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CE

Technical description

ADDICOM PA 731

1-port serial interface

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- 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.

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Declaration of Conformity

Document-Number/Month-Year: B-25812 / 03.1996

Manufacturer/Importer: ADDI-DATA GmbH Dieselstraße 3 D-77833 OTTERSWEIER

Type:

PA 731

Product description: Board to be inserted in an ISA slot of a PC 1-port serial interface RS232, RS422, RS485 or 20mA Current Loop

The above named product complies with the following European directives:

Directive 72/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.

The following norms have been applied:

IEC 61010-1 2002-08 IEC 61326-2 2004

2004/11/10

Date

P. Scient

Legally valid signature of the manufacturer

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$\star\star\star$ Protect yourself, the others and the environment $\star\star\star$

• Read carefully the safety leaflet (yellow)!

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



WARNING!

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



IMPORTANT! designates hints and other useful information.

• Any question?

Our technical support is at your disposal

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1 INTENDED PURPOSE OF THE BOARD

The board **PA 731** provides the personal computer (PC) with a 1-port 7asynchronous serial interface for the communication with external devices.

It is to be used in a free PC 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.

The operating modes have different features regarding electromagnetic compatibility.

Serial data is also exchanged with external devices through the 25-pin SUB-D male connector of the board **PA 731** in the chosen transmission mode RS232, RS422, RS485 or 20 mA current loop.

The connection with the external cables is to comply with the specifications:

- metallized plastic hoods
- shielded cable
- cable shield folded back and firmly screwed to the connector housing.

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.

Table 1-1: Operating mode

Operating modes
RS 232
RS 422 RS 485
20mA Current Loop

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.

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

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.

Connection to the peripheral

with a shielded cable, twisted in pairs. Connect the peripheral cable so that the differential lines described in the connector pin assignment with "+" and "-" are twisted in pairs.

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

The housing of the peripheral connector

- is to be firmly screwed together with the shield of the cable
- is to assure a low-resistance connection (< 100 m Ω) between the shield and the housing of the PC.

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

2 USER

2.1 Qualification

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

	<u>I rue value</u>	<u>Set value</u>
ESD	4 kV	4 kV
Fields	10 V/m	10 V/m
Burst	4 kV	2 kV
Conducted radio interferences	10 V	10 V



WARNING!

The EMC tests have been carried out in a specific appliance configuration. We guarantee these limit values **only** in this configuration¹⁾.

Consider the following aspects:

- your test program must be able to detect operation errors.
- your system must be set up so that you can find out what caused errors.

4.2 Physical set-up of the board

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



PA 731

¹⁾ We transmit our appliance configuration on request.

4.3 Options

Option U:	UART with 16-byte FIFO buffers
Option S:	Addressing through DIP switches
Option RC:	Modem control signals CTS, RTS as RS422 signals

4.4 Limit values

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

Minimum PC requirements:

- operating system:	 MS DOS	3.3,
	Windows	3.1,

Energy requirements:

- current consumption in mA
- (without load); typ:See table \pm 5%

	PA 731
+ 5 V from PC	130 mA

Modes:	RS232, RS422, RS485 or 20 mA current loop (active, passive)
Addressing:	COM1, COM2, COM3, COM4 selectable per jumper or with each address through DIP switches (option S)
Memory:	UART with 16-byte FIFO buffer (option U)
Protocol:	5-, 6-, 7- or 8-bit character
Parity:	Even, odd, none, mark and space $1, 1\frac{1}{2}$ or 2 stop bits
Transfer rates:	50 Baud up to 115200 Baud
Interrupt lines:	IRQ 3-5 for XT 10, 11, 15 for AT selectable through jumper

Overvoltage protection:	
• RS 422/RS 485:	Breakdown voltage = ± 6.5 V
	VCL ¹ = \pm 11.3 V; at Ipp ² = 35.4 A in 1 ms test Ppp ³ = SURGE 300 W / 1 ms All lines are protected against short-circuit through PTC resistors.
• RS 232:	Breakdown voltage = $\pm 25 \text{ V}$ VCL = $\pm 38 \text{ V}$; at Ipp = 9.6 A in the 8-20 µs test Ppp = SURGE 300 W/1 ms
• 20mA current loop:	Breakdown voltage = ± 26 V VCL = ± 41.5 V; at Ipp = 9.6 A in the 1 ms test Ppp = SURGE 400 W/1 ms

