

**SBC-400**

Half-size 486 All-in-One CPU Card  
with Cache

## **FCC STATEMENT**

THIS DEVICE COMPLIES WITH PART 15 FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE. (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

THIS EQUIPMENT HAS BEEN TESTED AND FOUND TO COMPLY WITH THE LIMITS FOR A CLASS "A" DIGITAL DEVICE, PURSUANT TO PART 15 OF THE FCC RULES. THESE LIMITS ARE DESIGNED TO PROVIDE REASONABLE PROTECTION AGAINST HARMFUL INTERFERENCE WHEN THE EQUIPMENT IS OPERATED IN A COMMERCIAL ENVIRONMENT. THIS EQUIPMENT GENERATES, USES, AND CAN RADIATE RADIO FREQUENCY ENERGY AND, IF NOT INSTALLED AND USED IN ACCORDANCE WITH THE INSTRUCTION MANUAL, MAY CAUSE HARMFUL INTERFERENCE TO RADIO COMMUNICATIONS. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA IS LIKELY TO CAUSE HARMFUL INTERFERENCE IN WHICH CASE THE USER WILL BE REQUIRED TO CORRECT THE INTERFERENCE AT HIS OWN EXPENSE.

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## **Packing list**

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

- 1 SBC-400 CPU card
- 1 6-pin mini-DIN dual outlet adapter for keyboard and PS/2 mouse
- 1 Hard disk drive (IDE) interface cable (40 pin)
- 1 Floppy disk drive interface cable (34 pin)
- 1 Parallel port adapter (26 pin)
- PC/104 Expansion connector converter (pin headers)
- PC/104 Module mounting supports

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

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## General Information

This chapter gives background information on the SBC-400.

Sections include:

- Card specifications
- Board layout



# Introduction

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The SBC-400 is an all-in-one CPU card that **supports L2 cache sizes from 128 KB to 512 KB** (32 KB x 8, 64 KB x 8, or 128 KB x 8). This CPU card uses the M1489/M1487 chipsets, which accept Intel, AMD, Cyrix, or other compatible 486-based CPUs. The SBC-400 is fully PC/AT compatible, so your software will run without modifications.

On-board features include two high-speed serial ports (**RS-232 and RS-232/422/485**) with 16C550 UARTs, one bi-directional parallel port, and a floppy drive controller. If program execution is halted by a program bug or EMI, the board's 16-stage watchdog timer can automatically reset the CPU or generate an interrupt. This ensures reliability in unmanned or stand-alone systems.

The SBC-400 is built with a high speed local bus IDE controller. This controller supports (through ATA PIO) mode 3 and mode 4 hard disks, which enable data transfer rates of over 11 MB/second. It connects up to two IDE devices, including large hard disks, CD-ROM drives, tape backup drives, etc. The built-in enhanced IDE controller provides a 4-layer 32-bit posted write-buffer and a 4-layer 32-bit read-prefetch-buffer to boost IDE performance.

The SBC-400 **supports 5V EDO DRAM**. It also provides two 72-pin SIMM (Single In-line Memory Module) sockets for on-board DRAM. This gives you the flexibility to configure your system memory from 1 ~ 128 MB using the most economical combination of SIMMs.

The SBC-400 also features power management to minimize power consumption. It uses CMOS components and complies with the "**Green Function**" standard.

If you need any additional functions, you can add industry-standard PC/104 expansion modules. We provide numerous PC/104 modules to meet your system requirements.

## Features

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- Accepts any Intel, AMD, Cyrix, or other compatible processor
- Half-size ISA bus CPU card, fully 486SX/DX/DX2/DX4 compatible
- Built-in 128 KB secondary cache, up to 512 KB
- Up to 128 MB of on-board DRAM; supports 5V EDO DRAM
- Built-in IDE (AT bus) hard disk drive interface, floppy drive controller
- One RS-232 and one RS-232/422/485 selectable serial port; uses 16C550 UARTs with 16-byte FIFO
- One bi-directional parallel port
- 32 to 140°F (0 to 60°C) operating temperature
- Watchdog timer, software programmable from 2 to 32 seconds (16 steps, 2 seconds per step)
- On-board keyboard connector and/or PS/2 mouse
- IDE HDD auto-detection
- Connectors for PC/104 module expansion
- Single +5V power supply
- "Green" function, supports power management

