AT4+

CPU Manual

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Chapter 1–Introduction

Product Overview

The AT4+ CPU board is based on a 80486 processor. This highly integrated, eight-layer board supports up to 128 Mbytes of fast page mode interleave DRAM, and provides an integrated floppy disk drive controller that supports up to two floppy disk drives. It also offers a high-performance, cost-effective integrated drive electronics (IDE) hard disk interface, two serial ports, one parallel port, and a VGA controller with flat panel support.

Standard Features

- **CPU**
    - 486SX and 486DX at 33 MHz and 486DX2 at 66 MHz, and 486DX4 at 100 MHz
    - 8 Kbyte internal cache
    - Eight SIMM sites support up to 128 Mbytes of parity-checked DRAM
    - Real-time clock with on-board battery backup
    - Keyboard port
    - Speaker jack on ORB
    - 8.33 MHz ATbus speed
- **I/O Controller**
    - IDE hard disk interface (supports two drives)
    - SA450 floppy disk interface (supports two drives)
    - Two 16550-compatible RS-232C serial ports
    - One Centronics-compatible parallel port
- **On-Board Local Bus Video Controller**
    - VGA analog output
    - 1 Mbyte Super VGA support
    - Flat panel driver circuitry
    - Local bus video

Block Diagram
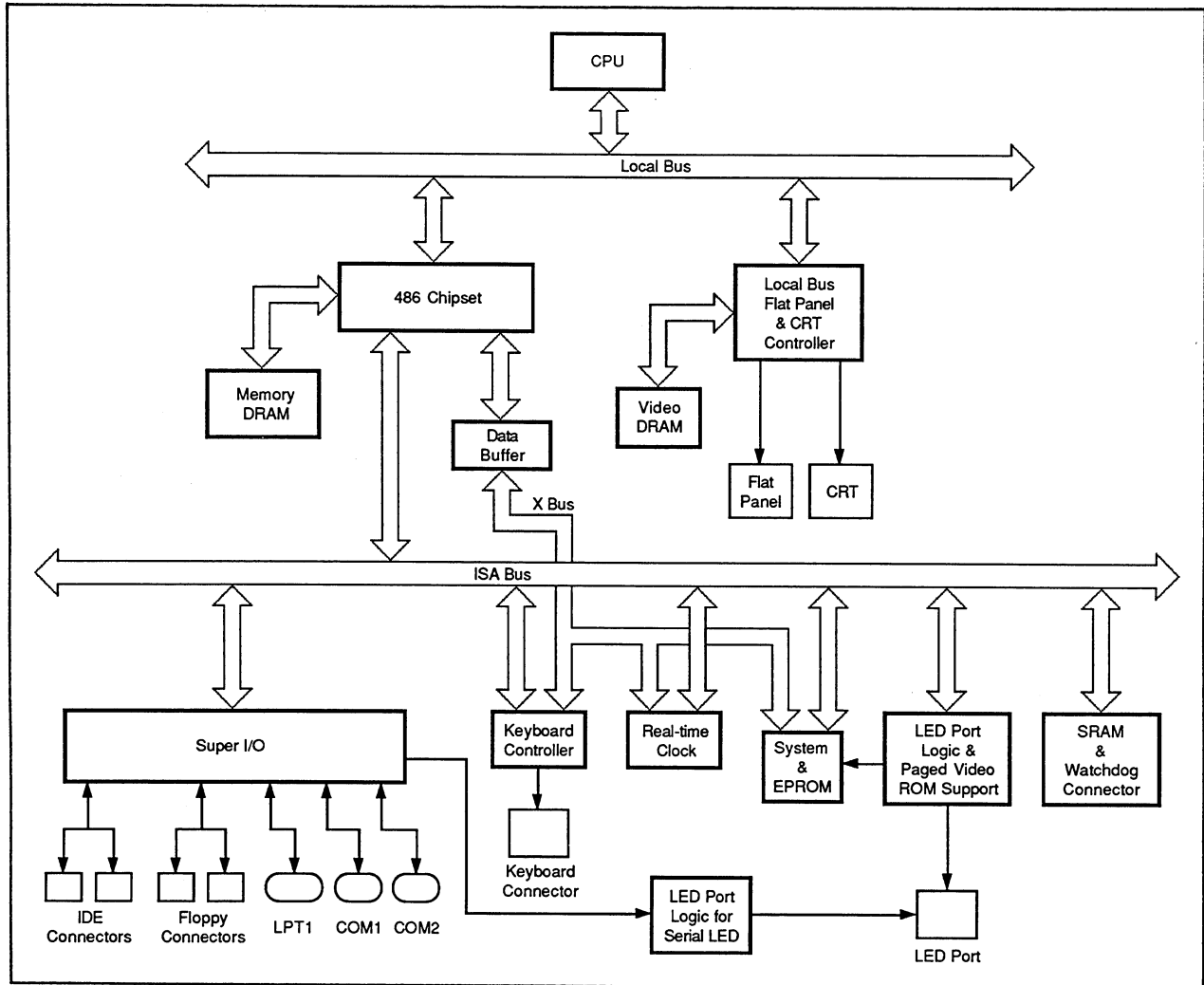
Figure 1-1. AT4+ Board Block Diagram

CPU

Features of the 486SX/DX/DX2/DX4 are highlighted below:

- Full 32-bit internal architecture
- 8-, 16-, 32-bit data types
- Eight general purpose 32-bit registers
- Object code compatible with 8086, 80186, 80286, and 80386 processors
- Runs MS-DOS, OS/2, and UNIX
- High-performance 32-bit data bus with 33 MHz clock
- Integrated Memory Management Unit (MMU)
- Virtual memory support
- Optional on-chip paging
- Four levels of hardware-enforced protection
- Virtual 8086 mode allows executing 8086 Software in a protected and paged system
- Large uniform address space
- Mbyte physical
- 64 Terabyte virtual
- 4 Gigabyte maximum segment size
- On-chip debugging support including breakpoint registers
- 486-compatible instruction set
- On-chip 8 Kbyte instruction/data cache
- Highly optimized variable length pipeline and on-chip 16-bit hardware multiplier

AT Chipset

The 82C836 AT chipset—located at site U24—provides the following features:

- 486 control logic and clocks support CPU speeds up to 33 MHz with zero (or one) wait states
- 146818-compatible real-time clock with 114 bytes of CMOS RAM
- Two 8237-compatible DMA controllers
- Two 8259-compatible interrupt controllers
- 8254-compatible programmable interval timer
- 82284-compatible clock generation and READY interface
- 82288-compatible bus controller

- DRAM controller that supports DRAM SIMM modules up to 16Mx9
- Memory controller that provides shadow RAM and support for 8-bit BIOS ROM
- DRAM refresh controller
- Four EMS page register (LIM EMS 4.0 and 3.2 compatible)
- Interface logic for an 80487SX numeric co-processor
- Interface logic for an 8042 keyboard controller
- Fast Gate A20 and Fast CPU Reset logic

VGA Controller

The on-board local bus SVGA controller (Cirrus Logic, Model #CL-GD6440) supports all IBM VGA, EGA, CGA, and MDA modes to the register level. The VGA adapter contains 1 Mbyte DRAM and supports Super VGA up to 1024 x 768 by 256 colors. The 8-bit VGA BIOS defaults to shadowed mode, which increases video performance.