 ¹ Clamping voltage
 ² Surge non repetitive reverse current
 ³ Peak Pulse Power

5 SETTINGS

5.1 Settings at delivery

Fig. 5-1: Component scheme of the PA 731 board



5.2 Jumper settings

5.2.1 Jumper location and settings at delivery

Fig. 5-2: Jumper location and settings at delivery



5.2.2 Jumpers settings



WARNING!

Do not operate the board simultaneously in several modes. Otherwise you may destroy the board, PC and/or the peripheral.

Make sure to set only the jumpers required for the respective functions.

Base address

You can also set the base address through DIP switches (Option S). See Chapter 5.3: Base address.

- J1 decodes address bit A4.
- J2 decodes address bit A8.

3				
Description	Address	Jumper	settings	Settings at delivery
COM1	3F8H	J] 00	J2 • •	-
COM2	2F8H	J] 0 0	J2 • •	1
COM3	3E8H	J] • •	J2 • •	-
COM4	2E8H	J] • •	J2 • •	-

Table 5-1: Setting the base address

Interrupt lines

 Table 5-2: Selection of the interrupt lines

Base address	Corresponding interrupt line	Jumper	Settings at delivery
COM1	IRQ4	J9	-
COM2	IRQ3	J8	1
COM3	IRQ10	J11	-
	IRQ11	J12	-
COM4	IRQ5	J10	_
	IRQ15	J13	-

Mode selection

The board cannot simultaneously operate in several modes.

	Table 5-3: Mode selection	
Settings	Function	

Jumper	Settings	Function	Settings at delivery
J14	set	RS232	✓
J15	set	RS422, RS485	When switching to RS 422, DJ2 has to be removed
DJ6	DJ6 © © © K L	Source of the CTS signal: CTS in RS232 mode	_
	DJ6 © © © K L	Source of the CTS signal: CTS in RS422 mode (Option RC)	_
DJ3	DJ3	Current loop - Transmitter Current flows in rest state	-
	DJ3 © E © F	Current does not flow in rest state	✓
DJ4	DJ4 o H o G	Current loop - Receiver Current flows in rest state	√
	DJ4	Current does not flow in rest state	-

Terminal resistors

Table	5-4:	Terminal	resistors
-------	------	----------	-----------

Jumper	Settings	Function	Settings at delivery
DJ1	DJ1	$RS422 = 100 \Omega$ terminal resistor	-
	A B		
	DJ1	$RS485 = 120 \Omega$	1
	ooAB		
J16	set	Option RC: terminal resistor for the CTS signal, when board operated in RS422	1

Controlling the transmitter

Select the control bit for the release of the RS485 transmitter through DJ2.

Settings	Function	Settings at delivery
DJ2 A B o o o c o D	Control occurs over the DTR signal	-
	Control occurs over the DATA-DIR signal	✓
	Control occurs over the RTS signal	-
DJ2 A B o o o c D	Automatic transmitter control (e.g. by using the standard drivers of the operating system)	_

|--|

1

IMPORTANT! To switch to RS422 the jumper DJ2 is not to be set.

Controlling the receiver

Select the control bit for the control of the RS485 receiver through J17.

Settings	Function	Settings at delivery
J17 •••	Alternate control (without echo)	-
J17 ooo A B	Control through the RD-EN bit (with echo)	1

Table 5-6: Receiver control with J17



IMPORTANT! To switch to RS422, **J17** is to be set in position **B**.

Selection of the isolation

Table 5-7: Selection of the isolation with DJ15

Settings	Function	Settings at delivery
DJ15 $\circ \circ \circ$ I J	Ground of the PC housing	~
DJ15 $\circ \circ \circ$ I J	Voltage supply ground of the PC	-

Table 5-8: Wait state logic (Option):

Only one jumper can be set at the same time. Number of wait-states per Jumper (Wait-state = 1 clock!)