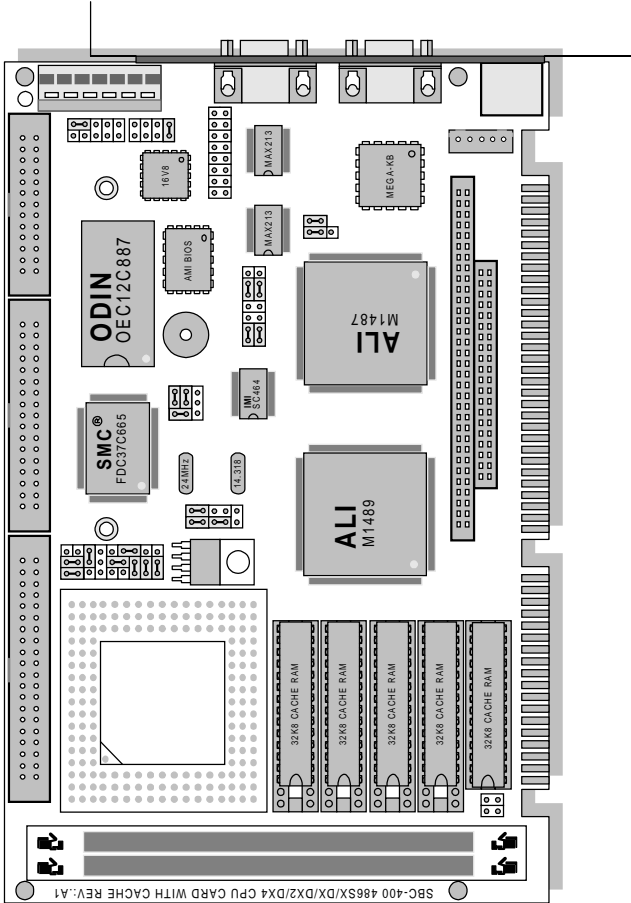
# Specifications

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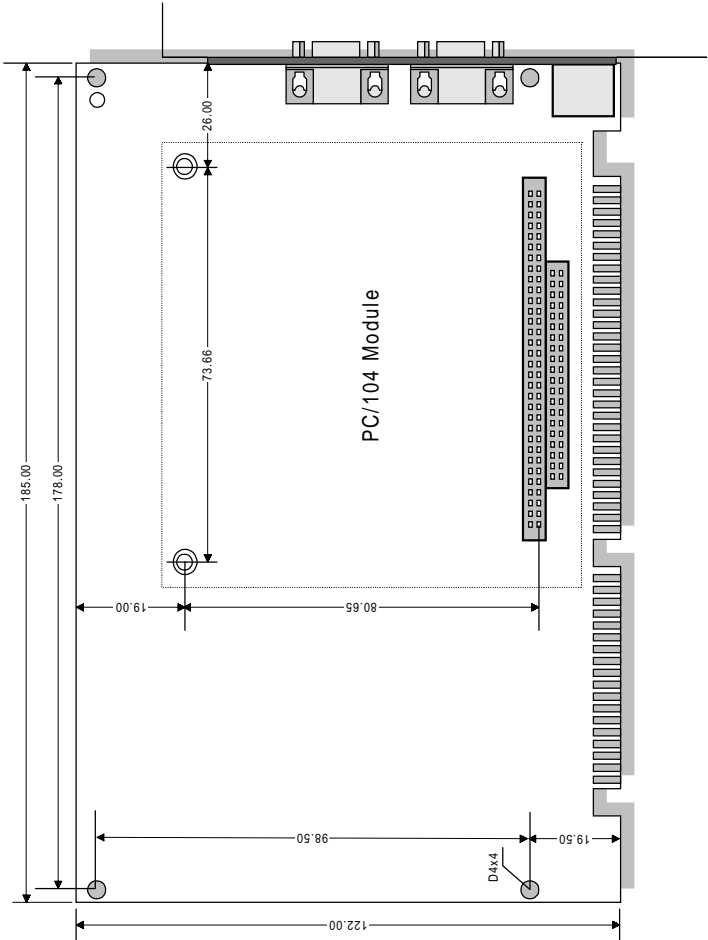
- **CPU:** Intel 486SX/DX/DX2/DX4, 486SX/DX/DX2/DX4-S; AMD Am486DX/DX2/DX4, DX2+/DX4+; Cyrix Cx486DX/DX2/M7; UMC U5
- **Bus interface:** ISA (PC/AT) bus
- **Data bus:** 32 bit
- **Processing ability:** 32 bit
- **Chipset:** ALI 1489/1487
- **RAM memory:** 1 MB to 128 MB, two 72-pin sockets
- **Shadow RAM memory:** Supports system and video BIOS of up to 256 KB in 32 KB blocks
- **L2 Cache memory:** On-board 128 KB, up to 512 KB (DIP package)
- **Enhanced IDE HDD interface:** Supports up to two enhanced IDE (ATA-2 bus) large hard disk drives or other enhanced IDE devices. Supports mode 3 and mode 4 hard disks (minimum data transfer rate of 11.1 MB/sec).
- **Floppy disk drive interface:** Supports up to two floppy disk drives, 5.25" (360 KB and 1.2 MB) and/or 3.5" (720 KB, 1.44 and 2.88 MB).
- **Bi-directional parallel port:** SPP/EPP/ECP standards.
- **Serial ports:** One serial RS-232 port and one serial RS-232/RS-422/RS-485 port, jumper selectable. Both with 16C550 UARTs with 16-byte FIFO buffer.
- **IRQ SELECTION FOR COM PORTS:**  
COMA: Supports COM 1/2/3/4 & address is selectable; IRQ3/4/11/12  
COMB: Supports COM 1/2/3/4 & address is selectable; IRQ3/4/11/12
- **BIOS:** AMI WinBIOS
- **Watchdog timer:** The time interval is software selectable from 2 to 32 seconds (16 steps, 2 seconds per step). Can generate a system reset.
- **PC/104:** 104-pin connector for a 16-bit bus
- **DMA channels:** 7

- **Interrupt levels:** 15
- **Keyboard connector:** A 6-pin mini DIN keyboard connector is located on the mounting bracket for easy access. An on-board keyboard 5-pin header connector is also available.
- **PS/2 Mouse connector:** Shared with keyboard connector.
- **Bus speed:** 8 MHz
- **System performance:** 325 MHz in 80486DX4-100 (Landmark V2.0)
- **Max. power requirements:** +5 V @ 2.5 A
- **Power supply voltage:** Single +5 V (4.75 V to 5.25 V)
- **Operating temperature:** 32 to 140°F (0 to 60°C); must use a cooling fan when using a DX4-100 CPU or above
- **Board size:** 7.3" (L) x 4.8" (W) (185 mm x 122 mm)
- **Board weight:** 1.2 lbs (0.5 Kg)
- **Green Function:** Yes
- **EMI:** Pending
- **MTBF:** Pending

# Board layout



# Card dimensions





# CHAPTER 2

## **Installation**

This chapter tells how to set up the SBC-400 hardware, including instructions on setting jumpers and connecting peripherals, switches and indicators. Be sure to read the all safety precautions before you begin the installation procedure.



# Jumpers and connectors

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Connectors on the board link it to external devices such as hard disk drives, a keyboard or floppy drives. In addition, the board has a number of jumpers that allow you to configure your system to suit your application.

The table below lists the function of each of the board jumpers and connectors.

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## Jumpers and connectors

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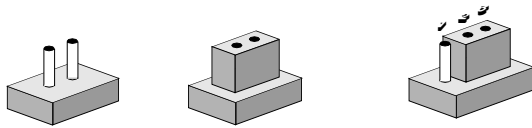
<b>Label</b>	<b>Function</b>
JP1	Cache memory select
JP2,3,4	CPU type select
JP5,6	CPU Vcc select
JP7,8	CPU clock select
JP9	Serial port IRQ select
JP10	Parallel port DRQ select
JP11	Parallel port DACK select
JP12	Power LED and keylock
JP13	External speaker
JP14	Reset switch
JP15	Turbo LED
JP17	Turbo switch
JP23,39	RS-232/422/485 select
JP38	Watchdog timer time-out signal select
CN1	Enhanced IDE connector
CN2	FDD connector
CN3	Parallel connector
CN4	Power connector
CN5,6	PC/104 module connectors
CN7	External keyboard connector
J1	Keyboard and/or PS/2 mouse connector
COMA	Serial port 1
COMB	Serial port 2

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# Setting 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.



**OPEN**

**CLOSED**

**CLOSED 2-3**

The jumper settings are schematically depicted in this manual as follows:



**OPEN**

**CLOSED**

**CLOSED 2-3**

A pair of needle-nose pliers may be helpful when working with jumpers.

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.

Generally, you simply need a standard cable to make most connections.

## Safety precautions

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**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.*



## Installing the CPU

---

The SBC-400 CPU card supports most 486 CPUs. The system's performance depends on the CPU you choose. You can install or upgrade the CPU in the board's PGA socket by following the procedures outlined below. If your system has an existing CPU, you need to remove it before installing the new CPU.

### Removing a CPU

1. Disconnect power from the chassis, and unplug all connections to the CPU card. Then, remove the CPU card from the chassis by following the instructions in the user's manual for your chassis.
2. Lift the CPU out of the PGA socket. The old chip may be difficult to remove. You may find spray chip lubricant, designed for pin-grid-array (PGA) devices, and a chip puller helpful. These are available at electronics hobbyists' supply stores.

## Installing a CPU

To install the CPU, follow the instructions that came with it. If no documentation was provided, the general procedure for installing a CPU are outlined below:

1. Lubricate the pins on the CPU with lubricant for PGA devices. This makes the CPU slide in much easier and greatly reduces the chance of damaging the pins and other components.
2. Carefully align the CPU so that it is parallel to the socket. Make sure that the notch on the corner of the CPU matches the notch on the inside of the socket.
3. Gently push the CPU into the socket. There will probably be a small gap between the CPU and the socket even when it is fully seated. **DO NOT USE EXCESSIVE FORCE!**

When you install a new CPU, you may have to adjust other settings on the board, such as CPU type, CPU clock and PCI speed, to accommodate it. Make sure that the settings are correct for your CPU. **Improper settings may damage the CPU.**

## CPU type select (JP2, JP3, JP4)

JP2, JP3, and JP4 must be set to match the CPU type. The chart below shows the proper jumper setting for their respective CPU.