The VGA controller supports IBM modes 0-13h. In addition to these standard IBM modes, the following Super VGA resolutions are supported:

- 132 x 25 text
- 132 x 50 text
- 800 x 600 x 16 colors
- 800 x 600 x 16 colors
- 1024 x 768 x 256 colors
- 640 x 400 x 256 colors
- 640 x 480 x 256 colors
- 800 x 600 x 256 colors

Jumpers are provided to disable the VGA (refer to Table 2-1). This allows other video adapters to be used.

I/O Controller

The I/O controller provides the system's serial, parallel, floppy, and IDE ports.

Chapter 2–Board Configuration

Board Layout
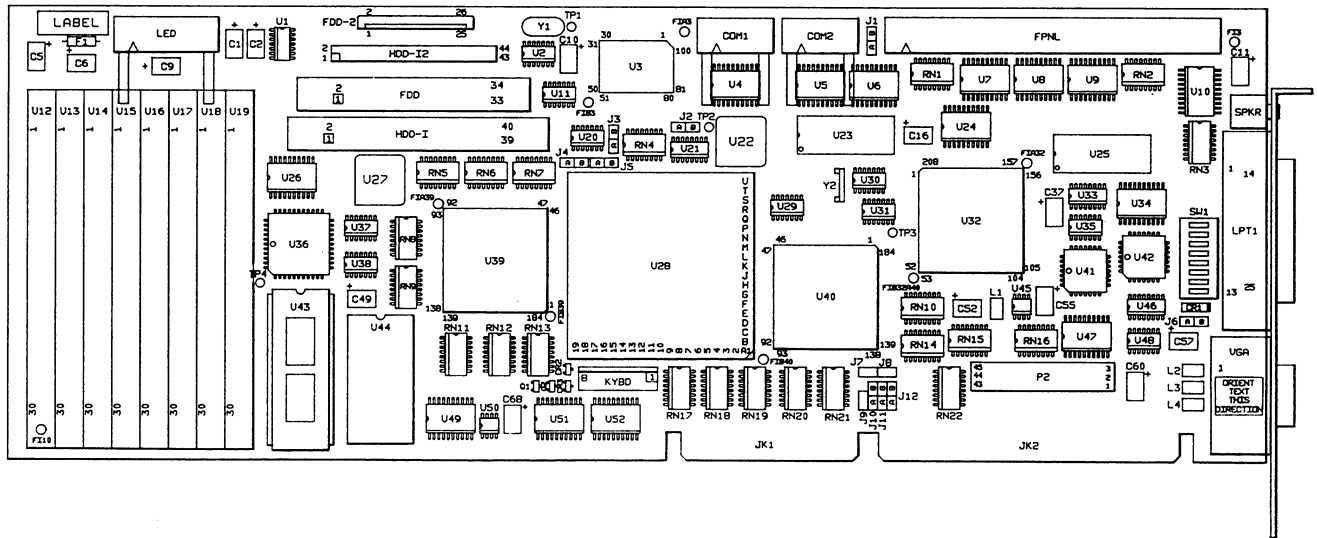
Figure 2-1. AT4+ Board Layout
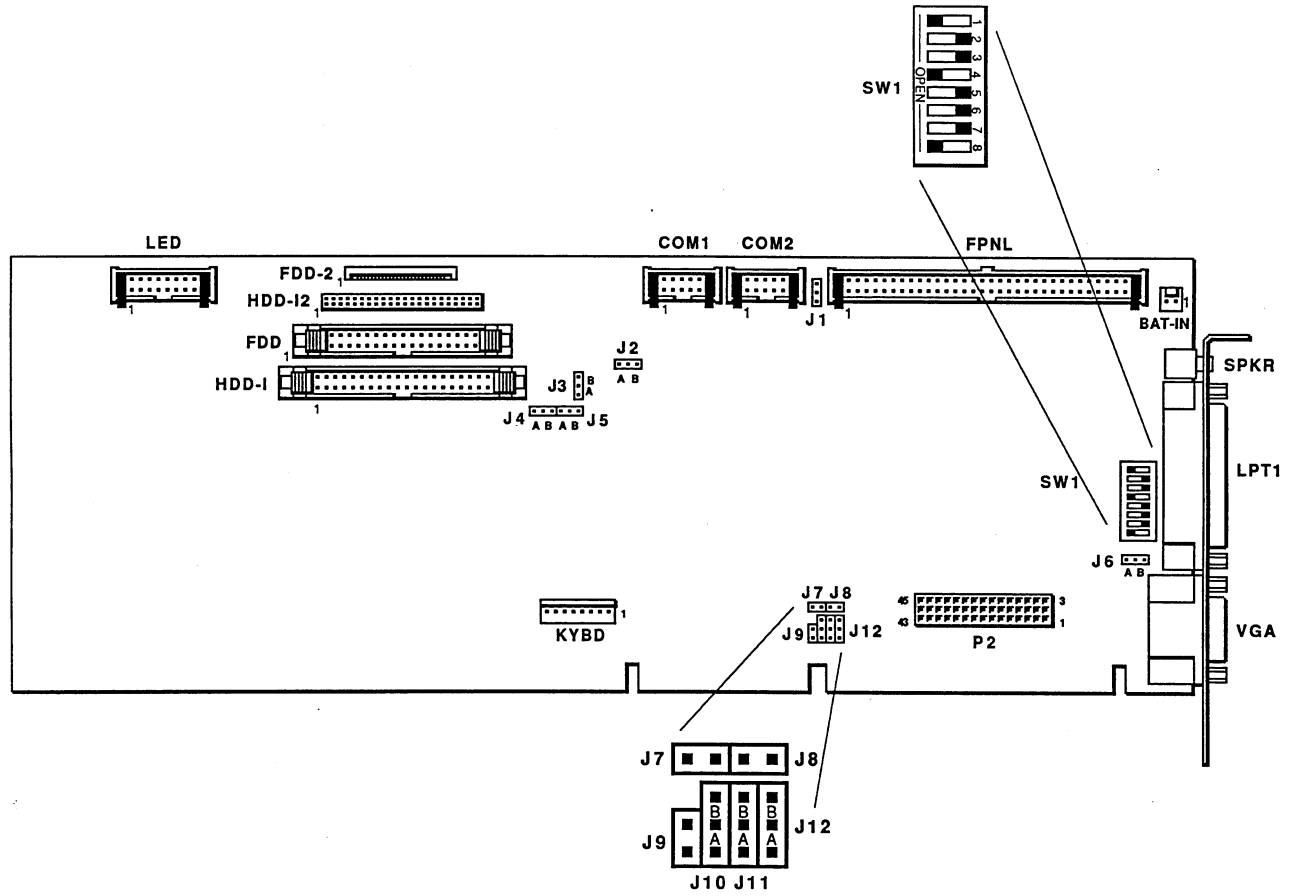
Figure 2-2. AT4+ Jumpers, Connectors, and Switches

