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PCA-6143P
Half-size 486SX/DX/DX2 CPU Card
with Flash/ROM Disk

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A Message to the Customer....

Advantech Customer Services

Each and every Advantech product is built to the most exacting specifications to ensure reliable performance in the unusual and demanding conditions typical of industrial environments. Whether your new Advantech equipment is destined for the laboratory or the factory floor, you can be assured that it will provide the reliability and ease of operation for which the name Advantech has come to be known.

Your satisfaction is our number one concern. Here is a guide to Advantech's customer services. To ensure you get the full benefit of our services, please follow the instructions below carefully.

Technical Support

We want you to get the maximum performance from your products. If you run into technical difficulties, we are here to help. But please consult this manual first. We have listed the answers to most commonly asked questions in Appendix E, Maintenance and troubleshooting.

If you still can't find the answer, gather all the information or questions that apply to your problem and, with the product close at hand, call your dealer. Our dealers are trained and ready to give you the support you need to get the most from your Advantech products. In fact, most problems reported are minor and are able to be easily solved over the phone.

In addition, free technical support is available from Advantech engineers every business day. We are always ready to give advice on application requirements or specific information on the installation and operation of any of our products.

Product warranty

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for one year from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability as a consequence of such events under the terms of this Warranty.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair and replacement service. If an Advantech product ever does prove defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered (e.g. type of PC, CPU speed, Advantech products used, other hardware and software used, etc.). Note anything abnormal and list any on-screen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product and any other information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return material authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completely filled-out Repair and Replacement Order Card and a photocopy of a dated proof of purchase (such as your sales receipt) in a shippable container. A product returned without dated proof of purchase is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

How to use this manual

Thank you for purchasing the **PCA-6143P Half-size 486SX/DX/DX2 CPU Card with Flash/ROM Disk**. We designed this manual to help you quickly and easily set up your card. You can use the manual in two ways:

Step by step:
The manual guides you through the configuration process from beginning to end. It gives detailed information to help you make each configuration choice. Special sections cover tasks such as installing memory chips, CPU upgrading and watchdog timer setup. A troubleshooting section lists solutions to common problems.

Quick Start:
Our special Quick Start section (on page 39) gives experienced users the information they need to setup the CPU card as quickly as possible. It concisely lists all jumper settings and connections. If you need more information, it directs you to the page number of the complete description. If you have any problems, you can work through the manual step by step for easy troubleshooting.

If you have any questions, feel free to call your local distributor or sales representative.

Packing list

Before you begin installing your card, please make sure that the following materials have been shipped:

- 1 PCA-6143P CPU card
- 1 6-pin mini-DIN keyboard adapter
- 1 Hard disk drive (IDE) interface cable (40-pin)
- 1 Floppy disk drive interface cable (34-pin)
- 1 Parallel port adapter (26-pin) kit
- 1 3½" diskette with Flash/ROM disk utility

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

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CHAPTER 1

Hardware Configuration

This chapter gives background information on the PCA-6143P. It then shows you how to configure the card to match your application and prepare it for installation into your PC.

Sections include:

- Card specifications
- Locating components
- Safety precautions
- Configuration – Jumper settings

Experienced users can skip to the Quick Start section on page 39.

Introduction

The half-size PCA-6143P comes equipped with either an 80486SX-25, 80486SX-33, 80486DX-33, 80486DX2-50 or 80486DX2-66 CPU. Also included on-board are one serial RS-232 port, one serial RS-232/422/485 port, an enhanced bi-directional parallel port, an IDE hard disk drive interface, a floppy disk controller and a watchdog timer. The watchdog timer ensures that the CPU will be reset if it stops due to a program or EMI problem, allowing the PCA-6143P to be used in stand-alone systems or unattended environments. The PCA-6143P's industrial-grade construction ensures continuous, reliable operation in harsh industrial environments at temperatures up to 140°F (60°C).

We designed the PCA-6143P with SBC (Single Board Computer) applications in mind. It incorporates a single-voltage power supply (+5 V) and a connector for PC/104 modules (Flat-panel/CRT VGA controller or Flash/RAM/ROM disk). A built-in Flash/ROM disk emulates a floppy disk drive of up to 1.44 MB capacity. It emulates the 1st, 2nd, 3rd or 4th DOS drive, depending on the physical disks installed and the DOS version. See Appendix A for details.

Built using CMOS technology, the PCA-6143P consumes very little power. Its two SIMM (Single In-line Memory Module) DRAM sockets accept 1 MB, 4 MB or 16MB SIMM modules for total on-board memory of 1 to 32 MB.

You can also use this 8-layer CPU card to transform any system into a 32-bit 486 compatible computer, its all-in-one configuration freeing-up valuable expansion slots. Its highly compact form and numerous features make it an ideal cost/performance solution for high-end commercial and industrial applications where high CPU speed and low mean-time-to-repair are critical.

Specifications

System

- **CPU**: 80486SX-25, 80486SX-33, 80486DX-33, 80486DX2-50, 80486DX2-66, or 80486DX4-100
- **Bus interface**: ISA (PC/AT) bus
- **System performance**:
  150 MHz with an 80486DX-33 MHz CPU (Landmark speed V1.14)
- **Data bus**: 32-bit
- **DMA channels**: 7
- **Interrupt levels**: 15
- **Processing ability**: 32-bit
- **Bus speed**: 8 MHz
- **Chipset**: ALI M1219
- **Real-time clock/calendar**:
  Uses DS-12887 RTC chip and quartz oscillator, powered by a lithium battery for 10 years of data retention

Memory

- **DRAM memory**: 1 MB to 32 MB
  Uses 256Kx36 (SIMM-256-8), 1Mx36 (SIMM-1000-8) or 4Mx36 (SIMM-4000-8) SIMMs with access time of 80 ns or less
- **Shadow RAM memory**: Support for system and video BIOS of up to 256 KB in 32 KB blocks

I/O

- **IDE hard disk drive interface**: Supports up to two IDE (AT bus) hard disk drives. BIOS enabled/disabled
- **Floppy disk drive interface**:
  Supports up to two floppy disk drives, 5¼" (360 KB and 1.2 MB) and/or 3½” (720 KB and 1.44 MB). BIOS enabled/disabled

- **Enhanced bi-directional parallel port**: Configurable to LPT1, LPT2, LPT3 or disabled. Standard female DB-25 connector provided
- **Serial ports**: One serial RS-232 port, one serial RS-232/422/485 port. Ports can be individually configured as COM1, COM2 or disabled

Industrial features

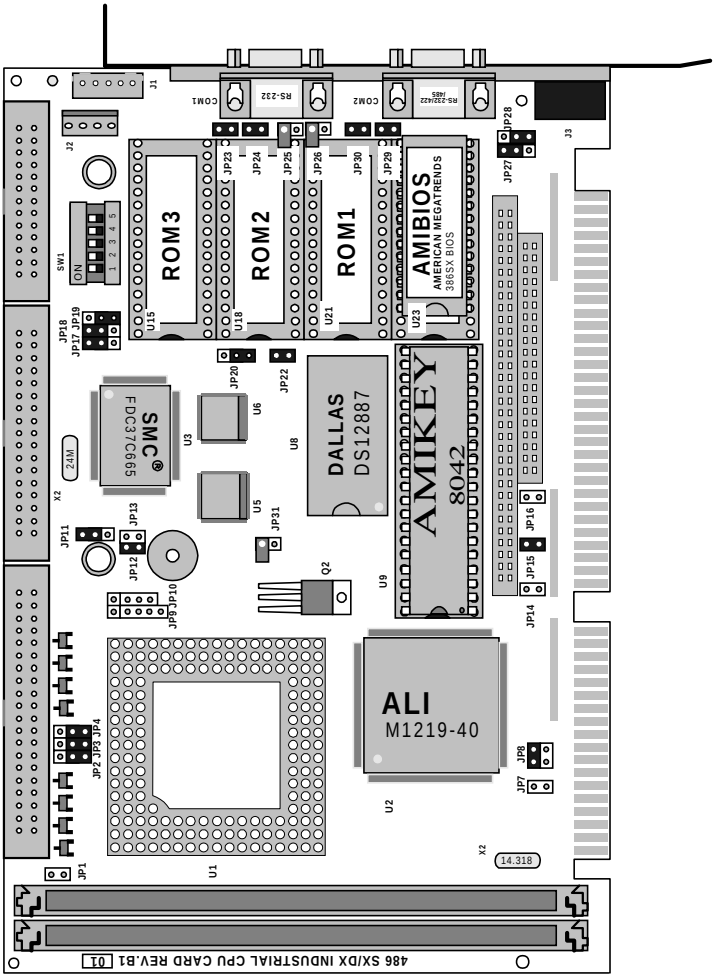
- **Watchdog timer**:
  BIOS configurable to *disabled* or *programmable ON/OFF*. The time-out interval is 0.5 sec. ~ 16 min. 48 sec. Your program uses hex 043 and 443 to control the watchdog
- **PC/104 connector**:
  A PC/104 16-bit bus connector for optional modules such as a Flash/RAM/ROM disk module and/or Flat-panel/CRT VGA modules
- **Keyboard connectors**: A 6-pin mini-DIN keyboard connector is located on the mounting bracket for easy access. An external keyboard adapter is also included. An on-board keyboard pin header connector is also available.

General

- **Max power required**: + 5 V @ 2 A
- **Power supply voltage**: +5 V (4.75 V to 5.25 V)
- **Operating temperature**: 32 to 140°F (0 to 60°C)
- **Size**: 7.3" (L) x 4.8" (W) (185 mm x 122 mm)
- **Weight**: 1.1 lbs (0.5 Kg)
- **EMI**: Pending
- **MTBF**: 64,500 hrs @ 25°C; 39,100 hrs @ 60°C

Locating components

This section identifies the location of the card's major components. It also includes a list of the function of each of the card jumpers. The following figure gives an overall view of the card.



PCA-6143P PCB Layout

Jumpers and connectors

Connectors on the board link it to external devices such as hard disk drives, a keyboard or PC/104 modules. In addition, the board has a number of jumpers which you use to configure it for your application.

The table below lists the function of each of the board jumpers and connectors. Later sections in this chapter give instructions on setting jumpers and detailed information on each jumper setting. Chapter 3 gives instructions for connecting external devices to your card. Pin assignments for each connector appear there or in Appendix D.

Jumpers and connectors

Number	Function	Page
J1	Keyboard connector	17
J2	SBC Power Connector	19
J3	Keyboard connector (6-pin mini-DIN)	17
JP1	Hard disk drive activity LED	18
JP2, 3	CPU type selection	60
JP4	Bus clock selection	9
JP7	Reset switch	17
JP8	Watchdog timer invokes system reset or IRQ15	9
JP9	Power LED and keylock	18
JP10	Speaker connector	19
JP11	Print IRQ selection	24
JP12	Turbo switch	18
JP13	Turbo LED	19
JP14	Bypass POST	8
JP15	Display type - color/mono	9
JP17	Parallel port DACK selection	24
JP18	Parallel port DRQ selection	24
JP19,23,24	SSD device selection	49
JP20,22,25,26, 27,28,29,30	COM2 RS-232/422/485 selection	21
JP31	CPU voltage selection	60

Number	Function	Page
CN1	HDD connector	16
CN2	FDD connector	15
CN3	Parallel/printer connector	16
CN4,CN5	PC/104 connectors	61
COM1	RS-232 serial port	20
COM2	RS-232/422/485 serial port	21

SIMM memory modules

On the left end of the card (away from the mounting bracket) are the two SIMM (Single In-line Memory Module) sockets which hold the card's DRAM memory. If you ordered DRAM SIMMs along with your card, the SIMMs may already be installed. If not, you should install them as described in Appendix C.

Flash/RAM/ROM disk

At the right of the card are three 32-pin sockets which hold the memory chips for the card's Flash/RAM/ROM disk. Instructions for installing memory chips appear in Appendix A.

Safety precautions

Follow these simple precautions to protect yourself from harm and your PC from damage.

