



DIN EN ISO 9001:2000
certified



ADDI-DATA GmbH
Dieselstraße 3
D-77833 OTTERSWEIER



Technical support:
+49 (0)7223 / 9493 - 0

Technical description

ADDINUM PA 160

32 TTL inputs/outputs
bidirectional

3rd edition 09/2004

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. 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

This manual, which is intended for the operator and its staff only, is protected by copyright. Duplication of the information contained in the operating instructions and of any other product information, or disclosure of this information for use by third parties, is not permitted, unless this right has been granted by the product licence issued. Non-compliance with this could lead to civil and criminal proceedings.

ADDI-DATA software product licence

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.

Reproduction of the software is forbidden (except for back-up and for exchange of faulty data carriers). Disassembly, decompilation, decryption and reverse engineering of the software are forbidden. This licence and the software may be transferred to a third party if this party has acquired a board by purchase, has agreed to all the conditions in this licence contract and the original owner does not keep any copies of the software.

Trademarks

- ADDI-DATA is a registered trademark of ADDI-DATA GmbH.
- Turbo Pascal, Delphi, Borland C, Borland C++ are registered trademarks of Borland Insight Company.
- Microsoft C, Visual C++, Windows XP, 98, Windows 2000, Windows 95, Windows NT, EmbeddedNT and MS DOS are registered trademarks of Microsoft Corporation.
- LabVIEW, LabWindows/CVI, DasyLab, Diadem are registered trademarks of National Instruments Corp.
- CompactPCI is a registered trademark of PCI Industrial Computer Manufacturers Group.
- VxWorks is a registered trademark of Wind River Systems Inc.

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.

1	DEFINITION OF APPLICATION	6
1.1	Intended use	6
1.2	Usage restrictions.....	6
1.3	General description of the board	6
2	USER	8
2.1	Qualification	8
2.2	Personal protection.....	8
3	HANDLING OF THE BOARD	9
4	TECHNICAL DATA	10
4.1	Physical set-up of the board.....	10
4.2	Limit values.....	10
4.3	Component scheme.....	11
5	INSTALLATION OF THE BOARD	12
5.1	Opening the PC.....	12
5.2	Selecting a free slot	12
5.3	Plugging the board into the slot	13
5.4	Closing the PC	13
6	SOFTWARE	14
6.1	Questions and software downloads on the web.....	14
7	CONNECTING THE PERIPHERAL.....	15
7.1	Connector pin assignment.....	15
8	FUNCTIONS OF THE BOARD	16
8.1	PC interface	16
8.2	Adjusting the base address	16
8.3	I/O address space.....	17
9	PROGRAMMING EXAMPLES	18
10	INTERRUPT	20

Figures

Fig. 3-1: Correct handling	9
Fig. 4-1: Component scheme	11
Fig. 5-1: PCI-5V slot (32-bit).....	12
Fig. 5-2: Opening the blister pack.....	12
Fig. 5-3: Inserting the board	13
Fig. 5-4: Fastening the board at the back cover	13
Fig. 7-1: 37-pin SUB-D male connector	15
Fig. 8-1: Block of DIP switches.....	16
Fig. 10-1: Interrupt - Position and meaning of the pins.....	20

1 DEFINITION OF APPLICATION

1.1 Intended use

The board **PA 160** 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 160 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 PA 160 is a powerful TTL input and output board which covers a wide range of applications because of its various possibilities. The most various tasks in TTL are performed with only one board.

The following functions are at your disposal:

- 32 input/output lines, bidirectional
- hardware latch strobe
- software latch strobe
- inputs/output can be latched
- 4 inputs/outputs can be read back, interruptable
- interrupt request can be reset over software.

The board needs no software initialization. It is ready to operate immediately after applying the working voltage and after power ON reset. Data transfer between the CPU and board PA 160 occurs directly over an input/output procedure. Each input/output byte occupies only one address within the 64K I/O address space. The base address is adjusted via DIP switch. The board PA 160 is equipped for direct use in a PC/XT/AT or compatible PC with a 62-pin direct connector.

Data exchange between the **PA 160** 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 board

The connection with our standard cable ST 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.