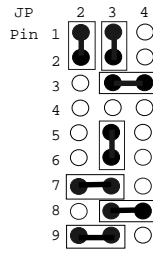
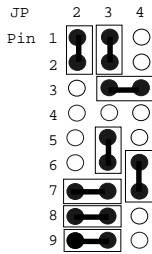
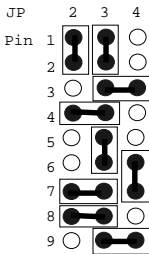
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### CPU Type select (JP2, JP3, JP4)

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Intel P24D  
Cyrilx MISC

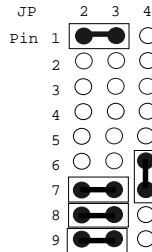
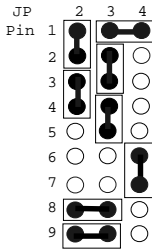
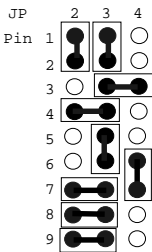
486DX/DX2/DX4-S 486SX-S



Cyrilx/IBM/SGS  
5x86

Cyrilx/IBM/SGS/TI486DX/DX2  
486DX2

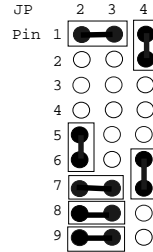
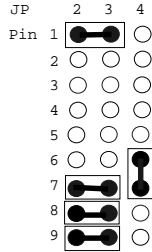
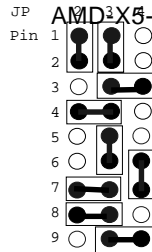
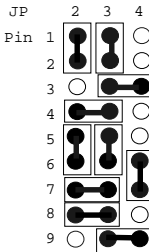
486SX



AMD-X5-133/150  
AMD DX2

AMD DX4 Enhanced

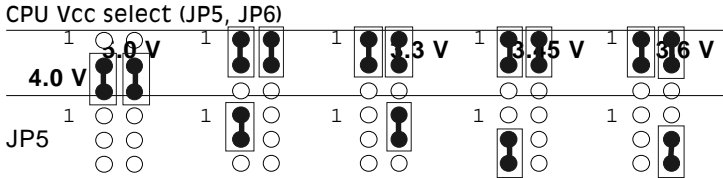
AMD DX4 Standard



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## CPU Vcc select (JP5, JP6)

JP5 and JP6 must be set to match the CPU type. The chart below shows the proper jumper settings for their respective  $V_{CC}$ .

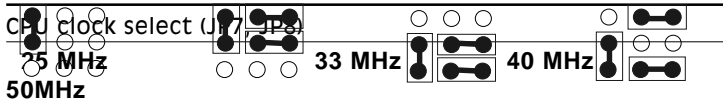


JP6

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## CPU clock select (JP7, JP8)

JP7 and JP8 are used to synchronize the CPU clock with the CPU type. Set the CPU clock according to the base CPU speed.



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## Installing DRAM (SIMMs)

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The SBC-400 CPU card provides two 72-pin SIMM (Single In-line Memory Module) sockets and supports between 1 MB to 128 MB of RAM.

When installing SIMMs, make sure that Bank 1 is filled first.

### Installing SIMMs

*Note that the modules can only fit into a socket one way.*

1. Insert the memory module into the socket at a moderate angle.
2. Push the module toward the vertical posts at both ends of the socket until the module is upright, and the retaining clips at both ends of the module click into place. When positioned correctly, the pins on top of the vertical posts should correspond to the circular holes on the ends of the module.
3. Repeat steps 1 and 2 for each module you install.

### Removing SIMMs

If you need to remove a SIMM, follow the procedures below:

1. Supporting the SIMM with a finger, use a pen or a similarly shaped object and press one retaining clip straight down.
2. Repeat for the other side. When released, the retaining clips will push the SIMM up and out of its upright position.



3. Carefully pull the SIMM out of the socket with your fingers.
4. Repeat the above steps for each module you remove.

## Selecting cache memory size





The SBC-400 features a 2nd level memory cache that supports 128, 256, or 512 KB of cache memory. Higher cache memory can improve your system's performance.

The cache uses SRAM chips in three sizes: 32 KB, 64 KB and 128 KB. The on-board cache memory banks consists of four SRAM chip sockets, each of which accepts one "Tag" chip. All SRAM chips must have a speed of 20 ns or faster. The table below shows the possible cache configurations:

Cache Configuration			
Cache size	Tag RAM		Data RAM
128 KB	one 32 K x 8	four 32 KB x 8 SRAMs	
256 KB	one 32 K x 8	four 64 KB x 8 SRAMs	
512 KB	one 32 K x 8	four 128 K x 8 SRAMs	

### Cache memory select (JP1)

When the cache size changes, you must make sure that JP1 is set to match the new cache memory size. The following chart shows the proper jumper setting for each cache configuration:

1  2	1  2	1  2
Cache memory select (JP1)	3  4	
<b>128 KB</b>	<b>256 KB</b>	<b>512 KB</b>

---

## **IDE hard drive connections (CN1)**

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You can attach two Enhanced Integrated Device Electronics hard disk drives to the SBC-400's internal controller. The card comes with a 40-pin flat-cable piggyback cable. This cable has three identical 40-pin flat-cable connectors.

### **Connecting the hard drive**

Wire number 1 on the cable is red or blue, and the other wires are gray.

1. Connect one end of the cable to CN1 on the CPU card. Make sure that the red (or blue) wire corresponds to pin 1 on the connector, which is labeled on the board (on the right side).
2. Plug the other end of the cable to the Enhanced IDE hard drive, with pin 1 on the cable corresponding to pin 1 on the hard drive. (See your hard drive's documentation for the location of the connector.)

Unlike floppy drives, you can make the connections with any of the connectors 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 install just one drive, set it as the master.

### Pin assignments

The following table lists the pin numbers and their respective signals:

Enhanced IDE connector (CN1)			
Pin	Signal	Pin	Signal
1	Reset	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
27	IRDY	28	BALE
29	N.C.	30	GND
31	IRQ	32	-I/O CS16
33	A1	34	N.C.

35	A0	36	A2
37	CS0	38	CS1
39	-ACT	40	GND

## Floppy drive connections (CN2)

You can attach up to two floppy disks to the SBC-400's on-board controller. You can use any combination of 5.25" (360 KB and 1.2 MB) and/or 3.5" (720 KB, 1.44 MB, and 2.88 MB) drives.

The SBC-400 CPU card comes with a 34-pin daisy-chain drive connector cable. On one end of the cable is a 34-pin flat-cable connector. There are two sets of floppy disk drive connectors, one in the middle, and one on the other end. 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).

### Connecting the floppy drive

1. Plug the 34-pin flat-cable connector into CN2 on the CPU card.
2. Attach the appropriate connector on the other end of the cable to the floppy drive(s). You can use only one connector in the 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.