1. To avoid electric shock always disconnect the power from your PC chassis before you work on it. Don't touch any components of the CPU card or other cards while the PC is on.
2. Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.
3. Always ground yourself to remove any static charge before you touch your CPU card. Be particularly careful not to touch the chip connectors. Modern integrated electronic devices, especially CPUs and memory chips, are extremely sensitive to static electric discharges and fields. Keep the card in its anti-static packaging when it is not installed in the PC and place it on a static dissipative mat when you are working on it. Wear a grounding wrist strap for continuous protection.

Jumper settings

This section tells how to set the jumpers to configure your card. It gives the card default configuration and your options for each jumper. After you set the jumpers and install the card, you will also need to run the BIOS Setup program (discussed in Chapter 5) to configure the serial port addresses, floppy/hard disk drive types and system operating parameters. Connections, such as hard-disk cables, appear in Chapter 3.

Card default setting

We set the card's jumpers at the factory for the most popular configuration. If this configuration matches your needs, you may not need to change the jumpers at all. The default configuration is as follows:

- Watchdog invokes system reset
- Parallel port IRQ7, DRQ1, DACK1
- Color display is attached
- Bypass POST (JP14)

How to set jumpers

You configure your card to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To “close” a jumper you connect the pins with the clip. To “open” a jumper you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2 or 2 and 3.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.

Display type (JP15)

This jumper sets the display adapter type attached to your card. If you are using a monochrome LCD or EL screen which uses a CGA, EGA, VGA or other color display adapter, set JP15 to color.

JP15	Setting
Open	Monochrome
Closed (default)	Color

Watchdog timer – system reset/IRQ15 (JP8)

When the watchdog timer activates (CPU processing has come to a halt), it can reset the system or generate an interrupt on IRQ15. Set jumper JP8 as shown in the following table:

JP8	Setting
1-2	System Reset
3-4	IRQ15

Bus clock selection (JP4)

JP4	Selection
1-2	Bus clk = CPU clk * 2/8
2-3	Bus clk = CPU clk * 2/6

Parallel Port Jumper Settings

Parallel Port IRQ selection (JP11)	
JP11	**IRQ no**
1-2	IRQ7 (default)
2-3	IRQ5

Parallel Port DRQ selection (JP17)	
JP17	**DRQ no**
1-2	DRQ1 (default)
2-3	DRQ3

Parallel Port DACK selection (JP18)	
JP18	**DACK no**
1-2	DACK1 (default)
2-3	DACK3

The following figure gives card dimensions for SBC applications:

Card dimensions

CHAPTER 2

Installation

This chapter gives guidelines for installing your CPU card into an PC chassis with an AT-compatible passive backplane. For specific instructions, consult the user's manual for your chassis.

Before you begin, double check the jumper settings for the card (described in Chapter 1). This could save you a lot of troubleshooting time later. If you are not sure about the proper setting, contact your local distributor or sales representative.

Warning! *Disconnect all power from the chassis before you install the CPU card. Unplug the power cord from the wall, don't just turn off the power switch. If you are not sure what to do, take the job to an experienced professional.*

Caution! *The electronic components on this CPU card are very sensitive to static electric charges. Use a grounding wrist strap to remove all static electricity before you touch any components. Place all components on a static-dissipative mat or in a static-shielded bag when they are not in the chassis.*

Install your CPU card as follows:

1. Remove power from the chassis and disconnect all power cords. Follow all power-down procedures outlined in your chassis user's manual.
2. Remove the chassis cover, then detach the card hold-down bracket. This bracket stretches across the top of each circuit card to hold it securely in place.
3. Locate a free slot in the chassis. You can use any 16-bit (double connector) slot. We suggest that you leave the maximum amount of space between boards to improve cooling.
4. You may need to remove a block-off cover at the end of the slot. Unscrew the cover and save the screw for use in Step 6.
5. Align the card square with the card-end guide slot and parallel to the connector. Slide the card carefully into the connector.
6. Make sure the card is completely seated in the connector. Screw the card I/O bracket to the case.

After you have installed the CPU card, you will need to attach the connecting cables as described in the following chapter. Replace the card hold-down bracket you removed in Step 2, replace the chassis cover and power-up your system.

Dimensions for SBC (Single Board Computer) installation appear in Chapter 1 (page 10).

CHAPTER 3

Connecting peripherals

This chapter tells how to connect peripherals, switches and indicators to the PCA-6143P board. You can access most of the connectors from at the top of the board while it is installed in the chassis. If you have a number of cards installed, or your chassis is very tight, you may need to partially remove the card to make all the connections. When everything is done, finish installing the card as described in Chapter 2.

The following table lists the connectors on the PCA-6143P. See Chapter 1 (page 5) for help with locating the connectors.

Component	Label	Page
HDD (IDE) connector	CN1	16
FDD connector	CN2	15
Parallel port	CN3	16
PC/104 connector	CN4, CN5	61
Keyboard connectors	J1, J3	17
Reset switch connector	JP7	17
Power LED and keylock connector	JP9	18
HDD LED connector	JP1	18
Turbo switch connector	JP12	18
Turbo LED connector	JP13	19
External speaker connector	JP10	19
SBC power connector	J2	19
RS-232 serial port	COM1	20
RS-232/422/485 serial port	COM2	21

The following sections tell how to make each connection. In most cases you will simply need to connect a standard cable. If you need to make your own cables, you can find pin assignments for the more complicated connectors in Appendix D.

Warning! *Always completely disconnect the power cord from your chassis whenever you are working on it. Do not make connections while the power is on, sensitive electronic components can be damaged by the sudden rush of power. Only experienced electronics personnel should open the PC chassis.*

Caution! *Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag when they are not in the chassis.*

Floppy drive connections

You can attach up to two floppy disk drives to the PCA-6143P's on-board controller. You can use any combination of 5.25" (360 KB and 1.2 MB) and/or 3.5" (720 KB and 1.44 MB) drives.

The card comes with a 34-pin daisy-chain drive connector cable. On one end of the cable is a 34-pin flat-cable connector. On the other end are two sets of floppy disk drive connectors. Each set consists of a 34-pin flat-cable connector (usually used for 3.5" drives) and a printed-circuit-board connector (usually used for 5.25" drives). You can use only one connector in each set. The set on the end (after the twist in the cable) connects to the A: floppy. The set in the middle connects to the B: floppy.

Attach the single 34-pin flat-cable connector to CN2 on the CPU card. For help finding the connector, see Chapter 1 (page 5). Wire number 1 on the cable is red or blue, the other wires are gray. Make sure that the red wire corresponds to pin one on the connector (on the right side).

Connect the A: floppy drive to the connector set on the other end of the cable. If you are connecting a 5.25" floppy drive, line up the slot in the printed-circuit-board (golden fingers) with the blocked-off part of the cable connector.

If you are connecting a 3.5" floppy drive, you may have trouble determining which pin is number one. Look for a number printed on the circuit board indicating pin number one. Also, the connector on the floppy drive connector may have a slot. When the slot is up, pin number one should be on the right. Check the documentation that came with the drive for more information.

Next, if required, connect the B: floppy drive to the connectors in the middle of the cable as described above.

If you need to make your own cable, you can find the pin assignments for the card's connector in Appendix D.

IDE hard drive connections

You can attach two IDE (Integrated Device Electronics) hard disk drives to the PCA-6143P's internal controller. The card comes with a 40-pin flat-cable piggyback cable. This cable has three identical 40-pin flat-cable connectors.

Wire number 1 on the cable is red or blue, the other wires are gray. Connect one end to connector CN1 on the CPU card. Make sure that the red wire corresponds to pin one on the connector (on the right side). See Chapter 1 for help finding the connector.

Unlike floppy drives, IDE hard drives can connect in either position on the cable. If you install two drives, you will need to set one as the master and one as the slave. You do this using jumpers on the drives. If you use just one drive, you should set it as the master. See the documentation that came with your drive for more information.

Connect the first hard drive to the other end of the cable. Wire one on the cable should also connect to pin one on the hard drive connector. You may have difficulty determining the pin number. Look for a number printed on the drive circuit board. Check the documentation that came with the drive for more information.

Connect a second drive as described above.

If you need to make your own cable, you can find the pin assignments for the card’s connector in Appendix D.

Parallel Port

You would normally use the parallel port to connect the card to a printer. The PCA-6143P includes an on-board parallel port, accessed through a 26-pin flat-cable connector, CN3. The CPU card comes with an adapter cable which lets you use a traditional DB-25 connector. The cable has a 26-pin connector on one end

and a DB-25 connector on the other, mounted on a retaining bracket. The bracket installs at the end of an empty slot in your chassis, giving you access to the connector.

To install the bracket find an empty slot in your chassis. Unscrew the plate that covers the end of the slot. Screw in the bracket in place of the plate. Next, attach the flat-cable connector to connector CN3 on the CPU card. Wire one of the cable is red or blue, the other wires are gray. Make sure that wire one connects to pin one of CN3. Pin one is on the right side of CN3. For help finding the connector, refer to Chapter 1 (page 5).

The pin assignments for the connector appear in Appendix D.

Keyboard connectors

The PCA-6143P board provides two keyboard connectors. A 5-pin connector (J1) supports passive backplane applications. A second 6-pin mini-DIN connector (J3) on the card mounting bracket supports single-board-computer applications. The card comes with an adapter to convert from the 6-pin mini-DIN connector to a standard DIN connector.

If you need to make your own adapter cable, you can find the pin assignments in Appendix D.

External switches and indicators

Next you may want to install external switches to monitor and control your CPU card. These features are completely optional — install them only if you need them.

Reset switch (JP7)

You can connect an external switch to easily reset your computer. This switch restarts your computer as if you had turned off the power then turned it back on. Install the switch so that it closes the two pins of JP7 when pressed (normally-open switch).

Power LED and keylock (JP9)

You can connect an LED to indicate when the CPU card is on. Pin 1 of JP9 supplies power to the LED and Pin 3 is the ground. For help finding JP9, refer to Chapter 1 (page 5).

You can use a switch (or a lock) to disable the keyboard. In this state the PC will not respond to any input. This is useful if you don't want anyone to change or stop a running program. Simply connect the switch between Pins 4 and 5 of JP9. The pin assignments for JP9 appear in the following table:

Power LED and keylock (JP9)

Pin	Function
1	LED Power (+5 V)
2	No Connection
3	Ground
4	Keyboard lock
5	Ground

Hard disk drive LED (JP1)

You can connect a LED to connector JP1 to indicate when the HDD is active. The pin on the top is positive.

Turbo switch (JP12)

You can connect a switch across the pins of jumper JP12 to change the CPU between Turbo and non-Turbo mode. When you close (short) the pins, the CPU card operates at full speed. When you leave the pins open, the card operates at slow speed for compatibility with older software.

You can also switch the CPU back and forth between Turbo mode and non-Turbo mode using the keyboard, but only when jumper JP12 is open. When jumper JP12 is closed, the CPU is fixed in Turbo mode. To switch into Turbo mode from the keyboard simultaneously press the Ctrl, Alt and keypad plus (+) keys. To switch into non-Turbo mode press the Ctrl, Alt and keypad minus (-) keys.

Turbo LED (JP13)

You can connect a LED indicator across jumper JP13 to indicate when the CPU is in Turbo mode. Marks on the circuit board indicate LED polarity (the lower pin is positive).

External speaker (JP10)

The CPU card has its own buzzer. You can also connect to the external speaker on your computer chassis. Connect leads to connector JP10 as shown below:

External speaker (JP10)

Pin no.	Function
1	+5 V_{DC}
2	Speaker out
3	Speaker out
4	Speaker out

SBC power connector (J2)

In single-board-computer (non-passive-backplane) applications you will need to connect power directly to the PCA-6143P board using connector J2. This connector is fully compatible with the standard PC power supply connector for a 3.5" FDD (or HDD). See the following table for its pin assignments:

SBC power connector (J2)

Pin no.	Function
1	+5 V_{DC}
2	GND
3	GND
4	+12 V_{DC}

Serial Ports

The PCA-6143P offers two serial ports: one RS-232 and one RS-232/422/485. These ports let you connect to serial devices (a mouse, printers, etc.) or a communication network.

