Model PCA-6126

ALL-IN-ONE 286 CPU CARD
WITH ROM DISK
(6126D/6126L)

Industrial PC Products

User's Manual

PCA-6126

ALL-IN-ONE 286 CPU CARD WITH ROM DISK

USER'S MANUAL

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Part No. 2006612601 Rev. B2
Printed in Taiwan, Jan. 1992

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CHAPTER 1. INTRODUCTION

1.1. Introduction

The PCA-6126 has been designed as an all-in-one, 16 MHz 80286 CPU card that plugs into any 16-bit expansion slot on a passive backplane, making your system IBM PC/AT compatible.

As an all-in-one CPU card, the PCA-6126 includes the following built-in features:

* 16 MHz 80286 CPU
* SIMM sockets for up to 4 MB of on-board DRAM
* Socket for a 10 MHz 80287 math co-processor
* AMI BIOS
* Headland HT-12 single chipset for low power consumption and reliability
* Floppy disk drive controller for any combination of two drives (3.5 inch, and/or 5.25 inch)
* IDE (AT-bus) hard disk drive interface for up to two hard disk drives
* Two serial ports, and one parallel port
* Programmable, built-in 360 KB ROM disk (6126D only)
* User programmable watchdog timer
* On-board keyboard connector
* Real-time clock/calendar with battery backup

The PCA-6126 has been manufactured in two models: the PCA-6126D and the PCA-6126L. The PCA-6126D comes with all the standard features and is equipped with a 360 KB ROM disk drive. The PCA-6126L is an inexpensive version of the PCA-6126D, includes all of the standard features, except for the 360 KB ROM disk drive.

This manual introduces the user to the specifications and installation of the PCA-6126 16 MHz 80286 All-in-One CPU card.

You will find that the PCA-6126's installation and setup is easy. Just set its jumpers and slide the card into any 16-bit expansion slot, and the PCA-6126 is ready to setup. Its AMI BIOS takes only seconds to setup from the keyboard. Once the initial setup is complete, the PCA-6126 is ready to go.

Choosing to program and install the 360 KB ROM disk provides for disk free operation. It replaces your physical drive A: as a virtual drive A:, allowing you to boot your system and run application programs without using a floppy disk.

The watchdog timer enhances the PCA-6126's reliability in industrial stand-alone and unmanned environments. It can be programmed to reset the PCA-6126 at various intervals to ensure that processing will proceed smoothly, uninterrupted by electromagnetic interference (EMI), software bugs, or other unexpected causes.

For added reliability and quality assurance, the PCA-6126 CPU card has been tested, and is suitable for industrial environments experiencing temperatures of up to 60 degrees Celsius (140 degrees Fahrenheit).

1.2. Specifications

* CPU: 16 MHz 80286

* Bus Interface: ISA (PC-AT) bus

* Math Co-processor: 10 MHz 80287

* Chipset: HCMOS Headland HT-12 single chipset for low power consumption and reliability

* RAM Memory: 512 KB, 1 MB, 2 MB, or 4 MB, using 256Kx9 (SIMM-256-8) or 1Mx9 (SIMM-1000-8) SIMMs (Single In-line Memory Module) with access time of 80 ns or less

Total Memory	SIMM-256-8	SIMM-1000-8
512 KB	2	-
1 MB	4	-
2 MB	-	2
4 MB	-	4

* EPROM Memory: Two 28-pin sockets for AMI BIOS

* Shadow RAM Memory: Supports for system and video BIOS in 16 KB blocks

* Extended Memory Mapping: 384 KB remapping in 64 KB blocks

* IDE (AT-Bus) Hard Disk Drive Interface: Supports up to two IDE hard disk drives, jumper enabled or disabled

* Floppy Disk Drive Interface: Supports up to two floppy disk drives, 5.25 inch (360 KB and 1.2 MB) and/or 3.5 inch (720 KB and 1.44 MB); jumper enabled or disabled

* Real-time Clock/Calendar: Real-time clock/calendar with Ni-Cd battery backup. External battery connector is provided.

* ROM Disk (6126D only): 360 KB, using three 27C010 128Kx8 bit EPROMs (or equivalent), 16 KB of memory are occupied by the ROM disk BIOS and buffer. EPROMs may be ordered separately.

* Watchdog Timer: Jumper configurable to ON/OFF or to enable/disable. The timer interval can be jumper selectable for 1.5, 15, or 150 seconds. I/O ports, hex 043 and 443, are used to access the watchdog timer.

* Watchdog Timer Accuracy: plus or minus 30%

* Parallel Port: Configurable to LPT1, LPT2, LPT3, or disable

* Serial Ports: Two RS-232 serial ports can be configured as COM1, COM2, or disabled individually. Each can be accessed through a D-9 male connector.

* DMA Channels: 7 channels of DMA

* Interrupt: 15 channels of vectored interrupts

* Keyboard Port: A keyboard connector (mini DIN 6-pin) is mounted on the PCA-6126 CPU card for easy access.

* CPU Clock: 16/8 MHz for high/low speed

* Bus Speed: 8 MHz

* PC Board: 6 layer PC board for low noise operation

* System Performance: Landmark speed(V2.0): 16/20 MHz when at 1/0 wait state

* Max Power Requirements: +5V @ 2.0A, +12V or -12V @ 0.1A

* Power Supply Voltage: +5V Vcc >4.75V and <5.25V

* Operating Temp.: 0 to 60°C (140°F)

* Board Size: 334mm(L) x 122mm (W)/0.5 Kg
  13.15"(L) x 4.8"(W)/0.227 Lbs.

CHAPTER 2. INSTALLATION

2.1. Initial Inspection

Before installing the PCA-6126, please make sure that the following materials have been shipped:

* 1 PCA-6126 CPU card

* 1 PCA-6126 User's Manual

* 1 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 Diskette containing the EMS driver software

