INDUSTRIAL COMPUTER SOURCE®

Model EPC26A/27
Product Manual

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INDUSTRIAL COMPUTER SOURCE®

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Table of Contents

List of Figures

List of Tables

Current Revision 2A

July 1996

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Chapter 1: Product Description

The EPC-26A/27 PC/AT-compatible CPU module is an EMC form factor EPC based on the DX2 and DX4 Intel486 processor. The EPC-26A uses the 50 MHz Intel486 DX2 CPU, while the EPC-27 uses the 100 MHz IntelDX4.

The EPC-26A/27 uses the Pico-Power Redwood chip set, a two-chip set packaged in a 176-pin TQFP.

This EPC meets stringent safety and low EMI standards (UL-1950). All front panel accessible ports have filter networks for reduced EMI and increased ESD protection.

The EPC-26A/27 processor modules contain the following features:

- The EPC-26A contains an Intel DX2 Enhanced processor (208-pin SQFP package, 3.3V). The EPC-27 is an Intel DX4 processor.
- One 72-pin 3.3V SIMM socket for memory sizes of 4, 8, 16 or 32 MB
- PC/AT compatible keyboard interface, reset switch and run LED
- Standard PC-compatible peripherals
- Time-of-day clock with 256 bytes of battery-backed CMOS RAM and user-replaceable battery
- One RS-232 9-pin DTE serial port (COM1) and one RJ45 serial port (COM2)
- Flashable Phoenix BIOS
- EXM expansion interface
- Optional 2 or 4 MB Flash memory and 128 KB SRAM and watchdog timer

The following table lists the environmental and electrical specifications of the EPC (with SIMM memory included).

Environmental		
Temperature	operating	0° to 60°C (*see below)
	storage	-40° to 85°C
Humidity	operating	5-95% (non-condensing)
	storage	5-95% (non-condensing)
Vibration	operating	.015" Peak to Peak 2.5g (max) 5-2000Hz
	storage	.030" Peak to Peak 5g (max) 5-2000Hz
Shock	operating	30g 11 msec duration
	storage	50g 11 msec duration
Electrical		
Power	maximum	+5V @1.2A
	typical	+5V @ 0.8A

Table 1-1: EPC Environmental and Electrical Specifications.

* Upper temperature limit degrades 2° C per 1000 ft. elevation. Maximum elevation 10,000 ft.

NOTE: The EPC-27 requires 200 ft/min airflow for 60°C operation. For configurations with no airflow, the maximum operating temperature for the EPC-27 is 43°C.

See Appendix A for mechanical dimensions.

Chapter 2: BIOS Configuration

Introduction

The EPC-26A/27 uses the Phoenix BIOS. This section details the various menus and sub-menus that are used to configure the system. Your system may be pre-configured and require very little intervention. This section is written as though you are encountering each field in sequence and for the first time.

Installation

Before installing the EPC, unpack and inspect it for shipping damage.

- DO NOT REMOVE THE MODULE FROM ITS ANTI-STATIC BAG UNLESS YOU ARE IN A STATIC-FREE ENVIRONMENT. THE EPC, LIKE MOST OTHER ELECTRONIC DEVICES, IS SUSCEPTIBLE TO ESD DAMAGE. ESD DAMAGE IS NOT ALWAYS IMMEDIATELY OBVIOUS, IN THAT IT CAN CAUSE A PARTIAL BREAKDOWN IN SEMICONDUCTOR DEVICES THAT MIGHT NOT IMMEDIATELY RESULT IN A FAILURE.
- ENSURE THAT THE INSTALLATION PROCESS AS DESCRIBED HEREIN IS ALSO PERFORMED IN A STATIC-FREE ENVIRONMENT.

Insertion in an EXM Carrier

Insertion of the EPC into an EXM carrier is straightforward. Remove a blank EXM panel from the carrier (by unscrewing the thumbscrews) and insert the EPC into the card guides. Firmly press the EPC front panel to ensure that the module is properly seated in the subplane and secure it with the thumbscrews.

- MAKE SURE THAT POWER TO YOUR SYSTEM IS OFF. THE EPC IS NOT DESIGNED TO BE INSERTED OR REMOVED FROM A LIVE SYSTEM.
- WHEN INSERTING THE EPC, AVOID TOUCHING THE CIRCUIT BOARD, AND MAKE SURE THE ENVIRONMENT IS STATIC-FREE.
- INSERT IT WITH ADEQUATE CONTINUOUS FORCE RATHER THAN TAPPING OR HAMMERING ON IT.

BIOS Setup Screens

The EPC-26A/27's BIOS contains a setup function to display and alter the system configuration. This information is maintained in the EPC-26A/27's nonvolatile CMOS RAM and is used by the BIOS to initialize the hardware in the EMC chassis.

The BIOS Setup can only be entered during the system reset process, following a power-up, front panel reset, or equivalent. Press the F2 key when prompted to enter Setup.

NOTE: The prompt to press the F2 key to enter the BIOS setup can optionally be suppressed in the BIOS setup. However, you can still press the F2 key to enter the BIOS setup screens, even if the prompt is suppressed.

Use the up and down cursor (arrow) keys to move from field to field. Use the right and left arrows to move from menu to menu, as noted in the menu bar at the top of the screen. If you use the arrow keys to leave a menu and then return, your active field is always at the beginning of the menu. If you select a sub-menu and then return to the main menu, you return to that sub-menu heading.

Fields with a triangle to the left are actually sub-menu headings; press Enter when the cursor rests on one of these headings to reach that sub-menu. For most fields, position the cursor at the field and from the numeric keypad, press the + and - keys to rotate through the available choices. Certain numeric fields can also be entered via the keyboard. Once the entry has been changed to appear as desired, use the up and down arrow to move to the next field.

Main BIOS Setup Menu

The main BIOS setup menu is shown below:

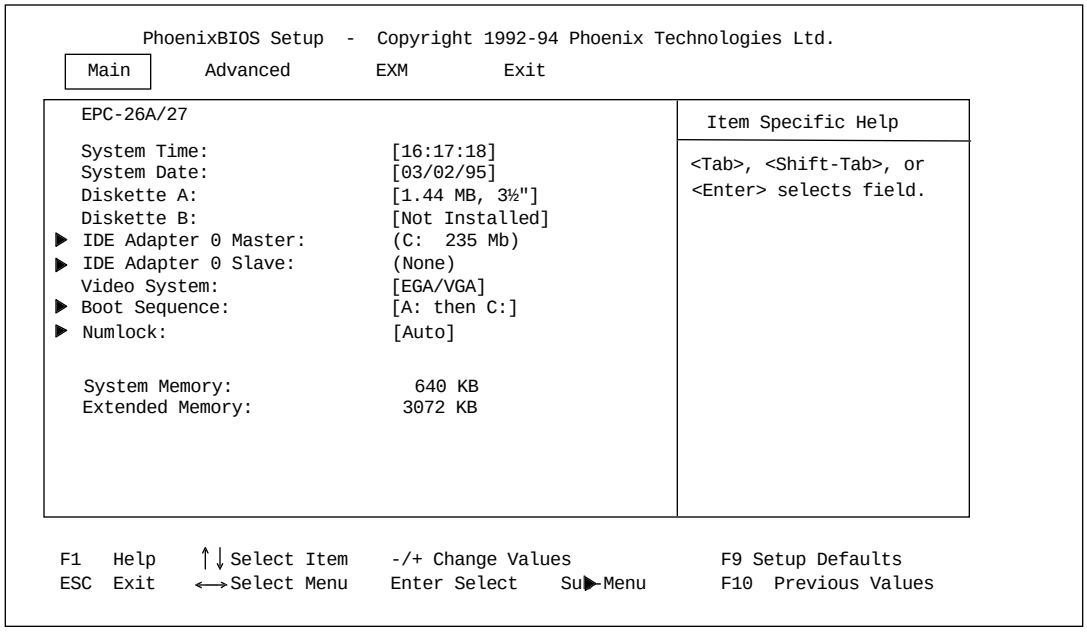

Figure 2-1: Main Menu.

The fields in each menu and sub-menu are explained below. Additional help information is available in the help area on the BIOS setup screen.

System Time:/System Date:

These values are changed by moving to each field and typing in the desired entry. Use the tab key to move from hour to minute to second, or month to day to year.

Diskette A:/Diskette B:

This field identifies the type of floppy disk drive installed as the A drive. If the EPC-26A/27 has a floppy drive installed, the proper setting is usually for a 1.44 MB floppy disk drive. Other options include 360K, 720K, 1.2 MBytes, and 2.88 Mbytes. If no drive is installed, the proper setting is NOT INSTALLED.

IDE Adapter 0 Master/Slave Sub-Menus:

These fields are headings for menus that allow you to enter complete disk drive information. Once the information is entered for the drive, the entry in the Main Menu shows the drive selected. For more information, turn to the section concerning the IDE Adapter Menus.

Boot Sequence Sub-Menu

The Boot Sequence Sub-Menu allows you to change the boot delay, boot sequence, and disable several displays during the boot process, such as the SETUP prompt, POST errors, floppy drive check, and summary screen. Once you have set the boot sequence, your choice displays in this entry in the Main menu. For more information, turn to the section concerning the Boot Sequence Sub-Menu.

Keyboard Features (Numlock) Sub-Menu

Use this menu to enable or disable various keyboard features, including enabling the Numlock key, enabling the key click, and setting the keyboard auto-repeat rate and delay. The Numlock setting displays for this entry in the Main Menu. For more information, turn to the section concerning the Keyboard Features Sub-Menu.

There are two more lines on the Main BIOS Setup Screen: "System Memory" and "Extended Memory." These are display-only fields set by the BIOS. No user interaction is required.

IDE Adapter Sub-Menus

There are two IDE adapter sub-menus: one for the master drive and one for the slave drive. To use an EXM-HD or EXM-MX series mass storage unit, you must configure a master adapter; the slave is optional, and not relevant to most RadiSys hardware. To see the detailed characteristics of the device or to change the device, choose the IDE Adapter 0 Master Sub-Menu to configure the fixed disk. The following screen displays:

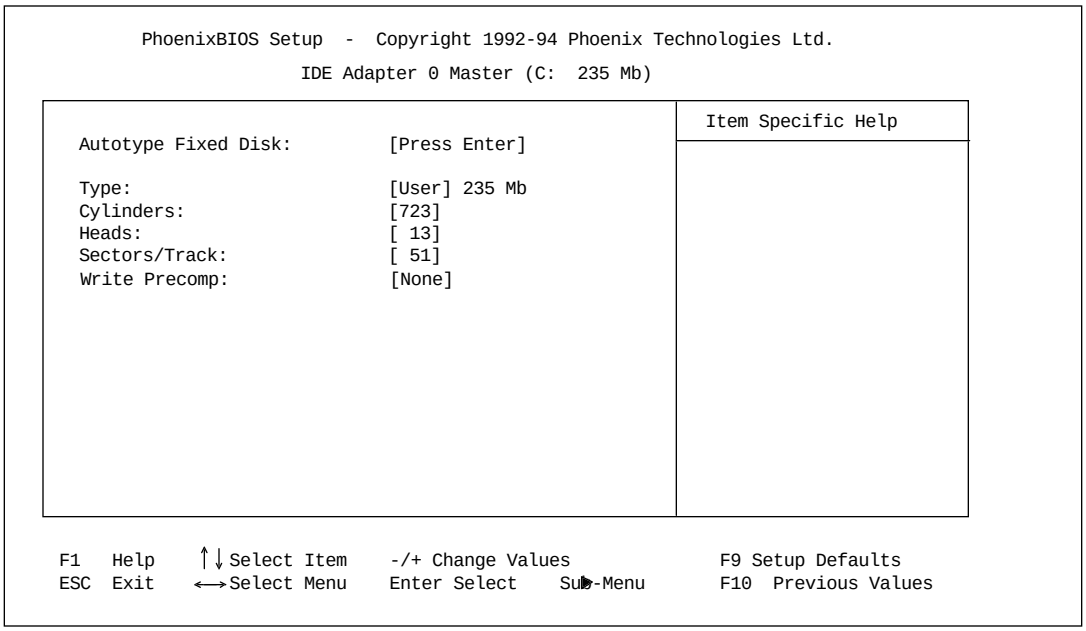

Figure 2-2. IDE Adapter Sub-Menu.

Autotype Fixed Disk

Use this option when setting up new disks. This option allows the BIOS to determine the proper settings of the disk based on information on the disk, which is detected by the EPC-26A/27 BIOS for drives that comply with ANSI specifications. Use the ENTER key to invoke this function.

Existing (formatted) disks must be set up using the same parameters that were used originally when the disk was formatted. You must enter the specific cylinder, head, sector information as listed on the label attached to the drive at the factory. Use the “User” type described below.

