EPC$^{\grave{o}}$-33/34

Hardware Reference

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1. Introduction

About This Chapter

This chapter contains three important sections: a description of the EPC-33/34 product; environmental and electrical specifications; and a brief overview of this manual.

Product Description

The EPC-33/34 is a single-board computer, based on the Intel486 SL Enhanced processor and the PicoPower PC/AT chipset.

The EPC-33/34 has been designed to meet stringent safety and low EMI standards (UL-1950). All mounting bracket ports have filter networks for reduced EMI and increased ESD protection.

Many of the connectors on the EPC-33/34 provide power through different pins. Connecting the wrong cable or reversing the cable can damage the EPC-33/34 and may damage the device being connected. Use extreme caution when preparing to connect cables to this product. Refer to Figure 2-3 for complete connector locations.

Features

The EPC-33/34 contains the following features:

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- The EPC-33 uses the Intel486-DX2 @ 50MHz.
  The EPC-34 uses the IntelDX4 @ 100MHz.
- One 72-pin socket for a SIMM providing 4, 8, 16, or 32MB of DRAM.
- Flashable Phoenix BIOS.
- PicoPower PC/AT chipset provides:
  - High performance DRAM controller
  - Two 8259 Programmable Interrupt controllers
  - Two 8237 DMA controllers
  - 8254 Programmable Timer Counters
  - 146818 Compatible Real Time Clock with 114 bytes of battery-backed
    CMOS RAM available
  - Enhanced IDE (EIDE) hard drive interface
- One RS232C serial port (COM1) available via DB-9 connector on the end plate.
- One serial port (COM2) as RS232 or RS422/485 available via shared header connector.
- IEEE 1284-1 compatible Parallel printer port (LPT1) available via shared header connector. Supports ECP mode.
- Floppy drive controller accessed via header connector.
- Enhanced IDE hard drive interface accessed via 2.5"-standard 2mm pitch 44-pin header connector.
- PC / PS-2 compatible keyboard interface on the end plate or header connector on board.
- Standard ISA-bus cardedge connector.

Options

- Local bus Cirrus Logic CL-GD7543 ("Viking") Super VGA/flat panel controller with 1MB of video memory
  - Supports Super VGA modes up to 800x600 on flat panel displays, and
    CRT displays up to 1024x768 256 colors (non-interlaced).
  - Supports simultaneous CRT displays and LCD displays.
  - SVGA is available via 15-pin D-sub on end plate and 10-pin header.
  - Flat panel support provided through a shrouded 44-pin header.
  - Video input is available through standard feature connector.
  - Software programmable flat panel contrast control
  - Software programmable flat panel backlight control.
- FLASH/SRAM option includes:
  - Up to 8 MB of Flash memory using the M-Systems Flash File System.
  - 256 KB of battery-backed SRAM.

Introduction

- Software programmable Watchdog Timer user-selectable from 125ms to 2 second time-out.
- Ethernet controller with 10BaseT connector.
- PC/104 daughter card interface sockets.

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Specifications

The table below lists environmental and electrical specifications of the EPC-33/34.

Environmental		
Temperature	operating*	0 - 60°C derated 2°C per 1000 ft (300 m) over 6600 ft (2000m)
	storage	-40 to 85°C
Humidity	operating	5 - 95% (non condensing)
	storage	5 - 95% (non condensing)
Altitude	operating	0 - 10,000 ft (3000 m)
	storage	0 - 40,000 ft (12,000 m)
Vibration	operating	2.5 g acceleration over 5-300 Hz sine wave (P-P), 1 oct/min sine sweep
	storage	5 g acceleration over 5-300 Hz sine wave (P-P), 1 oct/min sine sweep
Shock	operating	30 g, 11 ms duration, half-sine shock pulse
	storage	50 g, 11 ms duration, half-sine shock pulse
Electrical		
Current	typical	+5V @ 1.2A (EPC-33)
		+5V @ 1.8A (EPC-34)
		+12V @ 50mA for writing to Flash BIOS or on-board Flash memory

Table 1-1. EPC-33/34 Environmental and Electrical Specifications.

The Intel specification for the IntelDX4 chip states that the chip casing must not exceed 85°C. If ambient air temperature coming off the heat sink is below 42°C, then no forced air cooling is required. Intel recommends 200 linear feet per minute (lfm) air flow (60°C or below) for cooling purposes.

Vibration and shock specifications assume the EPC-33/34 is mounted as a single board computer. See Figure 2-1 for mechanical dimensions.

About This Manual

1   **1**

This manual is divided into the following:

Chapter 1   *Introduction.* Describes product, provides environmental and electrical specifications, and contains an overview of this manual.

Chapter 2   *Installation and Configuration.* Provides complete instructions on how to do the following: set jumpers, provide power, connect peripherals, mount, or install in a backplane, etc.

Chapter 3   *Theory of Operations.* Contains detailed information on memory, chipsets, Flash, SRAM, etc.

Chapter 4   *Connectors.* Provides pinout information for each connector.

Chapter 5   *Error Messages.* Contains recovery information for errors.

Chapter 6   *Support and Service.* Lists RadiSys support and service contacts.

Appendix A   *Chipset and I/O Mapping.* Provides information about registers and the I/O map.

Appendix B   *IRQs and DMA.* Lists the IRQs and DMA channels.

Appendix C   *Ethernet.* Describes the **AUTOSET** software and how to configure the Ethernet device drivers.

Appendix D   *LCD Cabling.* Provides LCD cabling information.

Appendix E   *VGA.* Describes the Cirrus Logic software and VGA drivers.

Appendix F   *Flash Formatting Software.* Explains how to format the Flash and configure the Flash device driver.

Appendix G
and   *Enabling the SRAM.* Describes how to configure SRAM drivers

how to format the SRAM.

2. Installation and Configuration

Introduction

Before installing the EPC-33/34, 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-33/34, 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.**

Pre-Installation

Before you mount or install the EPC-33/34 you should install any jumpers required for your configuration. Refer to the figure below.
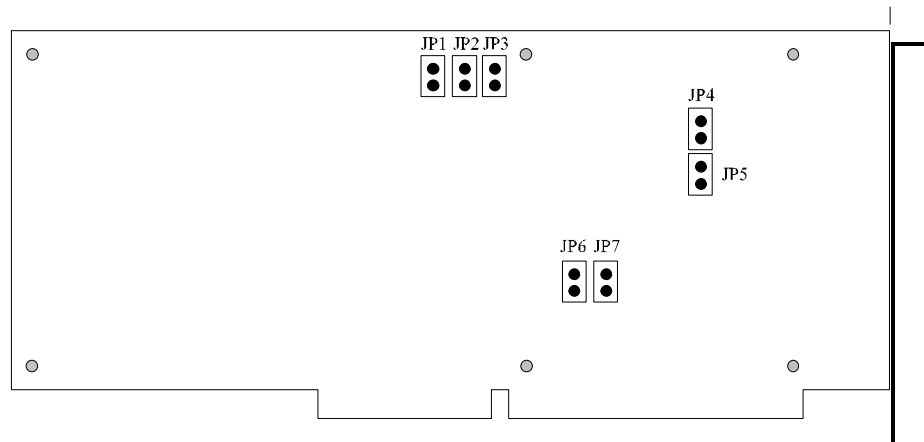
Figure 2-1. Location of EPC-33/34 Jumpers.

BIOS Jumpers

There are three BIOS jumpers and one video jumper that may or may not be required before you install or mount the EPC-33/34.

JP4 *BIOS Boot Block write enable*. This jumper must be installed in order to write to the BIOS Boot Block. Note that JP5 must also be enabled to write to the BIOS.

JP5 *BIOS write enable*. This jumper must be installed in order to write to the BIOS, such as when saving CMOS configuration information.

JP6 *Force BIOS Recovery*. This jumper is not routinely installed. It is used to force a BIOS recovery during the boot process.

JP7 *Monochrome CRT*. This jumper must be installed in order to use an external IBM Monochrome Display Adapter (MDA) compatible graphics card.

Video Jumpers

If you are using a flat panel display, you must set jumpers JP1-JP3 to configure the EPC-33/34 for use with your particular flat panel.

JP1, JP2, and JP3 are read by the video BIOS to select which of the six LCD flat-panel options will be used. Connecting an unsupported LCD flat-panel will produce unpredictable results. If the system BIOS detects that a flat panel and a VGA monitor are both connected to the system, then the video BIOS is initialized for the VGA monitor. The flat panel can then be turned on using the **CLMODE** software described in Appendix E.

Please note that a software addressable FET switch is also provided to allow application software control of the backlight on an LCD flat-panel. The default value is to come up with backlight control off. For more detailed information on the LCD flat-panels, refer to Chapter 3, *Theory of Operations* and Appendix D, *Video Modes and Supported Panels.*

In the table below, an 'on' in the jumper column indicates that the connector is jumpered. JP1, JP2, and JP3 are configured as follows to select the LCD flat-panel type:

Setting #	JP1	JP2	JP3	LCD Panel Description
0	on	on	on	Reserved
1	on	on	off	Sharp LM64C35P Passive Color LCD
2	on	off	on	Sharp LM64P89 Monochrome LCD
3	on	off	off	Sharp LQ10D131 Color TFT
4	off	on	on	Reserved
5	off	on	off	Reserved
6	off	off	on	Sharp LQ10DH11 Color TFT
7	off	off	off	NEC NL6448AC Color TFT

Table 2-1. LCD Flat Panel Jumper Selection

Due to a lack of standards in the LCD industry, standard cables are not available for the flat panels supported on the EPC-33/34. Pinouts for the cables are listed in Appendix D.

Mounting

The EPC-33/34 can be installed in an ISA-bus passive backplane or mounted using mounting holes on the board.

2   2

Mounting Holes

Six mounting holes are positioned on the PCB to allow for alternate mounting of the EPC-33/34 in something other than an ISA-bus chassis. These holes are located near the corners of the board and in the middle of the board top and bottom edges. Four of the holes are positioned to also be used as mounting holes for PC/104 module(s).