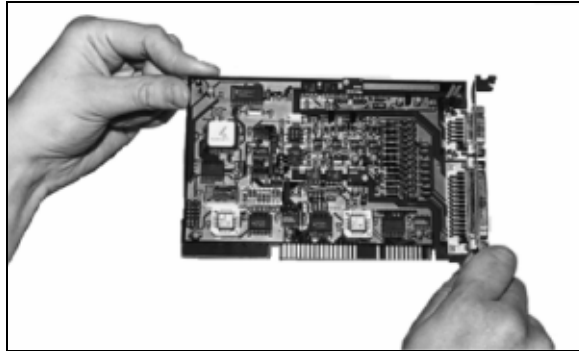
2.2 Personal protection

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

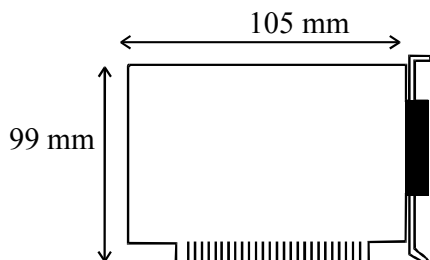


4 TECHNICAL DATA

4.1 Physical set-up of the board

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

Dimensions:



Weight:	approx. 100 g
Installation in:	ISA slot
Connection to the peripheral:	37-pin male connector
Accessories ¹ :	
Standard cable:	ST010
Screw terminal board:	PX901-D, PX901-DG

4.2 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

Energy requirements:

- Operating voltage of the PC: 5 V ± 5%
- Current consumption (without load): typ. 470 mA

Input channels

Number:	32 TTL
Input voltage:	> 2.4 V for level « 0 » < 0.7 V for level « 1 »

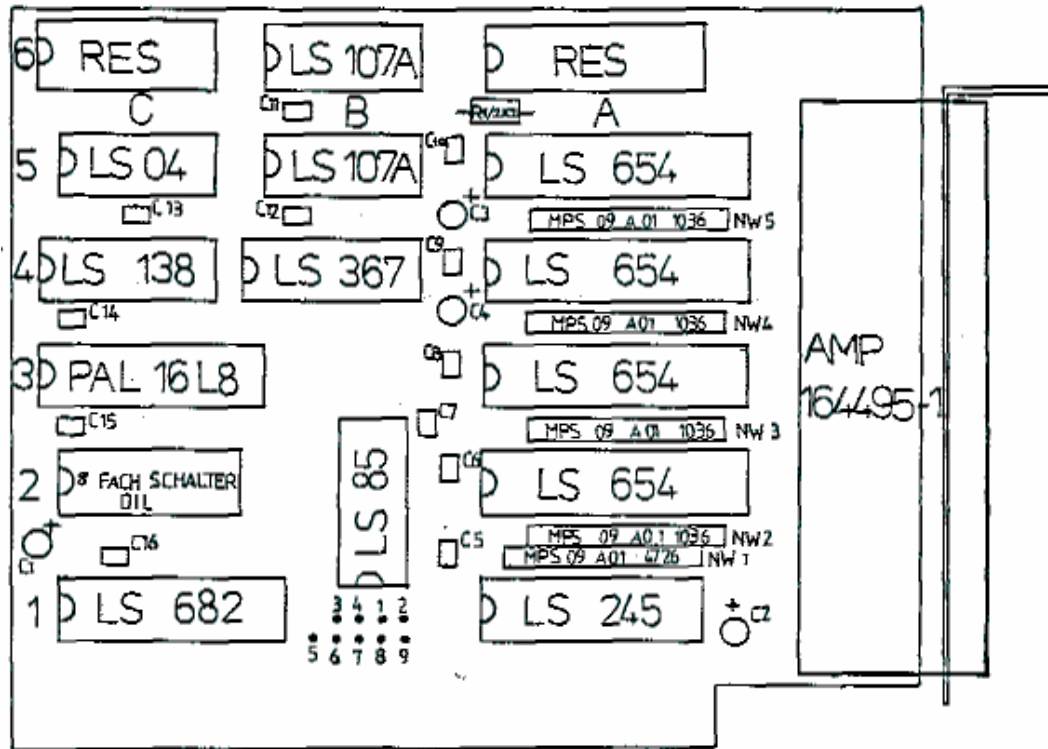
Sorties

Nombre :	32, open collector, internal pull-up resistor
Resistance :	10 K
Output current:	24 mA by 0.5 V
Signal delay:	70 ns

¹ Not included in the standard delivery.