Type

For the majority of users who are using a system that was pre-configured, you probably have an IDE hard disk drive. Select “None” if you are not using an IDE hard disk drive. In the case for which you have an IDE disk but cannot employ the “Autotype” feature, then select “User” for the Type and enter the correct drive values for cylinders, heads, and sectors/track from the label attached by RadiSys at the factory.

Note that there are some restrictions when setting up devices on the EPC-26A/27. If you plan to boot from a non-IDE device, such as the resident Flash memory, set the master drive as None and use the BIOS extension. You cannot boot from Flash and still have an IDE drive; the IDE drive must be drive C: if it is to be used. Flash BIOS extensions are enabled and configured in the Advanced Menu.

Once you have completed the setup for the IDE Master, you can choose the IDE Adapter 0 Slave Sub-menu to configure your second drive. When finished, press the ESC key to return to the Main Menu.

Boot Sequence Sub-Menu

The Boot Sequence Sub-Menu allows you to change the boot sequence options. The following displays:

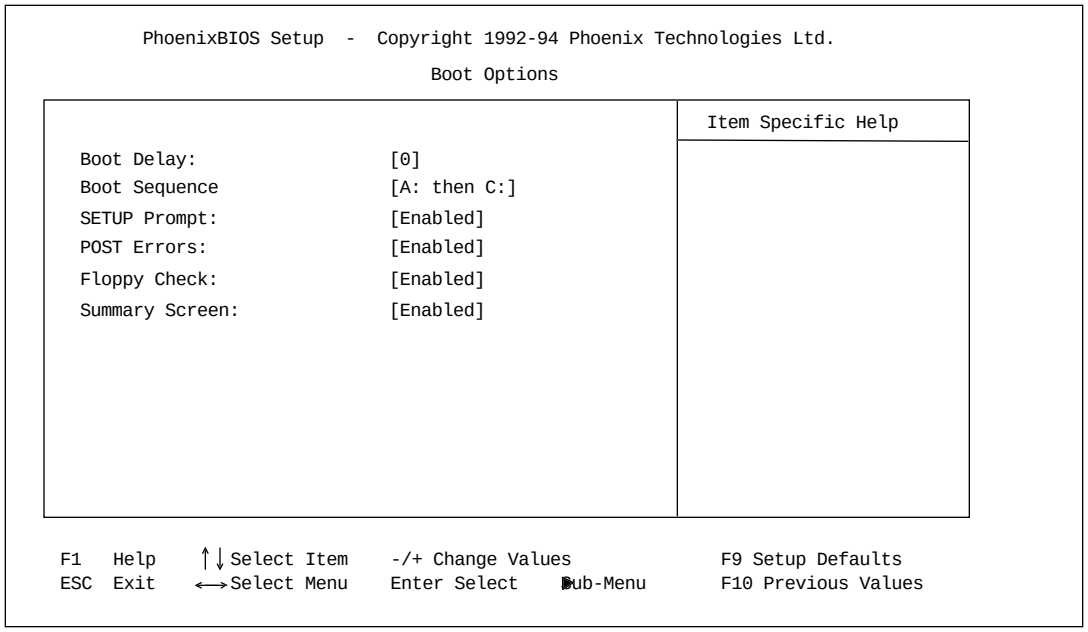

Figure 2-3: Boot Sequence Sub-Menu.

Boot Delay:

Use this option to set the system to delay booting for a time period in seconds that you set. This allows for long start up times on boot devices that spin up slowly. The default is zero.

Boot Sequence:

Use this option to define how the system treats floppy drive A: when booting. You can boot from a floppy in the A: drive or boot directly from the fixed disk drive. To reduce the amount of time required to boot, set the boot sequence to use the **C: drive only**. Note that the C: drive may be an IDE drive or Flash memory. The options are as follows:

1. **A: then C:** Used to boot from the floppy disk drive, or if no floppy is present in the A: drive, boot from the C: drive.
2. **C: then A:** Used to boot from the C: drive, whether Flash or IDE, or if none is present, boot from the A: drive.
3. **C: only** Used to boot from the C: drive without searching for an A: drive.

The default is A: then C:. The setting chosen here displays in the Boot Sequence Sub-Menu prompt.

About Drive Letter Assignment

The BIOS determines the boot device algorithmically. First it determines where the floppy drive fits into the sequence; however, for simplicity here, assume no A: drive. The BIOS starts by determining if an IDE controller is enabled. If so, this becomes the C: drive and is expected to be the boot device.

The BIOS searches memory for enabled mass-storage devices, and builds a device table. The first device it finds will be the C: drive, and thus the boot device. The search is performed either prior to IDE installation or after, depending on the selection in the Advanced Menu.

If an IDE drive is specified in the BIOS setup, it becomes the C: drive. Next, the BIOS looks for BIOS extensions predefined offsets with C800h to DFFFFh, up to the maximum of two drives.

There are many different boot options. One supported directly on the EPC-26A/27 hardware and BIOS is booting from a Flash ROMdisk. For more information on booting from a Flash ROMdisk, refer to setups in the Advanced Menu and the *XFORMAT Software User's Manual.*

Setup Prompt:

Use this option to enable or disable the message "Press F2 to enter Setup." Even if the message is disabled, you can still press F2 to enter the Setup Menu. The default is to enable this prompt.

POST Errors:

Use this option to stop during the boot if the system encounters error messages. Otherwise, the system will continue to attempt to boot despite any startup error messages that display. The default is to enable this option.

Floppy Check:

Use this option to enable or disable the floppy drive search during the boot. To speed up booting, you can disable the floppy check. It is still possible to boot from the A: drive even with the floppy check disabled. The default is to enable the floppy check.

Summary Screen:

Use this option to enable or disable a summary of the system configuration, which displays before the operating system starts to load. To save time, you can disable the summary screen. The default is to enable the summary screen display.

When you have completed the Boot Options Menu, exit back to the Main BIOS Setup Menu using the ESC key and complete the Keyboard Features Sub-Menu.

Keyboard Features Menu

Use this sub-menu to enable or disable various keyboard features.

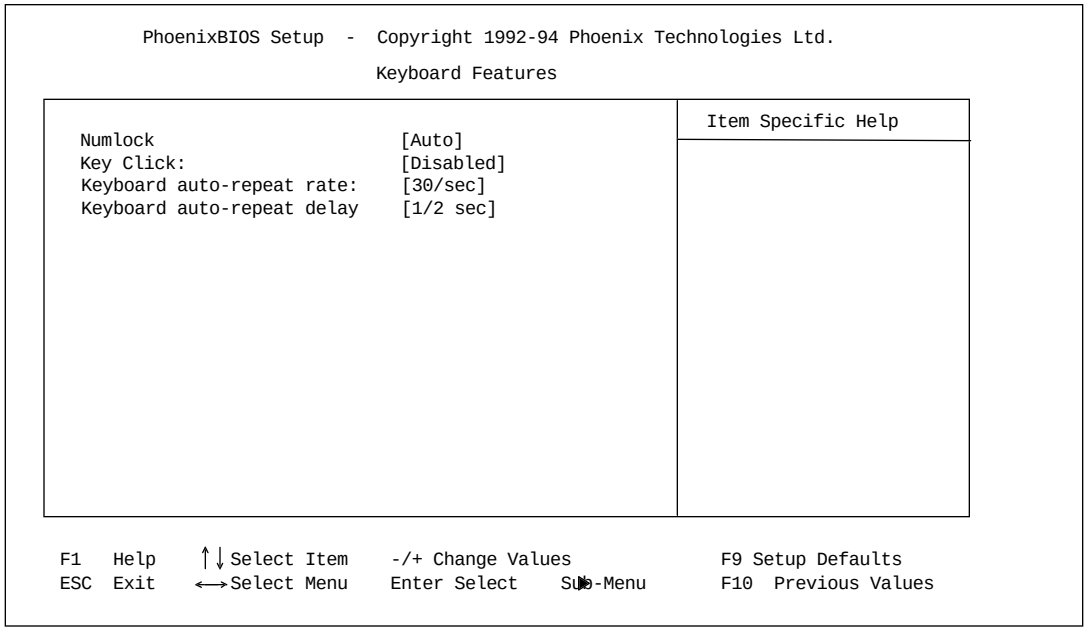

Figure 2-4: Keyboard Features Sub-Menu.

Numlock:

Use this option to enable or disable the Numlock feature of the keyboard. This enables the use of the keypad numbers. The default is to automatically engage the Numlock key at boot-up.

Key Click:

Use this option to enable or disable the key click feature on the keyboard. If enabled, the keyboard produces an audible click each time a key is pressed.

Keyboard auto-repeat rate:

Use this option to set the auto-repeat rate if holding a key down on the keyboard. The rates are from 2-30 per second.

Keyboard auto-repeat delay:

Use this option to set the delay between when a key is pressed and when the auto-repeat feature begins. Options are 1/4, 1/2, 3/4, and one second.

When you are finished with this menu, press ESC to exit back to the main BIOS Setup Menu.

Advanced Menu

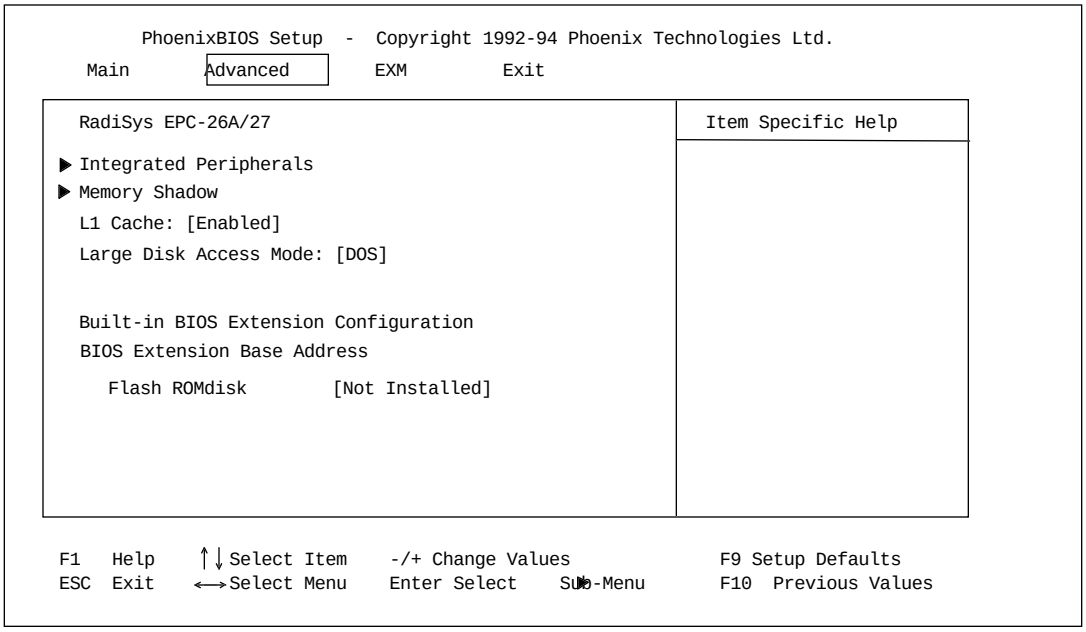

Figure 2-5: Advanced Menu.

The Advanced Menu contains settings for integrated peripherals, memory shadow, large disk access mode, and setting the Flash ROMdisk BIOS extension base addresses.

Integrated Peripherals Sub-Menu

Use this option to select the Integrated peripherals sub-menu, in order to configure the COM ports. This does not configure Ethernet, video, or Flash memory. For more information, turn to the section concerning the Integrated Peripherals Sub-Menu.

Memory Shadow Sub-Menu

The term “Memory Shadow” refers to the technique of copying information from ROM into RAM and accessing it in this alternate memory location. For more information, turn to the section concerning the Memory Shadow Sub-Menu.

Large Disk Access Mode:

If using a drive larger than 528 Mbytes, set this to DOS if you are running DOS, or set this to Other if using a different operating system.

Built-in BIOS Extension Configuration BIOS Extension Base Address Flash ROMdisk:

Use this option to enable Flash memory disks on the EPC-26A/27. This must be selected for the Flash memory to appear as a drive. The base address you select defines where the Flash ROMdisk BIOS extension is installed.

Options are the following:

DC000-DFFF0h
D8000-DBFF0h
D4000-D7FF0h
D0000-D3FF0h
CC000-CFFF0h
C8000-CBFFFh
Not Installed

Please note that you cannot have an IDE drive if the resident Flash memory is the boot device. For more information, refer to "*About Drive Letter Assignment*".

Integrated Peripherals Sub-Menu

Use the options in this sub-menu to enable or disable the COM ports.