The locations of the mounting holes are shown below. All dimensions are in inches.
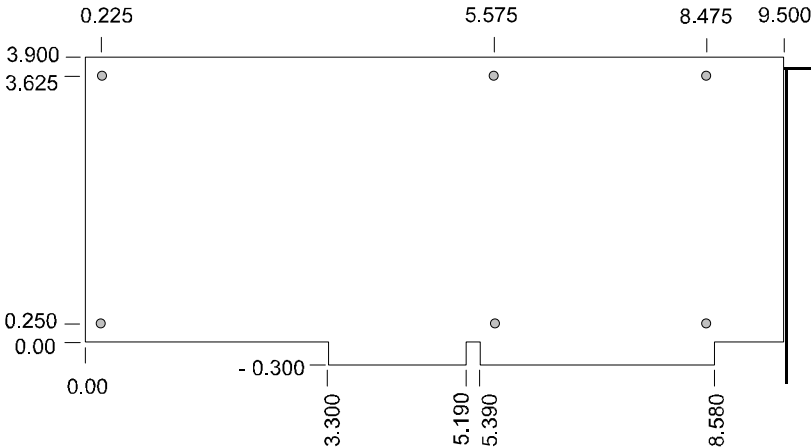
Figure 2-2. EPC-33/34 Dimensions.

The highest component on the board is the speaker, which extends 0.55" above the PCB. However, the end plate extends 0.75" above the PCB on the top flange.

To mount the EPC-33/34 to a surface using the screw holes, be sure to select a location where you have access to all available header pins and connectors. Mounting holes on the EPC-33/34 are 1/8" (0.125") in diameter, or 3.175 mm.

Refer to Figure 2-2 for a depiction of the EPC-33/34 mechanical dimensions.

Refer to Figure 2-3 for a depiction of the EPC-33/34 layout.
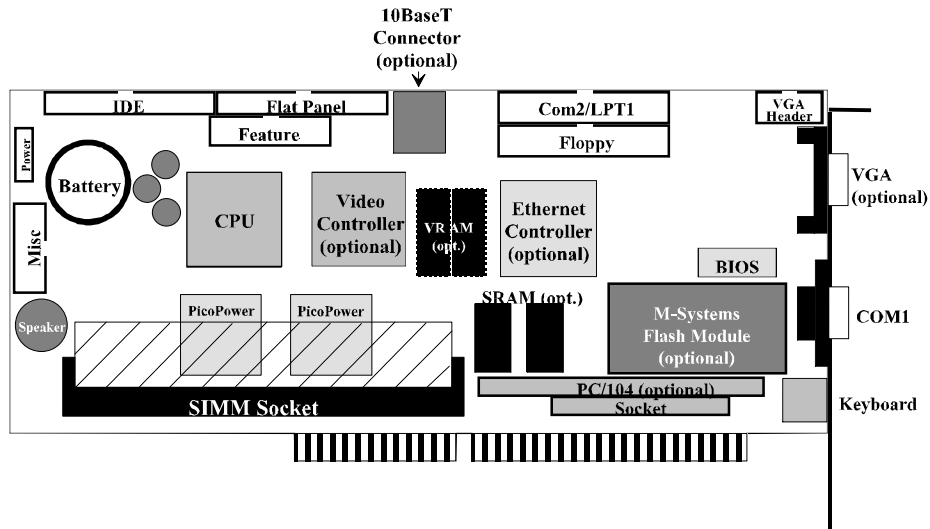
Figure 2-3. EPC-33/34 Layout.

It may be necessary to remove the PC mounting bracket from the EPC-33/34 before mounting flat on a surface.

ISA-bus Passive Backplane

Mechanically, the EPC-33/34 conforms to all outline requirements of the ISA-bus. The card is 9.5" long (measured from the inside of the end plate) by 4.2" tall including the card edge connector.

- ☞ MAKE SURE SYSTEM POWER IS OFF. THE EPC-33/34 CANNOT BE INSERTED INTO OR REMOVED FROM A LIVE SYSTEM.

- ☞ WHEN INSERTING THE EPC-33/34, 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.

2　　　　　**2**

Insertion of the EPC-33/34 into an ISA-bus chassis or a passive backplane is straightforward. Remove a blank panel from the chassis and insert the EPC-33/34 into the backplane card connector. Firmly press the EPC-33/34 down to ensure that the module is properly seated in the backplane.

Before Powering Up

Once the unit is mounted or installed, you are ready to connect cables and peripherals as needed. Refer to Figure 2-3 if necessary.

Perform the following steps *before* applying power to the board:

- keyboard connects to front-panel PS/2 style connector
- monitor connects to front-panel VGA connector or header (or use flat-panel)
- floppy drive connects to floppy header (optional)
- hard drive connects to IDE controller (optional)
- mouse connects to DB-9 serial port (optional)
- Ethernet connects to 10BaseT connector (optional)
- parallel port connects to COM2/LPT1 header (optional)

Also:
- make sure a SIMM is installed in the SIMM socket
- connect the MISC header for HDD, keylockpower etc. LEDs (optional)

At this point all cables, jumpers etc. should be connected to the EPC-33/34. You are now ready to apply power. For installations in most passive backplanes, power is provided. If not, and for EPC-33/34s using the mounting holes, power must be supplied to the six-pin power header located near the coin cell battery. For a description of the power header pinouts, refer to Chapter 4, *Connectors*.

Power-On Screen Display

The EPC-33/34 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.

During the setup and configuration of the EPC-33/34, a monitor and keyboard are required. A hard drive is recommended.

Whenever a hardware reset of the EPC occurs the system performs a power-on self-test (POST). The POST displays information showing the status of the BIOS self-test.

In the case below, floppy drive A: is not configured correctly. The screen image displays approximately as shown.

```
PhoenixBIOS Version 4.04
Copyright 1985-1995 Phoenix Technologies Ltd., All Rights Reserved


Copyright 1995 by RadiSys Corp.  Version 1.00.00


CPU = INTELDX4 100 Mhz
0000640K System RAM Passed
0003072K Extended RAM Passed
System BIOS Shadowed
Video BIOS Shadowed
UMB upper limit segment address:  F673
Diskette drive A error


Press <F1> to resume,  <F2> to Setup
```

Figure 2-4. POST Display with Error.

If errors occur during the power-on self-test, the BIOS displays the error on the appropriate line of the screen display and continues the boot process. It is important to watch the POST display to verify that no errors occur.

If error messages are displayed during or after the POST display, see Chapter 5, *Error Messages*.

BIOS Setup Screens

2   2

The EPC-33/34's BIOS contains a Setup function to display and alter the system configuration. This information is maintained in the EPC-33/34's nonvolatile CMOS RAM and is used by the BIOS to initialize the hardware.

The BIOS Setup can only be entered during the boot process, following a power-up, CTRL-ALT-DEL, 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.

```
        PhoenixNoteBIOS Setup  -  Copyright 1985-94 Phoenix Technologies Ltd.

      Main                  IDE Adapter 0 Master (C:  235 Mb)

                                               ┌──────────────────────────┐
                                               │      Item Specific Help  │
     Autotype Fixed Disk:        [Press Enter] │                          │
                                               │                          │
     Type:                       [User] 235 Mb │                          │
     Cylinders:                  [723]         │                          │
     Heads:                      [ 13]         │                          │
     Sectors/Track:              [ 51]         │                          │
     Write Precomp:              [None]        │                          │
                                               │                          │
                                               │                          │
     Multi-Sector Transfers:     [Disabled]    │                          │
     LBA Mode Control:           [Disabled]    │                          │
     32 Bit I/O:                 [Disabled]    │                          │
     Transfer Mode:              [Standard]    │                          │
                                               │                          │
                                               └──────────────────────────┘


     F1   Help   ↑↓  Select Item    -/+ Change Values      F9   Setup Defaults
     ESC  Exit   ←→  Select Menu     Enter Select  ▶  Sub-Menu   F10  Previous Values
```

Figure 2-6. 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-33/34 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, and 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, 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 disk's documentation.

BIOS Setup Main Menu

The BIOS Setup Main Menu is shown below:

```
      PhoenixNoteBIOS Setup  -  Copyright 1985-94 Phoenix Technologies Ltd.
   ┌──────┐
   │ Main │    Advanced        Exit
   └──────┘
  ┌─────────────────────────────────────────────┬──────────────────────────┐
  │  RadiSys EPC-33/34                           │    Item Specific Help    │
  │                                              │                          │
  │   System Time:            [16:17:18]         │  <Tab>, <Shift-Tab>, or  │
  │   System Date:            [03/02/95]         │  <Enter> selects field.  │
  │   Diskette A:             [1.44 MB, 3½"]     │                          │
  │   Diskette B:             [Not Installed]    │                          │
  │ ▶ IDE Adapter 0 Master:   (C:  235 Mb)       │                          │
  │ ▶ IDE Adapter 0 Slave:    (None)             │                          │
  │   Video System:           [EGA/VGA]          │                          │
  │ ▶ Boot Sequence:          [C: then A:]       │                          │
  │ ▶ Numlock:                [Auto]             │                          │
  │                                              │                          │
  │   System Memory:             640 KB          │                          │
  │   Extended Memory:          3072 KB          │                          │
  │                                              │                          │
  │                                              │                          │
  │                                              │                          │
  └─────────────────────────────────────────────┴──────────────────────────┘

   F1   Help   ↑↓  Select Item   -/+ Change Values      F9   Setup Defaults
   ESC  Exit   ←→  Select Menu   Enter Select ▶ Sub-Menu F10  Previous Values
```

Figure 2-5. BIOS Setup Main Menu.

The fields in each menu and sub-menu are explained below. Additional help information is available in the help area on each BIOS 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-33/34 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.

2   2

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.

Video System

These fields are the three basic settings to use with your monitor: EGA/VGA, CGA 80x25, and Monochrome.

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. The master drive is the C: drive. 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:

2   2

Note that the IDE adapter master 0 is not always the C: drive; it is merely the first IDE drive. If you have configured your Flash to be the bootable device, the first IDE drive appears as the D: drive. Flash BIOS extensions are enabled and configured in the Advanced Menu.

Multi-Sector Transfers

You can enable or disable multi-sector transfers as needed. This option allows the System BIOS to read ahead by the specified number of sectors whenever a disk access is performed, reducing the number of discrete disk reads. Autotyping can override your selection here. The default is to leave multi-sector transfers disabled.

LBA Mode Control

You can enable or disable Logical Block Addressing (LBA) as needed. LBA is a method used by newer, larger hard disk drives that are configured in logical blocks as opposed to the old cylinders/heads/sectors method. Autotyping can override your selection here. The default is to use the standard mode, i.e., to leave LBA mode control disabled.

32-Bit I/O

You can enable or disable 32-bit I/O as needed. This option allows the System BIOS to access the onboard IDE hard disk controller with 32-bit I/O accesses. Note that this does not refer to cable sizes or Windows disk access settings. The default is to leave 32-bit I/O disabled.

Transfer Mode

You can set the Transfer Mode for PIO1, PIO2, PIO3 or standard, as needed. Refer to your hard disk drive's documentation for more details. Autotyping will override your setting here. The default is to use the standard setting.