4.3 Component scheme

Fig. 4-1: Component scheme



C1 - C4 : 22 μ 16V
 C5 - C15 : 68n

5 INSTALLATION OF THE BOARD

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

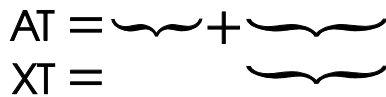
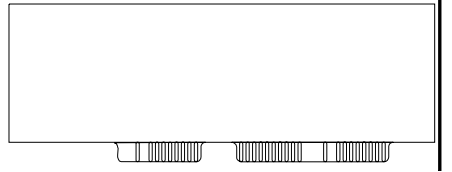
5.1 Opening the PC

- ◆ 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 ISA XT/AT slot.

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

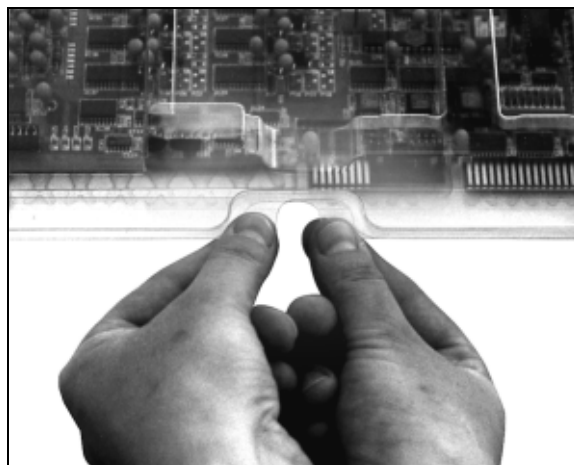


Remove the back cover of the selected slot according to the instructions of the PC manufacturer. Keep the back cover. You will need it if you remove the board

Discharge yourself from electrostatic charges.

Take the board out of its protective blister pack.

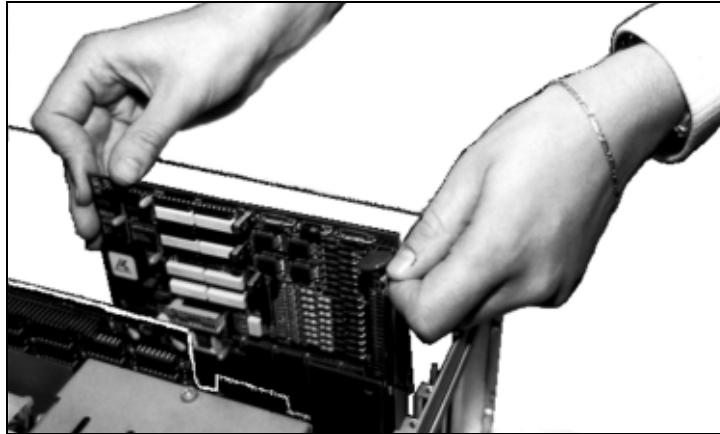
Fig. 5-2: Opening the blister pack



5.3 Plugging the board into the slot

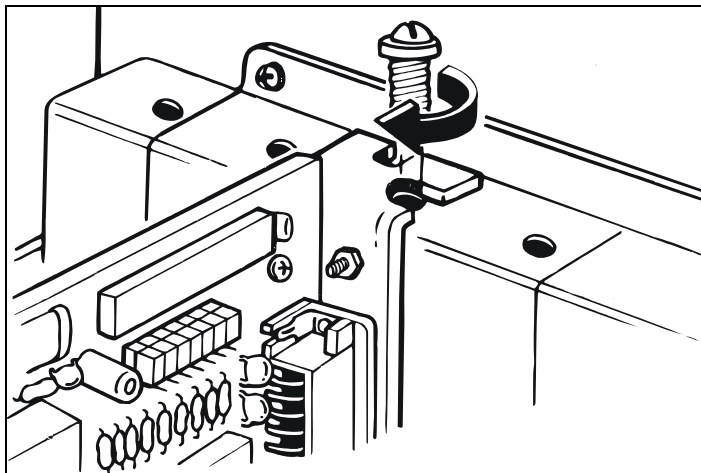
- ◆ Insert the board vertically into the chosen slot.

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 SOFTWARE



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.