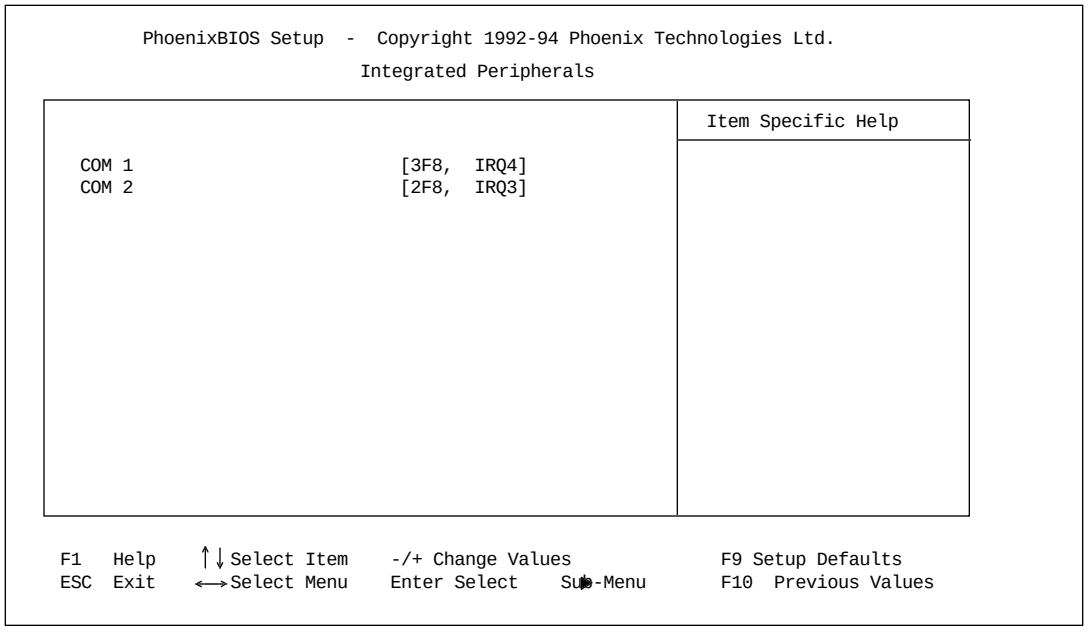

Figure 2-6: Integrated Peripherals Sub-Menu.

COM PORT/COM PORT

Use this option to enable or disable the COM1 and COM2 ports. The default for COM1 is 3F8 and IRQ4; the default for COM2 is 2F8 and IRQ3.

When you are finished, press ESC to exit back to the Advanced Menu.

Memory Shadow Sub-Menu

The term “Memory Shadow” refers to the technique of copying information from ROM into RAM and accessing it in this alternate memory location. The Memory Shadow Sub-Menu is discussed below.

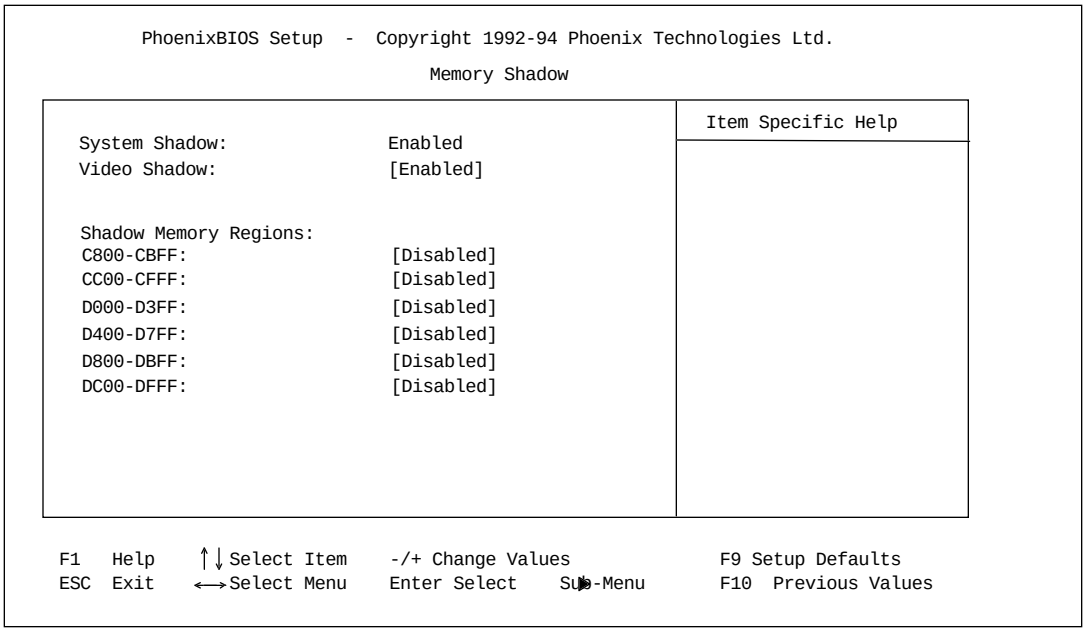

Figure 2-7: Memory Shadow Sub-Menu.

About Shadow Memory Regions:

The shadow regions should be used only if an EXM module is installed in the system that contains a BIOS ROM. Enabling shadowing for the region occupied by the ROM will increase system performance.

Do not enable shadowing for the region you may have specified for installing the Flash ROM disk. When this ROM extension is installed, it is automatically shadowed.

To exit this menu, press the ESC key. You return to the Main Menu.

This completes the setups for the Advanced Menu.

EXM Menu

Use this menu to set up the optional EXM expansion modules in your EPC-26A/27. Enter the EXM-ID, plus option byte information for OB1 and OB2. This information is found in the hardware reference manual shipped with each EXM expansion module.

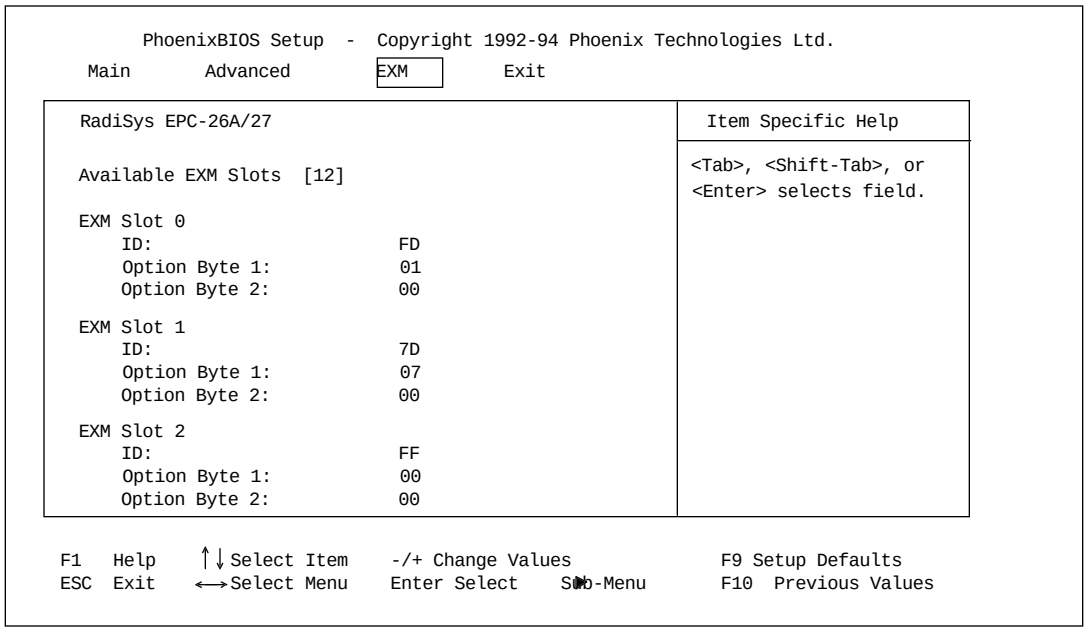

Figure 2-8: EXM Menu

Available EXM Slots [12]

The EXM Setup Menu will support up to 12 EXM slots. The Setup Menu provides a selection for the number of available slots in a system. The selected number of slots is stored in CMOS. The EPC-26A/27 will configure the EXM bus according to the number of EXM slots selected. The default slot configuration is for 12 slots.

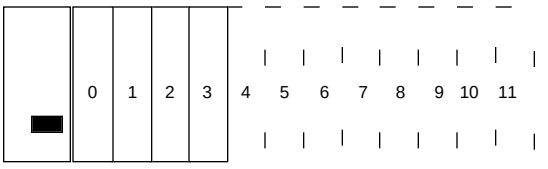

Figure 2-9: Slot Numbering in an EMC chassis

The standard chassis shown in Figure 2-9 may differ from your chassis. If you are unsure about EXM slot numbering in your chassis, refer to the chassis' specification sheet for information.

All slots **not** occupied by an EXM module should show an ID of FF and OB1/OB2 of 00 00 indicating that no EXM is present

EXM Menu Entries for EPC-26A/27

There are two possible entries for the EPC-26A/27, depending on whether the optional Flash/ SRAM is present. These entries must be made for the exact slot the EPC-26A/27 occupies.

If no Flash/SRAM is present, use FF 00 00 for the ID/OB1/OB2 entries in that slot.

If the optional Flash/SRAM is present, use FD 01 00 for the ID/OB1/OB2 entries in that slot.

EXM Menu Entries for Additional EXMs

For any additional EXMs installed in the chassis with the EPC-26A/27, consult the hardware reference manual for ID/OB1/OB2 information regarding the fields discussed below.

ID:

Enter the EXM-IDs for the EXMs you intend to install in this system. The number of EXMs that can be installed depends on the chassis you are using.

Option Byte 1:/ Option Byte 2:

Each EXM expansion module has values you must enter for the option byte 1 and option byte 2 configuration data. When you are finished with this menu, press the right arrow key to move to the Exit Menu, or press ESC.

Slots 0 through n

Enter the configuration information for each remaining EXM expansion module to be installed. Note that while most EXM hardware reference manuals depict a different setup BIOS from the EPC-26A/27, the ID/OB1/OB2 information ***is*** valid.

When using EXMs with configurable interrupts, DMA channels, I/O addresses, and/or memory addresses, avoid conflicts with built-in functions of the EPC-26A/27. Guidelines are:

1. If an interrupt is needed, use IRQ3, IRQ5, IRQ9, IRQ12, or IRQ15. IRQ7 can be used if a printer port is not being used. IRQ3 should not be used if the COM2 port is being used.
2. Use DMA channels 1, 3, 6, and 7.
3. Do not select I/O addresses that conflict with those in the EPC-26A/27. A complete list appears in Appendix A. For instance, I/O addresses in the 300-33F range can be used.
4. If the EXM needs to use upper memory addresses, they must be in the 0C8000-0EFFFF range.

Exit Menu

Use the options in this menu to save and exit, or abandon your changes and exit to the system.

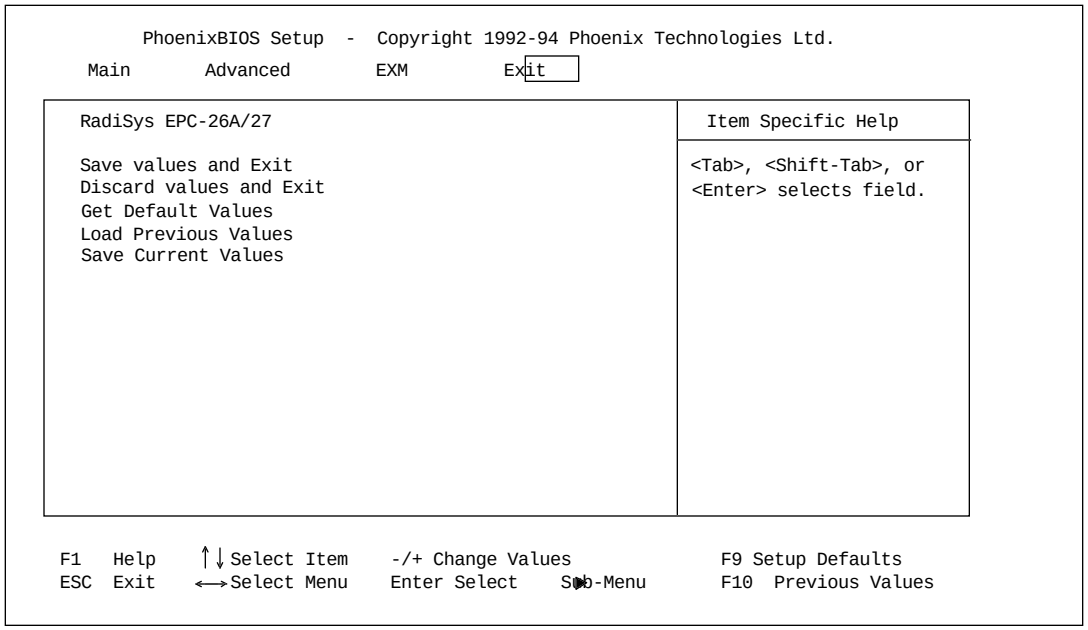

Figure 2-10: Exit Menu.