Jumper Settings

The table below lists the AT4+ jumpers, their default positions, and their functions (as illustrated in Figure 2-2).

Table 2-1. AT4+ Jumpers

Jumper	Position	Function
J1	A✓ B	Normal flat panel SHFCLK signal Inverted flat panel SHFCLK signal
J2	A✓ B	Oscillator enabled Oscillator disabled
J3	A✓ B	82C7xx chip enabled (I/O controller) 82C7xx chip disabled
J4, J5	A✓ B	486/487 486SX
J6	A✓ B	ORB not connected to logic GND ORB connected to logic GND
J7, J8, J9	IN✓ OUT	VGA enabled VGA disabled
J10	A✓ B	Parallel port set for IRQ7 (LPT1) Parallel port set for IRQ5 (LPT2)
J11	A✓ B	Secondary COM port set for IRQ3 (COM2) Secondary COM port set for IRQ11 (COM4)
J12	A✓ B	Primary COM port set for IRQ4 (COM1) Primary COM port set for IRQ10 (COM3)

✓indicates the default settings

Disabling Functional Blocks

The VGA controller can be disabled by removing jumpers J7, J8, and J9. The IDE and floppy drives and the parallel and COM ports can be disabled through the BIOS Setup Menus (refer to Chapter 3). You can also disable the I/O controller by changing J3 from A to B.

Battery-Backed RAM and Real-time Clock

The AT4+ uses a self-contained, battery-backed real-time clock. The real-time clock is specified for 10 years of operation in the absence of power at 70°C. Switch SW1-1 is used to clear CMOS memory. See switch setting table on the following page.

Switch Settings

The table below lists the available switch options and their default settings for the AT4+.

Table 2-2. Switch Settings

Switch	Position	Function
SW1-1	Open Closed✓	Clear CMOS memory CMOS is okay
SW1-2	Open Closed✓	Unused Unused
SW3-3	Open Closed✓	Monochrome display Color display
SW1-4,	Open Closed✓	Keyboard unlocked Keyboard locked
SW1-5	Open Closed✓	FPSEL3=1 FPSEL3=0
SW1-6	Open Closed✓	FPSEL2=1 FPSEL2=0
SW1-7	Open Closed✓	FPSEL1=1 FPSEL1=0
SW1-8	Open Closed✓	FPSEL0=1 FPSEL0=0

✓indicates the default settings

Flat Panels Supported by AT4+

The following table lists the flat panels supported by the AT4+ and their associated switch settings. It also lists the switch settings reserved for future flat panel types.

Table 2-3. Flat Panels Supported

SW1-5	SW1-6	SW1-7	SW1-8	Flat Panel Type
Closed	Closed	Closed	Closed	CRT
Closed	Closed	Closed	Open	Monochrome
Closed	Closed	Open	Closed	Color STN (passive)
Closed	Closed	Open	Open	Color TFT (active)
Closed	Open	Closed	Closed	Reserved
Closed	Open	Closed	Open	Reserved
Closed	Open	Open	Closed	Reserved
Closed	Open	Open	Open	Reserved
Open	Closed	Closed	Closed	Reserved
Open	Closed	Closed	Open	Reserved
Open	Closed	Open	Closed	Reserved
Open	Closed	Open	Open	Reserved
Open	Open	Closed	Closed	Reserved
Open	Open	Closed	Open	Reserved
Open	Open	Open	Closed	Reserved
Open	Open	Open	Open	Reserved

CPU Configurations

The AT4+ is designed to support a 33 MHz 486SX, 486DX, 486DX2, and 100 MHz 486DX4. The CPU is field upgradable to any CPU configuration.

Memory Maps

The AT4+ has 2, 4, 8, 16, and 32 Mbyte memory maps, one for each of the five possible local memory configurations (see Figures 2-3 thru 2-7).

FFFE0000-FFFFFFFF	System BIOS 128K
200000-FDFFFF	I/O Memory 14208K
100000-1FFFFF	DRAM 1024K
0F0000-0FFFFF	System BIOS 64K
0E0000-0EFFFF	ATbus I/O 64K
0C8000-0DFFFF	ATbus I/O 96K
0C0000-0C7FFF	VGA BIOS 32K
0A0000-0BFFFF	VGA DRAM Memory 128K
000000-09FFFF	DRAM 640K

Figure 2-3. 2 Mbyte Memory Map (as seen by the 486 CPU)

FFFE0000-FFFFFFFF	System BIOS 128K
400000-FDFFFF	I/O Memory 12160K
100000-3FFFFF	DRAM 3072K
0F0000-0FFFFF	System BIOS 64K
0E0000-0EFFFF	ATbus I/O 64K
0C8000-0DFFFF	ATbus I/O 96K
0C0000-0C7FFF	VGA BIOS 32K
0A0000-0BFFFF	VGA DRAM Memory 128K
000000-09FFFF	DRAM 640K

Figure 2-4. 4 Mbyte Memory Map (as seen by the 486 CPU)

FFFE0000-FFFFFFFF	System BIOS 128K
A00000-FDFFFF	I/O Memory 6016K
100000-7FFFFF	DRAM 7168K
0F0000-0FFFFF	System BIOS 64K
0E0000-0EFFFF	ATbus I/O 64K
0C8000-0DFFFF	ATbus I/O 96K
0C0000-0C7FFF	VGA BIOS 32K
0A0000-0BFFFF	VGA DRAM Memory 128K
000000-09FFFF	DRAM 640K

Figure 2-5. 8 Mbyte Memory Map (as seen by the 486 CPU)