JUMPER	SETTINGS	FUNCTIONS	SETTINGS AT DELIVERY
J3	set	3 wait states	Option: not available in the standard version
J4	set	4 wait states	Option: not available in the standard version
J5	set	5 wait states	Option: not available in the standard version
J6	set	6 wait states	Option: not available in the standard version
	set	7 wait states	Option: not available in the standard version

If no jumper is set, the number of wait-states determined in the PC for the I/O accesses is set by the PC. (depends on the system)

5.3 Setting the base address



WARNING!

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

Before installing the board

Check, that

- the base address is free
- the address range required by the board is not already used by the PC or by boards already installed in the PC.

Possible settings of the base address (see also ''Jumper settings'') You can find out which serial and parallel ports are already used by your PC.

• Load the DEBUG program.

Are recognised: COM1, C

COM1, COM2, LPT1, LPT2 for DOS 3.3 and COM1-COM4, LPT1-LPT2 for >DOS 4.0

Enter	On the screen	Meaning
	C:>	
debug <return></return>	-	
d40:0 <return></return>	F8 03 F8 02 00 00 00 00 -78 03	'address $03F8 = COM1$ ´address $02F8 = COM2$ ´address $0378 = LPT1$
q <return></return>		

COM1 = 03F8, COM2 = 02F8, LPT1=0378 are used in this example by the PC.

You can set the base address of the serial ports through the block DIP switches (Option S). In this case the jumpers J1 and J2 are to be open.

Address ranges

• Make sure that the address ranges of the serial ports do not overlap.

Decoding of the base addresses

The address decoding requires 8 bytes in the I/O address space. (0 to 3FF Hex).

Table 5-9: Decoding the base address (0390H)

	MSI	3														LSB
Decoded address bus	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
Selected Base address Hex	0		3			9			0							
Selected Base address binary	0	0	0	0	0	0	1	1	1	0	0	1	0	0	0	0
DIP-switches S2 Logic "0"= ON Logic "1" = OFF	*	*	*	*	*	*	s7 OFF	s6 OFF	s5 OFF	s4 ON	s3 ON	s2 OFF	s1 ON	X	X	X

X: Decoded address range of the board * :Permanetly decoded at logic "0"

Fig. 5-3: DIP switches

IMPORTANT!

You will find the switch s1 **S1** on the left of the DIP switches!

ON								
	s1	s2	s3	s4	s5	s6	s7	s8
OFF								

If you want to set a PA 731 with DIP switches to COM1-COM4, the switches S1 to S8 are to be set to OFF.



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

You will find additional information to these different steps in the sections 6.1 to 6.5.

6.1 Inserting the board

IMPORTANT!

Do observe the safety instructions.

6.1.1 Opening the PC

1

- 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.

6.1.2 Selecting a free slot

Two types of ISA slots are available: XT and AT.

Fig. 6-1: Types of slots



If necessary, the board can also be used in EISA slots. See in the PC manual which types of slots are free.

- 1. Decide in which type of slot to insert the board.
- **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 out of its protective pack

6.1.3 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: Fastening the board at the back cover



• Tighten all the loosed screws.

6.1.4 Closing the PC

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

6.2 Installing the software

The board is supplied with a CD-ROM.

The CD contains:

- ADDIREG for Windows NT 4.0 and Windows 95,
- You can also download the ADDIREG program from Internet.
- Standard software for the ADDI-DATA boards:
 - 16-bit for MS-DOS and Windows 3.11
 - 32-bit for Windows NT/95.

6.2.1 Installation under MS-DOS and Windows 3.11

- Copy the contents of PA731\16bit on a diskette. If several diskettes are to be used, the directory content is stored in several subdirectories (Disk1, Disk2, Disk3...).
- Insert the (first) diskette into a driver and change to this drive.
- Enter <INSTALL>.

The installation program gives you further instructions.

6.2.2 Installation under Windows NT / 95

- Select the directory PA731\32bit\Disk1.
- Start the setup program "setup.exe" (double click)
- Select one of the 3 parameters
 - 1- typical
 - 2- compact
 - 3- custom

Proceed as indicated on the screen and read attentively the "Software License" and "Readme".

In "custom", you can select your operating system.

The installation program gives you further instructions.