Save Values and Exit

Use this option if you want to save the values you have just entered and exit in order to load the operating system. The new values are loaded, and you exit and reboot.

Discard Values and Exit

Use this option if you want to discard the changes you just made and revert to the BIOS as it was before you started. The system boots with the old values.

Get default values

Use this option if you need to reset the BIOS values to the original, default values that were present before any other end users made changes.

Load previous values

Use this option if you want to load the system with the previous values before this editing session started. You do not exit.

Save Current values

Use this option to save the edits you have made during this session. You do not exit, and you can resume editing.

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Chapter 3: Theory of Operation

The EPC-26A/27 is a PC/AT compatible processor module. The standard functions of the PC architecture are embodied in the PicoPower Redwood chip set.

Processor and Coprocessor

The EPC-27 uses the 100 MHz 208-pin, 3.3V Intel486 DX4 SL Enhanced CPU which contains an integrated math coprocessor. The EPC-26A uses the 50 MHz DX2 in a similar configuration.

Memory

There is no base memory soldered to the EPC. Memory must be configured using a single SIMM module. See the figure below.

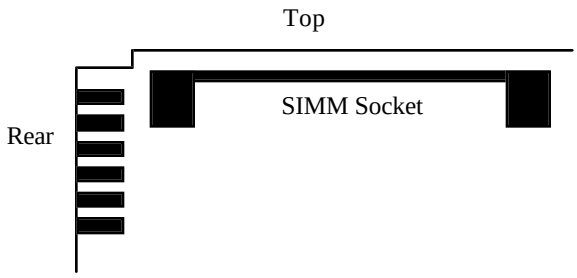


Figure 3-1: SIMM Socket Location.

WARNING:

Many of the components used in this EPC are designed to operate at 3.3V. Specifically this includes the CPU, the memory, and the PC chip set. The user should be careful not to place the SIMM memory modules that are delivered in this product in the socket of another product that uses 5V memory devices. This could cause permanent damage to the memory devices.

Memory Expansion

A single 72-pin SIMM socket is provided for memory expansion. A standard SIMM module is used for expansion, and must meet the following criteria:

- 3.3 Volt
- fast page mode
- 72-pin
- 70 nanosecond DRAM or better
- single-sided or double-sided

There are four different 72-pin SIMM modules that can be installed into the SIMM socket. The different sizes available are 4, 8, 16 and 32 MBytes.

Memory Map

The Intel DX2/DX4 SL Enhanced CPU supports a 32-bit physical memory address. Memory at addresses between 0 and 32 MB is mapped as follows:

Range	Content	
0000000	-009FFFFh	DRAM (first 640 KB)
00A0000	-00BFFFFh	Mapped to EXM expansion interface; almost always used by a video controller as video RAM
00C0000	-00C7FFFh	Shadowed video BIOS (if video is used) (write protected)
00C8000	-00DFFFFh	Mapped to EXM expansion interface
00E0000	-00EFFFF	System Upper Memory
00F0000	-00FFFFFh	Write-protected DRAM containing BIOS
0100000	-13FFFFFh	Extended memory when installed or mapped to EXM expansion interface
1400000	-1FEFFFFh	Mapped to EXM expansion interface
1FF0000	-1FFFFFFh	Mapped to BIOS ROM

Table 3-1: Memory Map.

0C8000 - 0EFFFF may be used either as page frame, BIOS extension, I/O buffer (i.e. for extended memory managers, Ethernet, etc.) or may be used by DOS as upper memory blocks if an extended memory manager driver is installed.

Note that since the EXM expansion interface has 24 address lines, some of the “mapped to EXM expansion interface” address areas map repeatedly, or wrap-around, in the expansion interface’s address space.

ROM and ROM Shadowing

The EPC system BIOS is mapped into the top of the processor's 32-bit address space. The BIOS contains the PC BIOS, self-test functions, and the setup screen program. This BIOS is stored in a single independent flash chip. This flash chip should not be confused with the optional "Flash Memory".

For best possible performance, the BIOS initialization software copies the ROM contents into DRAM (called shadowing) at addresses 0F0000-0FFFFF (also called the "F" page). After copying into this area, the BIOS write-protects it. Subsequent writes to this area complete successfully but do not alter the data.

The BIOS also searches segment C8000h through DFFFFh for the existence of additional BIOS EPROMs. Optional ROM extensions may be shadowed if so specified in the Advanced Setup Menu or Memory Shadow Sub-Menu.

Battery

The battery powers the CMOS RAM, Time of Day clock, and optional SRAM when system power is not present. At 60°C, the battery should have a shelf life of over four years. In a system that is powered on much of the time and where the ambient power-off temperature is less than 60°C, the battery is estimated to have a life of 10 years.

The battery supplied with the EPC is a 23mm. 3V lithium "coin" battery or equivalent (e.g. Panasonic BR2330 or Rayovac BR2335). It is mounted on the component side of the circuit board near the bottom front corner. Should the battery fail, you may obtain and install a replacement. The figure below illustrates how to change the battery.

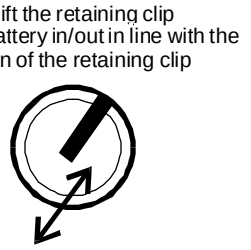


Figure 3-2: Battery Replacement.

Replacing the battery is a simple task. However, it is recommended that all setup parameters (especially hard disk drive info pertaining to number of heads and cyclinders) be written down while the battery is still good.

Jumpers

There are four jumpers on the EPC-26A/27 used primarily with the Flash formatting operation. The jumpers, which are located near the card edge and next to the SIMM socket, are show below.

H2 Reserved for future use.

H3 Use to enable writing to flash

H4 Do not use

H5 Forces a hosted re-flash of the BIOS. Must jumper H3 also.

Video Controllers

The EPC can operate with or without a video controller such as the EXM-13A.

At power-up, the BIOS searches the EXM configuration information by slot number (starting at 0) for the first video EXM where the card enable bit is set. If one is found, it will be initialized and used at power-up and the search exits.

If no video card is enabled in the EXM configuration information, a second search is done across the EXM expansion interface (beginning at slot 0) looking for an EXM video adapter. When a video adapter is found, the system will enable it and quit the search.

If no video controller is present, the BIOS operates without one. Programs that use the standard operating system and BIOS character output functions run successfully because the output is ignored. However, programs that rely on specific video modes, that write directly into the video RAM, or that directly call video BIOS functions, will fail.

Front Panel LED

The EPC-26A/27 has one green LED on the front panel. This RUN LED is lit whenever the EPC's DRAM memory is being accessed. It first comes on at power-up and should remain lit as long as the system is running. It is normal for the RUN LED to flicker during power-up. If the processor halts (or hangs) or runs entirely out of cache, the LED will go out.

Optional Flash/SRAM Memory

An option exists to purchase the EPC-26A/27 with a combination of 128 KBytes of SRAM and 2 or 4 MBytes of flash memory included on the EPC. RadiSys also markets an EXM-2A expansion module with even more flexibility in combining flash and SRAM. Note that the Flash/SRAM included with the EPC is compatible with the EXM-2A architecture. If this option is included, the EPC appears to software as though there were an integrated EXM-2A in the system.

Software cannot distinguish this from a system with a separate EXM-2A card using the same configuration. A system cannot enable both the optional Flash/SRAM and an EXM-2A expansion module at the same time.

Note that the **XFORMAT** program used to format flash memory is also distributed with the EXM-2 and EXM-2A expansion modules. Any references to the EXM-2 and/or EXM-2A are intended to denote your flash memory.

Watchdog Timer

The watchdog timer is only included with the optional Flash/SRAM. The watchdog timer is a 16-bit binary counter that monitors for overflow and, when detected, will signal a watchdog timer event based on the enable bits set in register 815D. The counter counts with a 64 KHz free running clock. This will cause a watchdog event after approximately 512 ms if the application software does not reset the timer.

An I/O read to address 815D resets the counter.

Bit 0 of register 815D enables an interrupt if the counter overflows. The clock is disabled to the counter if the interrupt is pending and not serviced. Service of the interrupt is signaled to the counter by reading register 815D. This will reset the counter value and resume counting. The interrupt is signaled on IRQ10.

Bit 1 of register 815D enables a HW reset to occur if the counter overflows. This reset will reset the entire system. This bit, if set, takes precedence over the setting of bit 0 in this register.

Application software that utilizes this timer should take care to reset the counter just prior to enabling either the interrupt or reset bits in register 815D. This will inhibit a spurious timer event from occurring just after enabling the timer.

Watchdog	**Register**	**815D**
7 - 2	1	0
Unused	H/W Reset	IRQ enable

Resetting the EPC

There are a number of ways to reset (reboot) the EPC.

Power-off, Power-on

This causes the entire system to reset. The system will run the power-on self-tests and reboot the operating system.

Front-panel Reset button

The Reset button causes the EPC to perform a hardware reset. The system will run the power-on self-tests and reboot the operating system.

Expansion Interface

Pin A57 on the EXM expansion interface connector is defined as ~RESETIN. Asserting this input (low) will reset the processor. This is provided to allow remote reset to be implemented. This is a full hardware reset. The system will run the power-on self-tests and reboot the operating system.

```
CTRL+ALT+DEL
```

This keyboard sequence is called a “warm boot.” The EPC does not reinitialize all of the processor’s hardware. The power-on self-test does not run. However, the operating system will be reloaded. This type of reset typically only works under DOS.

Additional abnormal conditions that cause a reset

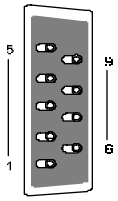
```
Low Vcc
No DRAM refresh signal from the micromonitor
```

Chapter 4: Connectors

This chapter specifies the details of the connectors on the EPC. These connectors adhere to existing standards. Pins are labeled from the point of view of looking into the front of the connector on the EPC.

Serial Ports

There are two COM ports on the EPC-26A/27. The COM1 serial port is an RS-232 DB-9 DTE connector. It has the following drive capability: VO_L = -5V min @ 3K load to GND and VO_H = 5V min @ 3K load to GND. COM1 is defined in the following table:



Pin	Signal	Pin	Signal
1	DCD	6	DSR
2	RxD	7	RTS
3	TxD	8	CTS
4	DTR	9	Ring indicator
5	Ground		

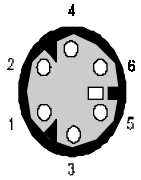
Table 4-1: COM1 DB9 Pin-out

COM2 is a DTE RJ45 phone jack and is defined in the following table:

Pin	Signal
1	Shield
2	CTS
3	TxD
4	DTR
5	RxD
6	DCD
7	Ground
8	RTS

Table 4-2: COM2 RJ45 Pin-out

Keyboard



The keyboard connector is a 6-pin DIN defined below:

Pin	Signal	Pin	Signal
1	Data	4	+5V
2	not used	5	Clock
3	Ground	6	not used

Table 4-3: Keyboard Connector Pin-out

EXM Expansion Connector

The EXM expansion connector on the rear of the EPC is a 116-pin cardedge connector. The mating connector is an AMP 650090-1 or equivalent. Pins A1 through A58 are on the component side of the board with pin A1 at the bottom of the board. Pins B1 through B58 are on the solder side of the board with pin B1at the bottom of the board.

More information about the EXM interface is available upon request.

Chapter 5: Troubleshooting & Error Messages

Troubleshooting

This section deals with problems that you may encounter that do not provide an error message. If an error message is displayed, see the next section of this chapter, *Common Error Messages*.

Symptoms	Possible cause(s)	Solution
System appears to boot (evidenced by RUN LED being on, floppy and/or hard disk being accessed) but provides no video.	Video adapter not fully seated. Monitor or cable problem. Video adapter failure. EPC cannot talk to EXM expansion interface.	Remove the video adapter. Reinsert the video adapter and verify proper seating of the edge connector. Verify that the cable pins are not bent and the cable is fully seated in the video adapter. If neccessary, try the monitor on another system to verify that the monitor is good. Replace video adapter. Verify that the EPC is fully seated in the edge connector.
System fails at power-up-will not run power-on self-test. Serial port(s) do not work.	The system is not getting power. Hardware failure. Port is disabled in the Setup screen. Interrupt conflicts. Port hardware failure.	Verify that +5V power is good and that the EPC is fully seated. Replace the EPC. Press CTLR+ALT+ESC to enter the Setup screen. Use the cursor arrows to move to the appropriate field and toggle the entry to enable the port. Another module may be using the same interrupts as COM1 and/or COM2. Verify that no other card in system is using IRQ3 or IRQ4. Replace the EPC.

Common Error Messages

This section contains a summary of error and warning messages alphabetized by message text. These are messages generated by the BIOS and MS-DOS that may be related to your hardware configuration.

Bad or missing command interpreter **DOS**

Problem: The DOS operating system cannot find the Command line interpreter.