### Pin assignments

The following table lists the pin assignments for CN2:

Floppy disk connector (CN2)			
Pin	Signal	Pin	Signal
1~33 (odd)	GND	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		

## Parallel port (CN3)

Normally, the parallel port is used to connect the card to a printer. The SBC-400 includes an on-board parallel port, CN3, which is accessed through a 26-pin flat-cable connector. 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.

### Installing the retaining bracket

The retaining bracket installs at an empty slot in your system's chassis. It provides an external port that allows your parallel peripheral to access to the card's parallel port connector.

1. Find an empty slot in your chassis.
2. Unscrew the plate that covers the end of the slot.
3. Screw in the bracket in place of the plate.
4. Next, attach the flat-cable connector to CN3 on the CPU card. Wire 1 of the cable is red or blue, and the other wires are gray. Make sure that Wire 1 connects to Pin 1 of the PRINTER connector. Pin 1 is on the right side of CN3.

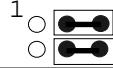
### Pin assignments

Parallel port connector (CN3)			
Pin	Signal	Pin	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 9	10	-Acknowledge

11	Busy	12	Paper empty
13	+ Select	14	- Auto feed
15	- Error	16	- Init printer
17	- Select input	18~25	GND

### Parallel port DRQ (JP10) and DACK (JP11)

You can select the parallel port DRQ and DACK by setting JP10 and JP11, respectively. The following charts show the available options.



Parallel port DRQ selection (JP10) and DACK selection (JP11)

DRQ1/DACK1 (default)	DRQ3/DACK3
JP10	JP10
JP11	JP11

## Power supply connections

### Power supply connector (CN4)

In single-board-computer (non-passive-backplane) applications you will need to connect power directly to the SBC-400 board using CN4. This connector is fully compatible with the standard PC power supply connector. See the following table for its pin assignments:

Power connector (CN4)	
Pin	Function
1	N.C.
2	+5 V <sub>DC</sub>

3	+12 V <sub>DC</sub>
4	-12 V <sub>DC</sub>
5	GND
6	GND

## Keyboard and PS/2 mouse connectors (CN7, J1)

The SBC-400 board provides two keyboard connectors. A 5-pin connector (CN7) supports passive backplane applications. A second 6-pin mini-DIN connector (J1) on the card mounting bracket supports single-board-computer applications. The card comes with an adapter to convert the 6-pin mini-DIN connector, used for the mouse, to the standard DIN connector for the keyboard.

### Keyboard connector (CN7)

Pin	Function
1	K.B. clock
2	K.B. data
3	N.C.
4	GND
5	+5 V <sub>DC</sub>

### Keyboard or PS/2 mouse connector (J1)

Pin	Function
1	K.B. data



2	PS/2 mouse data
3	GND
4	+5 V <sub>DC</sub>
5	K.B. clock
6	PS/2 mouse clock

## Serial ports

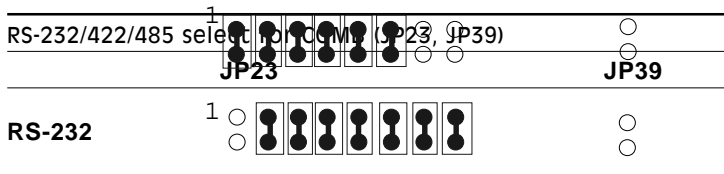
The SBC-400 offers two serial ports: one RS-232 and one RS-232/422/485. Using the BIOS Peripheral Setup program, you can select the address for each port or disable it.

The card mounting bracket has two serial port connectors. The DB-9 connector on the top of the bracket is COMA, the RS-232 serial port. The DB-9 connector on the bottom of the bracket is COMB, the RS-232/422/485 serial port.

### RS-232/422/485 select for COMB (JP23, JP39)

RS-232 serial ports are widely used for external input/output devices. The RS-422 and RS-485, however, are popular for industrial and laboratory applications because they offer high noise resistance and long range communication (up to 4000 ft, 1200 m). The RS-422 is commonly used for two-way communication between two devices, where as RS-485 is used for communication between a single master and a network of slave modules.

COMA is the RS-232 serial port, and COMB can function as an RS-232, RS-422, or RS-485, depending on the jumper settings for JP23 and JP39. To select the desired serial port type for COMB, adjust JP23 and JP39 as follows.



## RS-422

---

## RS-485

---

### **RS-232/422/485 serial port connections (COMA, COMB)**

#### **Pin assignments**

The following table shows the pin assignments for the card's RS-232 and RS-422/485 (COMB) serial port connectors:

RS-232 (COMA, COMB)		RS-422/485 (COMB)	
Pin	Signal	Pin	Signal
1	DCD	1	TX- (DTE)
2	RX	2	TX+ (DTE)
3	TX	3	RX+ (DTE)
4	DTR	4	RX- (DTE)
5	GND	5	Ground
6	DSR	6	RTS-
7	RTS	7	RTS+
8	CTS	8	CTS-
9	RI	9	CTS-

#### **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 printer) but was later adopted

by the 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	Ground	<	5	Ground	
6	RTS-	>	9	CTS-	
7	RTS+	>	8	CTS+	
8	CTS+	<	7	RTS+	
9	CTS-	<	6	RTS-	

**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
------------	----------

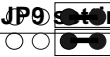
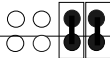
Pin	Signal		Pin	Signal
1	TX-	]-----Data-----[	1	TX-
4	RX-		4	RX-
2	TX+	]-----Data+-----[	2	TX+
3	RX+		3	RX+
5	Ground		5	Ground

## Serial ports IRQ select (JP9)

You can select the serial ports' IRQs by setting JP9 as follows:

Serial ports IRQ selection (JP9)

COMA	COMB	JP9 setting
IRQ3	IRQ4	
IRQ4	IRQ3	

---

IRQ11    IRQ12

---

IRQ12    IRQ11

---

## Watchdog timer setup

---

### Watchdog timer time-out signal select (JP38)

If CPU processing comes to a halt because of EMI or software bug, the watchdog timer can either reset the CPU or signal an interrupt on IRQ15.

---

Watchdog timer time-out signal select (JP38)

---

**Reset CPU**

**IRQ15**

---

### Watchdog timer programming

The watchdog timer must be programmed to write to I/O port address 443 at an interval shorter than the timer's preset interval. The timer's interval has a tolerance of  $\pm 5\%$ , so you should program an instruction that will refresh the timer before a time-out occurs.

The following steps illustrate how you might program the watchdog timer.

1. Write to I/O port 443 (Hex) and designate a time-out interval. This will enable the watchdog and set up its time-out interval.
2. Write to I/O port 043 (Hex) and any random value. This will in turn disable the watchdog timer.

The watchdog timer-out interval can be set at 16 levels between 2 and 32 seconds. The following table shows the Hex values for the appropriate time-out intervals:

---

Watchdog timer delay values

---

<b>Delay time</b>	<b>Value (Hex)</b>	<b>Delay time</b>	<b>Value (Hex)</b>
0~2	F	16~18	7
2~4	E	18~20	6

---

4~6	D	20~22	5
6~8	C	22~24	4
8~10	B	24~26	3
10~12	A	26~28	2
12~14	9	28~30	1
14~16	8	30~32	0

## External Switches and LEDs

---

### Power LED and keylock (JP12)

You can connect an LED to indicate when the CPU card is on. Pin 1 of JP12 supplies power to the LED and Pin 3 is the ground.