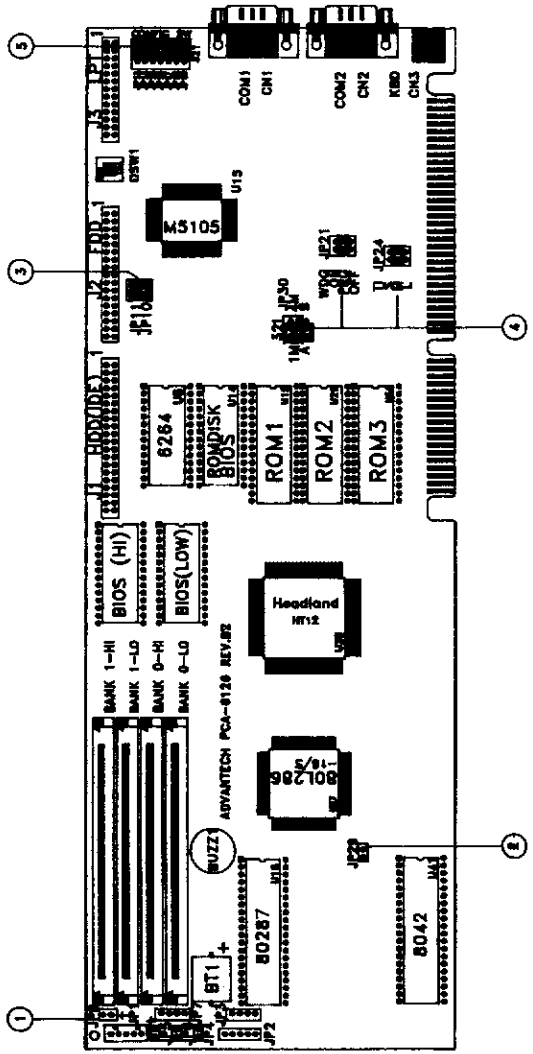
* 1 Diskette containing the ROM disk utility (6126D only)

If any of these items are missing, contact your Advantech distributor immediately.

2.2. Switch and Jumper Settings

Please refer to the following figures for the locations of all switches, jumpers and connectors.

Fig. 1 Switch and Jumper Locations



Jumper	Loc	Layout	Definition
JP1	1	1 o o o o o	Keyboard Connector 1. Clock 2. Data 3. N.C. 4. GND 5. +5V
JP2	1	1 o o o o o	Power LED and Keylock Connector 1. Power LED + 2. N.C. 3. GND 4. Keyboard Lock 5. GND
JP3	1	1 o o o o	Extrnal Speaker Connector 1. Speaker Output 2. N.C. 3. GND 4. + 5V
JP4	1	o o	Reset Switch
JP5	1	o o +	Turbo LED
JP6	1	o o	Turbo Switch
JP7	1	1 o o o o	External Battery Connector 1. +3.6V-6V (EXT.BAT+) 2. N.C. 3. GND 4. GND (EXT.BAT-)
JP8	1	o o +	HDD LED
JP10	3	1 o o	HDD Enable

Jumper	Loc	Layout	Definition
JP11	3	o o	HDD Enable
JP13	5	o o o	Reserved
JP14	5	o o o	FDD Enable/Disable
JP15 JP16 JP17	5	o o o o o o o o o	Serial port configuration
JP18 JP19	5	o o o o o o	Parallel port configuration
JP21	4	ON o o PGM o o OFF o o	Watchdog Setting ON. Watchdog Enable PGM. S/W programmable OFF. Watchdog Disable
JP24	4	S o o M o o L o o	Watchdog Timer Interval Setting S. Timeout = 1.5 sec. M. Timeout = 15 sec. L. Timeout = 150 sec.
JP29	2	o o	Color/Mono
JP30	4	1M o o o 4M o o o A o o o B	EPROM & Drive Setting 1. 1M/4M (EPROM type) 2. 1M/4M (EPROM type) 3. A: / B:

2.2.1. Parallel Port Configuration

The PCA-6126 supports one parallel port that can be configured as LPT1, LPT2 (default), and LPT3, or it can be disabled. Locate the series of jumpers (JP13 to JP19) that stand just below the parallel port connector (J3). Select the JP18 and JP19 jumpers. They are the last two sets of jumpers at the bottom of the JP13 to JP19 series.

The table, below, shows what pins to close on the JP18 and JP19 jumpers in order to configure the parallel port to your needs:

	JP18 o o o 3 2 1	JP19 o o o 3 2 1	Parallel Port
*	o o o	o o o	LPT2
	o o o	o o o	LPT1
	o o o	o o o	LPT3
	o o o	o o o	Disable

* Factory Setting

2.2.2. Serial Port Configuration

The PCA-6126's two serial ports are located on the card's retaining bracket, and can be configured as either COM1, COM2, or disabled by setting the JP15, JP16, and JP17 jumpers.

A. First, locate the JP15, JP16, and JP17 jumpers just above JP18.

B. Now, close the appropriate pins to configure the serial port to your needs.

The following table illustrates the jumper settings for the serial ports:

	JP15 o o o 3 2 1	JP16 o o o 3 2 1	JP17 o o o 3 2 1	Serial Port 1 (upper)	Serial Port 2 (lower)
*	o [o o]	o [o o]	o [o o]	COM1	COM2
	o [o o]	[o o] o	o [o o]	COM1	Disable
	[o o] o	o [o o]	o [o o]	COM2	COM1
	[o o] o	o [o o]	[o o] o	Disable	COM1
	o [o o]	o [o o]	[o o] o	Disable	COM2
	[o o] o	[o o] o	o [o o]	COM2	Disable
	o [o o]	[o o] o	[o o] o	Disable	Disable

* Factory Setting

2.2.3. Floppy Disk Drive Controller Enable/Disable

To enable or disable the PCA-6126's built-in floppy disk drive controller, the JP14 jumper must be properly set. Again, close the JP14 pins according to the specifications outlined in the following table:

	JP14 o o o 3 2 1	Floppy Drive Interface
*	o [o o]	Enabled
	[o o] o	Disabled

* Factory Setting

NOTE: JP12 and JP13 are reserved for manufacturer modification, and should **always** be set with pins 1 and 2 closed.

2.2.4. Hard Disk Drive Controller Enable/Disable

To enable or disable the PCA-6126's hard disk controller, first locate the JP10 and JP11 jumpers just below the floppy disk drive controller (J2). Close the jumpers accordingly:

	JP10 o o 2 1	JP11 o o 2 1	Hard Disk Drive Interface
*	[o o]	[o o]	Enable
	o o	o o	Disable

* Factory Setting

2.2.5. ROM Disk Setting

The PCA-6126's ROM BIOS and its work space occupy 16 KB of memory (8 KB as SRAM, and 8 KB for its data map). DIP switch, DSW1, is used to select the memory address for the ROM disk BIOS. This address must be selected in order to avoid conflicts with other firmware, such as video adapters.

If you intend to use the ROM disk, locate the DIP switch (DSW1) that lies between J2 and J3, and set the switches accordingly:

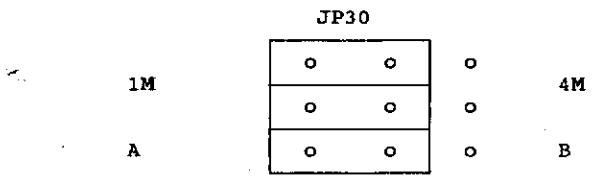
	DSW1 Position			ROM Disk Address (Segment)
	1	2	3	
	ON	ON	ON	Disable ROM Disk
	ON	ON	OFF	C400
	ON	OFF	ON	C800
	ON	OFF	OFF	CC00
*	OFF	ON	ON	D000
	OFF	ON	OFF	D400
	OFF	OFF	ON	D800
	OFF	OFF	OFF	DC00

* Factory Setting

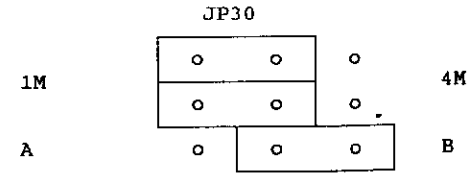
NOTE: If you intend to use the 360 KB ROM disk, it is advisable that you proceed to Chapter 5 to program the ROM disk before you actually plug the PCA-6126 into the backplane.