Solution(s): Either **COMMAND.COM** is not present at the specified (or default) directory level of the boot disk or the "SHELL=" statement in your **CONFIG.SYS** lists the file incorrectly (wrong directory or misspelled).

System CMOS Checksum Bad - Run Setup **CMOS**

Problem: One of the entries in the CMOS RAM is incorrect.

Solution(s): Run the BIOS setup program to determine what is wrong, and correct it. If the error occurs repeatedly, the EPC's battery has failed.

Disk boot failure, Insert system disk and press enter **BIOS**

Problem: No boot disk could be found. Your hard disk may not have been partitioned into logical drive(s). PCs look for logical drives to boot from. Hard disks are physical drives; partitions are logical drives.

Solution(s): If your BIOS setup screen has all disks disabled, or if your hard disk is disabled and no floppy diskette is inserted in the A: drive, run the BIOS setup program and verify that all disk parameters are correct. If they are, insert a bootable floppy disk in the A: drive and press enter. If a hard disk is present, verify that it is properly partitioned and formatted as a system disk and one partition is set active.

Incorrect Drive A Type - run setup **BIOS**

Problem: The floppy diskette(s) installed in the system do not match the configuration information listed in the BIOS setup screen. This may be due to incorrect entries in the BIOS setup screen or one or both drives may not be responding at power-up.

Solution(s): Run the BIOS setup program. Make sure the BIOS setup entries relating to floppy drives correctly reflect the attached floppy drives. If you have no floppy drives, both drive A and drive B should be set to none.

Also, verify that all floppy drives are firmly connected (via ribbon cable) and that each drive has power. If the floppy drive is getting power through the ribbon cable, make sure that the appropriate jumpers are set correctly.

Failure Fixed disk 0 **BIOS**

Problem: The IDE disk controller for drive C cannot be initialized.

Solution(s): Ensure that the +5V power to the controller and hard disk are good and, if used, the ribbon cable to the hard disk is fully seated.

If you are not using an IDE drive, enter the BIOS setup program. Enter the Fixed disk menu. Change the drive type to match the device being used.

EXM configuration error **BIOS**

Problem: The EXMs installed (or not installed) do not match the configuration information in the BIOS setup EXM menu.

Solution(s): Run the BIOS setup program. Enter the EXM menu. Verify the information listed on the screen, save any changes and reboot.

If necessary, refer to the section *EXM Setup Screen*, in Chapter 2 of this manual and/or your EXM manual(s) for more details.

Diskette Drive A Error **BIOS**

Problem: The configuration information in the BIOS setup says that one or more floppy disk drives are expected, but a floppy disk controller could not be found.

Solution(s): If you have no floppy diskette drives, enter the setup program and set both floppy drives to "NONE."

If you are using a floppy drive(s), verify that both the floppy controller and the floppy drive(s) have power.

General Failure reading drive ... **DOS**

Problem: This almost always indicates the presence of an unformatted hard disk partition or diskette.

Solution(s): Format the partition or diskette using the utilities supplies by your operating system.

Invalid drive specification **DOS**

Problem: You are trying to access a logical drive (e.g., A:, B:, ...) that is not known to the operating system.

Solution(s): Select a different logical drive. If you are trying to access a hard disk, you may need to create the logical partition.

Keyboard Error **BIOS**

Problem: This message indicates that the system did not recognize a keyboard at power-up or you pressed a key during the power-on selftest.

Solution(s): Check the integrity of the keyboard connector.

If you think you pressed a key during power-up, reboot the system using the front panel reset button.

Some keyboards are designed with a switch (or jumper) to allow the user to configure the keyboard for use with an AT machine or an XT machine. If this is the case with your keyboard, verify that the switch is in the AT position.

The keyboard may not be a valid PC/AT keyboard (e.g., it is a PC/XT-only or PS/2 keyboard). If this is the case, replace the keyboard with a PC/AT style keyboard.

Missing operating system **BIOS**

Problem: Although the system could read the hard disk and find the active partition, the operating system files could not be found.

Solution(s): This can be caused by using a drive type number in the BIOS setup menu that does not match the type number used to format the hard disk. run the BIOS setup program. Enter the Fixed Disk menu. Select the correct drive type to match the type used to format the disk originally. Save the changes and reboot the system.

This can also occur if the hard disk is partitioned and one partition is set active, but the partition is not formatted. Format the partition using the utilities supplied with your operating system.

Non-system disk or disk error **BIOS**

replace and press any key when ready

Problem: This is caused by an attempt to boot from a disk or diskette that is not recognized as a system disk; that is no system files exist on the disk or diskette.

Solution(s): Most often it results when you reboot with a non-system diskette in the floppy drive, because the BIOS always attempts to boot from the floppy drive if a diskette is installed.

If you are trying to boot from the hard disk, make sure that you do not have a diskette in drive A and press any key.

If you are trying to boot from floppy, insert a known good bootable system diskette in drive A and press any key.

Not ready reading drive ... **DOS**

Problem: This is usually caused by not fully inserting a diskette into the floppy drive.

Solution(s): Eject the floppy diskette and reinsert making sure that the diskette seats completely into the floppy drive.

Parity error in segment ... **DOS**

Problem: This could be a software error (reading a nonexistent memory area) or a true hardware failure.

Solution(s): Attempt to repeat the error. If the error occurs during the execution of your own proprietary software, verify that the memory location specified in your software is valid.

Press a key to reboot **BIOS**

Problem: A C: drive exists but is not set active.

Solution(s): Run your operating system disk partitoning program (like FDISK) and set the primary partition active.

Real time clock error - run setup **BIOS**

Problem: The battery-backed TOD clock is incorrect.

Solution(s): Run the BIOS setup program to determine what is wrong, and correct it. If the error occurs repeatedly, the EPC's battery has failed.

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Chapter 6: Programming Interface

Registers

This chapter contains information needed to write custom software drivers for the EPC's Flash or SRAM. If using the supplied software that supports Flash or SRAM as a disk device, skip this chapter. The EPC-26A/27 defines the following registers in the I/O space.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	I/O port
Device ID Reg	1	1	1	1	1	1	0	1	100
Config Option Byte 1 Reg	x	x	x	x	x	x	0	Cden	102
Low Address Register	Low Order Bits 0-7 of Flash/SRAM Address								8380
Middle Address Register	Low-Middle Bits 8-15 of Flash/SRAM Address								8381
Middle Address Register	High-Middle Bits 16-23 of Flash/SRAM Address								8382
Flash Data Access									8383
SRAM Data Access									8384
Reserved									8385
High Address Register	High Order Bits 24-31 of Flash/SRAM Address								8386
Battery Status	x	x	x	x	x	x	x	Batt ok	8387

Table 6-1. Flash/SRAM Registers.

The first two registers are standard read/write EXM registers for device identification and configuration. The EPC-26A/27 responds to accesses to ports 100h and 102h only if its EXM expansion interface line -EXMID is asserted. Registers 8380 - 8382 and register 8386 are write-only registers. Registers 8383 and 8384 are read/write, and register 8387 is read-only.

Configuration Registers

The Device ID register is an 8-bit read-only register at I/O address 100h, which may be read when ~EXMID is asserted. It returns the value FDh, so that the EPC-26A/27 appears as an EXM-2A device ID.

The Configuration Option Byte 1 Register (OB1) is an 8-bit register at I/O address 102h which may be read or written when ~EXMID is asserted. The only writable bit in OB1 is CDEN, which specifies whether the Flash/SRAM which appears as an EXM-2A is enabled (1) or disabled (0). If disabled, the Flash/SRAM will not respond to the 8380-8387 I/O addresses; it will only respond to reads from I/O port 100h and reads and writes from I/O port 102h (if -EXMID is asserted). During reads, the Flash/SRAM returns bit 1 in OB1 as a 0. This reveals the board as an EXM-2A.

Addressing Registers

The flash and SRAM devices are accessed by placing an address in the four address registers and then reading or writing the appropriate data register, which causes the data byte at the location specified in the address registers to be read or written. The four address registers are write-only. The EPC-26A/27's EXM-2A interface does not implement the High address register (8386). The I/O address 8386 is reserved for future use.

The EPC-26A/27's EXM-2A interface provides a means of performing fast reads and writes of sequential bytes in the flash memory or SRAM. After each read or write access, the Low Address Register is incremented, allowing the next byte of data to be accessed without re-writing the address registers. When the Low Address Register reaches FFh, the next access will increment the Low Address Register to 00h, but it will not affect the value of the other address registers.

Only the lower eight address bits are auto-incremented on a read/write to the SRAM or flash. Thus, the maximum string I/O read or write length that can be issued by software to access the flash or SRAM data is limited to 256 bytes. To obtain this maximum length, software must first load the address registers with an address that is aligned to a 256 byte boundary. To read a subsequent, contiguous 256 bytes, the software must manually update the Low-Middle, High-Middle, and High registers (and the lower address register, if the previous string read/write to flash/SRAM was not 256 bytes in length) before issuing another 256 byte string read/write.

Flash Data Access

Flash disk data can be read from address 8383. Writing to this address will cause a write to a flash device control register, which may result in unpredictable results. The details of manipulating the flash devices, such as using their command register and identifier, are not specified here; consult the datasheets for the Intel flash memory devices. Note that some functions require the write-protection jumper to be in the write-enabled position.

SRAM data access

The battery-backed SRAM is accessed in a similar fashion as the flash. The three low order address registers are set to the appropriate SRAM address and then an I/O read or write is performed to I/O address 8384 to read or write a byte of SRAM.

Address aliasing occurs when accessing the lower density SRAM chips. This may be used by software to determine the size of memory installed. The EPC-26A/27 uses a 128Kx8 chip SRAM chip; address aliasing begins at the 1MB boundary.

Note that during power-down transition there is a very small probability that a single byte of SRAM or flash memory could be incorrectly written. This is the same problem that a disk drive has if it is powered off during a sector write.

Battery Low Condition

If bit 0 is set to 0 in register 8387, the battery needs replacing because the voltage is less than approximately 2.5V. Note that the **XFORMAT** software will fail when the battery is low. The **SRAMDISK.SYS** driver issues a warning before continuing. The remainder of the bits in register 8387 are undefined.

SRAM Standard Memory Array

Typically, access to the SRAM is via a file system installed by the device driver **SRAMDISK.SYS**. For users who wish to bypass the file system and use the SRAM as a standard memory array, the following ANSI C routine is provided as an example of how to program an executable file.

```
#include <stdio.h>
#include <memory.h>
#include <conio.h>
typedef unsigned char UCHAR;
typedef unsigned short USHORT;
typedef unsigned long ULONG;
#define FAR          _far
#define BYTESPERSECTION 0x100
#define EXMID        0x96
#define EXMENABLE    0x00000001
#define LSWLOWBYTE   0x8380
#define LSWHIGHBYTE  0x8381
#define MSWLOWBYTE   0x8382
#define MSWHIGHBYTE  0x8386
#define SRAMDATA     0x8384
UCHAR    Slot  =     5;          /* presumes Flash is in slot 5 */
void
readsection(UCHAR FAR *target, ULONG sramoffset)
{   UCHAR ob;
    register USHORT rinductor;
    /*
    //   Enable the card to allow register access    */
    outp(EXMID,Slot);
    ob = inp(0x102);
```

```
        outp(0x102,ob | EXMENABLE);
        /*
        //   Load initial offset value (sramoffset should be
        // divisible by 256)
        */
        outp(MSWHIGHBYTE,(USHORT) (sramoffset >> 24));
        outp(MSWLOWBYTE,(USHORT) (sramoffset >> 16));
        outp(LSWHIGHBYTE,(USHORT) (sramoffset >>8));
        outp(LSWLOWBYTE,(USHORT) sramoffset);
        /*
        //   Read a section using the autoincrement feature.
        */
        for (rinductor = 0; rinductor < BYTESPERSECTION; rinductor++) {
           *target++ = (UCHAR) inp(SRAMDATA);
        }
        outp(0x102,ob);  /* restore the option byte */
    }
    void
    writesection(UCHAR FAR *source, ULONG sramoffset)
    {   UCHAR ob;
        register USHORT rinductor;
        /*
        //   Enable the card to allow register access
        */
        outp(EXMID,Slot);
        ob = inp(0x102);
        outp(0x102,ob | EXMENABLE);
        /*
        //   Load initial offset value (sramoffset should be
        // divisible by 256)
        */
        outp(MSWHIGHBYTE,(USHORT) (sramoffset >> 24));
        outp(MSWLOWBYTE,(USHORT) (sramoffset >> 16));
        outp(LSWHIGHBYTE,(USHORT) (sramoffset >>8));
        outp(LSWLOWBYTE,(USHORT) sramoffset);
        /*
        //   Write a section using the autoincrement feature.
        */
        for (rinductor = 0; rinductor < BYTESPERSECTION; rinductor++) {
           outp(SRAMDATA,*source++);
        }
        outp(0x102,ob);  /* restore the option byte */
    }
```

```
void
main()
{   UCHAR test[BYTESPERSECTION];
    UCHAR readbuffer[BYTESPERSECTION];
    register USHORT minductor;
    for (minductor = 0; minductor < BYTESPERSECTION; minductor++)
test[minductor] = minductor;
    writesection(test,0);
    readsection(readbuffer,0);
  if (memcmp(test,readbuffer,BYTESPERSECTION))
      printf("Buffer did not compare \n\r")
    else printf("Buffers comparison ok \n\r"):
```