6.1 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

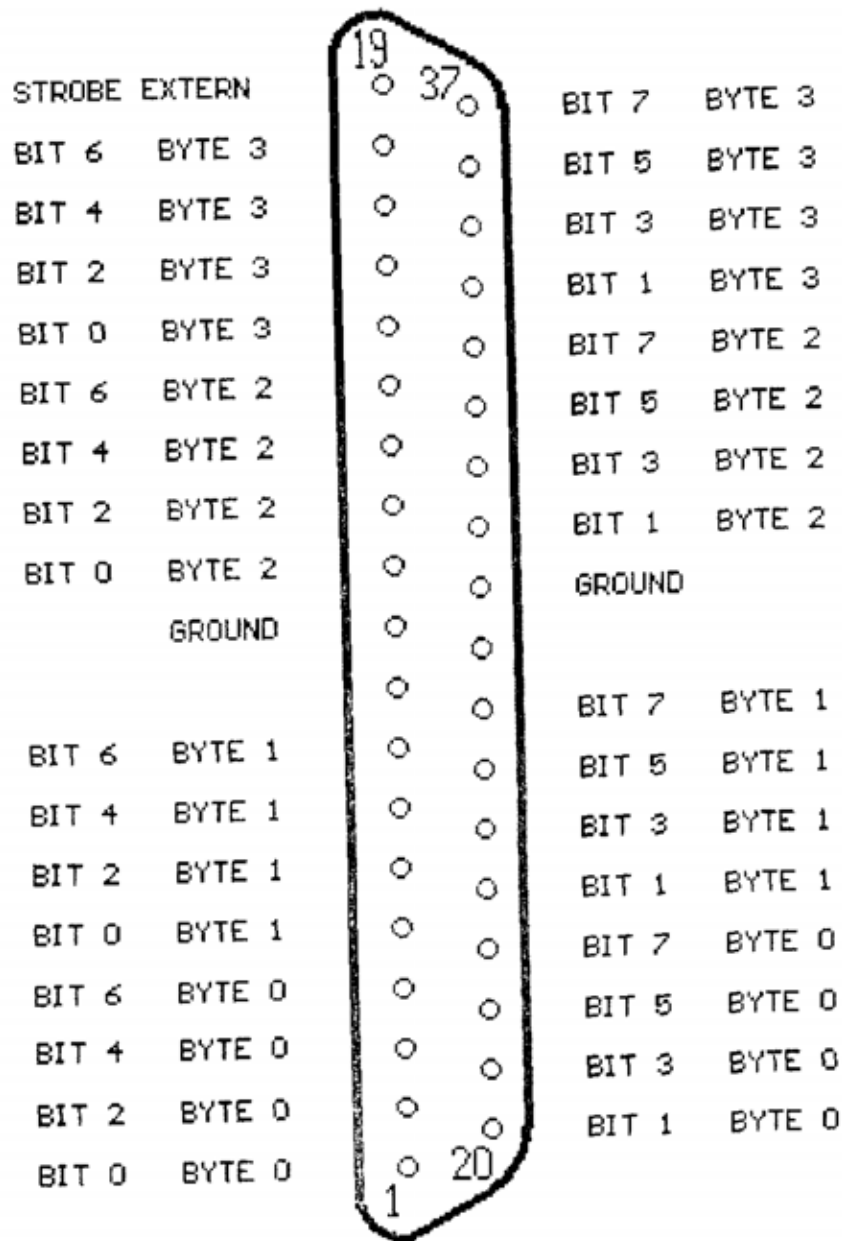
You can download the latest version of the software for the board **PA 160**

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

7 CONNECTING THE PERIPHERAL

7.1 Connector pin assignment

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



8 FUNCTIONS OF THE BOARD

8.1 PC interface

One of the outstanding characteristics of the PA 160 is the simple use of the I/O interface. The board reacts to I/O Read and I/O Write commands. The board's I/O address decoding allows to command the board within 1KB of the 64 KB I/O address space. The board uses the standard address, data and control signals of the PC bus.