2.2.5.1. EPROM Size And Drive Setting

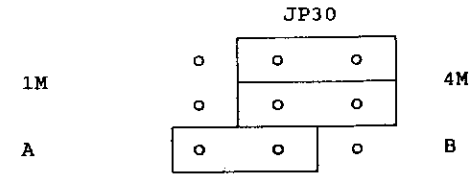
A. Using 1 Mega-bit EPROM to emulate drive A:



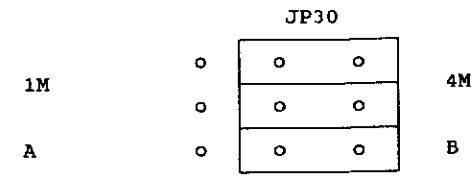
B. Using 1 Mega-bit EPROM to emulate drive B:



C. Using 4 Mega-bit EPROM to emulate drive A:



D. Using 4 Mega-bit EPROM to emulate drive B:



2.2.6. Watchdog Timer

The watchdog timer can be set at various intervals so that it will reset the PCA-6126's CPU if processing comes to a standstill, caused by EMI, software bugs ...(such as an infinity loop), or other unexpected causes.

There are three options available to the user for enabling or disabling the watchdog timer: always enabled, programmable enabled, and always disabled. To enable or disable the PCA-6126's watchdog timer, locate the JP21, JP22, and JP23 jumpers. There are about two inches below the JP10 jumper.

The following table specifies the settings for these jumpers:

	JP21 o o 2 1	JP22 o o 2 1	JP23 o o 2 1	Watchdog Timer
	[o o]	o o	o o	Always Enabled
*	o o	[o o]	o o	Programmable Enabled/Disabled
	o o	o o	[o o]	Always Disabled

* Factory Setting

The watchdog timer should be set to one of three intervals: short (1.5 seconds.), medium (15 seconds), or long (150 seconds). To set the watchdog's timed interval, locate the JP24, JP25, and JP26 jumpers, just below JP23. Set the jumpers accordingly:

	JP24 o o 2 1	JP25 o o 2 1	JP26 o o 2 1	Timer Interval
	[o o]	o o	o o	Short (1.5 sec.)
*	o o	[o o]	o o	Medium (15 sec.)
	o o	o o	[o o]	Long (150 sec.)

* Factory Setting

2.2.7. Color/Mono Display Setting

Color or mono graphics display for the PCA-6126 is set at the JP29 jumper, located near the lower, left-hand corner of the CPU. The table below illustrates the correct setting for the JP29 jumper:

	JP29 o o 2 1	Display
	[o o]	Color
*	o o	Mono

* Factory Setting

2.3. Memory Configuration

The PCA-6126 has been designed to accommodate up to 4 MB of RAM, consisting of two banks of SIMM (Single In-line Memory Module) sockets. Each bank consists of two SIMM sockets that can be configured as 512 KB or 1 MB of DRAM, using 256Kx9 SIMM, and 2 MB or 4 MB of DRAM, using 1Mx9 SIMM.

RAM access time for each configuration is 80 ns or less.

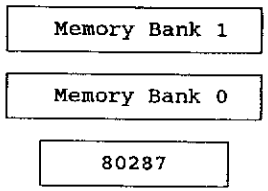
To configure the PCA-6126's memory to your needs, the following table outlines the RAM configuration:

Total Memory	SIMM-256-8 (256Kx9 SIMM)	SIMM-1000-8 (1Mx9 SIMM)	Bank
512 KB	2	N/A	0
1 MB	4	N/A	0 & 1
2 MB	N/A	2	0
4 MB	N/A	4	0 & 1

2.3.1. SIMM Installation

Installing SIMM on the PCA-6126 is very simple.

A. First, locate the CPU card's memory banks (U1); bank 0 is closest to the 80287 math co-processor socket, bank 1 is located just above bank 0 (see the following diagram).



NOTE: Memory bank 0 is always filled first.

B. When installing each SIMM card, make sure that the DRAM chips are facing the 80287 socket, and that the card's gold pins are pointing down into the SIMM socket.

C. Slip each SIMM into a socket at a 45 degree angle, fitting the bottom of the card snugly into place.

D. Gently push the SIMM into a vertical (90 degree) position until the card's edges snap into place between the socket's retaining guides.

E. Check to ensure that each SIMM fits snugly, and does not move around in its socket.

2.4. Installing the PCA-6126 onto the Passive Backplane

Before you plug in the PCA-6126 CPU card, be sure that all power cords, and peripheral cables (monitors, printers, etc.) are disconnected from the chassis.

A. Choose an available 16-bit expansion slot on the backplane, and plug in the CPU card. Use the CPU card's retaining bracket as a guide between

the edge of the backplane and the chassis' retaining wall.

B. Make sure that the CPU card is properly seated in the expansion slot.

C. Fasten the CPU card's retaining bracket to the chassis' retaining wall with a screw.

2.5. Connectors

2.5.1. Keyboard Connectors

The PCA-6126 is equipped with a mini-DIN, 6-pin connector at (CN3), and comes with an adaptor so you can conveniently connect your keyboard to the back of the CPU card.

If you do not wish to use this feature, you can plug your existing keyboard connector into JP1 on the CPU card, and use the DIN socket located on the passive backplane.

The following table shows the pin specifications of the JP1 and CN3 connections:

JP1	CN3	Signal
Pin - 1	Pin - 5	CLOCK
Pin - 2	Pin - 1	DATA
Pin - 3	Pin - 2, 6	N.C.
Pin - 4	Pin - 3	GND
Pin - 5	Pin - 4	+5V

2.5.2. Serial Port Connector

The PCA-6126 comes with two, RS-232 serial ports (CN1 and CN2). Serial port connection data is listed in the following table:

Port 1 CN1	Port 2 CN2	Signal
Pin - 1	Pin - 1	DCD
Pin - 2	Pin - 2	RX
Pin - 3	Pin - 3	TX
Pin - 4	Pin - 4	DTR
Pin - 5	Pin - 5	GND
Pin - 6	Pin - 5	DSR
Pin - 7	Pin - 7	RTS
Pin - 8	Pin - 8	CTS
Pin - 9	Pin - 9	RI

2.5.3. Parallel Port Connector

The PCA-6126 is equipped with an on-board parallel port, located at J3, and comes with a 26-pin adapter cable that has a D-25 connector mounted to a retaining bracket.