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Appendix A: Mechanical Dimensions

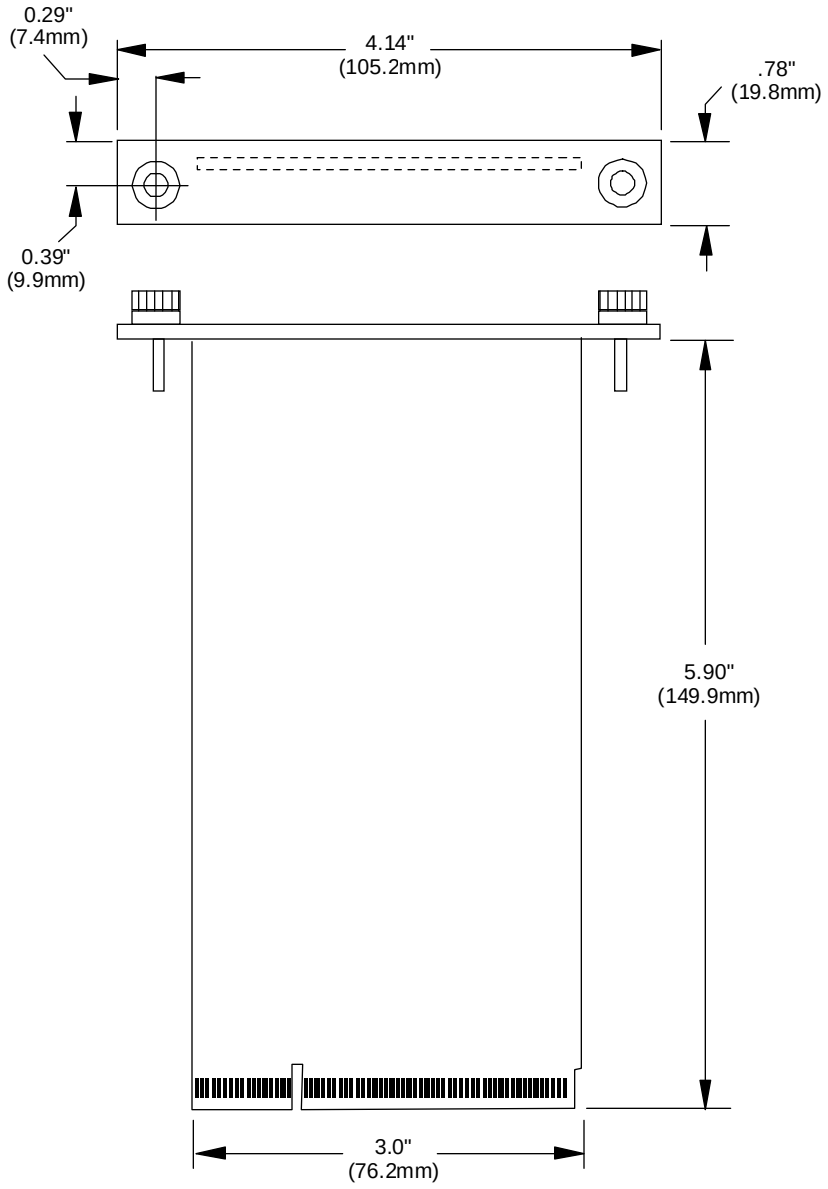

Figure A-1: EPC Mechanical Dimensions.

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Appendix B: Chip Set & I/O Map

The following defines the I/O addresses decoded by the EPC. It does not define addresses that might be decoded by EXMs.

I/O Addr	Functional group	Usage
000	DMA	Channel 0 address
001		Channel 0 count
002		Channel 1 address
003		Channel 1 count
004		Channel 2 address
005		Channel 2 count
006		Channel 3 address
007		Channel 3 count
008		Command/status
009		DMA request
00A		Command register (R)
		Single-bit DMA req mask(W)
00B		Mode
00C		Set byte pointer (R)
		Clear byte pointer (W)
00D		Temporary register (R)
		Master clear (W)
00E		Clear mode reg counter (R)
		Clear all DMA req mask(W)
00F		All DMA request mask

First Interrupt controller:

PicoPower Redwood chip set emulating 8259 of PC/AT

I/O Addr	Functional group	Usage
020	Interrupt controller 1	Port 0
021		Port 1

82C42 controller:

I/O Addr	Functional group	Usage
ED		Data register
EC		Index register

Counter-Timer functions:

PicoPower Redwood chip set emulating 8254 of PC/AT

I/O Addr	Functional group	Usage
040	Timer	Counter 0
041		Counter 1
042		Counter 2
043		Control (W)

Keyboard Port:

PicoPower Redwood chip set emulating PC/AT

I/O Addr	Functional group	Usage
060	Keyboard controller	Data I/O register
061	NMI status	NMI status
064	Keyboard controller	Command/status register

Time-of-Day Clock:

PicoPower Redwood chip set emulating MC6818 of PC/AT

I/O Addr	Functional group	Usage
070	Real-time clock	RTC index reg / NMI enable
071		RTC data register
		0 seconds
		1 seconds alarm
		2 minutes
		3 minutes alarm
		4 hours
		5 hours alarm
		6 day of week

I/O Addr	Functional group	Usage	
		7	date of month
		8	month
		9	year
		A	status A
		B	status B
		C	status C
		D	status D
		E	RAM
		3F	RAM

Page Registers:

PicoPower Redwood chip set emulating 74LS612 of PC/AT

I/O Addr	Functional group	Usage
081	DMA	Channel 2 page register
082		Channel 3 page register
083		Channel 1 page register
087		Channel 0 page register
089		Channel 6 page register
08A		Channel 7 page register
08B		Channel 5 page register
08F		Refresh page register

Second Interrupt Controller:

PicoPower Redwood chip set emulating 8259 of PC/AT

I/O Addr	Functional group	Usage
0A0	Interrupt controller 2	Port 0
0A1		Port 1

Second (16-bit) DMA Controller:

PicoPower Redwood chip set emulating 8237 of PC/AT

I/O Addr	Functional group	Usage
0C0		DMA Channel 4 address
0C2		Channel 4 count
0C4		Channel 5 address
0C6		Channel 5 count

I/O Addr	Functional group	Usage
0C8		Channel 6 address
0CA		Channel 6 count
0CC		Channel 7 address
0CE		Channel 7 count
0D0		Command/status
0D2		DMA request
0D4		Command register (R)
		Single-bit DMA req mask(W)
0D6		Mode
0D8		Set byte pointer (R)
		Clear byte pointer (W)
0DA		Temporary register (R)
		Master clear (W)
0DC		Clear mode reg counter (R)
		Clear all DMA req mask (W)
0DE		All DMA request mask

Coprocessor Interface:

An integrated co-processor replaces the 80287 of PC/AT

I/O Addr	Functional group	Usage
0F0	Coprocessor	Clear coprocessor busy
0F1		Reset coprocessor

Serial I/O (Com2) Port:

PicoPower Redwood chip set emulates 16550 of PC/AT

I/O Addr	Functional group	Usage
2F8	COM2 serial port	Receiver/transmitter buffer
		Baud rate divisor latch (LSB)
2F9		Interrupt enable register
		Baud rate divisor latch (MSB)
2FA		Interrupt ID register
2FB		Line control register
2FC		Modem control register
2FD		Line status register
2FE		Modem status register

Serial I/O (Com1) Port:

PicoPower Redwood chip set emulates 16550 of PC/AT

I/O Addr	Functional group	Usage
3F8	COM1 serial port	Receiver/transmitter buffer
		Baud rate divisor latch (LSB)
3F9		Interrupt enable register
		Baud rate divisor latch (MSB)
3FA		Interrupt ID register
3FB		Line control register
3FC		Modem control register
3FD		Line status register
3FE		Modem status register

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Appendix C: Interrupts and DMA Channels

Interrupts

The assignment of interrupts for the EPC is shown in the following table:

NMI	DRAM parity error, EXM expansion interface I/O channel check
IRQ0	timer
IRQ1	keyboard
IRQ2	IRQ8 - IRQ15 cascade through IRQ2
IRQ3	COM2 serial port
IRQ4	COM1 serial port
IRQ5	unassigned
IRQ6	usually needed for floppy disk controller
IRQ7	unassigned
IRQ8	clock
IRQ9	unassigned
IRQ10	watchdog timer (for Flash/SRAM option)
IRQ11	unassigned
IRQ12	unassigned
IRQ13	coprocessor
IRQ14	used by optional IDE disk controller
IRQ15	unassigned

DMA Channels

The assignment of DMA channels for the EPC is shown in the following table.

0	unassigned (8-bit)
1	unassigned (8-bit)
2	usually needed for floppy disk (8-bit)
3	unassigned
4	(Channel 0 - Channel 3 cascade through Channel 4)
5	unassigned (16-bit)
6	unassigned (16-bit)
7	unassigned - not connected to EXM expansion interface (16-bit)

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Appendix D: Creating Bootable Disks From Non-Bootable Drives

In order to create a bootable disk image from a non-bootable drive, use the **XFORMAT** function with the **/N** flag. Refer to the example below:

```
XFORMAT /N=6 /B=D: C:\FLASH
```

This example assumes that the D: drive is a non-bootable device, such as a network drive or a RAM disk, and contains the necessary system files; that DOS 6 is the operating system; and that files from the **C:\FLASH** directory will be copied to the system disk.

The drive specified by the **/B=** option ***must*** contain the system files **COMMAND.COM**, **IO.SYS** and **MSDOS.SYS** in addition to the **BB6.00** boot block file. These files are automatically copied to the flash disk root directory when the disk is made bootable. If these system files are not present, an error message displays and **XFORMAT** fails.

Since the **IO.SYS** and **MSDOS.SYS** files are hidden (i.e., do not display when using a **DIR** command), it is necessary to unhide them so that the DOS **COPY** command can transfer the files. For example, to reveal the attributes set for the **MSDOS.SYS** file, type the following:

```
ATTRIB MSDOS.SYS
```

Letters that display include S (system file), H (hidden file) and R (read-only). To prepare the hidden file **MSDOS.SYS** for copying, type either of the following:

```
ATTRIB -s -h MSDOS.SYS
or  ATTRIB MSDOS.SYS -s -h
```

Refer to the *Microsoft MS-DOS User Guide and Reference* or use the online help by typing **ATTRIB /?** at the command line for more information about the **ATTRIB** command and various file attributes.

It is a requirement for the **IO.SYS** and **MSDOS.SYS** files to be hidden, system, and read-only files in order for them to be bootable and/or safe from accidental damage. Be sure to re-run **ATTRIB** after copying the files to the destination disk to reset the system files.

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Appendix E: X-Format Flash and SRAM

XFORMAT is a utility program used to build DOS file structures on an EXM-2A and the EPC's optional resident flash and SRAM memory. **XFORMAT** is also used to build file system images that can be used in VME RAM disks or subsequently downloaded in flash.

Note that, as an example, when a 2 Mbyte disk of unformatted Flash memory is formatted, it will hold about 1.6 Mbytes of files.

XFORMAT cannot be used with the optional resident SRAM on the EPC-8.

Distribution Diskette Contents

The **File/Utilities** distribution diskette contains the following files that are of interest when formatting images:

XFORMAT.EXE	Flash formatting program
BB5.00	Boot sector files for DOS 5.0
BB6.00	Boot sector files for DOS 6.0, 6.1, & 6.2
SRAMDISK.SYS	Device driver to activate SRAM memory.
README.TXT	Information added after the manual was printed

Using XFORMAT with Flash Memory

Installation

Create a directory on the C: drive called **C:\EPCUTIL** (or another name you choose). Copy the files from the **File/Utilities** distribution diskette to the **C:\EPCUTIL** directory.

XFORMAT can run from the floppy diskette if necessary.

Formatting Resident Flash Memory

The BIOS determines the boot device algorithmically. First it determines where the floppy drive fits into the boot sequence; however, for simplicity here, assume no A: drive. The BIOS starts by determining if an IDE controller is configured. If so, this becomes the C: drive and is expected to be the boot device.

The BIOS searches memory for enabled mass-storage devices, and builds a device table. The first device it finds will be the C: drive, and thus the boot device. The search is performed either prior to IDE installation or after, depending on the selection in the BIOS.