6.3 Board configuration with ADDIREG

The ADDIREG registration program is a 32-bit program for Windows NT 4.0/95. The user can registrate all hardware informations 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.

6.3.1 Program description

1

1

IMPORTANT!

Insert the ADDI-DATA boards to be registrated before starting the ADDIREG program.

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

ADDI-DATA Gm source file <u>S</u> yster Board list config	bH registration p minfo <u>A</u> bout guration	rogram. Versio	n 0600 / 0417				
Board name	Base address	s Access	PCI bus/device/(slot)	Interrupt	ISA DMA	More inform	nation 🔺
<u>I</u> nsert			Edi	į			Clear
oard configura Base address r Base address : Access mode:	tion name : V	Interrupt name Interrupt :	e: D D D	MA name: MA channel		<u>S</u> et Default	<u>C</u> ancel <u>M</u> ore information
Save	<u>▼</u> <u>R</u> estore	<u>⊺</u> est registrat	ion <u>D</u> eins	tall	<u>P</u> rint registration	Quit	

Fig. 6-5: ADDIREG registration program

Screen explanation:

Table:

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

Board name:

Names of the different registrated boards (eg.: APCI-3120). When you start the program for the first time, no board is registrated in this table.

Base address:

Selected base address of the board.

1

1

IMPORTANT!

The base address selected with the ADDIREG program 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.

PCI bus / slot:

Used PCI slot. If the board is no PCI board, the message "NO" is displayed.

Interrupt:

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

IMPORTANT!

The interrupt selected with the ADDIREG program must correspond to the one set through DIP-switches.

ISA DMA:

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

More information:

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

Text boxes:

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

Base address name:

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

Base address:

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

Interrupt name:

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

Interrupt:

Selection of the interrupt number which the board has to use.

DMA name:

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

DMA channel:

Selection of the used DMA channel.

Buttons:

<u>E</u>dit ¹:

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

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

Board type list			
Board type list : PA370 PA3000 PA3100 PA3110 PA3500 APCI3001 APCI3120 PA731 PA732 PA755 PA7200	*	A/D converter, 16 single-ended or 8 differential input channels, 12-bit, 100 kH DMA, programmable amplifier, D/A converter, 2 to 8 output channels, 12-bit, unipolar/bipolar, timer, 24 TTL I/O.	z,
<u>0</u> k		ADDI-DATA	

Fig. 6-6: Configuring a new board

All boards you can registrate are listed on the left. Select the wished board. (The corresponding line is highlighted).

On the right you can read technical information about the board(s). Activate with "OK". You some back to the former screen

Activate with "OK"; You come back to the former screen.

Clear:

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

<u>S</u>et:

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

Cancel:

Reactivates the former parameters of the saved configuration.

Default:

Sets the standard parameters of the board.

More information:

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

¹ "x": Keyboard shortcuts; e.g. "Alt + e" for Edit

The following figure is the example of 4 serial interfaces.

Serial-4 Information	
Serial port 1 configuration	Serial port 2 configuration
PA7500 - COM1	PA7500 - COM2
Modul selection : PM232-G	Modul selection : PM232-G
Modem control signal	Modem control signal
Current flows (send)	Current flows (send)
Current flows (reception)	Current flows (reception)
RS485 echo enable	RS485 echo enable
Serial port 3 configuration	Serial port 4 configuration
PA7500 - COM3	PA7500 · COM4
Modul selection : PM485-G	Modul selection : PM485-G
Modem control signal	<u>Modem control signal</u>
Current flows (send)	Current flows (send)
Current flows (reception)	Current flows (reception)
RS485 echo enable	RS485 echo enable
<u>O</u> k	<u>C</u> ancel

Fig. 6-7: Communication board

If you use the standard driver for Windows, you can select the COM number. If you use the ADDI-DATA driver, you can select the identifier string for each module.

Several options like "Module selection" and the different parameters can only be activated if the functions are available.

Save:

Saves the parameters and registrates the board.

<u>Restore:</u>

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.

<u>P</u>rint registration:

Prints the registration parameter on your standard printer.

Quit:

Quits the ADDIREG program.

6.3.2 Registrating a new board

1

IMPORTANT!