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. The information required is similar to Master drive setup. 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:
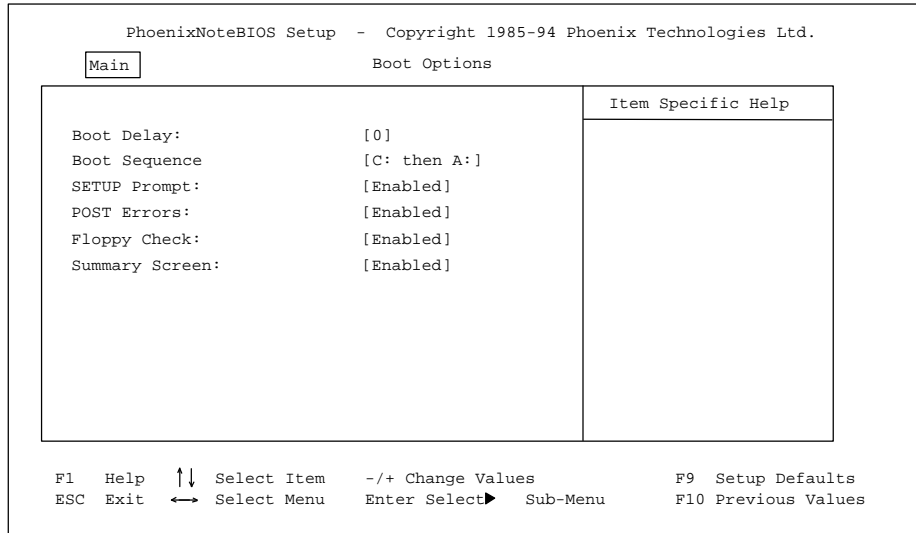
```
       PhoenixNoteBIOS Setup  -  Copyright 1985-94 Phoenix Technologies Ltd.
    ┌──────┐
    │ Main │                      Boot Options
    └──────┘
   ┌──────────────────────────────────────────┬──────────────────────────┐
   │                                           │     Item Specific Help   │
   │                                           ├──────────────────────────┤
   │   Boot Delay:              [0]            │                          │
   │   Boot Sequence            [C: then A:]   │                          │
   │   SETUP Prompt:            [Enabled]      │                          │
   │   POST Errors:             [Enabled]      │                          │
   │   Floppy Check:            [Enabled]      │                          │
   │   Summary Screen:          [Enabled]      │                          │
   │                                           │                          │
   │                                           │                          │
   │                                           │                          │
   │                                           │                          │
   │                                           │                          │
   │                                           │                          │
   └───────────────────────────────────────────┴─────────────────────────┘

   F1   Help    ↑↓  Select Item    -/+ Change Values        F9  Setup Defaults
   ESC  Exit    ←→  Select Menu    Enter Select▶  Sub-Menu   F10 Previous Values
```

Figure 2-7. 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:

2   2

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.

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, meaning the system will stop on encountering errors during the POST process.

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 Sub-menu

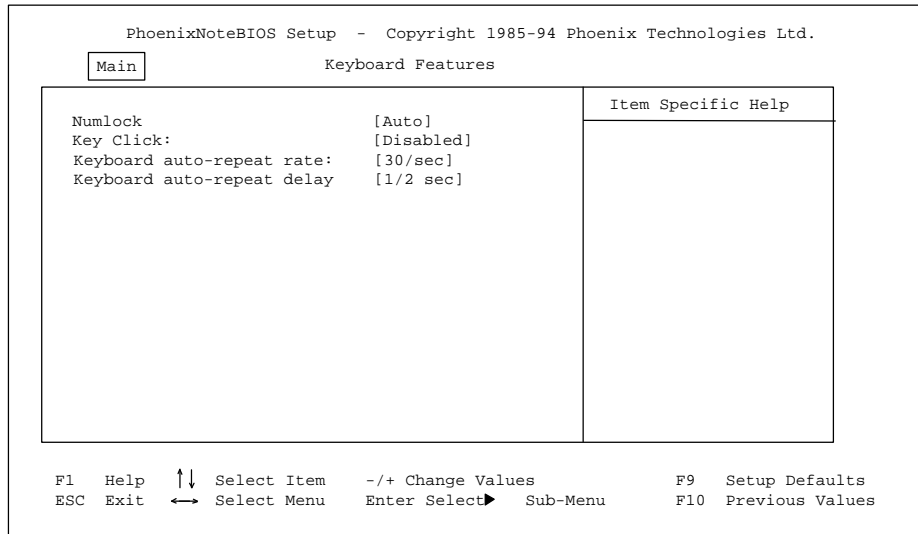Use this sub-menu to enable or disable various keyboard features.

```
        PhoenixNoteBIOS Setup  -  Copyright 1985-94 Phoenix Technologies Ltd.

     ┌──────┐
     │ Main │                    Keyboard Features
     └──────┘
   ┌────────────────────────────────────────┬─────────────────────────────┐
   │                                         │   Item Specific Help         │
   │ Numlock                    [Auto]       │                              │
   │ Key Click:                 [Disabled]   │                              │
   │ Keyboard auto-repeat rate:  [30/sec]    │                              │
   │ Keyboard auto-repeat delay  [1/2 sec]   │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   │                                         │                              │
   └─────────────────────────────────────────┴─────────────────────────────┘

    F1   Help   ↑↓  Select Item   -/+ Change Values         F9   Setup Defaults
    ESC  Exit   ←→  Select Menu   Enter Select▶  Sub-Menu    F10  Previous Values
```

Figure 2-8. 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 increment from two to 30 per second.

4hi744

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. If you do not set this feature, you cannot access more than 528 MBytes on larger hard disks.

RFA Memory Window

Use this option to disable or enable the RFA Flash. You must enable this option to use your Flash memory as a bootable or a non-bootable drive. When enabled, the Flash is visible to the system because E000-E7FF is consumed by the M-Systems file system. If using EMM386 or other memory managers, be sure to exclude this area. When disabled, E000-E7FF is not available for other BIOS functions.

Built-in BIOS Extension Configuration
RFA BIOS Base Address:

Use this option to enable the RFA BIOS extension on the EPC-33/34. The BIOS extension must be enabled for the Flash memory to appear as a bootable drive. The base address you select defines where the BIOS extension is installed. Be sure to exclude this area if using a memory manager such as EMM386.

Options are the following:

C800-CFFFh
CC00-D300h
D000-D7FFh
D400-DC00h
D800-DFFFh
Not Installed

Integrated Peripherals Sub-menu

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

2   2

```
         PhoenixNoteBIOS Setup  -  Copyright 1985-94 Phoenix Technologies Ltd.
      ┌─────────────┐         Integrated Peripherals
      │  Advanced   │
      └─────────────┘
                                                    ┌──────────────────────────┐
                                                    │     Item Specific Help    │
       COM port (DB-9 Connector)      [3F8,  IRQ 4] │                           │
       COM port (Header Connector)    [2F8,  IRQ 3] │                           │
       LPT port                       [378,  IRQ 7] │                           │
       Diskette Controller            [Enabled ]    │                           │
       IDE controller                 [Enabled ]    │                           │
       ECP                            [Enabled ]    │                           │
                                                    │                           │
                                                    │                           │
                                                    │                           │
                                                    │                           │
                                                    │                           │
                                                    └──────────────────────────┘


   F1   Help   ↑↓  Select Item   -/+ Change Values        F9   Setup Defaults
   ESC  Exit   ←→  Select Menu    Enter Select▶ Sub-Menu   F10  Previous Values
```

Figure 2-10. Integrated Peripherals Sub-menu.

COM port/COM port

Use this option to enable and configure or disable the COM1 and COM2 ports. The COM ports are user-definable for their address range and interrupt.

LPT port

Use this option to enable and configure or disable the LPT (parallel) port. The LPT port is user-definable for the address range and interrupt. The default for LPT1 is 378 and IRQ7.

Diskette Controller

Use this option to enable or disable the onboard floppy drive controller. This is useful if you need to enable a separate floppy controller card in your system.

IDE controller

Use this option to enable or disable the onboard IDE controller.

ECP

Use this option to enable the parallel port to operate as an Extended Capabilities parallel port (ECP). The ECP mode is for devices requiring higher data transfer rates; it also provides symmetric bi-directional communication.

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.

```
      PhoenixNoteBIOS Setup  -  Copyright 1985-94 Phoenix Technologies Ltd.
         ┌───────────┐          Memory Shadow
         │ Advanced  │
         └───────────┘
     ┌──────────────────────────────────────────┬─────────────────────┐
     │                                            │  Item Specific Help │
     │  System Shadow:            Enabled         ├─────────────────────┤
     │  Video Shadow:             [Enabled]       │                     │
     │                                            │                     │
     │  Shadow Memory Regions:                    │                     │
     │  C800-CBFF:                [Disabled]      │                     │
     │  CC00-CFFF:                [Disabled]      │                     │
     │  D000-D3FF:                [Disabled]      │                     │
     │  D400-D7FF:                [Disabled]      │                     │
     │  D800-DBFF:                [Disabled]      │                     │
     │  DC00-D8FF:                [Disabled]      │                     │
     │                                            │                     │
     │                                            │                     │
     │                                            │                     │
     └──────────────────────────────────────────┴─────────────────────┘

     F1   Help    ↑↓  Select Item    -/+ Change Values       F9   Setup Defaults
     ESC  Exit    ←→  Select Menu     Enter Select▶ Sub-Menu  F10  Previous Values
```

Figure 2-11. Memory Shadow Sub-menu.

About Shadow Memory Regions:

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

2   2

Do not enable shadowing for the same region you specified for TFFS. When this ROM extension is installed, it is automatically shadowed. If you make the same available region available to the ROM and a device driver, for example, a memory conflict results.

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

This completes the setups for the Advanced Menu.