You can select the address for each port (3F8H [COM1], 2F8H [COM2] or 3E8H) or disable it, through the BIOS Advanced Setup program, covered in Chapter 5.

The card mounting bracket holds the serial port connectors. This lets you connect and disconnect cables after you install the card. The DB-9 connector on the top of the bracket is the RS-232 port. The second DB-9 connector is the RS-232/422/485 port. The following sections tell how to make RS-232 and RS-232/422/485 connections.

RS-232 connections

Different devices implement the RS-232 standard in different ways. If you are having problems with a serial device, be sure to check the pin assignments for the connector. The following table shows the pin assignments for the card's RS-232 port:

RS-232 connector pin assignment

Pin no.	Signal
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

RS-232/422/485 serial port connections

RS-422 is commonly used for two-way communication between two devices, whereas RS-485 is used for communication between a single master and a network of slave modules.

Before you use the RS-232/422/485 port, you will need to select RS-232, RS-422 (the default) or RS-485 mode. Set jumpers JP20, 22, 25, 26, 27, 28, 29 and 30 according to the following table:

	RS-232	RS-422	RS-485
JP20	1 - 2	2 - 3	2 - 3
JP22	Open	Short	Short
JP25	Open	Open	Short
JP26	Open	Open	Short
JP27	Open	1-2	2-3
JP28	1-2	2-3	2-3
JP29	Open	Short	Short
JP30	Open	Short	Short

Pin assignments for the DB-9 connector RS-422/485 are as follows:

RS-422/485 connector pin assignments

Pin	Signal
1	TX - or send data - (DTE)
2	TX + or send data + (DTE)
3	RX + or receive data + (DTE)
4	RX - or receive data - (DTE)
5	Ground
6	RTS - or ready to send -
7	RTS + or ready to send +
8	CTS + or clear to send +
9	CTS - or clear to send -

å RS-422 signal wiring

RS-422 is used for long-distance point-to-point connections. RS-422 originally used four wires for one-way communication (with devices such as display terminals or printers) but was later adopted by industry for simultaneous two-way communication by doubling the number of wires.

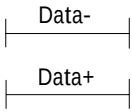
Each pin on the first device connects to a corresponding device on the second. Flow control lines manage the communication. The following table shows pin connections:

Computer A			Computer B	
Pin	**Signal**		**Pin**	**Signal**
1	TX-	——>	4	RX-
2	TX+	——>	3	RX+
3	RX+	<——	2	TX+
4	RX-	<	1	TX-
5	GND	<>	5	GND
6	RTS-	>	9	CTS-
7	RTS+	>	8	CTS+
8	CTS+	<——	7	RTS+
9	CTS-	<	6	RTS-

å RS-485 signal wiring

In a typical RS-485 application the host device requests data from a slave module then listens for the response. The host transmits and receives data on the same pair of wires. Software handles the flow control; no other wires are needed.

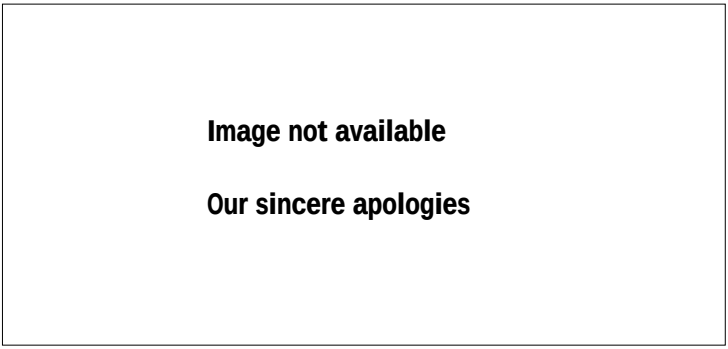
Pin assignments appear in the following table. Pins 1 and 4 share the Data+ wire. Pins 2 and 3 share the Data- wire.



Computer A			Device B	
Pin	**Signal**		**Pin**	**Signal**
1	TX-	–	1	TX-
4	RX-	–	4	RX-
2	TX+	–	2	TX+
3	RX+	–	3	RX+
5	GND		5	GND

RS-422/RS-485 driver and receiver circuit

The following figure shows the circuits for the card's RS-422 and RS-485 driver and receiver.



Driver and receiver circuit

Now that you have made all the required external connections, you can close up your chassis (as described in Chapter 2). If you are installing any other cards, do it now. You can then power up your system as described in the next chapter.

CHAPTER 4

Power-up

After you have set the jumpers (Chapter 1), installed SIMMs (Appendix C), installed the card (Chapter 2) and made all external connections (Chapter 3), you are ready to power-up your system.

Follow the startup procedure outlined in the manual for your chassis.

When you start your system, the BIOS will test the hardware and check the system configuration against the values stored in its CMOS memory.

Since this is the first time you are starting up, the BIOS will display an error message stating that the configuration does not match the stored values. You should then run the BIOS setup program as described in Chapter 5.

If the BIOS hardware diagnostic tests fail, you may see an error message on the screen describing the problem. If the BIOS found a problem early in the tests, you will need to determine the BIOS POST (Power On Self Test) results by counting beeps or using a POST card. See Appendix F for details.

The most common source of problems is incorrect jumper settings. Double check your settings (Chapter 1) and restart the system. If the system still has problems, see Appendix E, Maintenance and troubleshooting.

There are three methods you can use to restart your system after it is turned on:

1. Switch the power off, then on again
2. Reboot the system. Using the keyboard, simultaneously press the CTL, ALT and DEL keys
3. Depress the optional reset switch

Use of each of these methods will erase data from the system RAM memory. If you can, save any data stored in memory to a hard or floppy disk before you reset your system.

CHAPTER 5

BIOS diagnostics and SETUP

This chapter describes the card's diagnostic tests and how to set BIOS configuration data. BIOS POST (Power On Self Test) test codes appear in Appendix F.

POST (Power On Self Tests)

Whenever you start up your system, the CPU card runs a series of programs stored in an on-board ROM chip. These programs are divided into two stages:

System test and initialization

These routines test and initialize board hardware. If the routines encounter an error during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors. Non-fatal error messages usually appear on the screen along with the following instructions:

```
press <F1> to RESUME
```

Write down the message and press the F1 key to continue the bootup sequence. Non-fatal error messages appear in Appendix F.

If the routines encounter a fatal error, they will stop the tests and output a message indicating which test failed. If the fatal error comes before the screen device initializes, the card will indicate the error code through a series of beeps. Error beep codes also appear in Appendix F.

System configuration verification

These routines check the current system configuration against the values stored in the card's CMOS memory. If they don't match, the program outputs an error message. You will then need to run the BIOS setup program to set the configuration information in memory.

There are three situations in which you will need to change the CMOS settings:

1. You are starting your system for the first time
2. You have changed the hardware attached to your system
3. The CMOS memory has lost power and the configuration information has been erased.

The PCA-6143P's CMOS memory has integral lithium battery backup. The battery backup should last ten years in normal service, but when it finally runs down, you will need to replace the complete unit. Contact your sales representative or distributor for details.

Running the setup program

Normally, the only routine visible on the screen will be the memory test. The following figure shows the screen as it appears while the tests are occurring.

```
ROM BIOS(c) 1990 American Megatrends, Inc

xxxx KB OK

Hit <DEL> if you want to run SETUP

(c)American Megatrends, Inc.

xx-xxxx-xxxxxx-xxxxxxx-xxxxxx-xxxx
```

Power On Self Tests

A line of reference codes appears at the bottom left of the screen. These codes identify the options installed in the AMI BIOS. If you have a problem with your system, make a note of these codes before you contact your dealer for technical support.

To "freeze" the screen so that you can write down the codes, power-on the system and hold down a key on the keyboard. This will cause a "Keyboard Error" message to appear on the screen and the system will wait for you to press the <F1> key. After you

copy down the line, you can then press <F1> to continue the boot procedure. After the POST routines are complete, the following message appears:

```
Hit <DEL> if you want to run SETUP
```

Press the <DEL> key to access the BIOS setup program. The BIOS Setup screen will then appear.

BIOS Setup Main Menu

You use the following keys to control the BIOS SETUP program:

ESC: Exit to previous screen

ARROW KEYS: Moves the cursor to highlight the desired configuration option

PAGEUP/PAGEDOWN/CTRL-PAGEUP/CTRL-PAGE-DOWN:

Cycles through the configuration options for the highlighted feature. If there are less than ten available options, the Ctrl-PageUp and Ctrl-PageDown keys function the same as the PageUp and PageDown keys.

F1: Displays a help screen for selected feature.

F2/F3: Changes background and foreground colors.

F5: Retrieves the values which were resident when the current setup session was started. These values will be CMOS values if the CMOS was uncorrupted at the start of the session, or they will be the BIOS Setup default values.

F6: Loads all features in the Advanced CMOS Setup with the BIOS Setup defaults.

F7: Loads all features in the Advanced CMOS Setup with the Power-On defaults (the values in the CMOS when the system was started).

F10: Saves all changed made to Setup and exits program.

Standard CMOS Setup

Standard CMOS setup configures options that most users will need to change. Highlight **Standard CMOS Setup** in the main screen and press <ENTER>.

A warning message appears (shown below) whenever you select either Standard CMOS Setup or Advanced CMOS Setup from the main screen. Simply press any key to continue or ESC to abort.

```
Improper Use of Setup may Cause Problems!!
If System Hangs,.....Enter Setup by pressing
the <DEL> key
Do any of the following After Entering Setup
(i) Alter Option to make System Work
(ii) Load BIOS Setup Defaults
(iii) Load Power-On Defaults
Hit <ESC> to Stop now, Any other Key to
continue
```

BIOS Setup Warning Message

The following screen will then appear:

BIOS Setup Program - Standard CMOS SETUP
(C) 1991, American Megatrends Inc., All Rights Reserved

Date (mn / date / year): Tue, Jan 01 1991 Base memory: 640KB
Time (hour / min / sec): 09:39:06 Ext. memory: 0KB
Daylight Saving: Disabled

Hard disk C: type: 47= USER TYPE	Cyln	Head	WPCom	LZone	Sect	Size
	642	8	0	0	17	43MB

Hard disk D: type:Not Installed
Floppy drive A: :1.2MB, 51/4"
Floppy drive B: :Not Installed
Primary display :Monochrome
Keyboard :Installed

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

Month: Jan, Feb,.....Dec
Date : 01, 02, 03.....31
Year : 1901, 1902.....2099

Esc = Exit, ←→↓↑= Select, F2/F3 = Color, PgUp/PgDn = Modify

This screen lets you set following features:

Date:

System date. A prompt box at the lower left corner of the screen gives the range of allowable values.

Time:

System clock. Hour first, minute then second. Uses 24 hour clock format (for PM numbers add 12 to the hour: you would enter 4:30 p. m. as 16:30:00)

Daylight Savings: Disabled or Enabled

Hard Disk C: and **Hard Disk D:**

The BIOS supports 46 standard hard disk sizes and layouts. If your hard disk matches one of these types (shown below), highlight the number blank (for the appropriate drive, C: or D:) and press <PgDn> until the correct number appears. If the BIOS does not support your hard disk, select disk type 47 and enter each of the specifications into the blank spaces (e. g. number of cyln.). You can get these numbers from a label on your disk drive or from the documentation that came with the drive. After you have set up drive C:, you can then set up drive D:. If you have no drive D:, select Not Installed.