A. To connect the adapter cable to J3, make sure that the cable's red or blue stripe corresponds to pin 1 on the J3 connector.

B. Once the adapter cable has been connected to the J3 connector, fasten the D-25 connector to the chassis' retaining wall with a screw.

The following table gives a description of the parallel port's configuration:

Parallel (DB-25)	Signal Name	Printer (C-36)
Pin - 1	STROBE	Pin - 1
Pin - 2	DATA 0	Pin - 2
Pin - 3	DATA 1	Pin - 3
Pin - 4	DATA 2	Pin - 4
Pin - 5	DATA 3	Pin - 5
Pin - 6	DATA 4	Pin - 6
Pin - 7	DATA 5	Pin - 7
Pin - 8	DATA 6	Pin - 8
Pin - 9	DATA 7	Pin - 9
Pin - 10	-ACKNOWLEDGE	Pin - 10
Pin - 11	BUSY	Pin - 11
Pin - 12	PAPER EMPTY	Pin - 12
Pin - 13	+SELECT	Pin - 13
Pin - 14	-AUTO FEED	Pin - 14
Pin - 15	-ERROR	Pin - 15
Pin - 16	-INIT PRINTER	Pin - 16
Pin - 17	-SELECT INPUT	Pin - 17
Pin - 18-25	GROUND	Pin - 19-30, 16, 33

2.5.4. Floppy Disk Drive Connector

The PCA-6126's floppy disk drive interface supports any combination of two floppy disk drives (5.25 inch, 360 KB and 1.2 MB; and/or 3.5 inch, 720 KB and 1.44 MB).

A. Locate the floppy disk drive connector, at J2, on the CPU card.

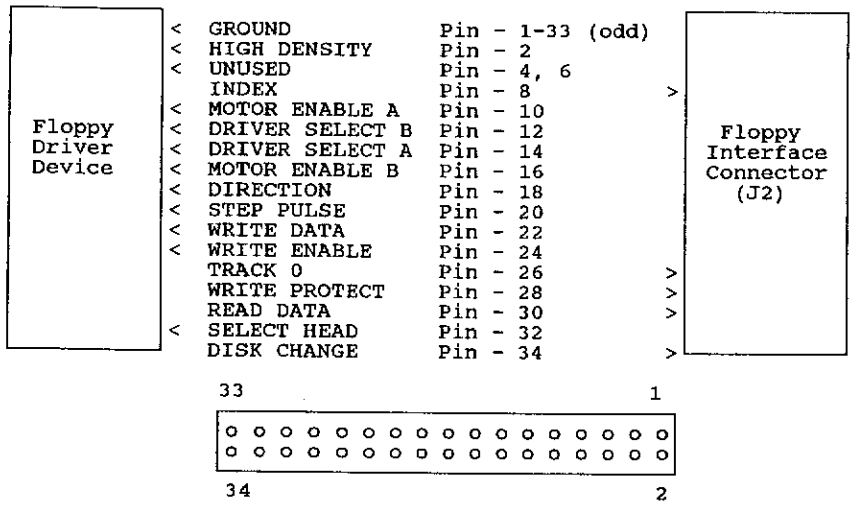
B. Take the 34-pin daisy-chain cable that has been provided with the card, and make sure that the red or blue stripe corresponds with pin 1 of the CPU card's connector (J2).

C. Once you have identified pin 1, connect the cable to the card.

D. Connect the other end of the cable to your floppy disk drive. The end with the twisted cable designates the disk drive that you connect it to as drive A:. The connector below that designates drive B:.

NOTE: If you decide to utilize the PCA-6126's ROM disk as disk drive A:, your physical floppy disk drive A: will automatically be replaced by the ROM disk. The ROM disk emulates a virtual drive A: that can be programmed to boot the system, and run user applications.

The following diagram shows how the PCA-6126 interface between the card's floppy disk drive connector and the floppy drive device:



NOTE: The color of pin 1 on the connector cable is red or blue. All other pins on the cable are grey.

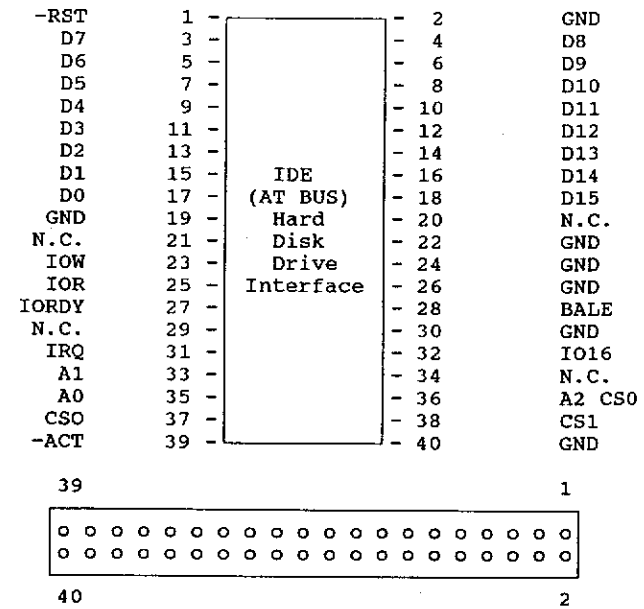
2.5.5. Hard Disk Drive Connector

The PCA-6126 also supports an IDE (AT bus), hard disk drive interface, which supports two hard disk drives. The IDE interface connection is located on the CPU card at J1.

A. Take the 40-pin ribbon connector that is provided with the PCA-6126, and connect it to the connector at J1, making sure that the red or blue stripe on the connector cable corresponds with pin 1 on J1.

B. Now, connect the other end of the cable to your hard disk drive.

The following diagram illustrates the PCA-6126's IDE (AT bus) hard disk drive connection:



NOTE: The color of pin 1 of the connector cable is red or blue. All other pins on the cable are gray.

2.5.6. Power LED and Keylock Connector

The power LED and keylock connector is located on the PCA-6126 at JP2 (near the battery). Connect the LED and keylock lead from the chassis to the JP2 connector.

The following table specifies the JP2 pin connections:

JP2	Description
Pin - 1	LED POWER +
Pin - 2	N.C.
Pin - 3	GROUND
Pin - 4	KEYBOARD LOCK
Pin - 5	GROUND

2.5.7. External Speaker Connector

The PCA-6126 comes equipped with its own buzzer. If you want to connect the computer chassis' external speaker, you may do so by connecting the speaker's lead wire to the CPU card's external speaker connector, located at JP3.(see the Fig. 1)

The following table gives the external speaker connector's specifications:

Connector	Description
Pin - 1	SPEAKER OUT
Pin - 2	N.C.
Pin - 3	GROUND
Pin - 4	+5V DC

2.5.8. Reset Switch Connector

Locate the reset lead wire on the computer chassis, and connect it to the CPU card's JP4 connector.