FFFE0000-FFFFFFFF	System BIOS 128K
EE0000-FDFFFF	I/O Memory 1024K
100000-EDFFFF	DRAM 15232K
0F0000-0FFFFF	System BIOS 64K
0E0000-0EFFFF	ATbus I/O 64K
0C8000-0DFFFF	ATbus I/O 96K
0C0000-0C7FFF	VGA BIOS 32K
0A0000-0BFFFF	VGA DRAM Memory 128K
000000-09FFFF	DRAM 640K

Figure 2-6.16 Mbyte Memory Map (as seen by the 486 CPU)

FFFE0000-FFFFFFFF	System BIOS 128K
2100000-FFFDFFFF	I/O Memory 110M
100000-20FFFFFF	DRAM 32768K
0F0000-0FFFFF	System BIOS 64K
0E0000-0EFFFF	ATbus I/O 64K
0C8000-0DFFFF	ATbus I/O 96K
0C0000-0C7FFF	VGA BIOS 32K
0A0000-0BFFFF	VGA DRAM Memory 128K
000000-09FFFF	DRAM 640K

Figure 2-7. 32 Mbyte Memory Map (as seen by the 486 CPU)

I/O Map

The AT4+ I/O map contains all IBM PC/AT architecture I/O ports, with some additions. The AT4+ is shipped with serial ports 1 and 2 and parallel port 1 enabled at the address specified. Standard PC/AT I/O addresses are shown in Table 2-4, on the following page. Status/LED port bits are described in Table 2-5, and CMOS RAM addresses are listed in Table 2-6.

Table 2-4. I/O Address Map

Hex Range	Device
000-01F	DMA Controller 1, 8237A-5 equivalent
020-021	Interrupt Controller 1, 8259 equivalent
022-023	Available
028	Headland chipset index register (see Note 3)
024	Headland chipset data register (see Note 3)
025-02F	Interrupt Controller 1, 8259 equivalent (see Note 3)
040-05F	Timer, 8254-2 equivalent
060-06F	8742 equivalent (keyboard)
070-07F	Real-time clock, bit 7 NMI mask (see Note 3)
080-091	DMA page register (see Note 3)
92	Port 92 (see Note 3)
93-9F	DMA page register (see Note 3)
0A0-0BF	Interrupt controller 2, 8259 equivalent (see Note 3)
0C0-0DF	DMA controller 2, 8237A-5 equivalent (see Note 3)
0F0	N/A
0F1	N/A
0F2-0FF	N/A
100	Cirrus 6440 power-up configuration register
101-1EF	Available
1F0-1F7	IDE controller (AT drive)
231	Xycom LED Port
278-27F	Parallel Port 2 (see Note 1)
280-2F7	Available
2F8-2FF	Serial Port 2 (see Note 1)
300-36F	Available
370-377	Alternate floppy disk controller (see Note 1)
378-37F	Parallel Port 1 (see Note 1)
380-3BF	Available
3C0-3CF	VGA/EGA2 (see Note 2)
3D0-3EF	Available
3F0-3F7	Primary floppy disk controller
3F8-3FF	Serial Port 1 (see Note 1)

Note 1

The serial and parallel port addresses may be changed or the port may be disabled. Therefore, these addresses may be used for some applications and not for others.

Note 2

Reference the Cirrus CL-GD6440 advance data book for detailed information.

Note 3

Reference the Headland HTK340 data book for detailed information.

Xycom enclosures feature six status LEDs. Three are wired to hardware (power, disk, and COM). The remaining three–Maintenance, Fault, and RADAR–are programmable and can be accessed through Xycom's LED/Status register, located at address 231h. Table 2-5 defines the bits in this eight-bit register.

Table 2-5. LED/Status Port (address 231h)

Bit	Read/Write	Description
0	R/W	1 Maintenance LED is off 0✓Maintenance LED is on
1	R	0✓Not used
2	R/W	1 Fault LED is off 0✓Fault LED is on
3	R/W	1 RADAR LED is on 0✓RADAR LED is off
4	R	0 Not used
5	R	0 Not used
6	R	0 Not used
7	R	1 CMOS OK 0 Clear CMOS memory

✓Indicates state after a hard reset (not <Ctrl> <Alt> <Del>)

Bits 0, 2, and 3 are reserved for use with the RADAR card; bits 1 and 4 are not used; and bit 7 reflects the status of the CMOS memory (see Table 2-6, on the following page for the CMOS Address RAM Map).

Table 2-6. CMOS RAM 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
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	Disk C extended byte
1A	Disk D extended byte
1B-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
40-5F	Reserved
60-6F	Reserved for Xycom CMOS
70-7F	Reserved

System Interrupts

Table 2-7 describes the interrupts used on the AT4+.

Table 2-7. AT4+ System Interrupts

Interrupt	Function
IRQ1	Keyboard controller
IRQ2	Cascade controller
IRQ3	Secondary COM port (COM2)*
IRQ4	Primary COM port (COM1)*
IRQ5	Parallel port (LPT2)*
IRQ6	Floppy drive
IRQ7	Parallel port (LPT1)*
IRQ8	Real-time clock
IRQ9	VGA controller
IRQ10	Primary COM port (COM3)*
IRQ11	Secondary COM port (COM4)*
IRQ14	IDE hard drive interface

*Interrupt selection depends on jumper configuration. See Table 2-1.

Shadow RAM

Shadowing is the process of loading the BIOS form EPROM into DRAM after power-up. Both the System and VGA BIOS can be shadowed into DRAM to increase system performance. Because shadowing the BIOS increases system performance, the AT4+ is factory-shipped with the System BIOS and Video BIOS shadowed.

All versions of the AT4+ allocate 384 Kbytes of DRAM for shadowing the BIOS and/or EMS memory.

Connectors

The connectors for the AT4+ are described below. Pinouts for each of the connectors are listed in Appendix A.

Floppy Drive Connector (FDD and FDD-2)

Floppy drive connector FDD is a 34-pin header; FDD-2 is a 26-pin flat flexible connector (FFC). They are the interface and control connections for up to two floppy drives.

IDE Hard Drive Connectors (HDD-I and HDD-12)

IDE hard drive connector HDD-1 is a 40-pin header; HDD-12 is a 44-pin header. They are the control connectors for any hard drive(s) interfaced with the AT4+. The board can control up to two hard drives.

COM1 Serial Port Connector (COM1)

COM1 is a 10-pin dual row header. A 10-pin ribbon socket to 9-pin IDC style adapter is required. For more information, refer to the system manual.

COM2 Serial Port Connector (COM2)

COM2 is a 10-pin dual row header. A 10-pin ribbon socket to 9-pin IDC style adapter is required. For more information, refer to the system manual.