Hard disk types

Type	Cyln	Head	WPcomp	LZone	Sect	Size
1	306	4	128	305	17	10 MB
2	615	4	300	615	17	20 MB
3	615	6	300	615	17	31 MB
4	940	8	512	940	17	62 MB
5	940	6	512	940	17	47 MB
6	615	4	65535	615	17	20 MB
7	462	8	256	511	17	31 MB
8	733	5	65535	733	17	30 MB
9	900	15	65535	981	17	112 MB
10	820	3	65535	828	17	20 MB
11	855	5	65535	855	17	35 MB
12	855	7	65535	855	17	50 MB
13	306	8	128	319	17	20 MB

Type	CyIn	Head	WPcomp	LZone	Sect	Size
14	733	7	65535	733	17	43 MB
16	612	4	0	663	17	20 MB
17	977	5	300	977	17	41 MB
18	977	7	65535	977	17	57 MB
19	1024	7	512	1023	17	60 MB
20	733	5	300	732	17	30 MB
21	733	7	300	732	17	43 MB
22	733	5	300	733	17	30 MB
23	306	4	0	336	17	10 MB
24	925	7	0	925	17	54 MB
25	925	9	65535	925	17	69 MB
26	754	7	754	754	17	44 MB
27	754	11	65535	754	17	69 MB
28	699	7	256	699	17	41 MB
29	823	10	65535	823	17	68 MB
30	918	7	918	918	17	53 MB
31	1024	11	65535	1024	17	94 MB
32	1024	15	65535	1024	17	128 MB
33	1024	5	1024	1024	17	43 MB
34	612	2	128	612	17	10 MB
35	1024	9	65535	1024	17	77 MB
36	1024	8	512	1024	17	68 MB
37	615	8	128	615	17	41 MB
38	987	3	987	987	17	25 MB
39	987	7	987	987	17	57 MB
40	820	6	820	820	17	41 MB
41	977	5	977	977	17	41 MB
42	981	5	981	981	17	41 MB
43	830	7	512	830	17	48 MB
44	830	10	65535	830	17	69 MB
45	917	15	65535	918	17	114 MB
46	1224	15	65535	1223	17	152 MB
47	user type					

Note that the user definition entry (47) lets you define a disk drive not defined in ROM. You have to supply all the relevant information concerning the drive characteristics. This is usually found on a label on the disk or in the disk's documentation.

The following chart shows the meaning of each of the hard disk parameters:

Hard disk parameters	
Type:	This is the number designation for a drive with certain identification parameters.
Cyl:	This is number of cylinders found in the specified drive type.
Heads:	This is the number of heads found in the specified drive type.
WPpcom:	WPcom is the read delay circuitry which takes into account the timing differences between the inner and outer edges of the surface of the disk platter. The number designates the starting cylinder of the signal.
L-Zone:	LZone is the landing zones of the heads. This number determines the cylinder location where the heads will normally park when the system is shut down.
Capacity:	This is the formatted capacity of the drive based on the following formula: (# of heads) x (# of cylinders) x (# of sectors) x (512 bytes/sec)

Floppy Drive A: and **Floppy Drive B:**

The BIOS supports any combination of 3.5" (720 KB and 1.44 MB) and 5.25" (360 KB and 1.2 MB) floppy disks. If you have no floppy disk installed, select Not Installed.

Primary Display:

Select the type of display you have connected. Options are: Monochrome, Color 40x25, VGA/PGA/EGA, Color 80x25 and Not Installed. You might use the Not installed option for a network file server.

Keyboard:

Options are Installed or Not Installed.

Note: If you are running your system on a non-dedicated file server, and you do not want the AMI BIOS to report any keyboard, video or floppy disk drive errors during POST, set the AMI BIOS Keyboard, Primary display and floppy disk features to “Not Installed.”

Advanced CMOS Setup

Advanced CMOS Setup controls system settings and the ALI M-1219 chipset's configuration registers. Adjusting these parameters may improve system performance, but make a note of the original settings before you make any changes. Some combinations of settings may cause your system to crash or become unreliable.

From the main menu highlight the Advanced CMOS Setup option and press <ENTER>. Press any key to clear the warning screen.

Features

The following chart lists card settings which you can change in Advanced CMOS Setup. It lists the default value for each setting. This screen has several help screens, accessed by pressing the <F1> key, which display setting options.

Feature	Available options
Type Rate Programming	Disabled (default) Enabled
Type Rate Delay (msec)	500 (default)
Type Rate (Chars/sec)	15 (default)
Above 1MB Memory Test	Disabled (default)
Memory Parity Error Check	Enabled (default) Disabled
Hit <DEL> Message Display	Enabled (default) Disabled
Hard Disk Type 47 RAM Area	0:300 (default) DOS 1KB
This setting determines where in memory the hard disk information is stored when you select hard disk type 47. If you disable BIOS Shadow RAM, the Hard Disk Type 47 parameter table will use regular RAM. There are two options, 0:300 (lower system RAM) and DOS 1 KB (the top 1KB of 640 KB base memory).	
Wait for <F1> if Any Error	Enabled (default) Disabled
System Bootup Num Lock	On Off (default)
Floppy Drive Seek At Boot	Enabled (default) Disabled

Feature	Available options
System Bootup Sequence	A:, C: (default) C:, A:
Internal Cache Memory	Enabled (default) Disabled
Password Checking Option	Disabled (default) Setup Always
Video ROM Shadow C000,32K	Enabled (default) Disabled
Adapter ROM Shadow C800,32K	Disabled (default) Enabled
Adapter ROM Shadow D000,32K	Disabled (default) Enabled
Adapter ROM Shadow D800, 32K	Disabled (default) Enabled
Adapter ROM Shadow E000, 32K	Disabled (default) Enabled
Adapter ROM Shadow E800,32K	Disabled (default) Enabled
The above settings shadow ROMs on plug-in cards. You will need to know the addresses of the ROMs.	
System ROM Shadow	Disabled Enabled (default)
Memory Wait State	Disable (default) Enable
Shadow BIOS Cacheable	Disable (default) Enable
16 Bit ISA Cycle Insert wait	0 w/s (default) 1 w/s
Slow refresh	Disabled (default) Enabled
Remapping	Disabled Enabled (default)
Turbo Priority Option	Same (default) Hardware

Feature	Available options
Serial Port 1	3F8H (default) 2F8H 3E8H Disabled
Serial Port 2	2F8H (default) 3F8H 2E8H Disabled
Parallel Port	378H (default) 278H 3BCH Disabled
Enhanced Parallel Port	Normal (default) EPP ECP ECP&ECC
IDE Controller	Enabled (default) Disabled
Floppy Controller	Enabled (default) Disabled
Watchdog Timer Setting	16 min 48 seconds 08 min 24 seconds 04 min 12 seconds 02 min 06 seconds 01 min 03 seconds 31.5 seconds 15.8 seconds 7.9 seconds 3.9 seconds 2.0 seconds (default) 1.0 seconds 0.5 seconds Disabled
Internal Flash/ROM disk	Disabled (default) Enabled

After you have made your configurations changes, press <ESC> to return to the main menu.

Auto Configuration with BIOS Defaults

This main menu option loads the system default values stored in the BIOS ROM at the factory.

Auto Configuration with Power-On Defaults

This main menu option loads the settings stored in the CMOS memory when you turned on your system. If your system behaves erratically, you can use this feature to check for incorrect settings.

Hard Disk Utility

This option lets you perform low-level hard disk drive preparation before you use the DOS FDISK or FORMAT utilities. All of its functions are destructive to existing data on the disk drive.

Most IDE hard drives come preformatted from the factory, so you will probably only need these utilities if your hard disk develops bad sectors or ages and needs to have the formatting information refreshed.

Write to CMOS and Exit/Do not Exit

After you have made your configuration changes, select **Write to CMOS and Exit**. If you decide you want to abandon the changes you have made, select **Do not Write to CMOS and Exit**.

The BIOS will then perform a memory test, and attempt to boot your system.

Be sure that your DOS system files are located on either drive A: or on your hard disk drive. If they are not, the BIOS will not be able to boot your system.

Quick Start

for experienced users

This Quick Start section puts all the vital configuration information in one place. If you need more information about any setting, just check the appropriate page reference.

1. Check card default setting

We set the card's jumpers at the factory for the most popular configuration. If this configuration matches your needs, you can skip to step 3. The default configuration is as follows:

- Watchdog invokes system reset
- Parallel port IRQ7, DRQ1, DACK1
- Color display attached
- Bypass POST (JP14)

2. Set jumpers

This section gives a quick description of each card configuration setting. If you need more information, just check the appropriate page references. Check the figure on page 5 for help finding jumpers or connectors.

JP15 Display type

If you are using a monochrome LCD or EL screen which uses a CGA, EGA, VGA or other color display adapter, set JP15 to color.

JP15	Setting
Open	Monochrome
Closed (default)	Color

Watchdog timer – reset, IRQ15 (JP8) p. 9

JP8	Setting
1-2	System Reset
3-4	IRQ15

CPU type selection (JP2, 3) p. 60

CPU	JP2	JP3	JP31
SX-25	Off	1-2	Closed
SX-33	Off	1-2	Closed
DX-25	2-3	2-3	Closed
DX-33	2-3	2-3	Closed
DX2-50	2-3	2-3	Closed
DX2-66	2-3	2-3	Closed
DX4-100 (3.45 V)	2-3	2-3	Open

JP20, 22, 25, 26, 27, 28, 29, and 30 – RS-232, RS-422 or RS-485 p. 20

	RS-232	RS-422 (def.)	RS-485
JP20	1-2	2-3	2-3
JP22	Open	Short	Short
JP25	Open	Open	Short
JP26	Open	Open	Short
JP27	Open	1-2	2-3
JP28	1-2	2-3	2-3
JP29	Open	Short	Short
JP30	Open	Short	Short

Flash/ROM disk p. 47

	JP19	JP23	JP24
SRAM 128K	-	Open	Short
SRAM 512K	-	Open	Open
FLASH 128K	2-3	Short	Short
FLASH 512K	2-3	Short	Open
EPROM 128K	1-2	Short	Short
EPROM 512K	1-2	Short	Open

Bus clock selection (JP4) p. 9

JP4	Selection
1-2	Bus clk = CPU clk * 2/8
2-3	Bus clk = CPU clk * 2/6

Parallel Port IRQ, DRQ, DACK Selection p. 10

Parallel Port IRQ selection (JP11)	
JP11	**IRQ no**
1-2	IRQ7 (default)
2-3	IRQ5

Parallel Port DRQ selection (JP17)	
JP17	**DRQ no**
1-2	DRQ1 (default)
2-3	DRQ3

Parallel Port DACK selection (JP18)	
JP18	**DACK no**
1-2	DACK1 (default)
2-3	DACK3

3. Install CPU

If your CPU was not installed, install it. See Appendix C.

4. Install memory

If your memory was not installed, install it. See Appendix C.

5. Install card

For instructions, see Chapter 2.

6. Connect peripherals

Connect the following external devices. See the figure on page 5 for help finding connectors. The page number after each connector references the detailed description in the text. Details for the more complicated connections appear on the following pages. Other connector pin assignments appear in Appendix D.

Connectors

Component	Label	Page
HDD (IDE) connector	CN1	16
FDD connector	CN2	15
Parallel port	CN3	16
Keyboard connectors	J1, J3	17
Reset switch connector	JP7	17
Power LED and keylock connector	JP9	18
HDD LED connector	JP1	18
Turbo switch connector	JP12	18
Bus Clock selection	JP4	19
Turbo LED connector	JP13	19
External speaker connector	JP10	19
SBC power connector	J2	19
RS-232 serial port	COM1	20
RS-232/422/485 serial port	COM2	21
PC/104 connector	CN4, CN5	61

Reset switch (JP7) p. 17

Reset Close pins of JP7, then open

Power LED and keylock (JP9) p. 18

Power LED and keylock

Pin	Function
1	LED Power (+5 V_{DC})
2	No Connection
3	Ground
4	Keyboard lock
5	Ground

Hard disk drive LED (JP1) p. 18

The pin on the top is positive.

Turbo switch (JP12) p. 18

Turbo switch settings	
Turbo	Closed
Non-Turbo, keyboard switchable	Open

To switch the CPU into Turbo mode from the keyboard simultaneously press the Ctrl, Alt and keypad plus (+) keys. To switch it to non-Turbo, simultaneously press the Ctrl, Alt and keypad minus (-) keys.

Turbo LED (JP13) p. 19

The pin on the bottom is positive.