2.5.9. Turbo LED Connector

Locate the turbo LED lead wire on the computer chassis, and connect it to the CPU card's JP5 connector.

2.5.10. Turbo Switch Connector

Locate the turbo switch lead wire on the computer chassis, and connect it to the CPU card's JP6 connector.

2.5.11. Hard Disk Drive LED Connector

Locate the hard disk drive LED lead wire on the computer chassis, and connect it to the CPU card's JP8 connector.

2.5.12. External Battery Connector

The PCA-6126 has a connector (JP7) for an optional, external battery connector. An external battery connector serves as a backup for the PCA-6126's on-board, lithium battery that supplies power to the computer's real-time clock.

If you have an external battery connector and wish to use it with the PCA-6126, connect it to the CPU card's JP7 connector.

The following table gives the JP7 connection's specifications:

JP7	Description
Pin - 1	+5V - +6V (BATTERY+)
Pin - 2	N.C.
Pin - 3	GND
Pin - 4	GND (BATTERY-)

CHAPTER 3. AMI BIOS

3.1. Turning On the Power

The first time you power up your system, you will need to follow the directions given in the following sections to specify your system's configuration, initialize and format your hard disk drive, and install system hardware. Follow the setup instructions according to the type of system BIOS your PCA-6126 had installed either AMI BIOS or Quadtel.

There are three procedures you will need to follow in this chapter:

1. Turn on your system's power.
2. Run the setup program to specify your system's configuration parameters.
3. Initialize and format your hard disk drive.

3.2. AMI BIOS Setup

The AMI BIOS setup program allows you to specify your system's hardware and memory configuration. (The AMI BIOS has its own program stored in ROM. There is no need for a seperate diskette to run this utility.)

The following instructions will assist in running the AMI BIOS' setup program:

1. If your system is already up and running, simultaneously press the Ctrl, Alt, and Del keys to reboot your system. If you have not yet turned on your system, please do so at this time.
   When the system has run through its power-on-self-test (POST), the following message will appear on your monitor's screen:

```
Press <Del> if you want to run SETUP or DIAGS
```

2. Press Del, and the following message will appear:

```
EXIT FOR BOOT
RUN CMOS SETUP
RUN DIAGNOSTICS
```

3. Highlight "RUN CMOS SETUP" by using the ↓ key to move the highlight bar, and press Enter. The AMI BIOS screen will appear on your monitor, similar to the one below:

```
CMOS SETUP (C) Copyright 1985-1990, American Megatrends Inc.,

Date (mn/date/year): Wed. Mar 15, 1989      Base memory size:  640 KB
Time (hour/min/sec): 13:29:34               Ext. memory size:  384 KB
Floppy drive A:      1.44 MB, 3.5"          Numeric processor: Not Installed
Floppy drive B:      Not Installed

                     Cyln  Head  WPcom  LZone  Sec  Size
Hard disk C: type:   1224  16    1224   1224   36   330 MB
Hard disk D: type:   820   6     820    820    17    42 MB
Primary display:     VGA or EGA
Keyboard:            Installed
BIOS shadow option:  Disabled
Scratch RAM option:  1
EMS size option:     0 KB
Waited stated option:Enabled
Memory relocation:   Enabled

Fixed type = 01....46, USER defined type = 47
For type 47 Enter: Cyln,Head,WPcom, LZone,Sec,
(WPcom is 0 for ALL, 65535 for NONE)

ESC = Exit, ↓ ← ↑ → = Select, PgUP/PgDn = Modify
```

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	28	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

To highlight the BIOS parameters, use the ↓ ← ↑ → keys, and the PgUP and PgDn keys to modify the values you need.

Date and Time

Set the system's date and time by highlighting the AMI BIOS' date and time feature. Then cycle through the settings with the PgUP and PgDn keys to select the appropriate date and time setting.

Floppy Disk Drive Configuration

To configure your system's floppy disk drives, highlight Floppy drive A: and/or Floppy drive B: with the arrow keys. Then use the PgUP and PgDn keys to select the drive specifications that correspond to the floppy disk drive you are using with your system.

NOTE: If you are not using any floppy disk drives with your system, be sure to specify Floppy drive A: or B: as "Not Installed."

Configuring your system's video display with the AMI BIOS setup program tells your system what type of video display it is using. Highlight this feature, and use the PgUP and PgDn keys to select the type of video display you are using.

To configure you monitor to your system, select the option that best describes the video adapter you are using from the following list:

* Monochrome (including MDA and Hercules)
* Color 40x25 (40-column mode)
* VGA or EGA
* Color 80x25 (80 column mode)
* Not Installed

The PCA-6126's AMI BIOS supports 46 hard disk drive types, plus one user definable drive type. To select the hard disk drive type you are using, first check the AMI BIOS Hard Disk Drive table in Section 3.3. to identify your drive's parameters.

Drive type 47 is user definable, and allows you to define your own hard disk drive parameters.

To select a desired drive type, highlight Hard disk C: and/or Hard disk D:, and cycle through the list until find the type that best describes the type of hard disk drive you are using.

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."

EMS memory size option

Use this option to indicate the presence or use of EMS memory in your system. Be sure that the memory relocation have been Enabled first, then enter the amount of memory in the EMS size options field is used by the BIOS to initialize the HT12 chip's EMS registers. All or part of the system's memory over 1 MB can be used as expanded memory.

When you are finished configuring your system with the AMI BIOS setup program, press Esc, and the following message will appear on your screen:

```
Write data into CMOS and exit (Y/N)
```

To save the setup information and exit the setup program, type "Y," and press Enter. The AMI BIOS will cold boot your system and 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.