If an IDE drive is specified in the BIOS setup, it becomes the C: drive. Next, the BIOS looks for BIOS extensions with predefined offsets C8000h to DFFFFh, up to the maximum of two drives.

There are many different boot options. One supported directly on the EPC hardware and BIOS is booting from a Flash ROMdisk.

To format the resident Flash memory, follow the instructions found in your hardware manual. For example, if you are formatting the EPC-8' onboard flash in slot 31, you must set the Flash jumper ("Flash", or JP5) before the Flash can be written. Refer to the chapter on hardware *Configuration and Installation* in your hardware manual for the location of the flash jumper.

When **XFORMAT** is used to format resident Flash memory, the program first checks the status of the battery to determine if enough voltage is present, then erases all flash memory, formats it, optionally adds system files to make it a boot device, and then copies a directory structure and files into it. The program is invoked with the following command line:

XFORMAT [*options*] [*srcdir*]

Note that you cannot simply copy files to a flash disk one at a time. You must use **XFORMAT** to first erase, then format, and finally copy the contents of a specified drive or directory, containing all the files you want present in flash to the flash disk.

When creating bootable disks from non-bootable sources such as a RAM drive, you must put all relevant files (i.e., **BB6.0** plus the files you want to copy) into the same directory that is specified at the end of the **XFORMAT** string.

If you are creating a bootable drive out of your flash memory, you must go back into the BIOS setup and select drive C: as flash and drive D: as none before you can boot from flash. You cannot boot from flash if the D: drive is set as IDE.

All files in directory *srcdir* (typically a directory on your hard disk) and all of its subdirectories (if any) and their files are copied into the resident Flash memory. To make changes to the flash disk you must rerun the **XFORMAT** function.

Each file is created with the same attributes except the files are also marked as read-only and unarchived (see the DOS **ATTRIB** command for more information).

Some examples of the **XFORMAT** invocation are described below.

1. XFORMAT /P=0 C:\MISC

Formats the flash memory found in slot 0 as a DOS-readable drive and copies all files, including subdirectories, from **C:\MISC** to the flash memory.

2. XFORMAT /P=31 A:

Formats the flash memory found in in slot 31 as a DOS-readable drive and copies all files, including subdirectories, from device A: to the flash memory.

3. XFORMAT /P=2 /N=6 /B=C:\SYSTEM C:\EPCUTIL

Formats the flash memory found in slot 2 as a bootable drive, using the boot sector file **BB6.00** and using system files **(MSDOS.SYS, IO.SYS,** and **COMMAND.COM**) from directory **C:\SYSTEM** and copies all files from **C:\EPCUTIL**.

Unless the **/F** option is selected, **XFORMAT** automatically determines the amount of available space on your EPC. It also calculates the amount of space needed for the files to be copied, and aborts without erasing the flash memory if there is insufficient space.

XFORMAT aborts if the source device (for either the file copy or for the system files) is the same flash being formatted.

Since the flash memory is represented to DOS as a fixed (non-removable) disk, DOS may have buffered data from the flash memory's files prior to its being formatted. As a result, you should reboot your system prior to accessing files in a newly formatted flash system.

Program Control Flags

The following flags are available when using the **XFORMAT** function. Note that a dash (-) can be used interchangeably with a slash (/) to set flags.

Control flags are divided into three categories: Source, Target, and Other.

Source Flags

/B=<sysdir> **Boot Disk Flag**. Creates a bootable disk image using the DOS system files specified by the **<sysdir>** parameter. The function formats and copies files to the formatted disk. A bootable disk image is created. The operation fails if it cannot find the operating system files.

/N=<ver> **Non-Boot Version Flag**. Creates a bootable disk image using the boot block file specified by the **<ver>** parameter. (The location of the system files is specified by the **/B** flag.) This option is useful for creating bootable flash disks from non-bootable sources such as network and RAM disk drives. The boot sector file for **/N=5** is **BB5.00** (DOS 5) and the boot sector file for **/N=6** is **BB6.00** (DOS 6.X). The boot sector files are supplied on the distribution diskette.

This operation fails if it cannot find the operating system files.

/S **System Flag**.Creates a bootable disk image using the DOS system files from the root of the current drive that **XFORMAT** is invoked from.

This operation fails if it cannot find the operating system files.

Target Flags

/F<name> <size> **File Output Flag**.Outputs the disk image to the file **<name>** with size **<size>. <size>** is a hex value that specifies the number of Kbytes in the target file. This option is used to create VMEbus disk Resident Flash Array (RFA) images, including bootable drives, using a serial download.

If you specify a size less than <100>, **XFORMAT** will still round up to 00.

/P=<slot> **Pos Flag**. Specifies the slot number of the flash/SRAM.

The slot number to specify is found in the table below. Check your ardware manual if you are unsure.

System	Slot #
EXM-2A	whichever slot # the EXM occupies
EPC-24/26/26A/27	whichever slot # the EPC occupies
EPC-8	slot 31
EPC-31/32	no slot number required (must use /T=O flag)

The position flag is not used when building file images.

/T **Type Flag**. This flag is used to format SRAM. Use /T=S for SRAM. Use /T=O for EPC-31/32 onboard flash.

The type flag is not used when building file images.

/V **Volume Label Flag**. Prompts for a disk volume label. A volume label identifies the disk and can be a maximum of 11 characters. The label conforms to the MS-DOS convention, thus the following are not allowed: * . + , : ; < > = ? [ ] \ / | ( ) ^ & . Label letters are converted to upper case.

Other Flags

/H **Help Flag.** Displays a list of available flags and their options.

/Q=m **Quiet Mode Flag**. Suppresses progress display messages. May be combined with the No Reboot Flag (i.e., **/Q=mr**).

/Q=r **No Reboot Flag**. Suppresses reboot upon successful completion. May be combined with the Quiet Mode Flag (i.e., **/Q=rm**).

NOTE: It is necessary to flush the DOS buffer areas prior to accessing newly formatted disks. This is accomplished by rebooting. This reboot suppression flag is strictly for use when **XFORMAT** is called from a batch file.

Not all flags are valid for every system. The **/S, /B,** and **/N** flags are not valid for SRAM drives and generate an error message when attempts are made to use these flags on SRAM.

Any program other than **XFORMAT** that attempts to write ***to*** the flash disk will cause the system to lock up. Typical applications that write to disk might be Norton Utilities or PC Tools; typical DOS commands would be **COPY, XCOPY, FORMAT**, and **FDISK**.

The flash portions of the EPC are visible to the operating system as separate logical drives. Applications that read the flash memory operate identically as if they were reading any “read only” media, such as CD-ROM disks. DOS commands such as **COPY** and **XCOPY** will operate correctly when the source of the copy is the flash disk.

For flash, each file is created with the same attributes except the files are also marked as read-only and unarchived (see the DOS **ATTRIB** command for more information). For SRAM, each file is created with the same attributes as the corresponding source file. The date/time stamp for file modification or creation stays the same also.

Using XFORMAT with SRAM

SRAM Disk Device Driver

When installing an SRAM drive, make sure you run **XFORMAT** on the drive ***before*** running the **SRAMDISK.SYS** driver. The driver will not recognize the SRAM disk until it has been formatted using **XFORMAT**.

The SRAM driver **SRAMDISK.SYS** allows use of the SRAM as a disk drive, usually E: after using an IDE disk for C: and flash as D:. The SRAM disk is not bootable.

When **SRAMDISK.SYS** is loaded, it will check the status of the battery voltage. If the battery voltage is above 2.5V, the driver will load. If the battery voltage is below 2.5V, an error message displays for a few seconds before continuing.

To load the **SRAMDISK.SYS** driver, edit the **CONFIG.SYS** file and insert the following line:

```
DEVICE=[path]SRAMDISK.SYS /[slot]
```

The *slot* you select depends on where the hardware containing the SRAM is installed in the EXM Setup Screen. For example, to configure the SRAM in an EPC located in slot 3, use the following command:

```
DEVICE=C:\EPC\SRAMDISK.SYS /3
```

The *path* you insert depends on what directory you create when you copy the **XFORMAT** software from the RadiSys distribution diskette to your target drive.

The SRAM driver can be loaded high to conserve conventional memory. Use the following line under DOS 6.X:

```
DEVICEHIGH=[path]SRAMDISK.SYS /[slot]
```

EXAMPLE

```
XFORMAT /P=0 /T=S C:\SRAM
```

Formats the SRAM and copies all files and subdirectories of directory **C:\SRAM** into the SRAM.

SRAM data integrity may be jeopardized when power is removed during a series of write operations to the SRAM. For this reason, **XFORMAT** checksums each sector. The **SRAMDISK.SYS** driver must compute the same checksum in order for the sector read to be successful. Corrupt sectors may be repaired with standard disk tools such as Norton Utilities.

Because SRAM disks are read/write, the [*srcdir*] parameter is optional for SRAM drive types. Files can be written to an SRAM device using standard DOS copy commands (**COPY, XCOPY**) after formatting it and loading the device driver.

Each file is created with the same attributes as the corresponding source file. The date/time stamp for file modification or creation stays the same also.

Creating a Serial RFA Image

This chapter defines a serial download and programming mechanism for a Resident Flash Array (RFA) contained in a EPC computer. This approach requires the inclusion of a BIOS extension to be present in the Boot Device (either ROM or Flash). The BIOS extension implements the Xmodem protocol and flash programming algorithms.

The extension BIOS is used in conjunction with the standard DOS based **XFORMAT** program to build bootable images in EXM-2A compatible flash subsystems (RFA). Programming support for the older version EXM-2 is not included.

Currently the EPC-8 is the only computer that utilizes the serial downloading and programming feature of **XFORMAT**.

Theory of Operation

Under normal circumstances, the RFA is programmed in the target machine using the **XFORMAT** utility. The RFA image is created by copying a subtree image from some DOS disk structure stored on the hard disk, floppy, network or RAM drive. For systems without persistent storage except for the flash memory, a problem can arise when a power failure in the target machine interrupts re-programming of the RFA. In this circumstance, the source disk (typically stored in a RAM disk) is erased and the RFA file structure is corrupt due to an incomplete program cycle.

Therefore, **XFORMAT** enables re-programming of the RFA without the requirement of attaching a hard disk, network or floppy to provide the source image.

Reprogramming the RFA is accomplished by downloading a flash image created by **XFORMAT**. When **XFORMAT** is executed it is directed to build an image and store the image into a .BIN file (using the /F command line argument). The file is downloaded to the target machine via a serial link between the target and source computers. Data integrity of the image transfer is guaranteed by using the Xmodem file transfer protocol. Any communication package capable of transmitting Xmodem/CRC packets can be used on the source computer to transfer the image.

XFORMAT and the extension BIOS write a CRC checksum at location 184H and 185H of the boot sector as the final step of RFA programming. When an incomplete flash program cycle has occurred, the CRC will contain FFFFH and execution of the serial RFA BIOS triggers the synchronization procedure in an attempt to establish communication with a host computer.

*It is presumed that all flash devices are erased starting with the lowest addressable device and incremented sequentially. This is the algorithm used in the **XFORMAT** program and the extension BIOS.*

The synchronization procedure alternatively polls COM1: and COM2: and attempts to synchronize with the source computer.

BIOS Installation

Installation of the extension BIOS is specific to the computer that contains the RFA BIOS. Synchronization Communication between the target and source computer are set by the extension BIOS for 9600 BPS, 8 data bits, 2 stop bits and no parity. The source computer must be executing a terminal program in order to synchronize communication with the target. Once the BIOS configures the communication ports, communication ports 1 (COM1:) and 2 (COM2:) are alternatively polled to wait for a reception of three space characters. The ports are polled in succession every six seconds. No information is transmitted to the source computer via the COM ports until synchronization is complete. If a connection to the source computer is not completed within 60 seconds, the extension BIOS is exited and the configured boot sequence is attempted. *The 60 second timeout is actually an escape mechanism to allow the system BIOS to regain control thus allowing the operator to enter the setup screen for re-configuration.*

The extension BIOS uses beep indicators to denote which port is currently being polled. A 800ms beep denotes a poll of COM1, while two 200ms beeps indicate COM2 is being polled. Once the operator hears the number of beeps corresponding to the serial port connection that is being used, the operator should press the space bar on the host computer until the extension BIOS banner is displayed in the host's terminal program. The extension BIOS indicates a successful connection by displaying the banner "Serial Extended Format Program". After this message is displayed, progress and instruction messages are displayed on the source computer's terminal session.

Restrictions and Requirements

XFORMAT is a DOS-based application. A DOS system must be available to create the flash image. The source computer must have the capability of running the Xmodem protocol.

Only COM1: and COM2: on the target computer are available to receive the flash image.

Because some machine configurations are video-less and keyboard-less, the extension BIOS make no provision or requirement for these devices.