External speaker (JP10) p. 19

External speaker	
Pin no.	**Function**
1	+5 V_{DC}
2	Speaker out
3	Speaker out
4	Speaker out

SBC power connector (J2) p. 19

SBC power connector	
Pin no.	**Function**
1	+5 V_{DC}
2	GND
3	GND
4	+12 V_{DC}

Serial Ports p. 20

Before you use the RS-232/422/485 port, you will need to select RS-232, RS-422 (the default) or RS-485 mode. Set jumpers JP20, 22, 25, 26, 27, 28, 29 and 30 according to the following table:

	RS-232	RS-422	RS-485
JP20	1-2	2-3	2-3
JP22	Open	Short	Short
JP25	Open	Open	Short
JP26	Open	Open	Short
JP27	Open	1-2	2-3
JP28	1-2	2-3	2-3
JP29	Open	Short	Short
JP30	Open	Short	Short

7. Power up

Power up your chassis following the procedure described in the chassis user manual. If you have problems, see Appendix E, Maintenance and troubleshooting. BIOS error codes appear in Appendix F.

8. Set up the BIOS

BIOS setup information appears in Chapter 5.

APPENDIX A

Flash/ROM disk

The PCA-6143P features an internal Flash/ROM disk drive. This drive emulates a floppy disk drive by using solid-state memory chips (Flash or EPROM) to store programs and data instead of the magnetic particles on the mechanical drive's disk. The Flash/ROM disk offers much faster access times than a floppy or hard disk and greatly increased reliability in harsh environments.

The Flash/ROM disk works by modifying the BIOS INT-13 disk I/O routine on boot-up. The routine then translates read and write commands to the disk so that they will correctly access the memory chips. You don't need any special drivers. You simply set the drive to act as a DOS drive (e. g. A:, B:, C: or D: - 1st, 2nd, 3rd or 4th floppy disks) and use standard DOS commands (COPY, DIR, etc.) to manipulate your data.

Before you use the Flash/ROM disk, you will need to enable it with the BIOS Advanced Setup Program, discussed in Chapter 5.

Memory devices

The Flash/RAM/ROM disk supports the following memory devices, or their equivalents:

- 27C010 128 KB x 8 EPROM
- 27C040 512 KB x 8 EPROM
- 28F010 128 KB x 8 +12 V Flash Memory (AMD/INTEL)
- 29C010 128 KB x 8 +5 V Flash Memory (ATMEL only)
- 29C040 512 KB x 8 +5 V Flash Memory (ATMEL only)

If you use EPROM, files on the disk are read only. You will need an external programmer to load your program and data files on the EPROMs.

If you use +5 V Flash memories (29C010 or 29C040) for the solid state disk, you can read or write data just like a floppy disk; you need not use an external programmer. If you use +12 V Flash memories (28F010) you will still need an external programmer to write data.

Drive capacity

The size of the emulated drive depends on the size and number of the chips you install. For example, if you install three 512 KB chips, you will have 3 x 512 KB = 1.536 MB, equivalent to a 1.44 MB floppy.

You will need to set jumpers JP19, JP23 and JP24 to match the type (Flash, RAM or ROM) and size (128 KB or 512 KB) of the devices you use. All the devices must be the same type and size.

The following tables shows the size and number of devices you will need for each size emulated disk. It also shows the corresponding settings of jumpers JP19, JP23(Flash/RAM/ROM) and JP24 (128 KB/512 KB).

	JP19	JP23	JP24
SRAM 128K	-	Open	Short
SRAM 512K	-	Open	Open
FLASH 128K	2-3	Short	Short
FLASH 512K	2-3	Short	Open
EPROM 128K	1-2	Short	Short
EPROM 512K	1-2	Short	Open

Drive configuration

Before you activate the Flash/RAM/ROM drive (using the BIOS Advanced Setup program), you will need to set the drive's I/O and memory addresses to avoid conflicts with other plug-in cards. You will also need to set the DOS drive designation to be used by the Flash/RAM/ROM drive. DIP switch SW1 controls each of these settings, as described in the following sections:

I/O address selection (SW1)

Positions 1 and 2 on DIP switch SW1 control the disk's I/O address.

Position 1	Position 2	I/O address (HEX)
Off	Off	Disabled
Off	On	200-201
On	Off	240-241
On	On	280-281

Memory address selection (SW1)

Positions 3 and 4 on SW1 control the Flash/ROM disk's memory address. If you select "Disabled", the disk will not function.

Position 3	Position 4	Memory address (HEX)
Off	Off	Disabled
Off	On	D2000 to D3FFF
On	Off	D6000 to D7FFF
On	On	DA000 to DBFFF

Drive emulated (SW1)

Positions 5 and 6 of SW1 control the DOS drive emulated by the Flash/RAM/ROM disk: 1st, 2nd, 3rd or 4th.

Position 5	Position 6	Drive
Off	Off	4th
Off	On	3rd
On	Off	2nd
On	On	1st

The actual drive letter assigned by DOS to the Flash/RAM/ROM disk depends on the floppy or hard disks installed in the system and the DOS version.

Drive Selection

DOS 5.0 (and later)

Floppy disks

The Flash/ROM disk will replace the corresponding floppy disk. For example, if you have a single floppy disk (drive A:) and assign the Flash/ROM disk to be the 1st drive (both switches 5 and 6 are on), any drive operations directed at drive A: will go to the Flash/ROM disk. This floppy drive will then be assigned the next free drive designation. The example below illustrates this.

Hard disks

The Flash/ROM disk will not replace corresponding hard disks. Instead, DOS will assign the Flash/ROM disk to the next free drive designation. For example, if you have a single hard disk (drive C:) and assign the Flash/ROM disk to be the 3rd drive (switch 5 on, switch 6 off), the Flash/ROM drive will become drive D:. If you have two hard disks, the Flash/ROM drive will become drive E:.

Example 1

You install the Flash/ROM disk as drive A: (both switches 5 and 6 are on).

Before installing Flash/ROM disk

	A	B	C
DOS 5.0+	FDD	FDD	HDD

After installing Flash/ROM disk

	A	B	C	D
DOS 5.0+	Flash/ROM	FDD	HDD	FDD

Example 2
You (try to) install the Flash/ROM disk as drive C:

Before installing Flash/ROM disk

	A	B	C
DOS 5.0+	FDD	FDD	HDD

After installing Flash/ROM disk

	A	B	C	D
DOS 5.0+	FDD	FDD	HDD	Flash/ROM

Booting from the Flash/RAM/ROM disk

If you wish to have the system boot from the Flash/RAM/ROM disk, simply set positions 5 and 6 on SW1 for the 1st FDD. Copy your application files to the disk along with the standard system files required to boot (command.com, io.sys, autoexec.bat, etc). The next time you start the system, it will boot from the solid state disk.

Inserting memory devices

After you've set all the jumpers and switches on the PCA-6143P, insert the appropriate memory devices into the card's sockets. Remember that you will need to program EPROMs before you insert them.

1. Make sure that the pins of the memory chips are perpendicular to the case and both rows are parallel to each other. Many times the chips come with the pins spread out slightly. Place the chip on a table top and carefully bend each line of pins together until they point directly down.
2. Insert each chip. Align the chips so their pins are perpendicular to the connector and the semicircular notch on the end of the chip matches the notch on the end of the socket. There will probably be a gap between the chip body and the socket when it is fully seated – do not push too hard!

Formatting the Solid State disk

If you use Flash memory or SRAM, it is advisable to format the Flash/SRAM disk before copying files to it. The DOS command is as follows:

```
FORMAT drv: /U ...
```

where drv = solid state disk drive A, B, C etc.

File copy utility

The utility program COOKROM.EXE, included on the card's utility disk, splits the files on a diskette into a series of binary files. You can then use an external programmer to copy the files to EPROM or +12 V Flash memory chips. It produces up to three files, depending on the size of the source files.

Using a memory manager (EMM386.EXE)

If you are using an extended or expanded memory manager (such as EMM386 or QEMM386), you will need to configure it to avoid the addresses used by the Flash/RAM/ROM disk (set by positions 1 and 2 of SW1). Otherwise, the memory manager will attempt to use these addresses, causing unreliable operation.

For example, the line in your CONFIG.SYS file that invokes EMM386, the DOS memory manager, might be the following:

```
DEVICE=EMM386.SYS X=D600-D7FF
```

This excludes a 8 KB range for the card from D6000 to D7FFF (the default addresses).

If you are using expanded memory, you will need to make sure that the memory manager is not putting the page frame in the disk's addresses. For example,

```
DEVICE=EMM386.EXE X=D600-D7FF FRAME = D800
```

You should also make sure that the disk's memory address is not shadowed in the BIOS.

CHAPTER B

Programming the watchdog timer

The PCA-6143P is equipped with a watchdog timer that resets the CPU or generates an interrupt if processing comes to a standstill for whatever reason. This feature ensures system reliability in industrial stand-alone and unmanned environments.

Programming the watchdog timer

If you decide to program the watchdog timer, you must write a program which reads I/O port address 443 (hex) at regular intervals. The first time your program reads the port, it enables the watchdog timer. After that your program must read the port at time intervals less than 2.0 seconds (as set in the BIOS), otherwise the watchdog timer will activate and reset the CPU or generate an interrupt on IRQ15. When you want to disable the watchdog timer, your program should read I/O port 043 (hex).

If CPU processing comes to a standstill because of EMI or a software bug, your program's signals to I/O port address 443 to the timer will be interrupted. The timer will then automatically reset the CPU or invoke an IRQ, and data processing will continue normally.

The following program shows how you might program the watchdog timer in BASIC:

```
10    REM Watchdog timer example program
15    REM Watchdog timer interval set to 2 sec in BIOS
20    X=INP(&H443) REM Enable and refresh the watchdog
30    GOSUB 1000 REM  Task #2, takes 2 sec to complete
40    X=INP(&H443) REM Refresh the watchdog
50    GOSUB 2000 REM  Task #2, takes 2 sec to complete
60    X=INP(&H043) REM Disable the watchdog
70    END
1000  REM Subroutine #2, takes 2 seconds to complete
      .
      .
      .
1070  RETURN
2000  REM Subroutine #2, takes 2 seconds to complete
      .
      .
      .
2090  RETURN
```

APPENDIX C

Upgrading

This appendix gives instructions for increasing the capabilities of your CPU card. It covers:

- DRAM memory installation (SIMMs)
- CPU installation and upgrading
- Installing PC/104 modules

Installing DRAM (SIMMs)

You can install anywhere from 1 MB to 32 MB of on-board DRAM memory using 256 KBx36, 1 MBx36 or 4 MBx36 SIMMs (Single In-line Memory Modules). Access time should be 80 ns or less.

Memory installs in two 72-pin SIMM sockets. See the figure on page 5 for help identifying the banks. You must fill both sockets, and both SIMMs must be of the same capacity, i. e. you cannot mix 256 KB SIMMs with 1 MB SIMMs. The following table shows the memory size for different SIMM capacities:

System memory configuration	SIMM size	Pcs
1 MB	256 KB x 36	1
2 MB	256 KB x 36	2
4 MB	1 MB x 36	1
8 MB	1 MB x 36	2
16 MB	4 MB x 36	1
32 MB	4 MB x 36	2

The procedure for installing SIMMs appears below. Please follow these steps carefully.

Warning! *Completely disconnect power from the system before you install SIMMs. Remove the CPU card from the chassis. .*

Caution! *Properly ground yourself (we recommend a grounding wrist strap) before you touch the CPU card or SIMMs. Both are very susceptible to damage from static discharge. Place the card and SIMMs on a static-dissipative surface or into a static-shielding bag when they are not installed.*

1. Locate the CPU card's memory banks, shown in the figure in Chapter 1 (page 5).

2. Install the SIMM cards. Install each SIMM so that its chips faces the CPU and its gold pins point down into the SIMM socket.
3. Slip each SIMM into a socket at a 45 degree angle and carefully fit the bottom of the card against the connectors.
4. Gently push the SIMM into a perpendicular position until the clips on the ends of the SIMM sockets snap into place.
5. Check to ensure that each SIMM is correctly seated and all connector contacts touch. The SIMM should not move around in its socket.