3.3. AMI BIOS Hard Disk Drive Table

Type	Cylns.	Heads	WPcomp	LZone	Capacity
1	306	4	128	305	10 MB
2	615	4	300	615	21 MB
3	615	6	300	615	31 MB
4	940	8	512	940	64 MB
5	940	6	512	940	48 MB
6	615	4	NONE	615	21 MB
7	462	8	256	511	31 MB
8	733	5	NONE	733	31 MB
9	900	15	NONE	901	115 MB
10	820	3	NONE	820	21 MB
11	855	5	NONE	855	36 MB
12	855	7	NONE	855	51 MB
13	306	8	128	319	21 MB
14	733	7	NONE	733	44 MB
15	000	0	000	000	00 MB
16	612	4	ALL CYLS	663	21 MB
17	977	5	300	977	42 MB
18	977	7	NONE	977	58 MB
19	1024	7	512	1023	61 MB
20	733	5	300	732	31 MB
21	733	7	300	732	42 MB
22	733	5	300	733	32 MB
23	306	4	ALL CYLS	336	10 MB
24	925	7	ALL CYLS	925	56 MB
25	925	9	NONE	925	72 MB
26	754	7	754	754	46 MB
27	754	11	NONE	754	72 MB
28	699	7	254	699	42 MB
29	823	10	NONE	823	71 MB
30	918	7	918	918	55 MB
31	1024	11	NONE	1024	98 MB
32	1024	15	NONE	1024	133 MB
33	1024	5	1024	1024	44 MB
34	612	2	128	612	10 MB
35	1024	9	NONE	1024	80 MB
36	1024	8	512	1024	71 MB
37	615	8	128	615	42 MB
38	987	3	987	987	25 MB
39	987	7	987	987	60 MB
40	820	6	820	820	42 MB
41	977	5	977	977	42 MB
42	981	5	981	981	42 MB
43	830	7	512	930	50 MB
44	930	10	NONE	830	72 MB
45	917	15	NONE	918	115 MB
46	000	00	000	000	00 MB

3.4. AMI BIOS Checkpoint Codes

When you first power up your system, the AMI BIOS will run through a power-on-self-test (POST) routine to check the status of your system's hardware and memory.

What happens that the BIOS signals a checkpoint by sending a code to I/O address, 80H. This is used to establish how far the POST has been executed throughout the power-on sequence. If there are any errors or hardware failures, the POST will locate and identify the problem. This information is useful if you need to troubleshoot faulty system boards.

You can purchase an optional Checkpoint Card to perform the checkpoint operation, from your dealer/distributor

The following list of checkpoint codes gives the I/O address and description of each respective checkpoint for the AMI BIOS's POST.

POST Error Codes	
01	NMI disabled & 286 reg. test about to start
02	286 register test over
03	ROM checksum OK
04	8259 initialization OK
05	CMOS pending interrupt disabled
06	Video disabled & system timer counting OK
07	8253 CH-2 test OK
08	CH-2 delta count test OK
09	CH-1 delta count test OK
0A	CH-0 delta count test OK
0B	Parity status cleared
0C	Refresh and system timer OK
0D	Refresh line toggling OK
0E	Refresh periods ON/OFF 50% OK
0D	Confirmed refresh On & about to start 64 KB memory
11	Address line test OK
12	64 KB memory base test OK
13	Interrupt vectors initialized
14	8042 keyboard controller test OK
15	CMOS read/write test OK
16	CMOS checksum/battery check OK
17	Monchrome mode set OK
18	Color mode set OK
19	About to look for optional video ROM
1A	Optional video ROM control OK
1B	Display memory R/W test OK
1C	Display memory R/W test for aleternate display OK
1D	Video retrace check OK
1E	Global equipment byte set to video OK
1F	Mode set call for Mono/Color OK
20	Video test OK
21	Video display OK
22	Power on message display OK
30	Virtual memory mode test about to begin

POST Error Codes (Cont.)	
31	Virtual memory mode test started
32	Processor in virtual mode
33	Memory address line test in progress
34	Memory address line test in progress
35	Memory below 1 MB calculated
36	Memory size computation OK
37	Memory test in progress
38	Memory initialization over (below 1 MB)
39	Memory initialization over (above 1 MB)
3A	Display memory size
3B	About to start below 1 MB memory test
3C	Memory test below 1 MB OK
3D	Memory test above 1 MB OK
3E	About to go to real mode shutdown
3F	Shutdown successful and enter into real mode
40	About to disable gate A-20 address line
41	Gate A-20 line successfully disabled
42	About to start DMA controller test
4E	Address line test OK
4F	Processor in real mode after shutdown
50	DMA page register test OK
51	DMA unit-1 base register test about to start
52	DMA unit-1 channel OK, about to begin CH-2
53	DMA CH-2 base register test OK
54	About to test f/f latch for unit
55	f/f latch test for both units OK
56	DMA unit 1 & 2 programmed OK
57	8259 initialization over
58	8259 mask register check OK
59	Master 8259 mask register OK, about to start slave
5A	About to check timer and keyboard interface level
5B	Timer interrupt OK
5C	About to test keyboard interrupt
5D	ERROR! timer/keyboard interface not in proper level
5E	8259 interrupt controller error
5F	8259 interrupt controller test OK
70	Start keyboard test
71	Keyboard BAT test OK
72	Keyboard test OK
73	Keyboard global data initialization OK
74	Floppy disk drive setup about to start
75	Floppy disk drive setup OK
76	Hard disk drive setup about to start
77	Hard disk drive setup OK
79	About to initialize timer data area
7A	Verify CMOS battery power
7B	CMOS battery verification done
7D	About to analyze diagnostics test results for memory
7E	CMOS memory size update OK
7F	About to check optional ROM C000:0

POST Error Codes (Cont.)	
80	Keyboard sensed to enable SETUP
81	Optional ROM control OK
82	Printer global data initialization OK
83	RS-232 global data initialization OK
84	80287 check/test OK
85	About to display soft error message
86	About to give control to system ROM E000:0
87	System ROM E000:0 check over
00	Control given to int-19, boot loader

CHAPTER 4. EMS DEVICE DRIVER

The Memory Management System is a device driver which manages the expanded memory space available for the PCA-6126.

4.1. EMS Driver Installation

In order to use the PCA-6126's expanded memory, you must follow the instructions outlined below:

A. Copy the HT12EMS.SYS driver from the factory supplied utility diskette onto your bootable disk drive.

If you boot from hard disk drive C:, insert the EMS utility diskette into drive A:. Now, type COPY A:\HT12EMS.SYS C:\, and press Enter.

If you do not have a hard disk drive, you may use two floppy disk drives: drive A:, and drive B:. Insert a bootable floppy diskette into drive A:, and insert the EMS utility diskette into drive B:, type COPY A:\HT12EMS.SYS B:\, and press Enter. Now, insert your bootable diskette into drive A:, and strike any key.

B. Add the following line to your CONFIG.SYS file on your boot drive:

DEVICE=HT12EMS.SYS

By including this command line in your CONFIG.SYS file, the EMS driver will be loaded with other default hardware values of the I/O address that enable the EMS driver and the memory address used for EMS paging.

If you already have a CONFIG.SYS file, use a text editor to create ASCII text that will add the new command line to your existing CONFIG.SYS file. You can also use the COPY CON: command described below to create a new CONFIG.SYS file. You may also add other lines to the old file as needed. Insert a new line at the top of your CONFIG.SYS file. If you experience compatibility problems with the CONFIG.SYS file's other devices, move the EMS line down one line and try it again. Shuffling the lines in your CONFIG.SYS file may solve

device driver conflicts.