8.2 Adjusting the base address

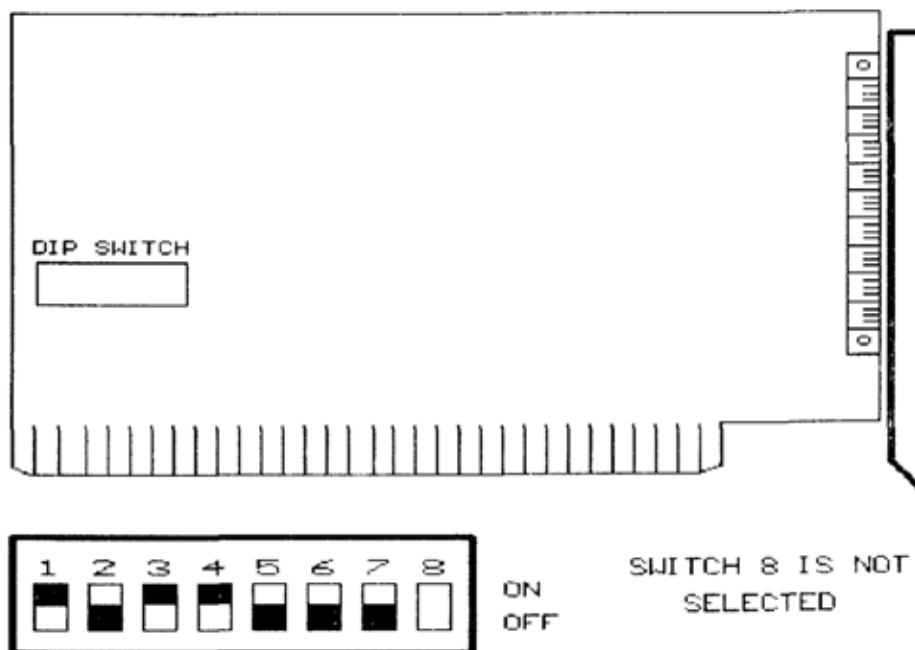
The highly integrated PAL module carries out with low costs the complex decoding. A block of 4 addresses is assigned to the board for data exchange with the CPU. This address block of the available I/O address space is freely selectable over a 8-pin block of DIP switches. The switches S1 to S7 can be set in "ON" or "OFF" position (S8 is not selected).

i **IMPORTANT!**
 a switch in "ON" position is equivalent to logic "0"
 a switch in "OFF" position is equivalent to logic "1"

Switch:	S8	S7	S6	S5	S4	S3	S2	S1
Adressbit:	--	A9	A8	A7	A6	A5	A4	A3

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

Fig. 8-1: Block of DIP switches



8.3 I/O address space

You will find in the table below the addresses for the different board functions.

Address	I/O function		Description	
YYYY+00H YYYY+00H	IORD	IOWR	Latch Output - Data	Channel 0
			Read Input - Data	Channel 0
YYYY+01H YYYY+01H	IORD	IOWR	Latch Output - Data	Channel 1
			Read Input - Data	Channel 1
YYYY+02H YYYY+02H	IORD	IOWR	Latch Output - Data	Channel 2
			Read Input - Data	Channel 2
YYYY+03H YYYY+03H	IORD	IOWR	Latch Output - Data	Channel 3
			Read Input - Data	Channel 3
YYYY+04H		IOWR	Dummy WR produces a software latch strobe for input latch	Channel 0-3
YYYY+04H	IORD		Read Latch - Data	Channel 0
YYYY+05H	IORD		Read Latch - Data	Channel 1
YYYY+06H	IORD		Read Latch - Data	Channel 2
YYYY+07H	IORD		Read Latch - Data	Channel 3

9 PROGRAMMING EXAMPLES

Reading an I/O channel

```

5      YYYYY = &H390      ; Board base address
10     A= Inp (YYYYY+0)   ; Reads a data byte of channel 0
15     B= Inp (YYYYY+1)   ; Reads a data byte of channel 1
20     C= Inp (YYYYY+2)   ; Reads a data byte of channel 2
25     D= Inp (YYYYY+3)   ; Reads a data byte of channel 3

```

Output a data on channel 2 (and reading back)

```

10     Outdate = 123      ; Set output data
20     OUT YYYYY+&H02,OUTDATE ; Output
30     INDATE2=INP (YYYYY+H02) ; Read back output data

```

Status of all 32 input/output latches

```

10     OUT YYYYY+&H04,0 ; Dummy WR = latch channel 0-3
20     A= INP (YYYYY+H04) ; Latch data channel 0
30     B= INP (YYYYY+H05) ; Latch data channel 1
40     C= INP (YYYYY+H06) ; Latch data channel 2
50     D= INP (YYYYY+H07) ; Latch data channel 3