CPU installation and upgrading

This section tells how to install or upgrade the card's CPU. You can upgrade your PCA-6143P to a higher powered 486 CPU at any time. Simply remove the old 486 CPU, install the new and set the jumpers for the CPU type and speed.

Warning! *Disconnect all power from the chassis before you remove or install the CPU card. Follow the power-down procedure outlined in the manual for your chassis. Unplug the power cord from the wall, don't just turn off the power switch. If you are not sure what to do, take the job to an experienced professional.*

Caution! *The electronic components on this CPU card are very sensitive to static electric charges. Use a grounding wrist strap to remove all static electricity before you touch any components. Place all components on a static-dissipative surface or in a static-shielded bag when they are not in the chassis.*

1. Disconnect power from the chassis and remove the CPU card. Follow the instructions in the user's manual for your chassis. You will also need to disconnect everything you connected in Chapter 3, Connections.

2. If you are upgrading the CPU, remove any existing CPU from the socket. (See Chapter 1 for help locating the socket.) The old chip may be difficult to remove. You may find spray chip lubricant (designed for pin-grid-array devices, PGAs) and a chip puller helpful (available at electronics hobbyist's supply stores).

3. Plug in the new CPU into the empty socket. Follow the instructions that came with the CPU or math coprocessor. If you have no instructions, do the following: Lubricate the pins of the CPU. Use lubricant designed for use with PGA devices. This will make the new CPU slide in MUCH easier and reduce the chance of bending pins or other damage. Next, carefully align the CPU so it is parallel to the socket and the notch on the corner of the CPU matches with the notch on the inside of the socket. Carefully slide in the CPU. There will probably be a gap between the CPU and the connector when it is fully seated – do not push too hard!

4. Switch jumpers JP2, JP3 and JP31 to match the new CPU according to the following table:

	JP2	JP3	JP31
SX-25	Off	1-2	Closed
SX-33	Off	1-2	Closed
DX-25	2-3	2-3	Closed
DX-33	2-3	2-3	Closed
DX2-50	2-3	2-3	Closed
DX2-66	2-3	2-3	Closed
DX4-100 (3.45 V)	2-3	2-3	Open

5. Reinstall the CPU card according to the instructions in Chapter 2.

Installing PC/104 modules

The PCA-6143P's PC/104 connectors let you attach PC/104 expansion modules. These modules perform the functions of traditional plug-in expansion cards, but save space and valuable slots. Modules available from Advantech include:

- PCM-3510 Super VGA module
- PCM-3520 Flat-panel/CRT VGA module
- PCM-3810 Solid-state Disk module
- PCM-3110 PCMCIA module
- PCM-3660 Ethernet module
- PCM-3718 30 KHz A/D module
- PCM-3724 48-channel DIO module

PC/104 modules are produced by over a dozen manufacturers, and the PC/104 form factor is being advanced as an appendix to the ISA bus standard.

Connectors CN4 and CN5 support 16-bit PC/104 modules. For module installation instructions, see the user manual for the module. For help locating the connectors, refer to Chapter 1.

If you want to make your own PC/104 module, the figure on the following page shows module dimensions. Pin assignments for the connector appear in Appendix D. For further information, contact your Advantech distributor or sales representative.

PCA-6143P dimensions (mm)

APPENDIX D

Detailed system information

This appendix contains information of a detailed or specialized nature. It includes:

- Parallel connector pin assignments
- HDD connector pin assignments
- FDD connector pin assignments
- Keyboard connector pin assignments
- Piggyback connector pin assignments
- Card connector pin assignments
- System I/O port address assignments
- System information I/O address assignments
- DMA channel assignments
- DMA controller registers
- DMA page addresses
- Interrupt assignments
- Timer channel assignments

Parallel/printer connector (CN3)

Pin no.	Signal
1	STROBE
2	DATA 0
3	DATA 1
4	DATA 2
5	DATA 3
6	DATA 4
7	DATA 5
8	DATA 6
9	DATA 7
10	- ACKNOWLEDGE
11	BUSY
12	PAPER EMPTY
13	+ SELECT
14	- AUTO FEED
15	- ERROR
16	- INIT PRINTER
17	- SELECT INPUT
18-25	GROUND

HDD connector (CN1)

Pin no.	Signal	Pin no.	Signal
1	- RST	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	N.C.
21	N.C.	22	GND
23	IOW	24	GND
25	IOR	26	GND

Pin no.	Signal	Pin no.	Signal
27	IORDY	28	BALE
29	N.C.	30	GND
31	IRQ	32	-IO CS16
33	A1	34	N.C.
35	A0	36	A2 CS0
37	CSO	38	CS1
39	-ACT	40	GND

FDD connector (CN2)

Pin no.	Signal
1-33 (odd)	GROUND
2	HIGH DENSITY
4, 6	UNUSED
8	INDEX
10	MOTOR ENABLE A
12	DRIVER SELECT B
14	DRIVER SELECT A
16	MOTOR ENABLE B
18	DIRECTION
20	STEP PULSE
22	WRITE DATA
24	WRITE ENABLE
26	TRACK 0
28	WRITE PROTECT
30	READ DATA
32	SELECT HEAD
34	DISK CHANGE

Keyboard connector pin assignment

J1	J3 (mini-DIN)	Signal
1	5	CLOCK
2	1	DATA
3	2, 6	N.C.
4	3	GND
5	4	+5 V

PC/104 Connector Pin Assignments

	CN4		CN5	
0	--	--	0V	0V
1	IOCHCHK*	0V	SBHE*	MEMCS16*
2	SD7	RESETDRV	LA23	IOCS16*
3	SD6	+5V	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	-5V	LA20	IRQ12
6	SD3	DRQ2	LA19	IRQ15
7	SD2	-12V	LA18	IRQ14
8	SD1	ENDXFR*	LA17*	DACK0*
9	SD0	+12	MEMR*	DRQ0*
10	IOCHRDY	(KEY)[2]	MEMW*	DACK5*
11	AEN	SMEMW*	SD8	DRQ5
12	SA19	SMEMR*	SD9	DACK6*
13	SA18	IOW*	SD10	DRQ6
14	SA17	IOR*	SD11	DACK7*
15	SA16	DACK3*	SD12	DRQ7
16	SA15	DRQ3	SD13	85V
17	SA14	DACK1*	SD14	MASTER*
18	SA13	DRQ1	SD15	0V
19	SA12	REFRESH*	(KEY)[2]	0V
20	SA11	SYSCLK	--	--
21	SA10	IRQ7	--	--
22	SA9	IRQ6	--	--
23	SA8	IRQ5	--	--
24	SA7	IRQ4	--	--
25	SA6	IRQ3	--	--
26	SA5	DACK2*	--	--
27	SA4	TC	--	--
28	SA3	BALE	--	--
29	SA2	+5V	--	--
30	SA1	OSC	--	--
31	SA0	0V	--	--
32	0V	0V	--	--

Card connector pin assignments – Side A

I/O pin	Signal name	Input/output
A1	-I/O CH CK	Input
A2	SD7	Input/Output
A3	SD6	Input/Output
A4	SD5	Input/Output
A5	SD4	Input/Output
A6	SD3	Input/Output
A7	SD2	Input/Output
A8	SD1	Input/Output
A9	SD0	Input/Output
A10	I/O CHRDY	Input
A11	AEN	Output
A12	SA19	Input/Output
A13	SA18	Input/Output
A14	SA17	Input/Output
A15	SA16	Input/Output
A16	SA15	Input/Output
A17	SA14	Input/Output
A18	SA13	Input/Output
A19	SA12	Input/Output
A20	SA11	Input/Output
A21	SA10	Input/Output
A22	SA9	Input/Output
A23	SA8	Input/Output
A24	SA7	Input/Output
A25	SA6	Input/Output
A26	SA5	Input/Output
A27	SA4	Input/Output
A28	SA3	Input/Output
A29	SA2	Input/Output
A30	SA1	Input/Output
A31	SA0	Input/Output

Card connector pin assignments – Side B

I/O pin	Signal name	Input/Output
B1	GND	Ground
B2	RESET DRV	Output
B3	+5Vdc	Power
B4	IRQ9	Input
B5	-5Vdc	Power
B6	DRQ2	Input
B7	-12Vdc	Power
B8	0WS	Input
B9	+12Vdc	Power
B10	GND	Ground
B11	-SMEMW	Output
B12	-SMSMR	Output
B13	-IOW	Input/Output
B14	-IOR	Input/Output
B15	-DRACK3	Output
B16	DRQ3	Input
B17	-DRACK1	Output
B18	DRQ1	Input
B19	-REFRESH	Input/Output
B20	CLK	Output
B21	IRQ7	Input
B22	IRQ6	Input
B23	IRQ5	Input
B24	IRQ4	Input
B25	IRQ3	Input
B26	-DACK2	Output
B27	T/C	Output
B28	BALE	Output
B29	+5Vdc	Power
B30	OSC	Output
B31	GND	Ground

Card connector pin assignments – Side C

I/O pin	Signal name	Input/Output
C1	SBHE	Input/Output
C2	LA23	Input/Output
C3	LA22	Input/Output
C4	LA21	Input/Output
C5	LA20	Input/Output
C6	LA19	Input/Output
C7	LA18	Input/Output
C8	LA17	Input/Output
C9	-MEMR	Input/Output
C10	-MEMW	Input/Output
C11	SD08	Input/Output
C12	SD09	Input/Output
C13	SD10	Input/Output
C14	SD11	Input/Output
C15	SD12	Input/Output
C16	SD13	Input/Output
C17	SD14	Input/Output
C18	SD15	Input/Output

Card connector pin assignments – Side D

I/O pin	Signal name	Input/Output
D1	-MEM CS16	Input
D2	-I/O CS16	Input
D3	IRQ10	Input
D4	IRQ11	Input
D5	IRQ12	Input
D6	IRQ15	Input
D7	IRQ14	Input
D8	-DACK0	Output
D9	DRQ0	Input
D10	-DACK5	Output
D11	DRQ5	Input
D12	-DACK6	Output
D13	DRQ6	Input

I/O pin	Signal name	Input/Output
D14	-DACK7	Output
D15	DRQ7	Input
D16	+5Vdc	Power
D17	-MASTER	Input
D18	GND	Ground

System I/O ports

Address range (Hex)	Device
000-01F	DMA controller
020-021	Interrupt controller 1, master
022-023	Chipset address
040-05F	8254 timer
043	Watchdog timer disable
060-06F	8042 (keyboard Controller)
070-07F	Real-time clock, non-maskable interrupt (NMI) mask
080-09F	DMA page register,
0A0-0BF	Interrupt controller 2
0C0-0DF	DMA controller
0F0	Clear math co-processor
0F1	Reset math co-processor
0F8-0FF	Math co-processor
1F0-1F8	Fixed disk
200-207	Game I/O
278-27F	Parallel printer port 2 (LPT 3)
2F8-2FF	Serial port 2
300-31F	Prototype card
360-36F	Reserved
378-37F	Parallel printer port 1 (LPT 2)
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome display and printer adapter (LPT 1)
3C0-3CF	Reserved
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1
443	Watchdog timer enable and trigger

System information I/O addresses

Address	Description
00-0D	* Real-time clock information
00	Second
01	Second alarm
02	Minutes
03	Minute alarm
04	Hours
05	Hours alarm
06	Day of week
07	Date of month
08	Month
09	Year
0A	Status register A
0B	Status register B
0C	Status register C
0D	Status register D
0E	* Diagnostic status byte
0F	* Shutdown status byte
10	Diskette drive type byte, drives A and B
11	Reserved
12	Fixed disk type byte, drives C and D
13	Reserved
14	Equipment byte
15	Low base memory byte
16	High base memory byte
17	Low expansion memory byte
18	High expansion memory byte
19-2D	Reserved
2E-2F	2-byte CMOS checksum
30	* Low expansion memory byte
31	* High expansion memory byte
32	* Date century byte
33	* Information flags (set during power on)
34-3F	Reserved