VGA Connector (VGA)

The VGA connector is a 15-pin subminiature located on the bottom right of the board.

Parallel Port Connector (LPT1)

The parallel port connector, LPT1, is a 25-pin female D subminiature connector.

Keyboard (KYBD)

The keyboard signals are located on an 8-pin ramp lock connector.

Speaker Jack (SPKR)

The speaker jack is a subminiature phone jack protruding through the ORB.

Flat Panel (FPNL)

The flat panel connector is a 64-pin dual row header.

Chapter 3–BIOS

Overview

The BIOS has been customized for the AT4+ board so it can surpass the functionality provided for normal PC/ATs. This custom BIOS allows users to access the value-added features present on the AT4+ module without interfacing the hardware directly.

General instructions for navigating through the screens are described below:

- Arrow Keys move the cursor up, down, left, and right. Pressing <Enter> validates the selection.

- <ESC> exits the menu. You are prompted to save any changes.

- <F1>0 saves the current configuration. With the exception of time and date, the configuration is not saved until <F1>0 is pressed.

- <F5> selects the previous or smaller value.

- <F6> selects the next or higher value.

- <F9> automatically configures the system with the default values. These default values are defined by the system configuration and the values set in the Setup Menu.

<table>
<tr><th>Note</th></tr>
<tr><td>Disk drives must be configured manually.</td></tr>
</table>

BIOS Main Setup Menu

The BIOS Main Setup Menu is presented as the top level in the BIOS setup menu structure. To access the Main Setup Menu, depicted below, press <Ctrl><Alt><S> simultaneously after the BIOS has completed the RAM test.

```
                    Main Setup Menu
             Copyright 1994, Xycom Inc.

  Setup
  Extended BIOS Features
  System Information
  Flat Panel
  Diagnostics

  ↑↓ Move    Enter  Select      Esc     Exit
```

Figure 3-1. Main Setup Menu

Note

The Flat Panel option in the Main Setup Menu only appears on Xycom flat panel systems.

The Diagnostics option in the Main Setup Menu only appears when a RADAR card is installed on the system.

Note

If the Solid State (Flash) Drive option is used, avoid repeated running of any hard disk diagnostic utility. The Flash Drive has a limited number of writes to each logical sector. Repeated writes from a diagnostic utility will prematurely shorten the life of the drive.

Setup Menu

On the Setup Menu, depicted in Figure 3-2 below, the time, date, and setup information contained in the CMOS RAM can be changed. This information is used by the System BIOS for system configuration.

```
Extended BIOS Setup - Copyright 1989-91 Quadtel Corporation

Current Date:    [01/01/1996]      Video System            [EGA/VGA]
Current Time:    [00:00:00]        Power-up Speed          Normal

[       640K]    System Memory     BIOS Shadow:            [System in RAM]
[      3072K]    Extended Memory                           [Video in RAM]
        96K      Shadow Memory     Wait States:            0, All Banks

Internal COM A: [COM1, 3F8h]       Internal Floppy         [Enabled    ]
Internal COMB:  [COM2, 2F8h]       Internal IDE            [Enabled    ]
Internal LPT:   [LPT1, 378h]       Setup Prompt            [Enabled]

Diskette Drive 0:  [1.44MB, 3 1/2] System Memory Cache     [On]
Diskette Drive 1:  [Not Installed]

Fixed Disk 0: Type: [None]
Fixed Disk 1: Type: [None]


←↑↓→    Move        F5  Previous Value      F9  Automatic Configuration
F1      Help        F6  Next Value          F10 Save Configuration
Esc     Exit
```

Figure 3-2. Setup Menu

Each of the options on the Setup Menu are described on the next few pages. *Default items are underlined.*

Current Date

The date entry sets the real-time clock for the month, day, and year. The left and right arrow keys and the enter key may be used to move from one field to the next. The numeric keys, 0-9, are used to change the field values. It is not necessary to type zeros in front of numbers.

Current Time(00:00:00 format)

The time entry sets the real-time clock for hours, minutes, and seconds. During the power-up sequence, the time is read from the real-time clock and saved in the BIOS system time.

The hour is calculated according to a 24-hour military clock, i.e., 00:00:00 through 23:59:59. The left and right arrow keys and the <Enter> key may be used to move from one field to the next. The numeric keys, 0-9, are used to change the field values. It is not necessary to enter the seconds or type zeros in front of numbers.

System Memory

This option should always indicate the size of conventional system memory as 640 Kbytes.

Extended Memory

This option sets the amount of extended memory in Kbyte increments. The maximum amount of extended memory is 128 Mbytes (120048 Kbytes).

Shadow Memory

This field displays the amount of shadow memory in use. The contents of this field are controlled by BIOS shadow selection. Shadow memory is used to copy the system and/or Video BIOS into RAM to improve performance. The AT4+ allocates Shadow RAM in Kbytes, and this number will be displayed on the menu. This field, which is not editable, is for reference only.

The AT4+ is shipped with the System BIOS and Video BIOS shadowed.

Internal COM A and COM B

These selections individually set the port address that will be programmed by the BIOS for each port. There are three options:

- Off

- Default for COM A   COM1 (3F8H)   OptionalCOM3 (3E8h0

- Default for COM B   COM2 (2F8h)   OptionalCOM4 (2E8h)

Note

It is recommended that automatic configuration be used to select the COM and LPT ports. Automatic configuration selects the first logical port address that does not conflick with any other communication port in your system. If the addresses are selected manually, conflicts with other devices in the system may occur.

Check the jumper settings for IRQs (see Table 2-1).

Internal LPT (Off/<u>LPT1, 378</u>/LPT1, 378h/LPT1, 3BCh)

This item selects the port addresses to be programmed by the BIOS for the internal LPT port. There are four options:

- Off
- LPT1 at 378h
- LPT1 at 278h
- LPT1 at 3bch

Diskette Drives 0 and 1

The following fields are used to specify the types of floppy disk drives connected to the PC/AT:

- Diskette Drive 0   (Not Installed/1.44MB, 3.½"/360KB, 5¼"/720KB, 3½")
- Diskette Drive 1   (Not Installed/1.44MB, 3½"/360KB, 5¼"/720KB, 3½")

Fixed Disk Drives 0 and 1

The following selection individually configures the disk drives as one of 45 drive types, a user-defined type, or none. If the type "User" is selected, several fixed disk parameters must be specified: *number of cylinders (CY), heads (HD), sectors per track (ST), landing zone cylinder (LZ), and write precompensation (WP).* Xycom has provided labels on all hard drives and Solid State drives which specify these "user" parameters.