```

Basic:

```

100 Sortie = 0
110 Cpt = 0
120 ResultP2 = 0
130 ResultP3 = 0
140 AdresseDeBase = &H300
150 Max = 2000
160 Outdate1 = &HAA
170 Outdate2 = &H55

200 while ((Sortie = 0) and (Cpt <= Max ))
210   out AdresseDeBase , Outdate 1      /* channel 0 IOWR : 1010 1010 */
220   out AdresseDeBase + 1, Outdate 2   /* channel 1 IOWR : 0101 0101 */
230   ResultP2 = inp (AdresseDeBase + 2) /* channel 2 IORD */
240   ResultP3 = inp (AdresseDeBase + 3) /* channel 3 IORD */
260   if ((ResultP2 = &HAA) and (ResultP3 = &H55)) then
270     Cpt = Cpt +1
280   else
290     Sortie = 1
300   End if
305 wend
310 if ((Sortie = 0) and (Cpt = Max)) then
320   print "Test of PA160 successful"
330 else
340   print "Test of PA160 not successful"
350 End if
360 End

```

```

TURBO PASCAL
program DEMO_P;
uses crt,dos ;

Var
  Adresse_de_base      :integer ;
  Max                  :integer ;

  i_Result_P2         :integer ;
  i_Result_P3         :integer ;
  i_Sortie            :integer ;
  i_Cpt               :integer ;

Begin
  i_Sortie              := 0 ;
  i_Cpt                 := 0 ;
  Max                   := 2000 ;
  Adresse_de_base      := $300 ;
  while (i_Sortie = 0) and (i_Cpt <> Max)
  do
    begin
      port[Adresse_de_base] := $AA ;           { channel 0 IOWT : 1010 1010 }
      port[Adresse_de_base + 1] := $55 ;       { channel 1 IOWT : 0101 0101 }

      i_Result_P2 := port [Adresse_de_base + 2] ; { channel 2 IORD }
      i_Result_P3 := port [Adresse_de_base + 3] ; { channel 3 IORD }

      if (i_Result_P2 = $AA) and (i_Result_P3 = $55)
      then
        i_Cpt := i_Cpt +1
      else
        i_Sortie :=1 ;
      end;
    if (i_Sortie = 1) or ( i_Cpt <>Max)
    then
      writeln ('Test of PA160 successful')
    else
      writeln ('Test of PA160 not successful')
    end;
  end;

```

C++

```

include <dos.h>
include <stdlib.h>

define Adresse_de_base 300
define MAX 2000

main (void)
{
  int i_Result_P2 ;
  int i_Result_P3 ;
  int i_Sortie = 0 ;
  int i_Cpt = 0 ;

  do
  {
    outportb (Adresse_de_base , 0XAA);          /* channel 0 IOWR : 1010 1010 */
    outportb (Adresse_de_base + 1 , 0X55);      /* channel 1 IOWR : 0101 0101 */

    i_Result_P2 = inportb (Adresse_de_base + 2 ) ; /* channel 2 IORD */;
    i_Result_P3 = inportb (Adresse_de_base + 3 ) ; /* channel 3 IORD */;

    if ((i_Result_P2 == 0XAA) && (i_Result_P3 == 0X55))
    {
      i_Cpt = i_Cpt + 1 ;
    }
    else
    {
      i_Sortie = 1 ;
    }
  }

  while ((i_Cpt != MAX) && (i_Sortie == 0));
  if ((i_Cpt == MAX) && (i_Sortie == 0));
  {
    printf ("Test of PA160 successful /n");
  }
  else
  {
    printf ("Test of PA160 not successful /n");
  }
}

```

10 INTERRUPT

A hardware strobe is produced when the signal changes from "0" to "1" at pin 19 of the front connector.

"0" high

"1" low

Before a channel can be used as an input, the corresponding channel line has to be set on "0".

i **IMPORTANT!**

"0" = $V > 2.4V$ at the output and

"1" = $V < 0.5V$ at the output

After a successful power ON reset, all the channels are set on logic "0". An immediate data input is thus possible without performing out an OUT before. A signal change from "0" to "1" (negative logic) at channel input 7 generates an interrupt. The interrupts are available on the wire wrap field (See Fig. 10-1). A Read of the data bytes of channel 0-3 resets the interrupt flip flop of the corresponding channels.

Fig. 10-1: Interrupt - Position and meaning of the pins