EXAMPLE

```
XFORMAT /F C:\EPCUTIL\TEMP.BIN 400 C:\TEMP
```

Creates a file that is a binary image of the information to be included in the flash memory. You then download the binary file into VME or into RFA.

Additional XFORMAT Uses

This chapter contains information about how to use XFORMAT to create a bootable image from a non-bootable drive and how to create a VME bus file system.

Creating a Bootable Image From a Non-Bootable Drive

In order to create a bootable disk image from a non-bootable drive, use the **XFORMAT** function with the **/N** flag. Refer to the example below:

```
XFORMAT /N=6 /B=D: C:\FLASH
```

This example assumes that the D: drive is a non-bootable device, such as a network drive or a RAM disk, and contains the necessary system files; that DOS 6 is the operating system; and that files from the **C:\FLASH** directory will be copied to the system disk.

The drive specified by the **/B=** option ***must*** contain the system files **COMMAND.COM**, **IO.SYS** and **MSDOS.SYS** in addition to the **BB5.00** or **BB6.00** boot sector file. These files are automatically copied to the flash disk root directory when the disk is made bootable. If these system files are not present, an error message displays and **XFORMAT** fails.

Since the **IO.SYS** and **MSDOS.SYS** files are hidden (i.e., do not display when using a **DIR** command), it is necessary to unhide them so that the DOS **COPY** command can transfer the files. For example, to reveal the attributes set for the **MSDOS.SYS** file, type the following:

```
ATTRIB MSDOS.SYS
```

Letters that display include S (system file), H (hidden file) and R (read-only). To prepare the hidden file **MSDOS.SYS** for copying, type either of the following:

```
ATTRIB -s -h MSDOS.SYS
or  ATTRIB MSDOS.SYS -s -h
```

Refer to the *Microsoft MS-DOS User Guide and Reference* or use the online help by typing **ATTRIB /?** at the command line for more information about the **ATTRIB** command and various file attributes.

It is a requirement for the **IO.SYS** and **MSDOS.SYS** files to be hidden, system, and read-only files in order for them to be bootable and/or safe from accidental deletion.

Be sure to re-run **ATTRIB** after copying the files to the destination disk to reset the system files.

Creating a VMEbus File System

The EPC can boot from or use a VMEbus-based RAM (volatile or non-volatile) file system. **XFORMAT** is used to create a file that the system can read, or boot from.

Basically, the program is run through a resident Flash disk when created, using the **/F** flag (file output). The file created is a disk image that, if written to the VMEbus address specified in the BIOS VME Setup, will be treated like a file system.

EXAMPLE

```
XFORMAT /F C:\EPCUTIL\TEMP.BIN 400 C:\TEMP
```

Creates a file that is a binary image of the information to be included in the flash memory. You then download the binary file into VME or into RFA.

Error Messages

The following alphabetically listed error messages display during error conditions using **XFORMAT.EXE**.

Error Message BATTERY NEEDS REPLACEMENT

Explanation The **XFORMAT** detected that the battery power is below 2.5V.

Resolution Replace the battery.

Error Message CANNOT READ **COMMAND.COM**

Explanation The command processor **COMMAND.COM** could not be located.

Resolution Copy **COMMAND.COM** to the appropriate directory and re-invoke **XFORMAT**.

Error Message <path> **COMMAND.COM** WILL NOT BE COPIED TO THE TARGET

Explanation A version of **COMMAND.COM** was found in the top directory of the **<srcdir>**.

Resolution Delete **COMMAND.COM** from the **<srcdir>** directory and re-invoke **XFORMAT**.

Error Message ERROR PROGAMMING FLASH DEVICE

Explanation The software is unable to write the flash as expected.

Resolution Check for either a hardware error, or if there is a conflict with other hardware or software using the Flash/SRAM registers.

Error Message INSUFFICIENT SPACE ON TARGET DEVICE

Explanation The source directory specified is too large to fit onto the target.

Resolution Remove some of the files from the source directory.

Error Message INVALID SLOT NUMBER SPECIFIED

Explanation The slot number is not a decimal number.

Resolution Ensure that the slot number does not contain any alpha or special characters.

Error Message INVALID SOURCE PATHNAME

Explanation **XFORMAT** could not find the directory specified as the source pathname.

Resolution Ensure that the source pathname exists.

Error Message INVALID TARGET SIZE SPECIFIED

Explanation An illegal character was detected in the file size portion of the/**F** parameter.

Resolution Specify the file size using only hex characters.

Error Message MORE THAN ONE SOURCE PATH WAS SPECIFIED

Explanation Multiple source paths were detected on the command line.

Resolution Remove one of the source paths from **XFORMAT**'s invocation line.

Error Message NO ARGUMENTS SPECIFIED

Explanation The command line does not specify any operations.

Resolution Execute **XFORMAT** with **/H** to display flags and options.

Error Message NO SLOT SELECTED

Explanation **XFORMAT** requires specification of a slot when formatting flash memory.

Resolution Rerun **XFORMAT** using the **/P**(osition) flag to indicate the correct slot number.

Error Message NO SRAM MEMORY IN SPECIFIED SLOT

Explanation The **/T=S** option was selected, however, no SRAM memory was detected on the card in the specified slot.

Resolution Ensure the **/P**(osition) flag is correct or that the **/T**(ype) flag is specified correctly.

Error Message REACHED END OF CLUSTER LIST BEFORE END OF BUFFER

Explanation Too many files were specified to copy for the available directory entries.

Resolution Reduce the number of files or separate them into more directories.

Error Message SOURCE PATHNAME TOO LONG

Explanation Insufficient storage for the pathname string.

Resolution Copy the files to a directory that is closer to the root.

Error Message SLOT <n> DOES NOT CONTAIN ENABLED FLASH

Explanation The slot number specified does not contain enabled flash memory.

Resolution Enable the flash memory from the BIOS using the EXM Setup Screen, or verify that the flash memory is present.

Error Message SLOT NUMBER OUT OF RANGE

Explanation The EXM slot number listed does not contain flash.

Resolution Ensure that the EXM slot specified contains flash.

Error Message SYSTEM DOES NOT CONTAIN ONBOARD FLASH

Explanation **/T=O** must not be used for an EPC's flash memory.

Resolution Repeat the command *without* the **/T=O** option.

Error Message TARGET SIZE NOT SPECIFIED

Explanation The **/F** option is ill-formed.

Resolution The syntax for the /F flag is **/F<filename> <size>**. The filename is specified and is followed by the file size in kilobytes.

Error Message UNABLE TO INITIALIZE FLASH DEVICE

Explanation **XFORMAT** cannot write to flash memory when the write disable jumper is installed. Or, no flash memory exists.

Resolution Install the Flash jumper prior to executing **XFORMAT**. Check that the system is properly connected to a +12V power supply.

Error Message UNABLE TO READ BOOT RECORD FILE

Explanation The boot record files are not in the **<srcdir>** path.

Resolution Copy the boot record files to the proper directory

Error Message UNRECOGNIZED FLAG

Explanation A mis-spelled or illegal flag was used.

Resolution Check the command line to ensure only legal flags are used.

Error Message VERIFY ERROR READING FLASH DEVICE

Explanation The software detected an error when comparing the block of data that was written and read back.

Resolution Check for either a hardware error, or if there is a conflict with other hardware or software using the Flash/SRAM registers.

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Appendix F: Flash BIOS Updating

Flash BIOS Updating

The EPC supports flash BIOS updates for system BIOS. These updates are accomplished by running the **NEW.BAT** file, which contains the DOS executable **NEWBIOS.EXE**

The **Utilities** diskette contains Flash formatting files in the root directory, and a subdirectory named using a 5-digit number to indicate the BIOS level included on the diskette. At this writing, this subdirectory is **\30505** (BIOS version 3.05.05).

The **NEWBIOS** program executes in either self-hosted or remote download modes. Self-hosted mode is for updating the flash BIOS of the system in which the **NEWBIOS** program is executing and is the default mode.

Remote download is only necessary for reprogramming BIOSes damaged by a power failure during a previous BIOS update process. Remote download requires a remote PC connected by a NULL modem to the EPC's COM1: port. On a standard DB-9 connector, the NULL modem should have pin 2 (Transmit Data) connected to pin 3 (Receive Data) and also pin 7 (Clear To Send) connected to pin 8 (Request To Send). Pin 5 (Signal ground) should be a direct connection between the DCE and DTE devices. The command line must contain the **/P** parameter to indicate which port is to be used on the computer running the **NEWBIOS** program (not the COM port on the EPC). For example, use **/P = 1** for COM1 on the source computer.

NEWBIOS can run from the floppy drive or the hard disk. To install the update files on your hard disk, create a subdirectory on your hard disk drive and use the DOS **COPY** command to copy the files from the **\30505** directory.

When in self-hosted mode, **NEWBIOS** uses a checksum to ensure that the BIOS is corrupted before proceeding. When running **NEWBIOS** as a remote download, the checksum step is bypassed.

To display the usage model, type **NEWBIOS** and press **<ENTER>.** Available options include:

NEWBIOS /F=<filelist> [/C=timeout] [/R=retries] [/P=port]

/C = <ms>	Wait period. Default is 30000 milliseconds.
/R = <count>	Retries. Default is 16 retries.
/P = <n>	COM port used on the source computer for remote downloads.

If no port selection is made using the **/P=**Port # parameter, **NEWBIOS** begins execution in self-hosted mode. **NEWBIOS** reprograms 120 Kbytes of the 128K flash BIOS. The first 8 Kbytes are used for the boot block and are not reprogrammable.

Download files are specified by using the **/F=**<filename> parameter. Files are copied into flash memory from low to high memory addresses. The files list must provide for the necessary files, in the correct order, and located at the correct offsets. To help accomplish this, two files (**FILL16.BIN** and **FILL8.BIN**) are included on the **Utilities** diskette.

The necessary order and offsets are as follows:

Offset	File	File(s) to Use
0	16K “filler”	**FILL16.BIN**
16K	16K “filler”	**FILL16.BIN**
32K	16K “filler”	**FILL16.BIN**
48K	64K system BIOS	**EPC24.BIN**
112K	8K “filler”	**FILL8.BIN**

For this example, assume that you are updating the BIOS on the system that is running **NEWBIOS.EXE**. Make sure the H3 jumper is installed to allow writing to the flash device. Remove this jumper after programming since aberrant programs may write to the flash device and corrupt the BIOS.

To update the BIOS in self-hosted mode, follow the instructions below:

1. Insert the EPC’s BIOS update diskette in drive A.
2. Switch the command line to drive A by typing **A:** and pressing **<ENTER>**.
3. Display the contents of the **NEW.BAT** file by typing **TYPE NEW.BAT** and press **<ENTER>**.

   The first time you perform this step, the following default file contents display:

   NEWBIOS /F=FILL16.BIN /F=FILL16.BIN /F=FILL16.BIN /F=EPC24.BIN / F=FILL8.BIN

4. Make sure the new system BIOS you are using is the *exact size* of **EPC24.BIN** (65,536 bytes).
5. Run the **NEW.BAT** file to begin the update.
6. The following message displays: “You have selected to update this computer’s BIOS. Is this correct? (Y/N) : “

   Select Y for yes if you are ready to proceed. Proceed to the next step. Select N for no if you want to re-check the **NEW.BAT** contents; go back to step 3.
7. Each file name included in **NEW.BAT** displays as the program executes.
8. This message displays: “Update completed successfully. Press any key to reboot.”

Press any letter or number on the keyboard. The system reboots using the new BIOS. Use this same procedure to update the BIOS using the remote download procedure, making sure to include the port designation (**/P=**) as discussed above.

These files are included for system updating with the EPC utilities diskette:

NEW.BAT	Self-hosted update batch file
NEWBIOS.EXE	Flash BIOS update program invoked from **NEW.BAT**
FILL8.BIN	8 KBytes fill file for unused portion of flash device
FILL16.BIN	16 KBytes fill file for unused portion of flash device
EPC24.BIN	64 KBytes EPC System BIOS

Refer to the **README.TXT** file on the floppy for additional information. Note that you cannot use the **NEWBIOS.EXE** file on this **Utilities** diskette with any other RadiSys EPC, and you can only use **NEWBIOS.EXE** shipped on this EPC's **Utilities** diskette on this EPC.

Saving/Restoring CMOS Parameters

It is possible to use the **NEWBIOS** function to copy and restore CMOS parameters into a 4K parameter block on the flash chip. This is useful if battery life becomes an issue, or for backup.

To save your CMOS parameters into a partition block in the flash memory, type the following:

```
NEWBIOS /S
```

To reverse the process and load the saved CMOS parameters in the flash memory back into CMOS, type the following:

```
NEWBIOS /L
```

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BUG REPORT

While we have tried to assure this manual is error free, it is a fact of life that works of man have errors. We request you to detail any errors you find on this BUG REPORT and return it to us. We will correct the errors/problems and send you a new manual as soon as available. Please return to:

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