Exit Menu

Use the options in this menu to save your edit(s) as you go along or when you exit back to the boot process. You can also exit without saving the edits, or go back to the original default setups installed at the factory. In addition, you can set your system up to backup or restore the BIOS setups usually stored in CMOS to a second location, Flash memory. BIOS setups stored in CMOS can be automatically restored in case of battery failure or if the CMOS becomes corrupt.

```
        PhoenixNoteBIOS Setup  -  Copyright 1985-94 Phoenix Technologies Ltd.
    Main      Advanced        Exit

   RadiSys EPC-33/34                              Item Specific Help

   Save values & Exit                          <Tab>, <Shift-Tab>, or
   Discard values & Exit                       <Enter> selects field.
   Get Default Values
   Backup CMOS to Flash
   Restore CMOS from Flash
   CMOS Restore Condition:   [Bad CMOS]
   Load Previous Values
   Save Current Values




   F1   Help   ↑↓ Select Item   -/+ Change Values        F9   Setup Defaults
   ESC  Exit   ←→ Select Menu   Enter Select▶  Sub-Menu   F10  Previous Values
```
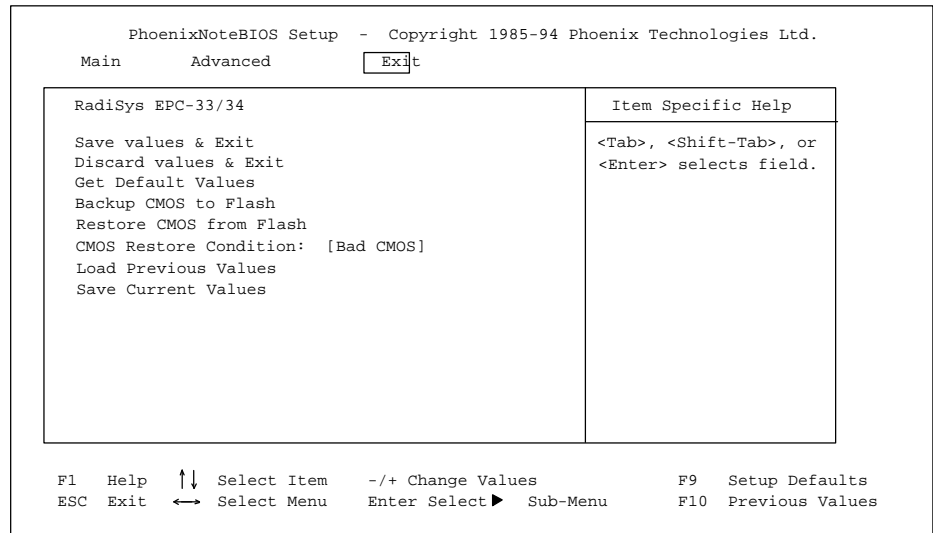
Figure 2-12. Exit Menu.

Save Values & Exit

Use this option when you want to save to CMOS the values you have just entered and then exit back to the boot process. The new values are loaded, and you exit and reboot. You will boot using the new BIOS setups.

You **must** use this option before you can use the "Restore CMOS from Flash" option. Note that you must jumper JP5 in order to write to Flash memory.

Discard Values & Exit

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

Get Default Values

Use this option when you need to reset the BIOS values all the way back to the original, default values that were configured at the factory, before any other end users made changes. You do not exit from the BIOS setups, so you can review the defaults and continue editing if you wish.

Backup CMOS to Flash

Use this option to immediately backup the current CMOS values to the Flash device. This is a useful "safety feature" that gives you a backup copy of the BIOS setups that is easily retrieved if necessary. Please note that in addition to backing up the current CMOS values, any edits you have made to the BIOS setups are automatically saved to CMOS **before** CMOS is backed up to Flash. This means that you do not have to use the 'Save Current Values' option before using this option if you have made changes.

Restore CMOS from Flash

Use this option to restore the CMOS setup configuration that is stored in the Flash device. If you have not previously backed up CMOS to Flash, you get an error message, "Failed to find a valid CMOS backup structure in Flash." Press any key to return to the Exit Menu and backup CMOS.

2   2

CMOS Restore Condition:

Use this option to set one of the options for the automatic restore condition. There are three options, as explained below, ranging from Never to Always, or conditional on an event. You must first save your BIOS setups to CMOS before you can restore them automatically.

Always. Every time the device boots, the setup configuration stored in Flash is re-loaded.

Never (default). During the boot process, the setup configuration stored in Flash is ignored.

Bad CMOS. Whenever the system detects corrupt CMOS during the boot process, the setup configuration in Flash is re-loaded.

Load previous values

Use this option if you want to immediately re-load the system with the previous values before this editing session started. These are not the defaults loaded at the factory; nor are they the values stored in Flash; these are the values present in the CMOS that were in use before the current editing session began. You do not exit, so you can review the changes made as a result of this selection.

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. This is useful for lengthy editing sessions involving several screens.

3. Theory of Operation

This chapter contains information about the following:

- EPC-33/34 processor
- Memory
- BIOS Flash EPROM
- Super VGA/Flat Panel controller subsystem
- SRAM Disk subsystem
- Flash Disk subsystem
- Ethernet port
- Watchdog timer
- ISA-bus
- Miscellaneous functions
- Resetting the EPC
- Power Requirements
- Peripheral interfaces
- IDE interface

Processor

The EPC-33 uses the 50 MHz Intel486 DX2 central processing unit (CPU). The EPC-34 uses the 100 MHz IntelDX4 CPU. Both CPUs are in a 208-pin PQFP package, and both contain an integrated math coprocessor. Note that this is **not** a socketed part, and therefore is not field-upgradable.

The board design uses the PicoPower chip set to interface the 80486 to the AT-bus. The chip set is packaged in two 176-pin TQFPs and supports mixed voltage designs (5V/3.3V).

Memory

The EPC-33/34 supports one bank (a bank is a single- or double-sided SIMM) of 70ns fast page mode DRAM installed in a 72 pin SIMM socket. The SIMM parts used on the EPC-33/34 are 3.3 volt versions of sizes 1Mx32 (4MB), 2Mx32 (8MB), 4Mx32 (16MB) and 8Mx32 (32MB). The EPC-33/34 does not use parity DRAM.

After power on reset, the BIOS finds and sizes the memory present in the system. The DRAM timing (in CPU clocks) in the EPC-33/34 system is set to enable the 80486 bus to achieve 4-2-2-2 timing. The EPC-33 can use SIMMs with speeds down to 80ns due to the slower bus clock speed.

The DRAM controller is set to map 80486 addresses in the region from 0x000C8000 to 0x000EFFFF to the AT-bus. The area from 0x000C8FFF to 0x000DFFFF may be used as shadow areas configured through setup. Memory accesses beyond the installed DRAM and not overlapping the 1MB video memory at 0x2000000 to 0x20FFFFF are automatically sent to the AT-bus. The video memory is above the system memory.

To improve the performance of the BIOS that is initially contained in an 8-bit wide Flash EPROM, the BIOS is shadowed in the DRAM at address 0x000FXXXX after power-on reset. The VGA BIOS is shadowed in the region 0x000C0000 to 0x000C7FFF.

Memory Expansion

A single 72-pin SIMM socket is provided for memory expansion. Modules must meet the following criteria:

- fast page mode, non-parity
- 72-pin, 3.3V
- 70 nanosecond DRAM or faster

Recommended part numbers for SIMMs are discussed in Chapter 6, *Upgrades*.

BIOS Flash EPROM

The main IBM-compatible BIOS and video BIOS resides in an Intel Flash device. It is based on the Phoenix NuBIOS 4.04 code base. It includes the video BIOS, supplied by Cirrus Logic, and support for flat panel displays. The BIOS supports a set of six different flat panel displays. Refer to Appendix D for more information.

The Flash device has one 8KB parameter block is used to shadow the CMOS memory, providing a method for saving setup information, even if the on-board battery fails. The CMOS setup/restore can be done automatically by the BIOS from the Exit Menu setups.

3   **3**

Super VGA / flat panel controller subsystem

A super VGA-compatible video and flat-panel display controller is provided on the CPU board. The controller is implemented with a Cirrus Logic CL-GD7543 ("Viking") part. The GD7543 includes an added MotionVideo and the following features: GUI acceleration, multimedia acceleration and enhancement, standard feature connector interface, 32-bit CPU interface, one 1 MByte of video memory, support for 640x480 and 800x600 LCDs, simultaneous display on both CRT and flat panel, 3.3V and 5.0V operation.

The VGA controller resides on the 32-bit 486 local bus. This requires the bus interface section of the VGA chip to operate at 3.3V. All other sections of the chip operate at 5V.

1 MB of video memory is present, implemented with two 256Kx16 DRAM devices. This memory provides standard VGA modes on a CRT or flat panel display, up to 640x480 resolution in 16.8 million colors. It also provides super VGA modes up to 800x600 on flat panel displays, and CRT displays of 800x600 64K colors, and 1024x768 256 colors (non-interlaced).

The video memory is mapped to a region of the memory space above the maximum 32MB of system RAM.

The VGA controller provides the following set of output connectors:

1. A 15-pin D-sub connector on the AT bracket to connect to a VGA monitor.
2. A 10-pin .100" pitch shrouded header which carries the same signals as the 15-pin D connector.
3. A 26-pin .100" pitch shrouded header to provide the feature connector interface.
4. A 44-pin 2.0mm pitch shrouded header to connect flat panel displays.

The VGA controller includes power-up and power-down sequence control to protect the flat panel. This includes separate outputs to control the panel logic voltage, the panel high-voltage, and the panel backlight voltage. The BIOS includes space for several different types of panels to be supported. At power-up, a set of jumpers is read by the VGA controller to select which of the six options is used. Refer to Appendix D for more information.

LCD Contrast Control

An adjustable DC-DC converter and associated circuitry is provided to allow software control of the contrast setting of an LCD flat panel. The output from this circuit are two variable voltages (positive and negative) which are available on the flat panel connector.

The contrast adjustment is done by writing an 8-bit value to the I/O Port at address 0x38D. The value written to this port is used to drive a Digital to Analog converter which controls the output voltage of the DC-DC converter. The output voltage ranges linearly from a minimum of approximately ±4V at a register value of 0xFF, to a maximum of +/-30V at a register value of 0x00. Positive and negative values change together when this register value changes.

LCD Backlight Control

A software addressable on/off FET switch is provided to allow application software control of the LCD backlight. This output on the flat panel connector is derived from the SVGA chip's backlight control, which is controlled by the power sequencing built into the chip, or it can be overridden by writing directly to the CR23 register in the SVGA chip. Writing to the I/O port at 3D4 sets up the index register so that the desired VGA register (CR23) can be accessed through I/O port 3D5. Writing a 1 to bit 3 of CR23 enables the override of the default backlight control. Once this bit is set, the backlight is controlled by bit 2 of CR23 no matter what is going on elsewhere in the VGA controller. Bit 2 of CR23 can then be used to directly turn the backlight on and off. Writing a 1 to this bit turns the backlight on, and writing a 0 to this bit turns the backlight off.

SRAM disk subsystem

Two 128Kx8 SRAM devices may be factory-installed on the EPC-33/34. This SRAM is not located in the processor's memory address space; it is accessed indirectly through I/O reads and writes. Single byte I/O writes to 0x380-0x382 are saved in latches that set up the lower, middle, and high address bits that drive the SRAM's address lines.