DMA channel assignments

Channel	Function
0	Spare (8-bit transfer)
1	SDLC (8-bit transfer)
2	Floppy disk (8-bit transfer)
3	Spare (8-bit transfer)
4	Cascade for DMA controller 1
5	Spare (16-bit transfer)
6	Spare (16-bit transfer)
7	Spare (16-bit transfer)

DMA controller registers

Address	Command code
0C0	CH0 base and current address
0C2	CH0 base and current word count
0C4	CH1 base and current address
0C6	CH1 base and current word count
0C8	CH2 base and current address
0CA	CH2 base and current word count
0CC	CH3 base and current address
0CE	CH3 base and current word count
0D0	Read status register/Write command register
0D2	Write mode register
0D4	Read temporary register/Write command register
0D6	Write mode register
0D8	Clear byte pointer flip-flop
0DA	Read status register/Write command register
0DC	Write mode register
0DE	Write all mask register bus

DMA Page Addresses

Page register	I/O Address
DMA Channel 0	0087
DMA Channel 1	0083
DMA Channel 2	0081
DMA Channel 3	0082
DMA Channel 5	008B
DMA Channel 6	0089
DMA Channel 7	008A
Refresh	008F

Interrupt assignments

Priority	Interrupt#	Interrupt source
1	NMI	Parity error detected
2	IRQ 0	Interval timer, counter 0 output
3	IRQ 1	Keyboard
-	IRQ 2	Interrupt from controller 2 (cascade)
4	IRQ 8	Real-time clock
5	IRQ 9	Cascaded to INT 0AH (IRQ 2)
6	IRQ 10	Reserved
7	IRQ 11	Reserved
8	IRQ 12	Reserved
9	IRQ 13	INT from co-processor
10	IRQ 14	Fixed disk controller
11	IRQ 15	Reserved
12	IRQ 3	Serial communication port 2
13	IRQ 4	Serial communication port 1
14	IRQ 5	Parallel port 2 (bus mouse)
15	IRQ 6	Diskette controller (FDC)
16	IRQ 7	Parallel port 1 (print port)

Timer channel assignments

Channel	Function
0	System timer
2	Refresh request generator
3	Tone generation for speaker

APPENDIX E

Maintenance and troubleshooting

This appendix describes the general maintenance that your CPU card requires to ensure reliable operation. It then gives some solutions to common card trouble-shooting problems.

General maintenance

As with any electronic equipment, an adequate maintenance program will ensure reliable performance.

In general terms, maintenance includes periodic inspection of the card and peripherals to ensure that they are clean and free from signs of dirt, dust, wear and stress.

Warning! *Always remove power from the complete system before installing the CPU card. Follow all power-down procedures outlined in the chassis user's manual. To avoid injury to personnel, disconnect the power cord from the power source. Only qualified, experienced electronics personnel should access the interior of the chassis.*

Caution! *Never allow moisture or condensation to come in contact with the PCA-6143P components or cables and connectors. Damage to sensitive components may occur.*

Inspect all cables and connectors to verify that they are securely fastened to their connecting components. Worn or stressed cables or connectors should be replaced.

All peripheral equipment used with the PCA-6143P should be properly maintained. Malfunctioning equipment should be immediately replaced to prevent damage to the CPU.

Industrial PC system troubleshooting guide

PROBLEM

Will not boot up

SOLUTION

Make sure that all cards on the passive backplane are firmly seated in their slots. Clean the pins on the cards and slot connectors on the passive backplane if necessary.

Check the DC output of the power supply. All required voltages (+5 V, + 12 V, etc.) should be present. The +5 V output should be within the range 4.75 V to 5.25 V.

Make sure that the DRAM modules are correctly inserted into their sockets and have the correct access time (usually 80 nsec or less)

Check that the CMOS is correctly set up. Check the HDD, FDD, wait states, error hold, etc.

Make sure the add-on cards are OK. Remove or change add-on cards and test again.

Ensure that the math co-processor is properly inserted in its socket.

Check the connections between the video card and monitor. Check display adjustments, especially when using LCD displays. The system may be booting up, but not displaying on the screen.

If you are booting from a floppy disk drive, make sure the floppy is bootable. If booting from a hard drive, make sure that it is properly formatted for your DOS version. New disks must first be partitioned (with FDISK) and formatted with FORMAT).

Check HDD and FDD cable connections. Make sure that the floppy drive is designated drive A: (the end connector on the FDD cable), and that the hard disk is designated drive C: (the end connector on the HDD cable).

Check connections for the reset, keylock and power LED wires.

Remove completely or adjust the value of the terminating resistor on your backplane.

Check for and remove viruses. The boot sector and partition table on your HDD may be damaged.

PROBLEM

CMOS setup loss

SOLUTION

Make sure that your application software does not write to CMOS data addresses.

PROBLEM

System hangs after working for a short time (about 20 minutes)

SOLUTION

Make sure the power switch is set to correct input range (110 or 220 V_{AC}). If the correct range is set, check the quality of the input power. It should be stable and between 90 and 120/200 and 240 V_{AC}. PC equipment should not be connected to the end of a power trunk line. Next, check the output of the power supply. The +5 V_{DC} supply should be between 4.75 and 5.25 V_{DC}.

Make sure the temperature of the case is less than 60°C (140°F). If necessary, clean the air filter and backplane.

Check that the SIMM DRAM modules have an access time of 80 nsec or less.

PROBLEM

Serial Port Failure

SOLUTION

Check cable connections between the PC and the remote terminal equipment. Make sure that the remote terminal equipment is functioning properly.

Check COM port assignment.

When using standard C, Pascal or BASIC serial port commands, make sure that either the port's DTR/DSR and RTS/CTS lines are looped back (shorted together in the connector), or the COM port

is set to loop back mode. Test using diagnostic software such as Checklt or QAPlus.

The RS-232 interface relies on good grounding for reliable operation. Check that all equipment has a good connection to ground, and that the ground potential is the same at both locations.

PROBLEM

Parallel Port Failure

SOLUTION

Make sure the printer cable is connected correctly.

Make sure that the printer is on-line and self-tests OK.

Make sure that application software is set correctly.

PROBLEM

FDD works incorrectly

SOLUTION

Check the connections between the CPU card and FDD.

Clean the magnetic head of the FDD. Make sure you are using diskettes of the proper capacity and format.

Check that the FDD type is correctly set in CMOS.

Reset the BIOS to the default setting and try again.

Make sure the super I/O configuration is setup correctly.

PROBLEM

HDD works incorrectly

SOLUTION

Check cable connections. Check that the master/slave jumpers are properly set. The boot drive should be the master.

Make sure the HDD type is correctly set in CMOS. Reset system setup to BIOS default settings and try again.

Check for and remove viruses. The boot sector and partition table on your HDD may be damaged.

Make sure the super I/O configuration is setup correctly.

Check for bad sectors on the hard disk (using a program such as Norton Disk Doctor). This is a common problem with Conner HDDs. If bad sectors are found, reformat the HDD.

PROBLEM

Add-on cards work incorrectly

SOLUTION

Check jumper and switch settings of add on cards.

Make sure that the card is firmly seated in its slot. Clean the pins on the card and the passive backplane connector if necessary.

Make sure the bus speed setting in CMOS setup is 8 MHz. Check that the shadow RAM and EMS settings in CMOS do not conflict with the add-on card's firmware and I/O addresses.

Remove (or replace) the terminating resistors on the passive backplane and test again. These resistors are especially important for high speed add-on cards.

PROBLEM

Real-time clock is not accurate

SOLUTION

Under standard conditions the DS-12887 is accurate to within two minutes per month.

Make sure the application software you are using does not interrupts the RTC and/or writes improper data to the RTC.

PROBLEM

Software

SOLUTION

Make sure that the memory, system configuration, display and HDD space meet the minimum requirements of the software. Make sure the software is properly installed.

Check for and remove viruses.

APPENDIX F

AMI BIOS error codes

This appendix lists the codes generated by the AMI BIOS if it encounters a hardware error during its POST (Power On Self Test) routines.

Whenever you start up your system, the CPU card runs a series of programs to test and initialize board hardware. If the routines encounter an error in during the tests, you will either hear a few short beeps or see an error message on the screen. There are two kinds of errors: fatal and non-fatal. The system can usually continue the boot up sequence with non-fatal errors. Non-fatal error messages usually appear on the screen along with the following instructions:

```
Press <F1> to RESUME
```

Write down the message and press the F1 key to continue the bootup sequence. The cure for most non-fatal error messages is simply to run the BIOS SETUP program, discussed in Chapter 5.

If the routines encounter a fatal error, they will stop the tests and output a message indicating which test failed. If the fatal error comes before the screen device initializes, the card will indicate the error code through a series of beeps.

You can also determine the number of the test that failed by reading the LED indicators on the top of the PCA-6143P board.

Please make a note of any BIOS error codes before you contact Advantech for technical support.

Beep codes

Beep codes indicate fatal errors through a series of audible tones output through the card's buzzer or a speaker. The number of beeps indicates the error, as shown in the following table:

BIOS error codes – Beep codes

Beeps	Meaning
1	Refresh failure – The card's memory refresh circuitry is faulty.
2	Parity error – A parity error was detected in the base memory (the first block of 64 KB) of the system.
3	Base 64 KB memory failure – A memory failure occurred within the first 64 KB of system memory.
4	Timer not operational – Timer #1 on the card has generated an error.

Beeps	Meaning
5	Processor error – The card's CPU has generated an error.
6	8042 Gate A20 failure – The keyboard controller (8042) contains the Gate A20 switch which allows the CPU to operate in protected mode. This error message means that the BIOS is not able to switch the CPU into protected mode.
7	Processor exception interrupt error – The CPU has generated an exception interrupt
8	Display memory read/write error – The system video adapter is either missing or has faulty memory. *Note: This is not a fatal error.*
9	ROM checksum error – The ROM checksum value does not match the value encoded in the BIOS.
10	CMOS shutdown register read/write error – The shutdown register for the CMOS memory has failed

Non-fatal error messages

Following are descriptions of the BIOS's non-fatal error messages:

8042 Gate A20 error
The gate-A20 portion of the keyboard controller (8042) has failed to operate correctly. Replace the 8042 chip or the keyboard.

Address line short
An error has occurred in the address decoding circuitry of the card.

Cache memory bad, do not enable cache!
The BIOS has found the cache memory on the board to be defective.

CH-2 timer error
Your card has two timer chips. An error with timer no. 1 is a fatal error, explained above.

C: drive error
The BIOS is not receiving any response from hard disk C:. Check the type of hard disk selected in the Standard CMOS Setup of the BIOS Setup Program to see if the correct hard You may need to run the Hard Disk Utility to correct this problem.

C: drive failure
The BIOS cannot get any response from hard disk drive C:. You may need to replace the disk.

CMOS battery state low
The battery used to stored the CMOS values appears to be low.

CMOS checksum failure
After the CMOS values are saved, a checksum value is generated to provide for error checking. If the previous value is different from the value currently read, this message appears. To correct this error, you should run the BIOS Setup Program.

CMOS display type mismatch
The type of video stored in CMOS does not match the type detected by the BIOS. Run the BIOS Setup Program to correct this error.

CMOS memory size mismatch
If the BIOS finds the amount of memory on your motherboard to be different from the amount indicated in the CMOS it generates this message. Run the BIOS Setup Program to correct this error.

CMOS system options not set
The values stored in CMOS are either corrupt or nonexistent. Run the BIOS Setup Program to correct this error.

CMOS time and date not set
Run Standard CMOS Setup in the BIOS setup program to set the date and time in the CMOS.

D: drive error
The BIOS is not receiving any response from hard disk D:. Check the type of hard disk selected in the Standard CMOS Setup of the BIOS Setup Program to see if the correct hard You may need to run the Hard Disk Utility to correct this problem.

D: drive failure
The BIOS cannot get any response from hard disk drive D:. You may need to replace the disk.

Diskette boot failure
The diskette used to boot-up in floppy drive A: is corrupt, which means you cannot use it to boot-up the system. Use another boot diskette and follow the instructions on the screen.