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

- Call up the ADDIREG program. The figure 6-5 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.

6.3.3 Changing the registration of a board

1

IMPORTANT!

To change the registration of a board, you must have administrator rights. Only an administrator is allowed to registrate 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.

6.3.4 Removing the ADDIREG program

The ADDI_UNINSTALL program is delivered on the CD-ROM.

• Start the ADDI_UNINSTALL program.

ADDI-DATA Uninstall program Ver	sion 0600/010	3	
□ ADDIREG / □ UNIVERSALDRIVER □ ADDICOM	· ·	<u>S</u> elect All	
D PA100			
	à.	Clear All	ADDI-DATA"
D PA110			
PA150 -			
L PA1500	A	Demeure	
L PAI508	Characteristics	<u>H</u> emove	
PA1610	· · · · · · · · · · · · · · · · · · ·		
🗆 PA200	_		
PA2000		<u>E</u> xit	
PA2200			
	B	Deinstall Registration t	ior AddiBea
PA310	-	<u>-</u>	

Fig. 6-8: The ADDI_UNINSTALL program

- Click on "Deinstall registration for AddiReg".
- Proceed as indicated until the complete removing of ADDIREG.
- You can also download the program from Internet.

6.4 ADDI-DATA on the Internet

Do not hesitate to visit us or e-mail your questions. Our Internet page is accessed:

- per e-mail:	info@addi-data.de	or
	hotline@addi-data.de	
- per Internet:	http://www.addi-data.com	

Free download of standard software

You can download the latest version of the software for the board PA 731.

i

IMPORTANT!

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

7 CONNECTION TO THE PERIPHERAL

7.1 Connector pin assignment

Fig. 7-1: 25-pin SUD-D male connector



Table 7-1: Pin assignment

Pin	Signal	Mode / Meaning
1	PG	Protection ground
2	TxD	RS 232 transmitted data
3	RXD	RS 232 received data
4	RTS	RS 232 request to send
5	CTS	RS 232 clear to send
6	DSR	RS 232 data set ready
7	SGND	RS 232 signal ground
8	DCD	RS 232 data carrier detect
20	DTR	RS 232 data terminal ready
22	RI	RS 232 ring indicator
24	Tx+	RS 422 transmit
23	Tx-	RS 422 transmit
17	Rx+	RS 422 received /RS 485 received
16	RX-	RS 422 received / RS 485 received
14	RTS+	RS 422 request to send+*
13	RTS-	RS 422 request to send-*
21	CTS+	RS 422 clear to send+*
19	CTS-	RS 422 clear to send-*
10	GND isola	Isolated ground
11	+Tx-CL-DATA	CL transmitted data
12	-Tx-CL-DATA	CL transmitted data
18	+RCV-CL-DATA	CL received data
25	-RCV-CL-DATA	CL received data
9	Current source out 1	Current source out 1
15	Current source out 2	Current source out 2

* RS 422: The signals on pins 13, 14, 19 and 21 are optionally available.

RS 422, RS 485 and current loop: If the board is operated under DOS (COM1 to COM4) and in case the modem control signals are not used, they must be externally wired to the front connector.
Pin 4 and 5: RTS with CTS
Pin 6, 8 and 20: DTR with DSR and DCD are to be wired together.

8 FUNCTIONS OF THE BOARD

8.1 Block diagram

Fig. 8-1: Bloc diagram of the PA 731 board



8.2 I/O mapping

		IORD				IOWR	R		
Base address + 0	Receiver Buff	er			Transmit Register				
Base address + 1	Interrupt Enab	le Regi	ister		Interrupt Enable Register				
Base address + 2	Interrupt Ident	Interrupt Identification Register							
Base address + 3	Line Control F	Line Control Register				Line Control Register			
Base address + 4	Modem Contro	Modem Control Register				rol Register DTR			
Base address + 5	Line Status								
Base address + 6	Modem Status								
Base address + 7				DATA- DIR			RD- ENA	DATA- DIR	
		D2	D1	D0		D2	D1	D0	

Table 8-1: I/O map

Description of the control bits in RS485

DATA-DIR is used in RS485 mode to enable the RS485 driver.
 DATA-DIR = "0" Writing is not possible (disabled)
 DATA-DIR = "1" Writing is possible

This bit can be re-read. Bit DATA-DIR is disabled after power ON reset.