- Fixed Disk 0   (None/1-14/16-45/User)
- Fixed Disk 1   (None/1-14/16-45/User)

Video System

There are four video adapter choices:

- EGA/VGA (Enhanced Graphics Adapter, Video Graphics Array, or any special video adapter)
- Monochrome
- CGA 40x25
- CGA 80x25

This field should not be changed from its default–EGA/VGA. This allows video functions to be controlled by the Video BIOS rather than the System BIOS.

Power-up Speed (<u>Normal</u>)

Power-up speed defaults to Normal and is *not* changeable.

BIOS Shadow (<u>System in RAM</u>/ROM, <u>Video in RAM</u>/ROM

The System BIOS and the VGA BIOS may be shadowed into DRAM. Shadowing is the process of loading the BIOS from EPROM into DRAM after power-up. Since the DRAM

bus width is 16 bits and the EPROM is only 8 bits, opcode fetches from the DRAM significantly increase system performance.

Wait States (0, All Banks)

This indicates the number of wait states for memory controlled by the chipset. The default is zero for all banks. Wait states is *not* changeable.

Internal Floppy (Disabled/Enabled)

This selection enables or disables the internal floppy disk drive controller.

Internal IDE (Disabled/Enabled)

This selection enables or disables the internal IDE hard disk drive controller.

Setup Prompt (Disabled/Enabled)

When enabled, which is the default, a prompt appears upon power-up telling users how to access the Setup Menus.

System Memory Cache (Off/On)

The system memory cache option–which refers to the 8 Kbyte internal cache on the 486– can be enabled or disabled by changing the field to On or Off. If the cache is disabled (Off), the AT4+ will take longer to perform memory accesses, thereby degrading system performance.

Extended BIOS Features Menu

The Extended BIOS Features Menu is depicted below.

```
┌─────────────────────────────────────────────────────────────────────┐
│        Extended BIOS Functions, Copyright 1989-91, Quadtel Corp.      │
├─────────────────────────────────────────────────────────────────────┤
│ Auto-park Disk: [No  ]        Keyboard Click:       [No  ]            │
│ Quick Boot:     [No  ]        Keyboard Delay        [3/4 Sec  ]       │
│ Screen Saver:   [Disabled]    Keyboard Rate:        [22/Sec  ]        │
│                               Numlock Boot State:   [Off  ]           │
├─────────────────────────────────────────────────────────────────────┤
│ ←↑↓→    Move       F5  Previous Value    F9  Automatic Configuration  │
│ Esc     Exit       F6  Next Value        F10 Save Configuration       │
└─────────────────────────────────────────────────────────────────────┘
```

Figure 3-3. Extended BIOS Features Menu

Each of the menu choices are defined below. Default items are underlined.

Auto Park Disk

This selection determines whether the System BIOS automatically parks the fixed disk drive. If this option is enabled, the System BIOS parks the fixed disk drive(s) heads after several seconds of inactivity. Most modern hard disk drives have self-parking heads, so enabling this option may not be necessary.

Caution

This feature can be incompatible with fixed disk drives that are not BIOS compatible and could cause problems with programs that do not utilize the BIOS for fixed disk I/O.

Note

Parking the heads causes some drives to spin down so that they do not respond to accesses quickly enough and display the message: "Not ready reading drive C. Abort, Retry, Fail?"

Screen Saver (Disabled/10 min/30 min/1 hour)

This option allows blanking the screen after a specified period of keyboard inactivity. This ensures that the data displayed does not permanently burn into the monitor. Blanking can be set to occur after 10 minutes, 30 minutes, or one hour, or this option can be disabled. Press any key to redisplay the screen after the screen saver has been activitated.

Caution

Do not enable the screen saver when running programs that do not use the BIOS for keyboard handling, such as Microsoft Windows. If the screen saver is enabled with these programs, the screen blanks after the specified time, regardless of activity, and can only be restored by exiting the program.

Keyboard Click (No/Yes)

If enabled, this function provides audible key press feedback by causing the BIOS to click through the system speaker every time a key is pressed. This option is only valid for systems with a speaker connected to the speaker jack (SPKR).

Keyboard Delay (1/4, 1/2, 3/4, 1 second)

This sets the amount of time that elapses after a key is pressed before the key starts to repeat. The smaller the time selected, the faster the key repeats.

Keyboard Rate (2/6/10/13/18/<u>22</u>/27/30 per second)

This option defines the rate at which the keyboard repeats while a key is pressed. The higher the number, the faster the key repeats.

Numlock Boot State (Auto/On/<u>Off</u>)

This option determines how the BIOS defines the numlock key at power-up or soft reset. Default is Off. If Auto is selected, the BIOS sets the numlock (numeric keys selected) if it detects a 101- or 102-key keyboard at power-up. If an 84-key keyboard is detected, numlock is turned off (cursor keys selected). Choosing On will select the numeric keys, regardless of keyboard; choosing Off (or leaving it as the default) will select the cursor keys, regardless of the keyboard.

System Information Menu

The System Information Menu displays data about your system configuration and is shown in Figure 3-4 below. This menu is not user configurable.

```
┌─────────────────────────────────────────────────────────────┐
│    System Information, Copyright 1989-91 Quadtel Corp.        │
├─────────────────────────────────────────────────────────────┤
│ Processor:    80486/DX        LPT1 Address: 0378h             │
│ Coprocessor: None             LPT2 Address: Unused            │
│                               LPT3 Address: Unused            │
│ BIOS ID: 3170A0000B                                           │
│ BIOS Revision: 03.06.01       COM1 Address: 03F8H             │
│                               COM2 Address: 02F8h             │
│ Programmable Memory: 4096K    COM3 Address: Unused            │
│ Other Memory:        OK       COM4 Address: Unused            │
│                                                               │
│                               Internal Mouse: No              │
├─────────────────────────────────────────────────────────────┤
│              Press <any key> to exit                          │
└─────────────────────────────────────────────────────────────┘
```

Figure 3-4. System Information Menu

The System Information Menu states the type of processor and math co-processor used, and the port addresses. The BIOS ID and revision are specified to your unit. Programmable memory is the memory controlled by the BIOS. Other memory includes ATbus memory that is annexed as DOS memory.

System Security

System security is provided to restrict access to your computer system. If you want to use system security, select this option and the following window will be displayed.

```
┌────────────────────────────────────────────────┐
│            Change system password:              │
├────────────────────────────────────────────────┤
│         Enter new password: [      ]            │
│       Re-enter new password: [      ]           │
├────────────────────────────────────────────────┤
│ F1  Help       Enter  Acccept      Esc    Exit  │
└────────────────────────────────────────────────┘
```

Figure 3-5. System Security Window

Use a password value which is easy for you to remember. You may designate up to eight characters for your password (the characters are not case sensitive). You can use any combination of numbers, characters, and letters (you can use the <Shift> key, but you cannot use the <Ctrl> or <Alt> keys). To set the password, enter the password twice. To remove your password, simply press <Enter> twice without entering any password characters.