If you do not have a CONFIG.SYS file, create one. To create a CONFIG.SYS file, follow the instructions listed below.

1. If you boot your system from drive A:, type COPY CON: A:\CONFIG.SYS.
2. Press Enter.
3. Type DEVICE=HT12EMS.SYS.
4. Press Enter
5. At this time, type any other lines you wish to add to the CONFIG.SYS file. If you do not want to add any other lines, then go to the next step.
6. Press the <F6> or type ^Z (Ctrl Z), this generates a ^Z symbol which signifies the end of a command sequence. Press Enter when you are ready to copy the completed CONFIG.SYS file to your hard disk drive root directory or bootable diskette.

C. Run the setup utility (refer to Chapter 3 for instructions on how to run the AMI BIOS). Set the following option in the setup utility:

[XXXXK] EMS Memory

D. When the EMS driver is executed, a title and copyright notice will appear on the screen as follows:

```
AMI Expanded Memory Manager Version 4.00 (HT12 03.01)
Copyright American Megatrends Inc. 1989, 1990, All Rights Reserved.

        Testing Memory: XXXXK
```


CHAPTER 5. ROM DISK

The PCA-6126D is the only model that is equipped with the 360KB/1.44MB ROM disk drive. The PCA-6126's 360KB/1.44MB ROM disk utilizes either 128Kx8-bit (1 Mega-bit) or 512Kx8-bit (4 Mega-bit) EPROMs (order separately) to emulate drive A: or drive B:

The ROM disk feature enhances diskless operations for dedicated, run-only applications. With the ROM disk enabled, you can boot your system and run application automatically, without using a mechanical disk drive.

To program the ROM disk's EPROMs, you need an EPROM programmer, a formatted diskette, and the ROM disk utility program disk.

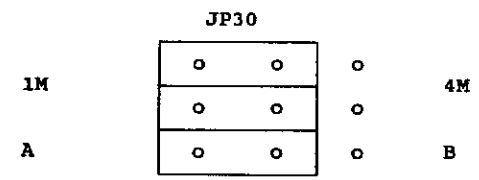
With the help of the attached ROM disk utility "COOKROM.EXE", it is easy to make the ROM disk. COOK.EXE will check the master diskette first, and find out the percentage of diskette usage. Then, COOKROM.EXE will split the master diskette's content into up to 3 binary files. Only the useful data on the diskette will be processed. It is suggested to use other available utilities, such like PCTOOLS, or Norton Utilities, to avoid your diskette from fragmentary usage.

NOTE: The ROM disk features does not necessarily have to be utilized by the user. You can always disable this feature by setting the DIP switch (DSW1) in accordance with section 2.2.5.

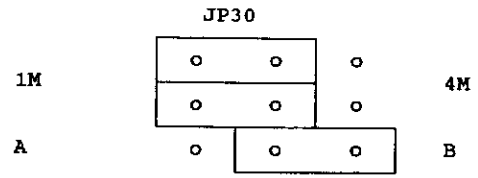
5.1. Utilizing 1 Mega-bit EPROM To Emulate 360KB Disk Drive

5.1.1. Jumper Setting

A. To emulate drive A:



B. To emulate drive B:



5.1.2. Available EPROMs

Intel D27C010, AMD Am27C010, Atmel At27C010 or equivalent.

5.1.3. Examples

If you would like to make a bootable 360K ROM-Disk by 1 Mega-bit EPROMS, following instructions will be helpful for you to program and install the PCA-6126's ROM Disk:

A. First, prepare a 360KB floppy diskette which contains the DOS system files(i.e. IBMBIO.COM, IBMDOS.COM, COMMAND.COM, or equivalent), and any other files you will use. If necessary, create a CONFIG.SYS file or an AUTOEXEC.BAT file.

B. Execute the PCA-6126's ROM disk utility program "COOKROM.EXE". This will generate three files (at most):
ROM1.BIN(for chip U19), ROM2.BIN(for chip U29), ROM3.BIN(for chip U34), onto your hard disk or floppy disk, according to your assignment.

C. Prepare an EPROM programmer (such as Advantech's PC-UPROG) that supports Atmel At27C010 (or equivalent). Follow the EPROM programmer's operation instructions to program and verify the EPROMS chip by chip.

D. Insert the programmed EPROM chips into sockets ROM1, ROM2, and ROM3 accordingly.

E. Set the DIP switch (DSW1) to its proper setting to enable the ROM disk.

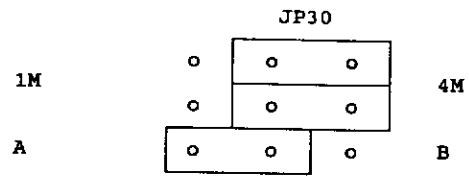
Set the JP30 to select 1 Mega EPROM and to emulate drive A:

F. Disconnect the physical floppy A: or change it to drive B:, then reboot the system. ROM disk will replace the phsical floppy drive A: as a read-only virtual drive A:

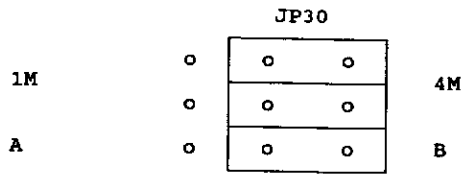
5.2. Utilizing 4 Mega-bit EPROM To Emulate 1.44MB Disk Drive

5.2.1. Jumper Setting

A. To emulate drive A:



B. To emulate drive B:



5.2.2. EPROM

Intel D27C040, AMD Am27C040 or equivalent.

5.2.3. Examples

If you would like to make a bootable 1.44M ROM-Disk by 4 Mega-bit

EPROMS. The following instructions will be helpful for you to program and install the PCA-6126's ROM Disk:

A. First, prepare a 1.44MB floppy diskette which contains the DOS system files(i.e. IBMBIO.COM, IBMDOS.COM, COMMAND.COM, or equivalent), and any other files you use. If necessary, create a CONFIG.SYS file or an AUTOEXEC.BAT file.

B. Execute the PCA-6126's ROM disk utility program "COOKROM.EXE". This will generate three files (at most):
ROM1.BIN(for chip U19), ROM2.BIN(for chip U29), ROM3.BIN(for chip U34), onto your hard disk or floppy disk, according to your assignment.

C. Prepare an EPROM programmer (such as Advantech's PC-UPROG) that will support Intel D27C0040, 512Kx8-bit EPROM (or equivalent). Follow the EPROM programmer's operational instructions to program and verify the EPROMS chip by chip.