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. The pin assignments appear in the following table:

---

Power LED and keylock (JP12)

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

---

### External speaker (JP13)

The CPU card has its own buzzer. You can disable the internal buzzer and connect an external speaker to JP13. Enabling the external speaker automatically disables the internal buzzer.

---

### External speaker (JP13)

---

Pin	Function
5	Vcc
4	Speaker output
3	Buzzer in
2	Speaker output
1	NC

---

### Reset switch (JP14)

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. The following table shows the pin assignments for the JP14.

---

### Reset switch (JP14)

---

Pin	Function
1	Ground
2	Reset

---

### Turbo LED (JP15)

You can connect a LED indicator across JP15 to indicate when the CPU is in Turbo mode. Marks on the circuit board indicate LED polarity (the pin on the left is positive).

---

### Turbo LED (JP15)

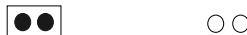
---

Pin	Function
1	Turbo
2	Ground

---

### Turbo switch (JP17)

You can connect a switch to the Turbo switch (JP17) to change CPU speed between Turbo and Normal. When the pins are open, the CPU card operates at full speed. When you close the pins, the card operates at slow speed for compatibility with older software.



---

### Turbo switch (JP17)

---

Pin	Function	Low speed	High Speed
1	- Deturbo	<i>SWAPPED 2</i>	<i>INSTALLATION 33</i>
2	Pull low		

---





# CHAPTER 3

## **AMI WinBIOS Setup**

This chapter describes the card's diagnostic tests and how to set BIOS configuration data in a Windows environment.

# General information

---

WinBIOS Setup configures system information that is stored in CMOS RAM. Unlike conventional BIOS setup programs, WinBIOS features a graphical user interface that is easy to use.

## Starting WinBIOS setup

As POST executes, the following appears;

Hit <DEL> if you want to run SETUP

Press <DEL> to run WinBIOS setup.

## WinBIOS main menu

The WinBIOS setup screen appears as follows:



## Using a mouse with WinBIOS setup

WinBIOS Setup can be accessed via keyboard, mouse, or pen. The mouse click functions are:

- single click to change or select both global and current fields
- double click to perform an operation in the selected field

## Using the keyboard with WinBIOS setup

WinBIOS Setup has a built-in keyboard driver that uses simple keystroke combinations:

<b>Keystroke</b>	<b>Function</b>
<tab>	Move to the next window or field.
→, ←, ↑, ↓	Move to the next field to the right, left, above, or below.
<ENTER>	Select in the current field.
+	Increments a value.
-	Decrements a value.
<ESC>	Closes the current operation and return to previous level.
<PgUp>	Returns to the previous page.
<PgDn>	Advances to the next page.
<Home>	Returns to the beginning of the text.
<End>	Advances to the end of the text.
<ALT>+H	Access a help window.
<ALT>+<Spacebar>	Exit WinBIOS Setup.
Alphabetic keys	A to Z are used in the Virtual keyboard, and are not case sensitive.
Numeric keys	0 to 9 are in the Virtual keyboard and Numeric keypad.

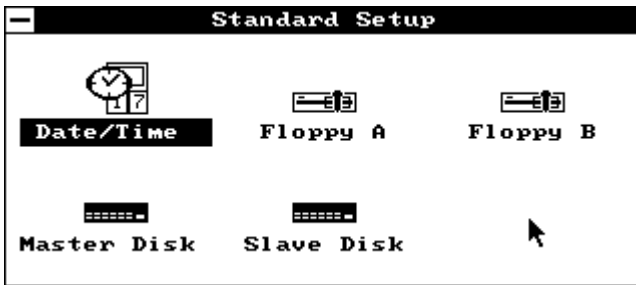
# Setup

---

## Standard Setup

The WinBIOS Setup options described in this section are selected by choosing the Standard icon from the WinBIOS Setup main menu selection screen, as shown below.

The Standard Setup screen appears:



### Date, Day and Time Configuration

Select the Date and Time icon in the Standard setup. The current values for each category are displayed. Enter new values through the keyboard.

### Floppy A, Floppy B

Select these icons to configure the type of floppy drive that is attached to the system: 360 KB 5¼", 1.2 MB 5¼", 720 KB 3½", 1.44 MB 3½", and/or 2.88 MB 3½". The settings have not been pre-installed.

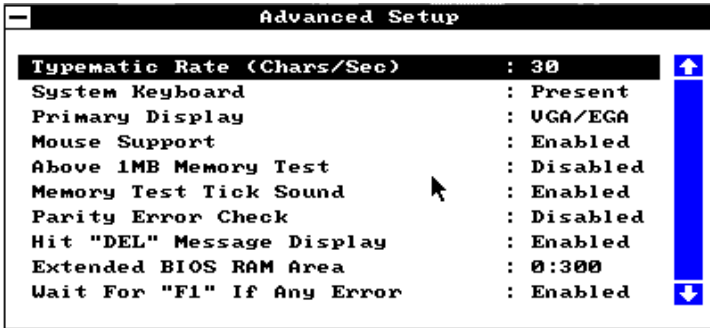
### Master Disk, Slave Disk

Select these icons to configure the hard disk type you are using for the master and the slave. The settings have not been pre-installed. Type in 1~46, User, ESDI, or SCSI.

## Advanced Setup

Select the Advanced icon from the WinBIOS Setup main menu to enter Advanced setup.

The Advanced Setup options described in this section are the standard options as shown on the following screen.



### Typematic Rate (Char/Sec)

Typematic Rate sets the rate at which characters on the screen repeat when a key is pressed and held down. The settings are 15, 20, 24, 30 characters per second.

### System Keyboard

This option specifies if error messages are displayed if a keyboard is not attached. This permits you to configure workstations with no keyboards. The settings are Absent or Present.

### Primary Display

Select this icon to configure the type of monitor attached to the computer. The settings are Monochrome, Color 40 x 25, Color 80x25, VGA/PGA/EGA/, or Not Installed.

### Above 1 MB Memory Test

When this option is enabled, the WinBIOS memory test is performed on all system memory. When disabled, the memory test is done only on the first 1 MB of system memory.

### **Memory Test Tick Sound**

This option enables (turns on) or disables (turns off) the ticking sound during the memory test.

### **Memory Parity Error Check**

This option enables or disables parity error checking for system RAM. The settings are Enabled (all system RAM parity is checked) or Disabled (parity is checked only on the first 1 MB of system RAM).

### **Hit <Del> Message Display**

Disabling this option prevents the message

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

from appearing when the system boots. The settings are Enabled or Disabled.

### **Extended BIOS RAM Area**

Specify in this option if the top 1 KB of the system programming area beginning at 639 K or 0:300 in the system BIOS area in low memory will be used to store hard disk information. The settings are Top 1 K or 0:300.

### **Wait for <F1> If Any Error**

WinBIOS POST runs system diagnostic tests that can generate a message followed by:

```
Press <F1> to continue
```

If this option is enabled, WinBIOS waits for the end user to press <F1> before continuing. If this option is disabled, WinBIOS continues the boot process without waiting for <F1> to be pressed.