Once a valid password has been entered, the BIOS will request the password eac time the system is powered on or soft reset.

You must enter the same sequence of digits you entered to set the password. The BIOS will also request the password before you can enter the Main Setup Menu. This prevents unauthorized access to the system security control.

If you enter an incorrect password, the following window will display:

```
┌──────────────────────────────┐
│          Notice!             │
├──────────────────────────────┤
│      Invalid Password.       │
├──────────────────────────────┤
│      Press <any key>         │
└──────────────────────────────┘
```

Figure 3-6. Incorrect Password Window

After entering an incorrect password three times, the following window will display:

```
┌──────────────────────────┐
│   !! SYSTEM DISABLED!!    │
│        (013AD8)           │
└──────────────────────────┘
```

Figure 3-7. System Disabled Window

If this window appears, the system has been halted. Reset the system and enter the correct password.

If you lose your password, write down the number in parentheses on the System Disabled Window and contact Xycom.Using this number, we can generate an alternate password that will allow you to gain access to your system.

Flat Panel Menu

If you select the Flat Panel entry in the Main Setup Menu (this selection will only appear on a Xycom flat panel system), a menu will appear only if a flat panel display is connected. If the flat panel does not support backlight blanking, "Not Available" will be in the timeout field. In a system that has a flat panel that allows backlight blanking, the menu shown below will allow you to disable backlight blanking, or set the backlight timeout.

```
Flat Panel Menu, Copyright 1994, Xycom Inc.

Backlight Blanking Timeout: [10 minutes]

Esc    Exit                  F5  Previous Value
F10    Save Configuration    F6  Next Value
```

Figure 3-8. Flat Panel Menu

When blanking is enabled, the flat panel backlight will be turned off if no keys are pressed within the specified time. The blanking timeout can be set to any multiple of five minutes up to a maximum of 60 minutes. After the backlight has been turned off, pressing any keyboard or keypad key will turn the backlight back on (the keycode of the key that was pressed to turn on the backlight will not be passed to the software currently running the system).

> **Note**
>
> The flat panel controller may not have a backlight timeout option or the backlight timeout period might not be configurable. If either of these conditions apply, "Not Available" will display.

Diagnostic Menu

When a RADAR card is installed on the system, the Diagnostics option is available. Selecting this option activates the Diagnostics Menu. Refer to the 9000-RAD manual for information on this menu.

BIOS Compatibility

This BIOS is IBM PC/AT compatible with additional CMOS RAM and BIOS data areas used.

CMOS RAM Usage

This BIOS uses the standard PC/AT battery-backed CMOS RAM. Xycom reserves addresses 60h-6Fh in addition to the standard BIOS definitions.

BIOS Data Area Usage

This BIOS uses the standard PC/AT BIOS data area locations, as well as the following locations: 0040h:00F0h, 0040h:00F2h, and 0040h:00F4h.

Appendix A - Pinouts

This appendix describes the pinouts for the AT4+ connectors defined in Chapter 2.

Floppy Drive Connector (FDD and FDD-2)

Floppy drive connector FDD is a 34-pin header; FDD-2 is a 26-pin flat flexible connector (FFC). They are the interface and control connections for up to two floppy drives.

Table A-1. Floppy Drive Connector (FDD)

Pin	Signal	Pin	Signal
1	GND	18	FDIRC*
2	FRWC*	19	GND
3	GND	20	FSTEP*
4	N/C	21	GND
5	KEY	22	FWD*
6	N/C	23	GND
7	GND	24	FWE*
8	IDX*	25	GND
9	GND	26	FTK0*
10	MO1*	27	GND
11	GND	28	FWP*
12	FDS2*	29	GND
13	GND	30	FRDD*
14	FDS1*	31	GND
15	GND	32	FHS*
16	MO2*	33	GND
17	GND	34	DCHG*

Table A-2. Floppy Drive Connector (FDD-2)

Pin	Signal	Pin	Signal
1	+5V	14	FSTEP*
2	IDX*	15	GND
3	+5V	16	FWD*
4	FDS1*	17	GND
5	+5V	18	FWE*
6	DCHG*	19	GND
7	N/C	20	FTKO*
8	N/C*	21	GND
9	N/C	22	FWP*
10	MO1*	23	GND
11	N/C	24	FRDD*
12	FDIRC*	25	GND
13	GND	26	FHS*

IDE Hard Drive Connectors (HDD-I and HDD-12)

IDE hard drive connector HDD-1 is a 40-pin header; HDD-12 is a 44-pin header. They are the control connectors for any hard drive(s) interfaced with the AT4+. The board can control up to two hard drives.

Table A-3. IDE Hard Drive Connector (HDD-I)

Pin	Signal	Pin	Signal
1	RESET*	21	N/C
2	GND	22	GND
3	IDED7	23	IOW*
4	SD8	24	GND
5	SD6	25	IOR*
6	SD9	26	GND
7	SD5	27	N/C
8	SD10	28	ALE
9	SD4	29	N/C
10	SD11	30	GND
11	SD3	31	IRQ14
12	SD12	32	IOCS16
13	SD2	33	SA1
14	SD13	34	N/C
15	SD1	35	SA0
16	SD14	36	SA2
17	SD0	37	HCS0*
18	SD15	38	HCS1*
19	GND	39	HDACTIVE*
20	N/C	40	GND

Table A-4. IDE Hard Drive Connector (HDD-12)

Pin	Signal	Pin	Signal
1	RESET*	23	IOW*
2	GND	24	GND
3	IDB7	25	IOR*
4	SD8	26	GND
5	SD6	27	N/C
6	SD9	28	ALE
7	SD5	29	N/C
8	SD10	30	GND
9	SD4	31	IDEINT
10	SD11	32	ATIOCS16
11	SD3	33	SA1
12	SD12	34	N/C
13	SD2	35	SA0
14	SD13	36	SA2
15	SD1	37	HCS0*
16	SD14	38	HCS1*
17	SD0	39	HDACTIVE*
18	SD15	40	GND
19	GND	41	+5V
20	N/C	42	+5V
21	N/C	43	GND
22	GND	44	N/C

COM1 Serial Port Connector

COM1 is a 10-pin dual row header. A 10-pin ribbon socket to 9-pin IDC style adapter is required.