D. Insert the programmed EPROM chips into sockets ROM1, ROM2, and ROM3 accordingly.

E. Set the DIP switch (DSW1) to its proper setting to enable the ROM disk. Set the JP30 to select 1 Mega EPROM and to emulate drive A:

F. Disconnect the physical floppy A: or change it to drive B:, then reboot the system. ROM disk will replace the phsical floppy drive A: as a read-only virtual drive A:

CHAPTER 6. WATCHDOG TIMER

The PCA-6126 is equipped with a watchdog timer that resets the system if processing comes to a standstill, caused by electromagnetic interference (EMI), software bugs, or any other unexpected causes. This feature ensures system reliability in industrial stand-alone and unmanned environments.

Refer to section 2.2.6. for instructions on enabling and disabling the watchdog timer.

6.1. Programming the Watchdog Timer

If you choose to select the user programmable (enable/disable) mode for the watchdog timer, close jumper JP22 on the PCA-6126 CPU card. By choosing this function, the user must program one of the following two instructions.

READ I/O PORT 443(hex) : Enable and refresh the watchdog timer
READ I/O PORT 043(hex) : Disable the watchdog timer

To enable the watchdog timer, you must program an instruction that will read I/O port, address 443. At the same time, you will also want to program this instruction so that it not only reads I/O port, address 443, but also periodically refreshes and initializes the watchdog before it has a chance to reset the system at its timed interval.

While the PCA-6126's CPU is processing, the watchdog timer resets the system at intervals previously set at the JP24, JP25, and JP26 jumpers (short, 1.5 seconds; medium, 15 seconds; long, 150 seconds). This can be troublesome because the system is unnecessarily reset each time a timed interval occurs; processing does not ordinarily occur that frequently.

By programming an instruction that periodically refreshes the watchdog timer, you can prevent it from unnecessarily resetting the system. If CPU processing does come to a standstill, the watchdog timer will then reset the system, without any problems.

To program an instruction that periodically refreshes the watchdog timer, you must write the program so that it reads I/O port, address 443 at an interval shorter than the watchdog's preset timed interval. This procedure ensures that

the watchdog timer is periodically refreshed and initialized before it has a chance to reset the system unnecessarily.

In other words, if the watchdog's timed interval is set at, say 15 seconds, you should program an instruction that will repeatedly refresh the watchdog at about 10 seconds or less, ensuring that it will not reset the system unnecessarily.

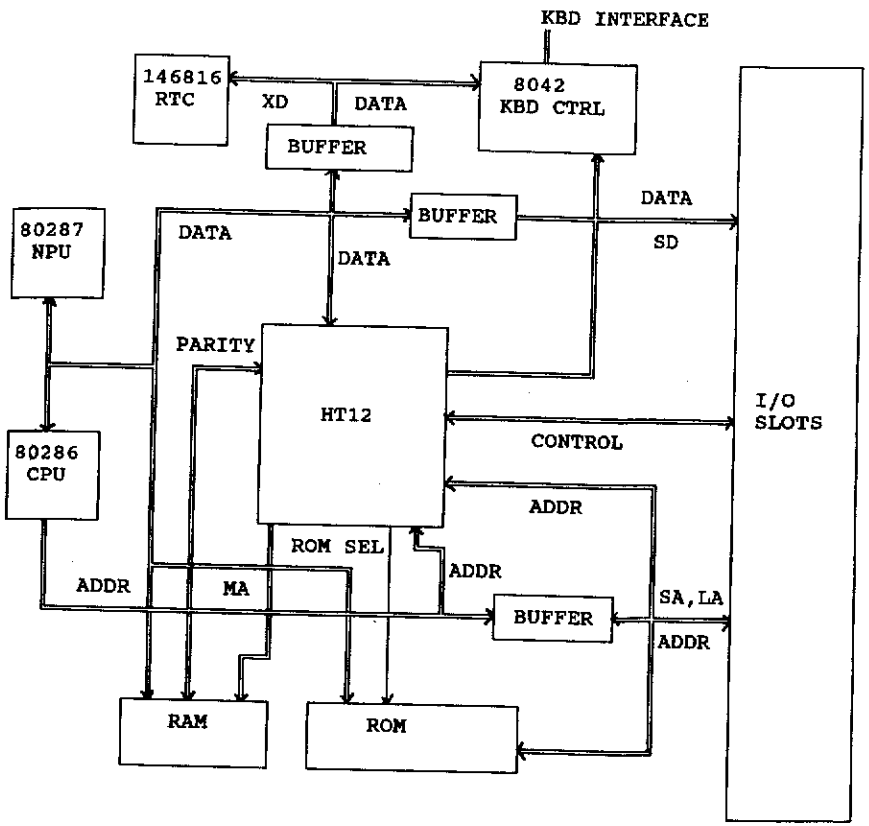
Keep in mind that the watchdog's timed intervals have a tolerance of plus or minus 30%. So, if you set the watchdog timer at a 15 second interval, program an instruction that will repeatedly refresh it within 10 seconds. For example your program could be written as:

```
10 REM EXAMPLE PROGRAM
20 X=INP(&H443) REM ENABLE AND REFRESH THE WATCHDOG
30 GOSUB 1000 REM  TASK #1, 2 SEC
40 GOSUB 2000 REM  TASK #2, 3 SEC
50 GOSUB 5000 REM  TASK #3, 4 SEC
60 GOTO 20
70 END


1000 REM SUBROUTINE #1, TAKE 2 SEC TO COMPLETE
   .
   .
   .
1070 RETURN


2000 REM SUBROUTINE #2, TAKE 3 SEC TO COMPLETE
   .
   .
   .
2090 RETURN


5000 REM SUBROUTINE #3, TAKE 4 SEC TO COMPLETE
   .
   .
   .
5080 RETURN
```

To disable the watchdog timer, you should program a similar instruction that will read I/O port, address 043.

CHAPTER 7. SYSTEM INFORMATION

7.1. Block Diagram



7.2. I/O Address Map

Hex Range	Device
000-01F	DMA controller
020-03F	Interrupt controller 1, Master
040-05F	8254 Timer
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

7.3. Bus Connectors

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 CH CK	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

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

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

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
D14	-DACK7	Output
D15	DRQ7	Input
D16	+5Vdc	Power
D17	-MASTER	Input
D18	GND	Ground

7.4. CMOS RAM Index Register Address Map

Address	Description
00-0D	* Real-time clock information
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

7.5. Real-time Clock Information (Index Address 00-0D)

Byte	Function	Address
0	Seconds	00
1	Second alarm	01
2	Minutes	02
3	Minute alarm	03
4	Hours	04
5	Hours alarm	05
6	Day of week	06
7	Date of month	07
8	Month	08
9	Year	09
10	Status register A	0A
11	Status register B	0B
12	Status register C	0C
13	Status register D	0D

7.6. DMA, Interrupt and Timer

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	
Hex Address	Command Codes
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

Page Address	
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

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