### **System Boot Up Num Lock**

When On, this option turns off Num Lock when the system is powered on so the end user can use the arrow keys on both the numeric keypad and the keyboard.

### **Floppy Drive Seek at Boot**

When this option is enabled, WinBIOS performs a Seek command on floppy drive A: before booting the system.

### **System Boot Up Sequence**

This option sets the sequence of boot drives (either floppy drive A: or hard disk drive C:) that WinBIOS attempts to boot from after POST completes. The settings are C:, A: (first C:, then A:) or A:,C: (first A:, then C:).

### **System Boot Up CPU Speed**

This option sets the speed of the CPU at system boot time. The settings are High or Low.

### **External Cache**

This option enables secondary cache memory. If *Both* is selected, internal cache and external cache memory is enabled. If *Internal* is chosen, only the internal cache memory in the Pentium CPU is enabled. If *Disabled* is chosen, all cache memory in the Pentium CPU is disabled.

### **External Cache Mode**

This option selects the type of caching algorithm used by WinBIOS and the computer for L2 (external) secondary cache memory. The settings are Wr-Thr (Write-Through) or Wr-Back (Write-Back).

### **Turbo Switch function**

When this option is set to Enabled, the externally mounted turbo switch is enabled.

### **Password Checking**

This option enables the password check option every time the system boots or the end user runs Setup. If *Always* is chosen, a user password prompt appears every time the computer is turned on. If *Setup* is chosen, the password prompt appears if WinBIOS is executed. The Optimal and Fail-Safe default settings are *Setup*.

### **Video ROM Shadow C000,32K**



When this option is enabled, the video ROM area from C0000h - C7FFFh is copied (shadowed) to RAM for faster execution. The settings are Absent, NoShadow, or Shadow.

**Shadow C800,16K**

**Shadow CC00,16K**

**Shadow D000,16K**

**Shadow D400,16K**

**Shadow D800,16K**

**Shadow DC00,16K**

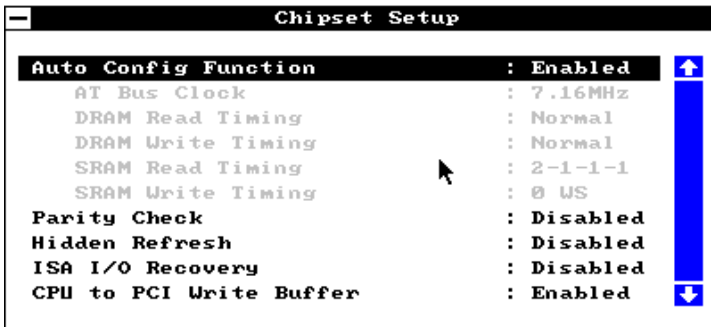
These options enable shadowing of the contents of the ROM area in the option title. The settings are Absent, NoShadow, or Shadow. The ROM area that is not used by ISA adapter cards will be allocated to PCI adapter cards.

**Auto KeyLock Timeout**

This option sets the timeout value for the WinBIOS AutoKeyLock feature. If Password support is enabled, AutoKeyLock automatically locks the keyboard and mouse if there has been no system activity for the length of time specified in this option. The settings are Disabled, 1 Min., 2 Min., 3 Min., 4 Min., 5 Min., 6 Min., 7 Min., 8 Min., 9 Min., 10 min., 11 Min., 12 Min., 13 Min., 14 Min., 15 Min. The Optimal and Fail-Safe defaults are Disabled.

## Chipset Setup

The WinBIOS Setup options described in this section are selected by choosing the Chipset icon from the WinBIOS setup main menu, shown below.



The following is a list options offered by Chipset Setup

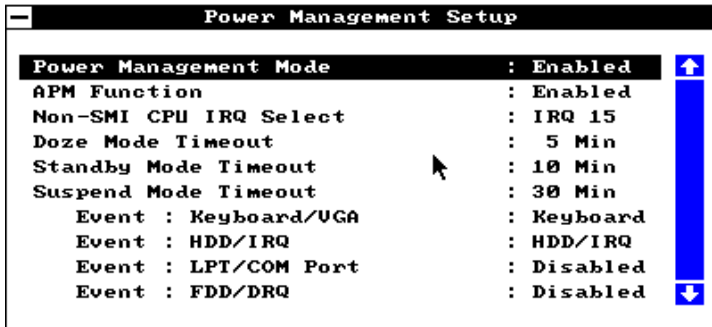
### Chipset setup options

Function	Options
Auto Configuration Function	Disabled/Enabled
	7.16
	CPU Bus Speed/3
	CPU Bus Speed/4
	CPU Bus Speed/5
	CPU Bus Speed/6
	CPU Bus Speed/8
DRAM Read Timing	Slow
	Normal
	Faster
	Fastest
DRAM Write Timing	Slow
	Normal
	Faster
	Fastest
SRAM Read Timing	2-1-1-1
	3-1-1-1
	3-2-2-2
	4-2-2-2

<b>Function</b>	<b>Options</b>
SRAM Write Timing	0 W 1 W
Parity check	Disabled Enabled
Hidden Refresh	Disabled Enabled
Cyrix CPU L1 Cache Mode	WT (Write-through) WB (Write-back)
ISA I/O Recovery	Disabled Enabled
CPU to PCI Write Buffer	Disabled Enabled
Byte Merge	Disabled Enabled
Fast Back to Back	Disabled Enabled
C x 5 x 86 Linear Wrapped Mode	Disabled Enabled
PCI IDE Trigger Type	Edge Level

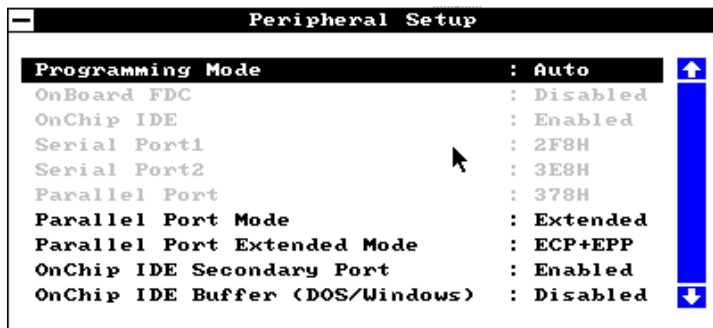
## Power Management Setup

As part of the "Green" function, the Power Management setup offers options to help reduce power consumption. To see the the options in this group, choose the Power Mgmt icon from the WinBIOS Setup main menu.



## Peripheral Setup

To access Peripheral Setup, select the Peripheral icon in the WinBIOS main menu. The following screen appears:



### Programming Option

#### Auto

When set to Auto, WinBIOS automatically detects all adapter cards installed in the system and configures the onboard I/O (serial ports, parallel ports, floppy controllers, and IDE controller). All other Peripheral Setup option settings are ignored. Any serial port, parallel port, floppy controller or IDE (Integrated Drive Electronics) controller on an adapter card in an expansion slot is configured before onboard I/O.