 RD-ENA is used in RS485 mode for enabling the RS485 receiver. RD-ENA = "0" Reception is possible RD-ENA = "1" Reception is not possible

RD-ENA is active after system reset. The system is in the reception mode.



WARNING!

Do not operate the board simultaneously in several modes. Otherwise you may destroy the board, PC and/or the peripheral.

8.3 RS232

Adjust the jumper J14 to operate under this mode. See "5.2 Jumper settings"

Protection wiring

All lines are protected trough Transil protection diodes. (See limit values)

8.4 RS422

Adjust jumper J5 and remove DJ2. If you want to transmit, first enable RS422 driver with the DTR signal.

Example:

```
Modem_CTRL : = Basisadresse + 4 ;
    port [Modem_CTRL]: = $01 ; (* Driver enabled *)
    port [Modem_CTRL]: = $00 ; (* Driver disabled *)
```

Caution!

The RD-ENA bit (base address +7, bit D1) is to be set to "0" otherwise no reception is possible.

1

IMPORTANT! To switch to RS422, **J17** is to be set in position **B**.





Inverted DTR signal

Over jumper DJ1 (position A) you can set a 100 Ω terminal resistor. (See jumper settings)

Fig. 8-3: Insertion of a resistor over jumper DJ1



Over jumper J6 you can set a 100 Ω terminal resistor.





External connection



Fig. 8-5: RS422 external connection



Fig. 8-6: RS422 external connection with option RC

Protection wiring: RS422 transmitter

The protection wiring consists in 2 Schottky double diodes BAR43S. Max. direct current: 100 mA

Fig. 8-7: Protection wiring - RS422 transmitter



8.5 RS485

Jumper J15 is to be set for this operation of this mode.

After reset of the system, the RS485 driver is locked (inactive), the RS485 receiver is active.

4 possibilities are available to enable the transmitter:

port [Basisadresse + 7] : = \$00 ; (*Driver disabled *)

- Automatic transmitter control

The transmitter is automatically released by data transmission and then disabled.

Fig. 8-8: Selection of DTR, RTS or DATA-DIR over Jumper



The board is supplied with a 120 Ω terminal resistor, which you can select though jumper J1 (set to B).

Controlling the receiver

You have 2 possibilities to control the receiver:

- To disable the receiver the RD-ENA bit is to be set (operation with echo).

E.g.: port [Basisadresse + 7] : = \$03 ; (* Driver enabled*) (* Receiver disabled*)

- Alternate release with the transmitter control (operation without echo) i.e during transmission the receiver is disabled, if no transmission occurs it is released.



Fig. 8-9: Selection of the receiver control

Protection wiring: RS422/RS485 receiver

Overvoltage protection: the protection circuitry consists in Transil diodes. The lines Rx+ and Rx- are protected against short-circuit through PTC resistors.





8.6 Current loop

The board can function as a constant current interface. The board receives and transmits as well as in active or passive mode.

Two 20 mA current loop sources are on the board. They are optically isolated from the PC with optical couplers (5300 V isolation voltage) and DC/DC converter (500 V isolation current).

Through DJ3 you can decide if -on the transmitter side- current flows or not in rest state. You can invert the received signal through jumper DJ4 (See jumper settings).

20 mA Current Loop: cabling

Active mode

The current source of the board supplies with the necessary 20 mA current loop the transmitter and receiver lines.

Passive mode

The current source from the peripheral supplies with the necessary 20 mA current loop the transmitter and receiver lines.



Fig. 8-11: Active transmission/active reception



Fig. 8-12: Active transmission/passive reception



Fig. 8-13: Passive transmission/ active reception



Fig. 8-14: Passive transmission/ passive reception



Fig. 8-15: Connection to a Siemens S5

9 DEVICE DRIVER

To install the port of the **PA 731** please use the standard drivers which are delivered with Windows NT 4.0. You can read additional information about the Windows API functions for the settings and the use of the serial interfaces in the manual delivered with the board:

"SERIAL COMMUNICATION in WIN32"

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

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