Display switch not proper
Jumper JP15 is set incorrectly. *(Remember to shut down the system first).*

DMA #1 error
An error has occurred with the board's first DMA channel.

DMA #2 error
An error has occurred with the board's second DMA channel.

DMA error
An error has occurred with the board's DMA controller

FDD controller failure
An error has occurred with the board's floppy disk drive controller

HDD controller failure
An error has occurred with the board's floppy disk drive controller

INTR #1 error
Interrupt channel #1 has failed the POST routine

INTR #2 error
Interrupt channel #2 has failed the POST routine

Invalid boot diskette
The BIOS can read the diskette in floppy drive A:, but it cannot boot-up the system with it. Use another boot diskette and follow the instructions on the screen.

KB/Interface error
The BIOS has found an error with the board's keyboard connector

Keyboard error
The BIOS has encountered a timing problem with the keyboard. Make sure you have an AMI Keyboard BIOS installed in your system. You may also have set the "Keyboard" option in the Standard CMOS Setup to "Not Installed", which will cause the BIOS to skip the keyboard POST routines.

Keyboard is locked... Unlock it.
The keyboard lock on the system is engaged. The system must be unlocked to continue the boot-up procedure.

No ROM BASIC
This error occurs when a proper bootable sector cannot be found on either the floppy diskette drive A: or the hard disk drive C:. The BIOS will try at this point to run ROM BASIC, and this error message will be generated when the BIOS does not find it.

Off board parity error
The BIOS has encountered a parity error in some memory installed in an I/O expansion slot. The message will appear as follows:

```
OFF BOARD PARITY ERROR
ADDR (HEX) = (XXXX)
```

XXXX is the address (in hexadecimal) at which the error occurred.

On board parity error
The BIOS has encountered a parity error in some memory installed in the CPU card. The message will appear as follows:

```
ON BOARD PARITY ERROR
ADDR (HEX) = (XXXX)
```

XXXX is the address (in hexadecimal) at which the error occurred.

Parity error ????
The BIOS has encountered a parity error with some memory in the system, but it is unable to determine the address of the error.

BIOS Checkpoint Codes

The following list of checkpoint codes gives the number for each checkpoint for the AMI BIOS POST. Codes are Copyright AMI-BIOS CHECK-POINT © 1991 American Megatrends Inc., All Rights Reserved. 1346 Oakbrook Dr. #120. GA 30093. Phone: (404)-263-8181, Fax: (404)-263-9381

Code	Description of Check-point
01	Processor register test about to start. NMI to be disabled.
02	NMI is Disabled. Power on delay starting.
03	Power on delay complete. Any initialization before keyboard BAT is in progress.
04	Any initialization before keyboard BAT is complete. Reading keyboard SYS bit
05	Soft reset/power-on determined. Going to enable ROM. i. e. disable shadow RAM/Cache if any.
06	ROM is enabled. Calculation ROM BIOS checksum
07	ROM BIOS checksum passed
08	BAT command to keyboard controller is issued. Going to verify the BAT command.
09	Keyboard controller BAT result verified. Keyboard command byte to be written next.
0A	Keyboard command byte chewed is issued. Going to write command byte data.
0B	Keyboard controller command byte is written. Going to issue Pin-23, 24 blocking/unblocking command
0C	Pin-23, 24 of keyboard controller is block/unblocked NOP command of keyboard controller to be issued next.
0D	NOP command processing is done. CMOS shutdown register test to be done next.
0E	CMOS shutdown register R/W test passed. Going to calculate CMOS checksum
0F	CMOS checksum calculation is down
10	CMOS initialization done (if any). CMOS status register about to init for Date and Time.

11	CMOS Status register initialized. Going to disable DMA and Interrupt controllers.
12	DMA controller #1, #2 interrupt controller #1, #2 disabled About to disable Video display and init port-B
13	Video display is disabled and port-B is initialized. Chipset init/auto memory detection about to begin.
14	Chipset initialization/auto memory detection over. 8254 timer test about to start.
15	CH-2 timer test halfway. 8254 CH-2 timer test to be complete.
16	CH-2 timer test over. 8254 CH-1 timer test to be complete.
17	CH-1 timer test over. 8254 CH-0 timer test to be complete.
18	CH-0 timer test over. About to start memory refresh.
19	Memory Refresh started. Memory Refresh test to be done next.
1A	Memory Refresh line is toggling. Going to check 15 msec ON/OFF time.
1B	Memory Refresh period 30 msec test complete. Base 64k memory test about to start.
20	Base 64k memory test started. Address line test to be done next.
21	Address line test passed. Going to do toggle parity.
22	Toggle parity over. Going for sequential data R/W test.
23	Base 64k sequential data R/W test passed. Any setup before Interrupt vector init about to start.
24	Setup required before vector initialization complete. Interrupt vector initialization about to begin.
25	Interrupt vector initialization done. Going to read I/O port of 8042 for turbo switch (if any)
26	I/O port of 8042 is read. Going to initialize global data for turbo switch.
27	Global data initialization is over. Any initialization after interrupt vector to be done next.
28	Initialization after interrupt vector is complete. Going for monochrome mode setting.

29	Monochrome mode setting is done. Going for Color mode setting.
2A	Color mode setting is done. About to go for toggle parity before optional ROM test.
2B	Toggle parity over. About to give control for nay setup required before optional video ROM check.
2C	Processing before video ROM control is done. About to look for optional video ROM and give control.
2D	Optional video ROM control is done. About to give control to do any processing after video ROM returns control.
2E	Return from processing after the video ROM control. If EGA/VGA not found then do display memory R/W test.
2F	EGA/VGA not found. Display memory R/W test about to begin.
30	Display memory R/W test passed. About to look for the retrace checking.
31	Display memory R/W test or retrace checking failed. About to do alternate Display memory R/W test.
32	Alternate Display memory R/W test passed. About to look for the alternated display retrace checking.
33	Video display checking over. Verification of display type with switch setting and actual card to begin.
34	Verification of display adapter done. Display mode to be set next.
35	Display mode set complete. BIOS ROM data area about to be checked.
36	BIOS ROM data area check over. Going to set cursor for power on message.
37	Cursor setting for power on message is complete. Going to display the power on message.
38	Power on message display complete. Going to read new cursor position.
39	New cursor position read and saved. Going to display the reference string.
3A	Reference string display is over. Going to display the Hit ESC message.
3B	Hit ESC message displayed. Virtual mode memory test about to start.

40	preparation for virtual mode test started. Going to verify from video memory.
41	Returned after verifying from display memory. Going to prepare the descriptor tables.
42	Descriptor tables prepared. Going to enter in virtual mode for memory test.
43	Entered in the virtual mode. Going to enable interrupts for diagnostics mode.
44	Interrupts enabled (if diagnostics switch is on). Going to initialize data to check memory wrap around at 0:0.
45	Data initialized. Going to check for memory wrap around at 0:0 and find the total system memory size.
46	Memory wraparound test done. Memory size calc. over. About to go for writing patterns to test memory.
47	Pattern to be tested written in extended memory. Going to write patterns in base 640 K memory.
48	Patterns written in base memory. Going to find out amount of memory below 1 M.
49	Amount of memory below 1 M found and verified. Going to find out amount of memory above 1 M
4A	Amount of memory above 1 M found and verified. Going for BIOS ROM data area check
4B	BIOS ROM data area check over. Going to check ESC and to clear memory below 1 M for soft reset.
4C	Memory below 1 M cleared. (SOFT RESET) Going to clear memory above 1 M.
4D	Memory above 1 M cleared. (SOFT RESET) Going to save the memory size.
4E	Memory test started. (NO SOFT RESET) About to display the first 64 K memory test.
4F	Memory size display stared. This will be updated during memory test. Going for sequential and random memory test.
50	Memory test below 1 M complete. Going to adjust memory size for relocation/shadow.
51	Memory size adjusted due to relocation/shadow. Memory test above 1 M to follow.

52	Memory test above 1 M complete. Going to prepare to go back to real mode.
53	CPU registers are saved including memory size. Going to enter in real mode.
54	Shutdown successful, CPU in real mode. Going to restore registers saved during preparation for shutdown
55	Registers restored. Going to disable gate A20 address line.
56	A20 address line disable successful. BIOS ROM data area about to be checked.
57	BIOS ROM data area check halfway. BIOS ROM data area check to be complete.
58	BIOS ROM data area check over. Going to clear Hit ESC message.
59	Hit <ESC> message cleared. WAIT... message displayed. About to start DMA and interrupt controller test.
60	DMA page register test passed. About to verify from display memory.
61	Display memory verification over. About to go for DMA #1 base register test.
62	DMA #1 base register test passed. About to go for DMA #2 base register test.
63	DMA #2 base register test passed. About to go of BIOS ROM data area check.
64	BIOS ROM data area check halfway. BIOS ROM data area check to be complete.
65	BIOS ROM data area check over. About to program DMA unit 1 and 2.
66	DMA unit 1 and 2 programming over. About to initialize 8259 interrupt controller.
67	8259 initialization over. About to start keyboard test.
80	Keyboard test started. Clearing output buffer, checking for stuck key. About to issue keyboard reset command
81	Keyboard reset error/stuck key found. About to issue keyboard controller interface test command.
82	keyboard controller interface test over. About to check for lock-key.
83	Command byte written. Global init done. About to check for lock-key

84	Lock-key checking over. About to check for memory size mismatch with CMOS.
85	Memory size check done. About to display soft error and check for password or bypass setup.
86	Password checked. About to do programming before setup.
87	Programming before setup complete. Going to CMOS setup program.
88	Returned from CMOS setup program and screen is cleared. About to do programming after setup.
89	Programming after setup complete. Going to display power on screen message.
8A	First screen message displayed. About to display WAIT... message.
8B	WAIT... message displayed.
8C	Main and Video BIOS shadow successful. Setup options programming after CMOS setup about to start.
8D	Setup options are programmed
8E	Mouse check and initialization complete. Going for hard disk
8F	Floppy check returns that floppy is to be initialized. Floppy setup to follow.
90	Floppy setup is over. Test for hard disk presence to be done.
91	Hard disk presence test over. Hard disk setup to follow.
92	Hard disk setup complete. About to go for BIOS ROM data area check.
93	BIOS ROM data area check halfway. BIOS ROM data area check to be complete.
94	BIOS ROM data area check over. Going to set base and extended memory size.
95	Memory size adjusted due to mouse support
96	Returned after verifying from display memory. Going to do any init before C800 optional ROM control.
97	Any init before C800 optional ROM control is over. Optional ROM check and control will be done next.
98	Optional ROM control is done.About to give control to do any required processing after optional ROM returns control.

99	Any initialization required after optional ROM test over. Going to setup timer data area and printer base address.
9A	Return after setting timer and printer base address. Going to set the RS-232 base address.
9B	Returned after RS-232 base address. Going to do any initialization before coprocessor test.
9C	Required initialization before coprocessor is over. Going to initialize the coprocessor next.
9D	Coprocessor initialized. Going to do any initialization after coprocessor test.
9E	Initialization after coprocessor test is complete. Going to check extended keyboard
9F	Extended keyboard check is done
A0	Keyboard ID command issued. Keyboard ID flag to be reset.
A1	keyboard ID flag reset. Cache memory test to follow.
A2	Cache memory test over. Going to display any soft errors.
A3	Soft error display complete. Going to set the keyboard typematic rate.
A4	Keyboard typematic rate set. Going to program memory wait states.
A5	Memory wait states programming over. Screen to be cleared next.
A6	Screen cleared. Going to enable parity and NMI.
A7	NMI and parity enabled. Going to do nay initialization required before giving control to optional ROM at E000.
A8	Initialization before E000 ROM control over. E000 ROM to get control next.
A9	Returned from E000 ROM control. Going to do any initialization required after E000 optional ROM control.
AA	Initialization after E000 optional ROM control is over. Going to display the system configuration.
00	System configuration is displayed. Going to give control to INT 19h boot loader.

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