I/O reads/writes to 0x384 access the SRAM data at the address stored in the latches. Each read or write from the data port also increments the address in the latches to allow efficient reading or writing of sequences of bytes in the SRAM. These latches are initialized to 0x00 at power-up and will be cleared by any AT-bus reset.

In order to use the SRAM as a disk device, you must first format it, using the **SRAMFMT.EXE** utility, then load the **SRAMDISK.SYS** device driver during the boot process.

Flash disk subsystem

The EPC-33/34 can contain an optional Flash disk up to 8 MBytes in size, using a module and a full read/write Flash file software system licensed from M-Systems. The system can also be booted from the Flash disk.

+12V (a maximum of 150ma is required) must be supplied via the power connector or the ISA-bus (or PC/104 sockets) to allow erasing and writing the Flash disk device.

The interface to the Flash disk is implemented through a memory window in the ISA-bus memory space at E000:0. This memory window is programmed using a range comparator function of the PicoPower PC/AT chipset. The upper address bits which select pages within the 4MB Flash disk are provided by two registers at I/O port 0x389-A. These registers provide the upper twelve bits of the Flash address. (In a 4MB system, only 10 of these bits are used.)

The register at 0x38B is used to select the size of the window used to access the Flash. The bits in this register select the source of the A15-A12 address bits sent to the Flash memory. If the bits in 0x38B are '0' then the ISA-bus address bits are used. If the bits in 0x38B are '1' the lower bits of 0x389 are used. The window size must also be programmed into the chipset to provide the appropriate address decode.

Flash Disk Registers:		
Address	D7-D4	D3-D0
0x389	Flash address A19-A16	Flash address A15 - A12
0x38A	unused	Flash address A23 - A20
0x38B	unused	Memory Window Size select

A fourth register is used to provide control of the programming voltage to the Flash disk. This register is located at I/O port 0x38C and uses only one bit. When this bit is set to 1, the programming voltage is enabled. A 0 in this bit disables all write operations to the Flash disk. This bit can also be read back to verify that the programming voltage is actually being supplied to the Flash components (a '1' indicates the presence of the programming voltage).

Flash Control Register 0x38C:	
D7-D1	D0
Unused	Flash program voltage enable

Ethernet Port

The Ethernet subsystem is compatible with Western Digital 8013, Novell NE2000 and NE2000+ cards through the use of National Semiconductor's DP83905 AT/LANTIC chip.

The default configuration for the Ethernet port is as a WD8013-compatible card. The I/O base address is 0x280. Interrupts are signaled on IRQ5. These parameters can be changed by running the **AUTOSET** program that is supported under DOS. The alternate I/O base addresses are 0x240, 0x280, 0x2C0, 0x300, 0x320 and 0x340. The alternative interrupts are IRQ9, IRQ10 and IRQ15.

RadiSys assigns a unique Ethernet ID to each board at production time using RadiSys' range of IDs.

Two 8K x 8 RAM chips are present for packet buffering.

A boot ROM is not supported.

The EPC-33/34 provides a connector for a 10BaseT Ethernet cable on the top edge of the circuit board.

Watchdog timer

A watchdog timer function is included to provide either an NMI or a RESET signal to the CPU in the event that software loses control of the system.

A register is present that enables or disables the watchdog timer function and allows the selection of different timeout periods. The register returns the value FF when read. It is defined as follows:

Watchdog Register 0x388:			
D7 - D4	D3-D2	D1	D0
Timeout Length	Unused	Watchdog NMI enable	Watchdog RESET enable

If the timeout length bits are set to 0, the watchdog timeout is set to 125 mS. Otherwise, the timeout length bits define a four bit number which adds additional time to the period (in steps of 125 mS) up to a maximum of 2 seconds. Times are approximate; the actual timing is done off the ISA-bus refresh signal using a long counter.

If the watchdog enable bits are set to 0, the watchdog function is available only on the TIMEOUT pin of the miscellaneous connector. If either bit is set to 1, watchdog time-outs will be enabled on the corresponding line to the CPU (NMI or RESET). The watchdog signals (TIMEOUT and/or NMI and/or RESET) will be asserted if the specified time interval elapses with no read or write from the watchdog register. Once asserted, the signals remain asserted until the counter is reset by accessing this register.

Upon power-on reset and all AT-bus resets, this register is initialized to 0x00.

ISA-bus

Connection is made to the ISA-bus through a standard PC/AT-style card edge connector. This connector includes two sections; one is a 31-position connector, and the second an 18-position connector. Each position has one contact on each side of the board. These card edge connectors are designed, positioned and connected per the ISA-bus specification and are gold plated, 30 micro inch [0.76 micron] minimum, over nickel.
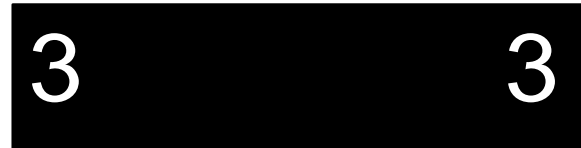
The ISA-bus signals are provided by the PicoPower PC/AT chipset. The buffer strengths, Iol and Ioh, on the bus are 12mA.

The clock speed of the ISA-bus is set to approximately 8 MHz.

Terminations contained on the EPC-33/34 CPU board are as follows:

3   3

Signal	Termination
Address lines	
SA0 - SA19, and LA17 - LA24:	10K pullup to VCC
Data lines	
SD0 - SD15:	10K pullup to VCC
Control strobes	
~IOR, ~IOW, ~MEMR, ~MEMW, ~SMEMR, ~SMEMW:	4.7K pullup to VCC
Xfer response signals	
~IOCS16, ~MEMCS16, ~0WS, ~MASTER:	300 ohm pullup to VCC
DRQ inputs:	10K pulldown to GND
IRQ inputs:	10K pullup to VCC
~REFRESH output:	Open-collector, with 4.7K ohm pullup to VCC
RESETDRV, OSC, BALE, AEN, SYSCLK, TC	No termination
~SBHE output:	10K pullup to VCC
~IOCHCK input:	4.7K pullup to VCC
IOCHRDY input:	1K pullup to VCC

Note that pull-ups are provided on lines driven by the "current master" in order to place these lines in a known state during the transfer of control to an ISA-bus add-in card that uses the MASTER feature to gain control of the bus from the CPU.

Miscellaneous functions

Keyboard controller

A PC-compatible keyboard controller is provided on the board. Connection to it is made with a 6-pin mini-DIN circular connector, the type used in PS/2 designs and in other RadiSys CPU designs. This connector is located at the bottom of the AT bracket along the back edge of the circuit board. The keyboard connections are also provided in the test connector which is used in manufacturing test. An input is provided on the miscellaneous connector for the connection of a keylock switch to disable the keyboard.

There are two jumpers as inputs to the keyboard controller to select color or monochrome display and to force an update of the system BIOS. Refer to Chapter 2, *Installation and Configuration*, for more information.

Power to the keyboard is fused to meet safety agency requirements (e.g., UL1950).

Battery

A built-in socketed coin cell battery is provided for backup of the real-time clock and CMOS RAM. This cell will be installed at the factory, and is user-replaceable. The cell used is a 3V lithium coin cell, Panasonic part number BR2330 (250mA-hour) or equivalent.

1. Gently lift
   retaining clip

2. Slide battery
   in/out in line with
   the direction of the
   retaining clip.

Figure 3-1. Replacing the Battery.
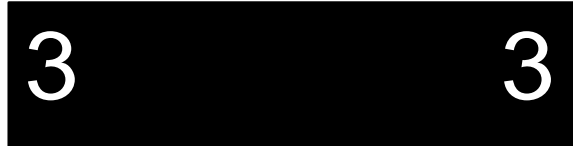
Diode and/or resistor protection is employed in accordance with UL1950/EN0950 requirements to prevent damage from reverse current.

Speaker

A very small speaker (0.5" [12.7 mm] maximum) is installed on the PCB and connected to the standard PC "beep" generation circuit. It is expected that in high-noise situations a larger external speaker would be connected.

The external speaker is driven with a 5V P-P square-wave signal, with current limiting resistors. The speaker may be connected directly to either a piezoelectric speaker or an electromagnetic speaker.

Miscellaneous function connector

A 14-pin standard 0.100" [2.54 mm] center header connector is provided to allow access to several miscellaneous functions of the CPU card. These functions include the following:

Speaker   A signal is provided to allow the user to connect an external speaker to the circuit provided on the CPU board to generate sound.

HDD access LED   A signal is provided for the user to connect an external LED to indicate hard disk drive access. An external current-limit resistor is not required; current is limited by a 330 ohm resistor to VCC.

Power on LED   A signal is provided for the user to connect an external LED to indicate that power is applied to the system. An external current limit resistor is not required; current is limited by a 330 ohm resistor to VCC.

Reset switch   An input is provided for the user to connect an external, SPST-NO switch to provide a reset input to the system. This signal may also be driven with an open-collector TTL signal.

Key switch input   An input is provided to port P17 of the keyboard controller. This is normally connected to a keylock switch to disable the keyboard in the PC/AT system. This input has an internal pullup resistor to VCC.

Watchdog Timer   An output pin is provided which carries the TIMEOUT signal from the watchdog timer.

3   3

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 runs the power-on self-tests and reboot the operating system.

External Reset Input

The external reset input causes the EPC-33/34 to perform a hardware reset. The system runs the power-on self-tests and reboot the operating system.

BIOS Setups EXIT Screen

From the EXIT screen, when you exit and save changes a reboot causes a hardware reset. The system runs the POST and reboots the operating system. It does not cause an AT reset.

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.

Watchdog timer

This causes the entire system to reset. The system runs the power-on self-tests and reboot the operating system. See below for more details.

Additional abnormal conditions that cause a reset

Low Vcc

Power Requirements

In most applications, the EPC-33/34 operates on 5V DC power only. The voltage required is between 4.75 and 5.25 volts. +12V must be supplied via the ISA-bus or the power connector to erase or program the FLASH devices, including the BIOS.

+5V may be supplied either via the ISA-bus edge connector, the PC/104 bus header, or the power connector. Care must be taken that the maximum current ratings of the connectors are not exceeded.

3   3

Peripheral Interfaces

Serial and parallel port functions and a floppy disk drive controller are contained in a multi-IO chip, the FDC37C665GT, manufactured by Standard Microsystems Corp. (SMC). For details of the operation of these functions, refer to the SMC data sheet for this device.

Serial Ports

The COM1 serial port is located in a user-definable I/O address range. The default is 3F8. The default is for COM1 serial port interrupts to be signaled using IRQ4. Connection to COM1 is provided by a standard male DB-9 connector mounted on the card bracket.

