitalInput (BYTE_ b_BoardHandle,
BYTE_ b_Channel,
PBYTE_ pb_ChannelValue)

Parameters:

- Input:		
BYTE	b_BoardHandle	Handle of board **PA 110**
BYTE	b_Channel	Number of the input channel to be read (1 to 64)
- Output:		
PBYTE	pb_ChannelValue	State of the digital input channel 0 -> low 1 -> high

Task:
Indicates the state of an input. The variable *b_Channel* passes the input channel to be read (1 to 64). A value is returned with the variable *pb_ChannelValue* : 0 (low) or 1 (high).

Return value:
0: No error
-1: The handle parameter of the board is wrong
-2: The input number is not between 1 and 32

2) i_PA110_Read8DigitalInput (...)

Syntax:
<Return value> = i_PA110_Read8DigitalInput (BYTE b_BoardHandle,
BYTE b_Port,
PBYTE pb_PortValue)

Parameters:
- Input:

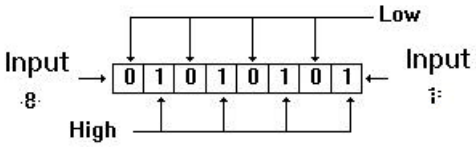
BYTE	b_BoardHandle	Handle of the **PA 110**
BYTE	b_Port	Number of the input port to be read (1 or 8)

- Output:

PBYTE	pb_PortValue	State of the digital input port (0 to 255)

Task:
Indicates the state of an 8-bit port. The variable *b_Port* passes the port to be read (1 or 4). A value is returned with the variable *pb_PortValue* .

Example:
b_Port = 1
pb_PortValue = 55 Hex



A voltage is present on the input channels 1, 3, 5, 7
A voltage is not present on the input channels 2, 4, 6, 8.

Return value:
0: No error
-1: Handle parameter of the board is wrong
-2: The parameter port number is wrong (parameter 1 to 8)

3) i_PA110_Read16DigitalInput (...)

Syntax:
<Return value> = i_PA110_Read16DigitalInput (BYTE b_BoardHandle,
BYTE b_Port
PLONG pl_InputValue)

Parameters:
- Input:

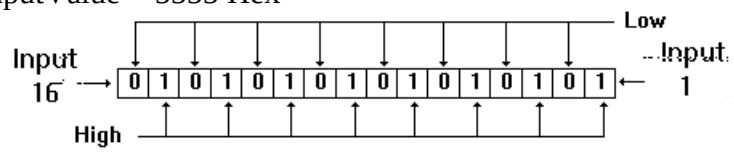
BYTE	b_BoardHandle	Handle of the **PA 110**
BYTE	b_Port	Number of the 16-bit input port to be read (1 or 4)

- Output:

PLONG	pl_InputValue	State of the digital input channels of both ports (0 to 65535)

Task:
Indicates the state of a 16-bit port. The variable b_Port passes the port to be read (1 to 4). A value is returned with the variable *pl_InputValue*

Example:
Parameter
b_Port = 1
pl_InputValue = 5555 Hex



A voltage is present on the input channels 1, 3, 5, 7, 9, 11, 13, 15 .
A voltage is not present on the input channels 2, 4, 6, 8, 10, 12, 14, 16.

Return value:
0: No error
-1: The handle parameter of the board is wrong
-2: The parameter port number is wrong (Parameter 1 to 4)

4) i_PA110_Read32DigitalInput (...)

Syntax:

```
<Return value> =  i_PA110_Read32DigitalInput     (BYTE    b_BoardHandle,
                                                  BYTE    b_Port,
                                                  PLONG   pl_InputValue)
```

Parameters:

- Input:

BYTE	b_BoardHandle	Handle of board **PA 110**
BYTE	b_Port	Number of the 16-bit input port to be read (1 or 2)

- Output:

PLONG	pl_InputValue	State of the digital input channels of both ports (0 to 2^{32})

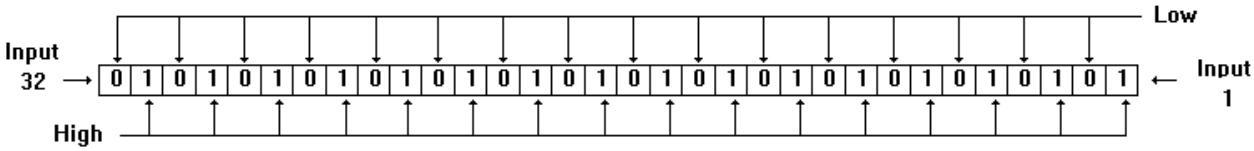
Task:

Indicates the state of the 32 inputs channels.

Example:

Parameter

pl_InputValue = 555555555 Hex



A voltage is present on the input channels 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29 and 31.
A voltage is not present on the input channels 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30 and 32.

Return value:

0: No error
-1: Handle parameter of the board is wrong
-2: The parameter port number is wrong (Parameter 1 or 2)