Table A-5. COM1 Serial Port Connector

Pin	Signal	Pin	Signal
1	DCD1	6	CTS1
2	DSR1	7	DTR1
3	RXD1	8	R11
4	RTS1	9	GND
5	TXD1	10	NO CONNECT

COM2 Serial Port Connector

COM2 is a 10-pin dual row header. A 10-pin ribbon socket to 9-pin IDC style adapter is required.

Table A-6. COM2 Serial Port Connector

Pin	Signal	Pin	Signal
1	DCD2	6	CTS2
2	DSR2	7	DTR2
3	RXD2	8	R12
4	RTS2	9	GND
5	TXD2	10	NO CONNECT

VGA Connector

The VGA conector is a 15-pin subminiature located on the bottom right of the board.

Table A-7. VGA Connector

Pin	Signal	Pin	Signal
1	RED	9	KEY
2	GREEN	10	GND
3	BLUE	11	N/C
4	N/C	12	N/C
5	GND	13	HSYNC
6	GND	14	VSYNC
7	GND	15	N/C
8	GND		

Parallel Port Connector (LPT1)

The Parallel port connector, LPT1, is a 25-pin female D subminiature connector.

Table A-8. Parallel Port Connector

Pin	Signal	Pin	Signal
1	STROBE	14	AUTOFEED
2	PD0	15	PERROR
3	PD1	16	INIT
4	PD2	17	SELIN
5	PD3	18	GND
6	PD4	19	GND
7	PD5	20	GND
8	PD6	21	GND
9	PD7	22	GND
10	PACK	23	GND
11	PBUSY	24	GND
12	PE	25	GND
13	SELECT		

Keyboard (KYBD)

The keyboard signals are located on an 8-pin ramp lock connector.

Table A-9. Keyboard Connector

Pin	Signal
1	SPEAKER
2	+5V
3	KBINHIBIT*
4	DATA
5	CLK
6	+12V
7	GND
8	NC

Speaker Jack (SPKR)

The speaker jack is a subminature phone jack protruding through the ORB.

Table A-10. Speaker Jack Connector

Pin	Signal
TIP	SOURCES CURRENT
SLEEVE	GND

Flat Panel Connector (FPNL)

The flat panel connector is a 64-pin dual row header.

Table A-11. Flat Panel Connector

Pin	Signal	Pin	Signal
1	GND	33	GND
2	MAINT LED	34	FP11
3	FAULT LET	35	GND
4	SERIAL	36	BLANK
5	LED	37	GND
6	DRIVE LED	38	SHFCLK
7	RADAR LED	39	GND
8	GND	40	LP
9	KB CLOCK	41	GND
10	GND	42	FLM
11	RESET*	43	GND
12	GND	44	ACDCLK
13	ENAVDD*	45	GND
14	GND	46	FP17
15	ENAVEE*	47	FP18
16	GND	48	FP19
17	FP0	49	FP20
18	FP1	50	GND
19	FP2	51	FP21
20	FP3	52	FP22
21	GND	53	FP23
22	FP4	54	FP24
23	FP5	55	GND
24	FP6	56	N/C
25	FP7	57	N/C
26	GND	58	N/C
27	FP8	59	N/C
28	GND	60	N/C
29	FP9	61	N/C
30	GND	62	N/C
31	FP10	63	N/C
32	GND	64	GND
	FP11		

Appendix B - Installation of Additional DRAM

DRAM

The AT4+ has eight single line memory modules (SIMMs) sites in which to add memory. Due to the 33 Mhz CPU speed, the access time of the DRAM interface is very important. To run 0 wait states, you must have a 70 ns access time for three chip DRAM SIMMs.

The AT4+ can accommodate 4, 8, 16, or 32 Mbytes of DRAM. SIMM sizes of 256Kx9, 1Mx9, or 4Mx9 DRAM may be used. The table below lists the combinations needed for the five memory configurations. The "U" number location is silk screened on the back of the board.

Table B-1. DRAM SIMM Module Combinations

Memory	SIMM Site U1 (quantity)	SIMM Site U2 (quantity)
4 Mbytes	1Mx9 (4)	Empty
8 Mbytes	1Mx9 (4)	1Mx9 (4)
16 Mbytes	4Mx9 (4)	Empty
32 Mbytes	4Mx9 (4)	4Mx9 (4)

For other memory configurations, contact the Xycom Customer Service Department.

Recommended manufacturers for DRAM, along with the respective part numbers, are listed below:

Table B-2. DRAM Manufacturers/Part Numbers

Manufacturer	1Mx9 SIMM (70NS)	256Kx9 SIMM (70NS)	4Mx9 SIMM (60NS)
Micron	MT3D19M-7	MT3D569MP-7	N/A
Samsung	KMM591000AN-7	KMM591000AN-7	N/A
Hitachi	HB56619B-7A	N/A	HB56A49BR-6A
Xycom	98012-001	98011-001	98749-001

DRAM Installation

Figure B-1 shows DRAM installation.
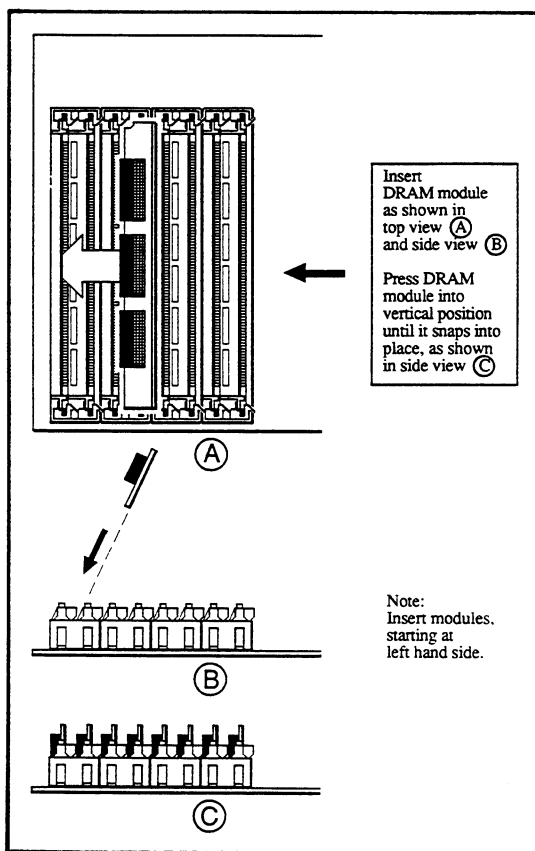
Figure B-1. DRAM Installation

To remove a strip, pull outward on the plastic tab while lifting the end. Loosen one side, then the other.

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