The COM2 serial port is located in a user-definable I/O address range. The default is 2F8. The default is for COM2 serial port interrupts to be signaled using IRQ3. Connection to COM2 is made via a standard header connector on the board that is shared with the parallel port.

Both COM ports are 16C550-compatible and contain FIFOs. The best way to bring up the FIFO is to set it up within the applications software, but if that is not possible it can be set through the debug (or equivalent) routine. Bit 0 of the FIFO Control Register (FCR) must be set with an I/O write to the Interrupt Identification Register (IIR). For example, if COM1 uses the default address 3F8, writing to 3FA with the hex value 01 enables the FIFO.
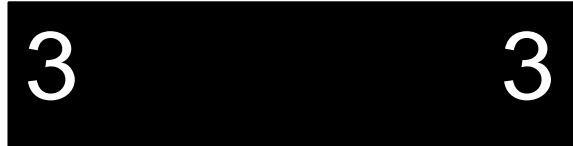
Parallel Port

The parallel port is located in a user-definable I/O address range (278, 3BC, or 378). Parallel port interrupts are signaled using IRQ7. Connection to this port is made via a header connector on the board that is shared with the COM2 serial port. The parallel port is bi-directional and since it conforms to IEEE 1284-I, the parallel port supports ECP modes.

Floppy Disk Controller

The floppy disk controller is fully PC-compatible, supporting one or two floppy drives. It occupies I/O addresses 0x3F2, 0x3F4, 0x3F5, and 0x3F7. It uses bus interrupt IRQ6 and the 8-bit DMA channel corresponding to DRQ2 and ~DACK2 on the AT-bus. Connection to a floppy disk drive is made via a standard 34-pin ribbon cable header mounted on the PCB. Power for the drive must be provided externally. Note that you must use a straight-through cable to drive A (no twist); drive B gets the twist.

IDE Interface

The IDE hard disk interface is provided by the PicoPower PC/AT chipset. The IDE hard disk is mapped to I/O addresses 0x1F0 - 0x1F7, 0x3F6, and 0x3F7. Note that I/O address 0x3F7 is shared with the floppy disk controller as required for PC compatibility. The IDE hard disk uses AT-bus interrupt IRQ14. Connection to an IDE hard disk is made through a 44-pin 0.079" [2.0 mm] pitch ribbon cable header (the standard for 2.5" and 1.8" HDD's) mounted on the PCB. As part of the CPU chipset, this interface exists on the 486 local bus and can therefore support the higher throughput requirements of the Enhanced IDE specification. Up to two drives are supported by the IDE interface including IDE CD-ROM drives. If the onboard IDE controller is disabled in the Advanced Menu of the BIOS setup, you can use your own IDE controller card on the AT-bus.

NOTES

4. Connectors

Overview

This chapter specifies the pinouts of the connectors on the EPC-33/34. 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-33/34. Refer to Figure 2-3 for the board location of each connector. The following table lists each connector (or equivalent) and the part number for the suggested mate:

Ref.	Function	On PCB	Suggested Mate
J1	Ethernet	RJ-45 8-pin	AMP 554739-1
J2	VGA pinout	JST KSEY-15S-1A3F19-13	AMP 748364-1
J3	COM1	JST JSEY-9P-1A3F19-13	AMP 205204-4
J4	KBD	AMP 749266-1	AMP 750206-4
CN1	Power	AMP 171825-6	AMP 171822-6
CN2	HDD	Samtec STMM-122-01-S-D-20	3M 152244-0110-GG
CN3	VGA feature connector	Samtec TST-113-01-S-D-LL	3M 3399 6600
CN4	Flat Panel	Samtec STMM-122-01-S-D-20	3M 152244-0110-GG
CN5	COM2/LPT	3M 2534-6002UB	3M 3414 6600
CN6	FDD	3M 2534-6002UB	3M 3414 6600
CN7	VGA connector	3M 2510-6002UG	3M 3473 6600
CN8	Misc.	3M 2514-6002UB	3M 3385-6600
CN9	PC/104	Samtec ESQ-132-37-G-D	ESQ-132-39-G-D
		Samtec ESQ-120-37-G-D	ESQ-120-39-B-D

Table 4-1. Connector Mating.

Ethernet

Ethernet 10BaseT (J1) 8-pin RJ-45	
1	TPT+
2	TPT-
3	TPR+
4	n/c
5	n/c
6	TPR-
7	n/c
8	n/c
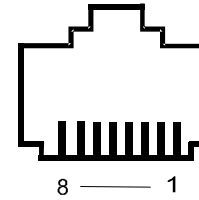
Table 4-2. Ethernet Connector Pinout.

VGA

VGA (J2) 15-pin female high-density D-sub JST KSEY-15S-1A3F19-13 or equiv.	
1	RED
2	GREEN
3	BLUE
4	n/c
5	GND
6	ANALOG GND
7	ANALOG GND
8	ANALOG GND
9	n/c
10	GND
11	n/c
12	n/c
13	H SYNC
14	V SYNC
15	n/c
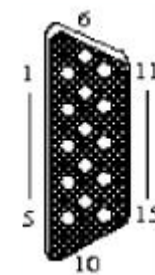
Table 4-3. VGA Connector Pinout.

4   4

COM1

COM1: (J3) 9-pin male D-sub JST JSEY-9P-1A3F19-13 or equiv.	
1	CD
2	RXD
3	TXD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI
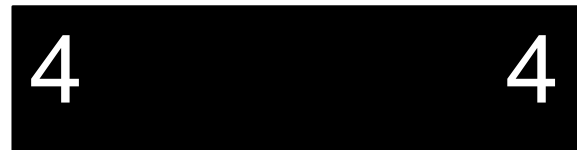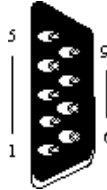
Table 4-4. COM1 Connector Pinout.

Keyboard

Keyboard (J4) 6-pin mini-DIN circular AMP 749266-1 or equivalent	
1	KEYBOARD DATA
2	n/c
3	GND
4	KEYBOARD VCC
5	KEYBOARD CLK
6	n/c
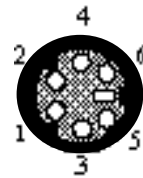
Table 4-5. Keyboard Connector Pinout.

Power Connector

Power (CN1) AMP #171825-6, 6 position, 0.098" [2.50 mm] pitch	
1	GND
2	GND
3	GND
4	VCC
5	VCC
6	+12V
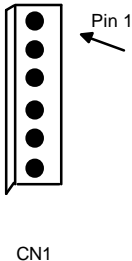
Table 4-6. Power Connector Pinout.

IDE Connector

IDE HDD (CN2)			
22x2, 0.079" [2.0 mm] pitch header			
1	~RESET	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	key
21	n/c	22	GND
23	~IOW	24	GND
25	~IOR	26	GND
27	IOCHRDY	28	n/c
29	n/c	30	GND
31	IRQ	32	~IOCS16
33	A1	34	~PDIAG
35	A0	36	A2
37	~HCS0	38	~HCS1
39	~DASP	40	GND
41	VCC	42	VCC
43	GND	44	n/c

Table 4-7. IDE Connector Pinout.

Top of board

Pin 1

CN2

Bracket
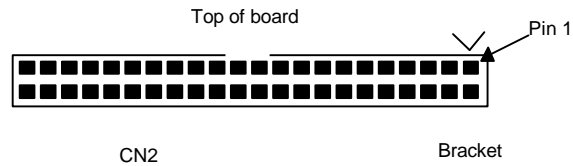
VGA Feature Connector
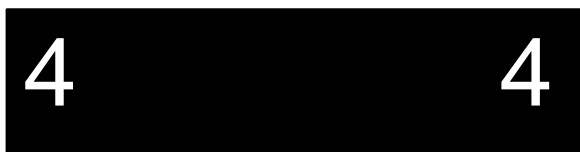
VGA Feature Connector (CN3)			
13x2, 0.100" [2.54 mm] pitch header			
1	GND	2	FCP0
3	GND	4	FCP1
5	GND	6	FCP2
7	FCEVIDIEO	8	FCP3
9	FCESYNC	10	FCP4
11	n/c	12	FCP5
13	n/c	14	FCP6
15	GND	16	FCP7
17	GND	18	VCLK
19	GND	20	BLANK
21	GND	22	HSYNC
23	FCVCLK	24	VSYNC
25	OVRW	26	GND

Table 4-8. VGA Feature Connector Pinout.
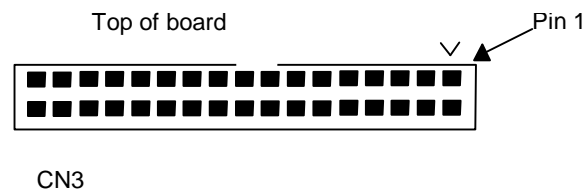
Flat Panel Connector

Flat-Panel Connector (CN4) 22x2, 0.079" [2.0 mm] pitch header			
CN4	Signal	CN4	Signal
1	FP0	2	FP1
3	FP2	4	FP3
5	FP4	6	FP5
7	FP6	8	FP7
9	FP8	10	FP9
11	FP10	12	FP11
13	FP12	14	FP13
15	FP14	16	FP15
17	GND	18	FPVCLK
19	GND	20	FP18
21	GND	22	LFS
23	MOD	24	FP23
25	VSYNC	26	FPDE
27	HSYNC	28	VEE
29	FP19	30	VBB
31	~LITEON	32	SWVDD
33	FP20	34	GND
35	LLCLK	36	GND
37	FPVEE	38	FPVCC
39	FP21	40	+VADJ
41	-VADJ	42	FP17
43	FP22	44	FP16
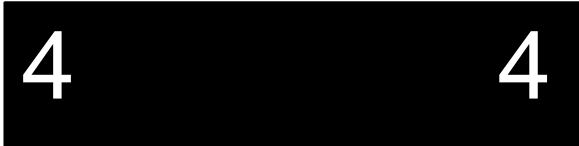
Table 4-9. Flat Panel Connector Pinout.
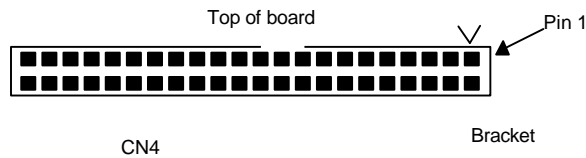
COM2/LPT1 Connector (RS-232)
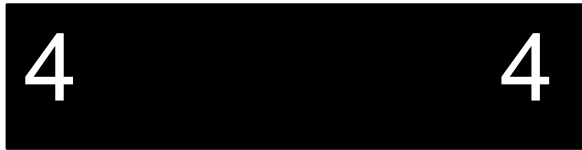
RS-232 COM2: / LPT1: (CN5)			
17x2, 0.100" [2.54 mm] pitch header			
1	COM2: DCD	2	COM2: DSR
3	COM2: RXD	4	COM2: RTS
5	COM2: TXD	6	COM2: CTS
7	COM2: DTR	8	COM2: RI
9	GND	10	LPT1: ~STB
11	LPT1: ~AUFD	12	LPT1: D0
13	LPT1: ~ERROR	14	LPT1: D1
15	LPT1: ~INIT	16	LPT1: D2
17	LPT1: ~SLIN	18	LPT1: D3
19	GND	20	LPT1: D4
21	GND	22	LPT1: D5
23	GND	24	LPT1: D6
25	GND	26	LPT1: D7
27	GND	28	LPT1: ~ACK
29	GND	30	LPT1: BUSY
31	GND	32	LPT1: PE
33	GND	34	LPT1: SLCT

Table 4-10. COM2/LPT Connector Pinout (RS-232).