In addition, WinBIOS also attempts to avoid IRQ conflicts. If the offboard serial ports are configured to specific starting I/O ports via jumper settings, WinBIOS configures the onboard serial ports to avoid conflicts. For example, if the default serial port starting I/O ports (serial port1 - 3F8h, serial port2 - 2F8h, serial port3 - 3E8h, serial port4 - 2E8h) are, the configurations listed in the following table are possible:

---

### Offboard serial port configuration

---

# of ports	port assignment	onboard serial port
2	3E8h and 2F8h	3E8h and 3E8h
2	3F8h and 3E8h	3F8h and Disabled
1	2F8h	3F8h and Disabled
1	3F8h	2F8h and Disabled

### Manual

If Manual is selected, the settings chosen by the end user in the Peripheral Setup apply. WinBIOS will report any I/O conflicts after display the BIOS Configuration summary screen.

### **Onboard FDC**

This option enables the use of the floppy drive controller on the motherboard (if installed). The settings are Enabled or Disabled.

### **Onboard IDE**

This option enables the use of the IDE controller on the motherboard, if installed. The settings are enabled or Disabled.

### **First Serial Port Address**

IRQ4 is used for the first serial port (COM1). This option enables serial port 1 on the motherboard, if installed. The settings are 2E8h.

### **Second Serial Port Address**

IRQ3 is used for the second serial port (COM2). This option enables the serial port 2 on the motherboard, if installed. The settings are 2E8h.

### **Parallel Port Address**

IRQ7 is used for the parallel port (LPT1). The IRQ can be changed to IRQ5. This option enables the parallel port on the motherboard, if installed. The settings are 278h.

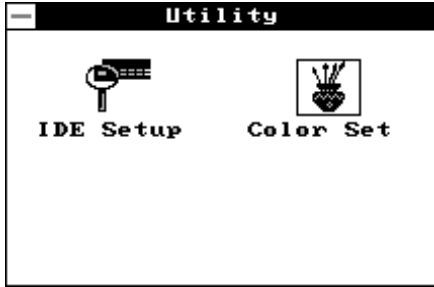
### **Parallel Port Mode**

This option specifies the parallel port Mode. The settings are Normal or Extended.

# Utility

---

The following icons appear in this section:



## **Detect C:**

If drive C: is an IDE drive, the hard disk drive parameters for drive C: are automatically detected and reported to the Hard Disk Drive C: screen in Standard Setup, so you can easily configure drive C:.

## **Detect D:**

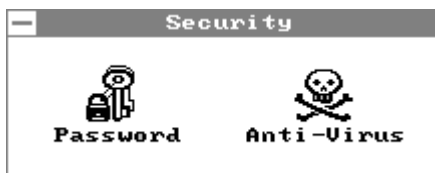
If drive D: is an IDE drive, the hard disk drive parameters for drive D: are automatically detected and reported to the Hard Disk Drive D: screen in Standard Setup, so you can easily configure drive D:.

## **Color Set**

This option sets the WinBIOS Setup screen colors.

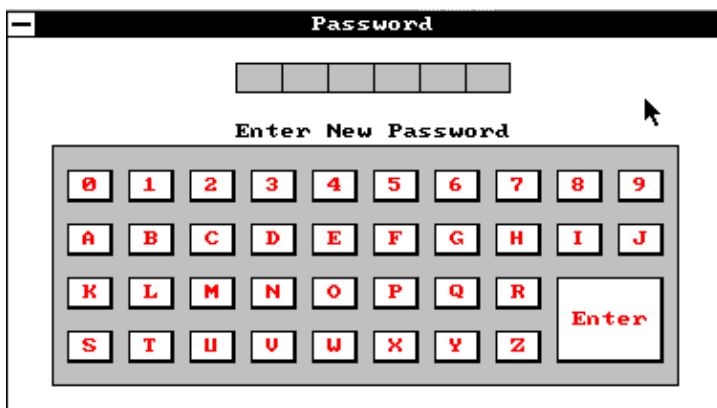
# Security

The following icons appear in this section:



## WinBIOS password support

WinBIOS Setup has an optional password feature. The system can be configured so that all users must enter a password every time the system boots or when WinBIOS Setup is executed. The following screen appears when you select the password icon.



You can enter a password by:

- typing the password on the keyboard
- selecting each letter via the mouse
- selecting each letter via the pen stylus (pen access must be customized for each specific hardware platform.)



## **Setting a Password**

The password check option is enabled in Advanced Setup by choosing either *Always* or *Setup*. Here, you determine the password to be used. The password is stored in CMOS RAM.

### **To assign a password,**

1. Enter a 1-6 character password. The password does not appear on the screen when typed.
2. Retype the password when prompted by WinBIOS.

A message box will appear when the password is confirmed.

Keep a record of the password. If you forget the password, you must drain CMOS RAM and reconfigure the system.

### **Changing a password**

1. Select the Password icon from the Security section of the WinBIOS Setup main menu.
2. Enter the password and press <ENTER>. The screen does not display the characters entered.
3. After the new password is entered, retype the new password as prompted and press <ENTER>.

If the password confirmation is incorrect, an error message appears. If the new password is entered without error, press <ESC> to return to the WinBIOS setup Main Menu. The password is stored in CMOS RAM after WinBIOS Setup completes. The next time the system boots, you are prompted for the password if the password function is present and is enabled.

## Anti-virus

Select the Anti-virus icon from the Security section of the WinBIOS Setup main menu. WinBIOS issues a warning when any program (or virus) issues a Disk format command or attempts to write to the boot sector of the hard disk drive. The settings are Enabled or Disabled.

If enabled, the following appears when a write is attempted to the boot sector. You may have to type N several times to prevent the boot sector write.

```
          Boot Sector Write !!!  
Possible VIRUS: Continue (Y/N)? _
```

The following is displayed after any attempt to format any cylinder, head, or sector of any hard disk drive via the BIOS INT 13 Hard Disk Drive Service:

```
          Format!!!  
Possible VIRUS: Continue (Y/N)? _
```

## Default

---

The icons in this section permit you to select a group of settings for all WinBIOS Setup options. Not only can you use these icons to quickly set system configuration parameters, you can choose a group of settings that have a better chance of working when the system is having configuration-related problems.



### Original

Choose the Original icon to return to the system configuration values present in WinBIOS Setup when you first began this WinBIOS Setup session.

### Optimal

You can load the optimal default settings for the WinBIOS Setup options by selecting the Optimal icon. The Optimal default settings are best-case values that should optimize system performance. If CMOS RAM is corrupted, the Optimal settings are loaded automatically.

### Fail-Safe

You can load the Fail-Safe WinBIOS Setup options settings by selecting the Fail-Safe icon.

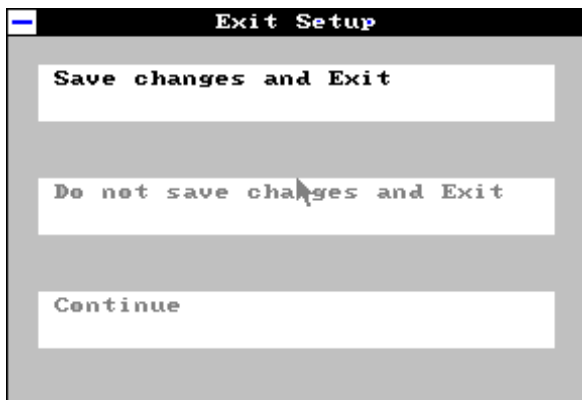
The Fail-Safe settings provide the most stable settings, though they do not provide optimal performance. Use this option as a diagnostic aid if the system is behaving erratically.