Pin 1

Top of board

CN5
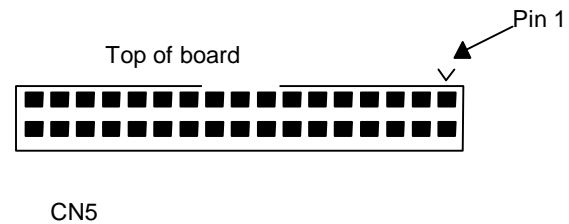
COM2/LPT1 Connector (RS-485 version)

RS-232 COM2: / LPT1: (CN5) 17x2, 0.100" [2.54 mm] pitch header			
1	GND	2	COM2: CTS-
3	COM2: RTS+	4	COM2: CTS+
5	COM2: RTS-	6	COM2: RXD+
7	COM2: TXD+	8	COM2: RXD-
9	COM2: TXD-	10	LPT1: ~STB
11	LPT1: ~AUFD	12	LPT1: D0
13	LPT1: ~ERROR	14	LPT1: D1
15	LPT1: ~INIT	16	LPT1: D2
17	LPT1: ~SLIN	18	LPT1: D3
19	GND	20	LPT1: D4
21	GND	22	LPT1: D5
23	GND	24	LPT1: D6
25	GND	26	LPT1: D7
27	GND	28	LPT1: ~ACK
29	GND	30	LPT1: BUSY
31	GND	32	LPT1: PE
33	GND	34	LPT1: SLCT

Table 4-11. COM2/LPT Connector Pinout (RS-485).

Pin 1

Top of board
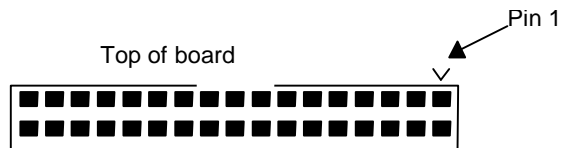
CN5

Floppy Disk Drive Connector

Floppy Disk Drive Controller (CN6)			
17x2, 0.100" [2.54 mm] pitch header			
1	GND	2	~DENS
3	n/c	4	n/c
5	n/c	6	n/c
7	GND	8	~INDEX
9	GND	10	~MO1
11	GND	12	~DS0
13	GND	14	~DS1
15	GND	16	~MO0
17	GND	18	~DIR
19	GND	20	~STEP
21	GND	22	~WDATA
23	GND	24	~WGATE
25	GND	26	~TRK00
27	GND	28	~WRPRT
29	GND	30	~RDATA
31	GND	32	~SIDE
33	GND	34	~DSKCH

Table 4-12. Floppy Disk Drive Controller Connector Pinout.

Top of board   Pin 1
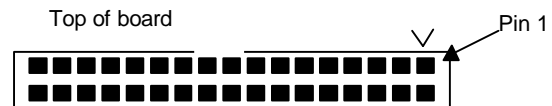
CN6

VGA Header

VGA header (CN7) 8x2, 0.100" [2.54 mm] pitch header			
1	RED	2	ANALOG GND
3	GREEN	4	ANALOG GND
5	BLUE	6	ANALOG GND
7	HSYNC	8	GND
9	VSYNC	10	GND

Table 4-13. VGA Header Pinout.

Top of board   Pin 1

CN7
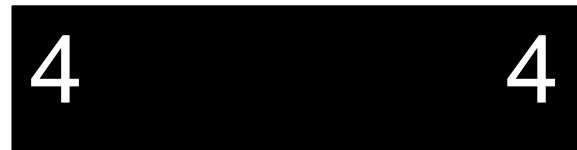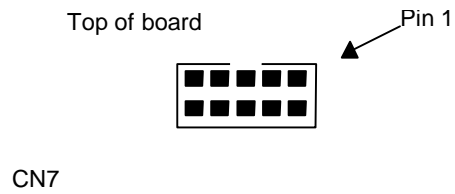
Miscellaneous Connector

Miscellaneous Connector (CN8)			
7x2, 0.100" [2.54 mm] pitch header			
1	KEYLOCK SW IN	2	GND
3	HDD LED ANODE	4	HDD LED CAT
5	PWR LED ANODE	6	PWR LED CAT
7	RST SW IN	8	GND
9	SPRK OUT	10	GND
11	n/c	12	GND
13	TIMEOUT	14	n/c

Table 4-14. Miscellaneous Connector Pinout.

End of board

Pin 1

CN8
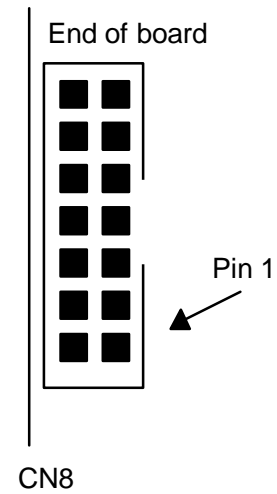
PC/104 Connector Pinout

PC/104 Connector (CN9) 32x2, 0.100" [2.54 mm] pitch socket			
CN9	Signal	CN9	Signal
A1	~IOCHCK	B1	GND
A2	SD7	B2	RESETDRV
A3	SD6	B3	VCC
A4	SD5	B4	IRQ9
A5	SD4	B5	n/c
A6	SD3	B6	DRQ2
A7	SD2	B7	n/c
A8	SD1	B8	~0WS
A9	SD0	B9	+12V
A10	IOCHRDY	B10	GND
A11	AEN	B11	~SMEMW
A12	SA19	B12	~SMEMR
A13	SA18	B13	~IOW
A14	SA17	B14	~IOR
A15	SA16	B15	~DACK3
A16	SA15	B16	DRQ3
A17	SA14	B17	~DACK1
A18	SA13	B18	DRQ1
A19	SA12	B19	~REFRESH
A20	SA11	B20	SYSCLK
A21	SA10	B21	IRQ7
A22	SA9	B22	IRQ6
A23	SA8	B23	IRQ5
A24	SA7	B24	IRQ4
A25	SA6	B25	IRQ3
A26	SA5	B26	~DACK2
A27	SA4	B27	TC
A28	SA3	B28	BALE
A29	SA2	B29	VCC
A30	SA1	B30	OSC
A31	SA0	B31	GND
A32	GND	B32	GND

Table 4-15. PC/104 Connector Pinout.

PC/104 Connector (CN9)			
20x2, 0.100" [2.54 mm] pitch socket			
CN9	Signal	CN9	Signal
C0	GND	D0	GND
C1	~SBHE	D1	~MEMCS16
C2	LA23	D2	~IOCS16
C3	LA22	D3	IRQ10
C4	LA21	D4	IRQ11
C5	LA20	D5	IRQ12
C6	LA19	D6	IRQ15
C7	LA18	D7	IRQ14
C8	LA17	D8	~DACK0
C9	~MEMR	D9	DRQ0
C10	~MEMW	D10	~DACK5
C11	SD8	D11	DRQ5
C12	SD9	D12	~DACK6
C13	SD10	D13	DRQ6
C14	SD11	D14	~DACK7
C15	SD12	D15	DRQ7
C16	SD13	D16	VCC
C17	SD14	D17	~MASTER
C18	SD15	D18	GND
C19	GND	D19	GND

Table 4-16. PC/104 Connector Pinout.
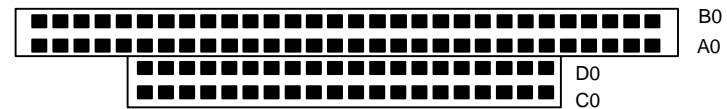
AT-bus Connector Pinouts

AT-bus (XT side) (P2) 31x2, 0.100" [2.54 mm] pitch card edge			
P1	Signal	P1	Signal
A1	~IOCHCK	B1	GND
A2	SD7	B2	RESETDRV
A3	SD6	B3	VCC
A4	SD5	B4	IRQ9
A5	SD4	B5	n/c
A6	SD3	B6	DRQ2
A7	SD2	B7	n/c
A8	SD1	B8	~0WS
A9	SD0	B9	+12V
A10	IOCHRDY	B10	GND
A11	AEN	B11	~SMEMW
A12	SA19	B12	~SMEMR
A13	SA18	B13	~IOW
A14	SA17	B14	~IOR
A15	SA16	B15	~DACK3
A16	SA15	B16	DRQ3
A17	SA14	B17	~DACK1
A18	SA13	B18	DRQ1
A19	SA12	B19	~REFRESH
A20	SA11	B20	SYSCLK
A21	SA10	B21	IRQ7
A22	SA9	B22	IRQ6
A23	SA8	B23	IRQ5
A24	SA7	B24	IRQ4
A25	SA6	B25	IRQ3
A26	SA5	B26	~DACK2
A27	SA4	B27	TC
A28	SA3	B28	BALE
A29	SA2	B29	VCC
A30	SA1	B30	OSC
A31	SA0	B31	GND

Table 4-17. AT-bus Connector (P2) Pinout.
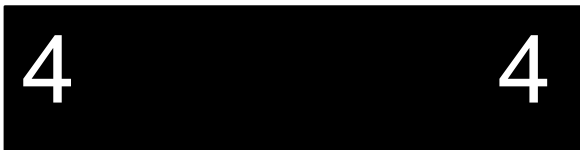
AT-bus (AT side) (P1)			
18x2, 0.100" [2.54 mm] pitch card edge			
P2	Signal	P2	Signal
C1	~SBHE	D1	~MEMCS16
C2	LA23	D2	~IOCS16
C3	LA22	D3	IRQ10
C4	LA21	D4	IRQ11
C5	LA20	D5	IRQ12
C6	LA19	D6	IRQ15
C7	LA18	D7	IRQ14
C8	LA17	D8	~DACK0
C9	~MEMR	D9	DRQ0
C10	~MEMW	D10	~DACK5
C11	SD8	D11	DRQ5
C12	SD9	D12	~DACK6
C13	SD10	D13	DRQ6
C14	SD11	D14	~DACK7
C15	SD12	D15	DRQ7
C16	SD13	D16	VCC
C17	SD14	D17	~MASTER
C18	SD15	D18	GND

Table 4-18. AT-bus Connector (P1) Pinout.