## Exiting WinBIOS

---

You can exit WinBIOS by pressing the <ESC> key while in the WinBIOS main menu screen.

The following screen appears:



Select the option you desire, and the system will continue its bootup sequence.



## **Watchdog Timer Demo Program**

The following demo program illustrates the programming steps required to enable, set, and disable the watchdog timer.

```

#include<stdio.h> #include<dos.h> #include<conio> #include
<time.h> #include<graphics.h> void mydelay(void);
/* MAIN PROGRAM */ void main (void) {
unsigned int   dog=0
              run_time=0;
              char inkey;

clrscr();
gotoxy(15, 6);printf("AAEON TECHNOLOGY, INC.");
gotoxy(15, 7);printf("WATCHDOG TIMER TEST & DEMO
PROGRAM");
gotoxy(15, 9);printf("Please setup watchdog delay
time:(2 Sec-30 Sec)");
/* Set watchdog timer time-out interval */
scanf("%2d",&dog); /* Input watchdog timer time-
out interval (Sec) */
dog=dog/2; /* Convert time-out interval
to designated Hex */
dog=15-dog;
outportb (0x443,dog); /* Enable watchdog timer */
/* Setup screen display format */
gotoxy(15,11);printf("Now enable watchdog!");
gotoxy(15,12);printf("You can put keyboard reset or
disable watchdog.");
gotoxy(15,13);printf(" [1]. Reset watchdog.");
gotoxy(15,14);printf(" [2]. Disable watchdog.");
gotoxy(15,15);printf(" [3]. Return to O.S.");
/* Read key pressed */
while(1){
    if(kbhit()){
        inkey=getch();
        switch(inkey){
            case '1': /* Reset Watchdog timer */
                gotoxy(15,11);printf("Now enable
                watchdog timer!");
                outportb(0x443,dog);
                run_time=0;
                break;
            case '2': /* Disable Watchdog timer */
                gotoxy(15,12);printf("Now
                disable watchdog timer!");
                outportb (0x43,dog);
                return;
            default : break;
        }
    }
}

```

```

mydelay();
run_time=run_time+1;

/* Display time elapsed */
gotoxy(45,11);printf("%2d.%1d sec",run_time/
10,run_time%10);
}
}
/* USER FUNCTION LIBRARY */ void mydelay(void) /*
Delay program: */ /* Delay 109.89ms (18.2Hz*2) */{
    clock_t start,end;
    start=clock();
    end=start;
    while((end-start)<2){
        end=clock();
    }
}

```





# APPENDIX B

## **Installing PC/104 Modules**

This appendix gives instructions for installing PC/104 module.

## Installing PC/104 modules

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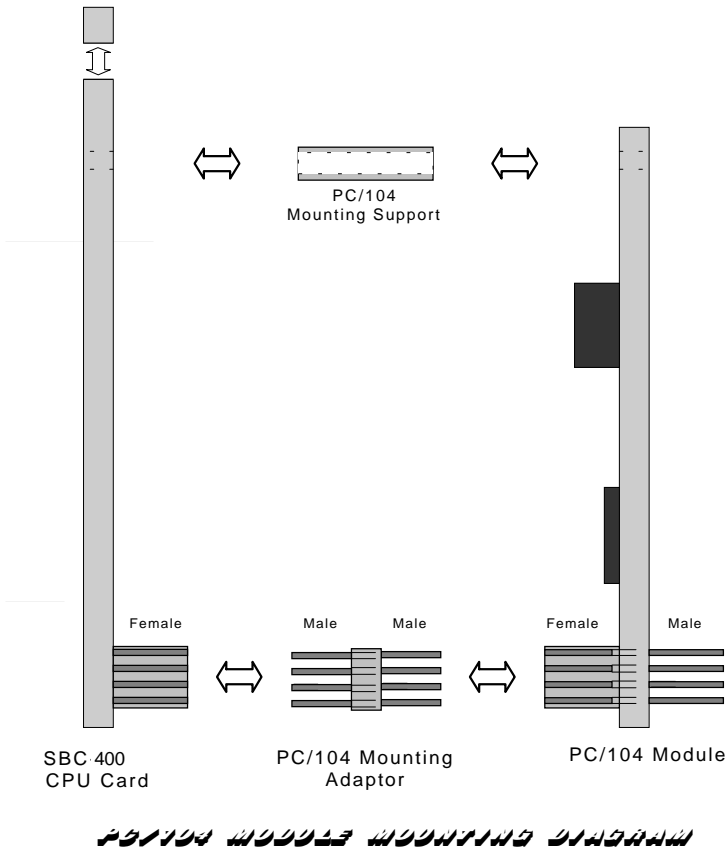
The SBC-400's PC/104 connectors give you the flexibility to attach PC/104 expansion modules. These modules perform the functions of traditional plug-in expansion cards, but save space and valuable slots. Modules include:

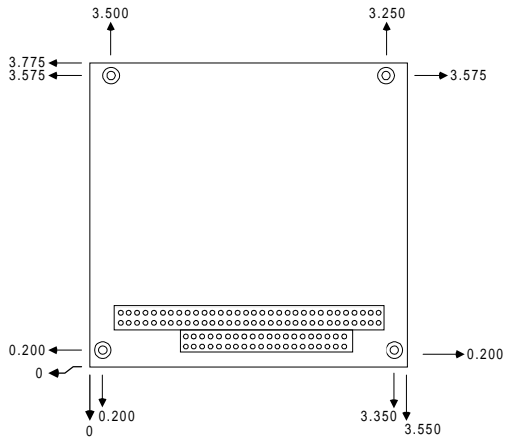
- **PCM-3290**      GPS Module
- **PCM-3810**      Solid-state Disk Module
- **PCM-3820**      High Density Flash Disk Module
- **PCM-3110**      PCMCIA Module
- **PCM-3111**      Secondary PCMCIA Module
- **PCM-3610**      Isolated RS-232 and RS-422/485 Module
- **PCM-3660**      Ethernet Module
- **PCM-3718**      30 KHz A/D Module
- **PCM-3724**      48-channel DIO Module
- **PCM-3910**      Breadboard Module

To install these modules on the SBC-400 is a quick and simple operation. The following steps show how to mount the PC/104 modules:

- Step 1      Remove the SBC-400 from your system paying particular attention to the safety instructions already mentioned above.
  
- Step 2      Make any jumper or link changes required to the CPU card now. Once the PC/104 module is mounted you may have difficulty in accessing these.
  
- Step 3      Normal PC/104 modules have "male" connectors and mount directly onto the main card. However, for reasons that ensure better bus matching, the connectors on the SBC-400 and the PC/104 module are both "female". For this reason you need to plug-in a "male-male" adapter connector (included with the SBC-400). Please refer to the following PC/104 module mounting diagram on the following page. After this is in place you then have the correct mounting connector to accept your PC/104 module.

- Step 4 Mount the PC/104 module onto the CPU card. Do this by pressing the module firmly but carefully onto the mounting connectors.
- Step 5 Secure the PC/104 module onto the CPU card using the four mounting spacers and screws.





**MODULE DIMENSIONS**