5. Error Messages

Introduction

This section deals with only the most common error messages encountered when booting up. Error messages can come from DOS or from the Phoenix BIOS..

Common Error Messages

This section contains a summary of the most common 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.

BIOS Error Messages

DISKETTE DRIVE A (B) ERROR   BIOS

Problem: Drive A: or B: is present but fails the BIOS POST diskette tests.

Solution(s): Check to see that the drive is defined with the proper diskette type in Setup and that the diskette drive is attached. correctly.

EXTENDED RAM FAILED AT OFFSET: NNNN   BIOS

Problem: Extended memory is not working properly.

Solution(s): Re-configure extended memory.
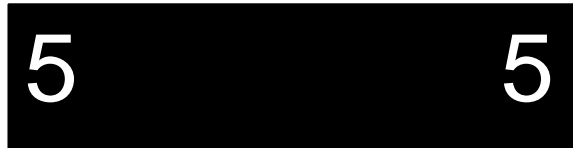
FAILING BITS: NNNN BIOS

Problem: The hex number nnnn is a map of the bits at the RAM address (in System, Extended, or Shadow memory) which failed the memory test. Each 1 (one) in the map indicates a failed bit.

Solution(s): Contact RadiSys Technical Support.

FIXED DISK X FAILURE / FIXED DISK CONTROLLER FAILURE BIOS

Problem: The fixed disk is not working or is not configured properly.

Solution(s): Check to see if the fixed disk is attached properly.

Run Setup to ensure that the fixed disk type is correctly identified.

INCORRECT DRIVE A (B) TYPE BIOS

Problem: The floppy drive listed is not correctly identified in Setup.

Solution(s): Enter the BIOS Setup program and set the floppy drive size correctly.

INVALID NVRAM MEDIA TYPE BIOS

Problem: There is a problem with NVRAM access.

Solution(s): Contact RadiSys Technical Support.

KEYBOARD CONTROLLER ERROR BIOS

Problem: The keyboard controller failed its POST test.

Solution(s): Try replacing the keyboard. Use a different make or model, if possible. If the problem persists, the onboard keyboard controller is producing the error. Contact RadiSys Technical Support.

KEYBOARD ERROR BIOS

Problem: The keyboard is not working.

Solution(s): Replace the keyboard. The error is in the keyboard, not the keyboard controller.

KEYBOARD ERROR NN BIOS

Problem: There is a stuck key on the keyboard.

Solution(s): The BIOS discovered a stuck key at scan code nn.

KEYBOARD LOCKED BIOS

Problem: The keyboard is locked to deny access to the system.

Solution(s): Check the miscellaneous header to see if it is being used properly. An input is provided to port P17 of the keyboard controller to lock the keyboard.

MONITOR TYPE DOES NOT MATCH CMOS - RUN SETUP BIOS

Problem: The monitor in use is not the same as the one recorded in the Setup.

Solution(s): Run Setup and check the video system identified in the Main Menu.
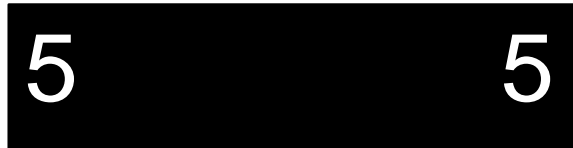
OPERATING SYSTEM NOT FOUND   BIOS

Problem: An operating system is not present on either Drive A: or Drive C:.

Solution(s): Check the Setup and make sure the fixed disk and drive A: are
                properly identified..

PREVIOUS BOOT INCOMPLETE - DEFAULT CONFIGURATION USED   BIOS

Problem: Previous POST did not complete successfully.

Solution(s): The POST loads the system's default values and offers to run Setup.
                If the failure was caused by incorrect values and they are not
                corrected, the next boot will likely fail. On systems with control of
                wait states, improper Setup settings can also terminate POST and
                cause this error on the next boot. Run Setup and verify that the wait-
                state configuration is correct. This error is cleared the next time the
                system is booted.

5   5

REAL TIME CLOCK ERROR   BIOS

Problem: The real-time clock failed the BIOS test.

Solution(s): Try cold-starting the system. You may want to wait long enough for
                the system to drain completely -- 30 minutes or so. Contact RadiSys
                Technical Support.

SHADOW RAM FAILED AT OFFSET:NNNN   BIOS

Problem: Shadow RAM failed at the offset nnnn of the 64K block at which the
                error was detected..

Solution(s): Contact RadiSys Technical Support.

SYSTEM BATTERY IS DEAD - REPLACE AND RUN SETUP   BIOS

Problem: The CMOS clock battery indicator shows that the coin cell battery is dead.

Solution(s):   Remove and replace the battery. Refer to Chapter 3, *Theory of Operations*, for more information. Run the Setups once the new battery is in place. Contact RadiSys Technical Support if they system is going through batteries quickly.

SYSTEM CACHE ERROR - CACHE DISABLED   BIOS

Problem: The RAM cache failed the BIOS test, so the BIOS disabled the cache.

Solution(s):   Contact RadiSys Technical Support.

5   **5**

SYSTEM CMOS CHECKSUM BAD - RUN SETUP   BIOS

Problem: System CMOS has been corrupted or modified incorrectly, perhaps by an application program that changes data stored in CMOS.

Solution(s):   Run Setup and reconfigure the system.

SYSTEM RAM FAILED AT OFFSET:NNNN   BIOS

Problem: System RAM failed at offset nnnn in the 64K block at which the error was detected.

Solution(s):   Contact RadiSys Technical Support.

SYSTEM TIMER ERROR   BIOS

    Problem: The timer test failed.

    Solution(s): Contact RadiSys Technical Support.

MS-DOS Operating System Error Messages

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).

5   **5**

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 supplied 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.

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.

5   5

5   5

6. Upgrades

☛ **DO NOT HANDLE THE EPC-33/34 MEMORY MODULE UNLESS YOU ARE IN A STATIC-FREE ENVIRONMENT.**

Memory

The EPC-33/34 SIMM module can accommodate a single 4 MB, 8 MB, 16 MB or 32 MB SIMM with the following specifications:

- 72 pin, 3.3V
- fast page mode, non-parity
- single-sided or double-sided

The following table shows which part number to order when upgrading the EPC-33 or the EPC-34.

Size	Part Number	Description
4MB	70-0064	1M X 32
8MB	70-0065	2M X 32
16MB	70-0066	4M X 32
32MB	70-0067	8M X 32

The EPC33/EPC34 requires 70ns SIMMs.

Be sure to turn the system OFF before attempting to upgrade the memory.

NOTES

6   6
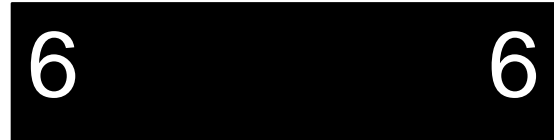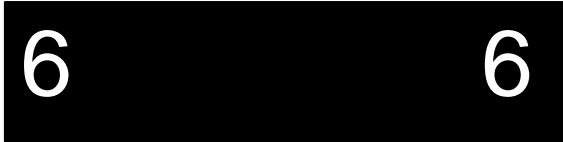
7. Support and Service

In North America

Technical Support

RadiSys maintains a technical support phone line at (503) 646-1800 that is staffed weekdays (except holidays) between 8 AM and 5 PM Pacific time. If you have a problem outside these hours, you can leave a message on voice-mail using the same phone number. You can also request help via electronic mail or by FAX addressed to RadiSys Technical Support. The RadiSys FAX number is (503) 646-1850. The RadiSys E-mail address on the Internet is *support@radisys.com*. If you are sending E-mail or a FAX, please include information on both the hardware and software being used and a detailed description of the problem, specifically how the problem can be reproduced. We will respond by E-mail, phone or FAX by the next business day.

Technical Support Services are designed for customers who have purchased their products from RadiSys or a sales representative. If your RadiSys product is part of a piece of OEM equipment, or was integrated by someone else as part of a system, support will be better provided by the OEM or system vendor that did the integration and understands the final product and environment.

Bulletin Board

RadiSys operates an electronic bulletin board (BBS) 24 hours per day to provide access to the latest drivers, software updates and other information. The bulletin board is not monitored regularly, so if you need a fast response please use the telephone or FAX numbers listed above.

The BBS operates at up to 14400 baud. Connect using standard settings of eight data bits, no parity, and one stop bit (8, N, 1). The telephone number is (503) 646-8290.
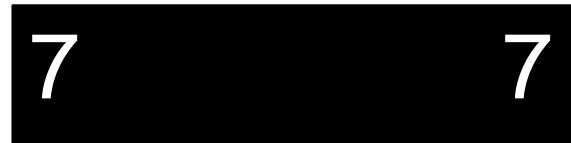
Repair Services

Factory Repair Service is provided for all RadiSys products. Standard service for all RadiSys products covers factory repair with customers paying shipping to the factory and RadiSys paying for return shipment. Overnight return shipment is available at customer expense. Normal turn-around time for repair and re-certification is five working days.

Quick Exchange services (immediate shipment of a loaner unit while the failed product is being repaired) or other extra-cost services can be arranged, but need to be negotiated in advance to allow RadiSys to pool the correct product configurations. RadiSys does not maintain a general "loaner" pool: units are available only for customers that have negotiated this service in advance.

RadiSys does not provide a fixed-price "swap-out" repair service, as customers have indicated that issues of serial number tracking and version control make it more convenient to receive their original products back after repair.

Warranty Repairs

Products under warranty (see warranty information in the front of this manual) will have manufacturing defects repaired at no charge. Products sent in for warranty repair that have no faults will be subject to a recertification charge. Extended Warranties are available and can be purchased at a standard price for any product still under warranty. RadiSys will gladly quote prices for Extended Warranties on products whose warranties have lapsed; contact the factory if this applies.

Customer induced damage (resulting from misuse, abuse, or exceeding the product specifications) is not covered by the standard product warranty.

Non-Warranty Services

There are several classes of non-warranty service. These include repair of customer induced problems, repairs of failures for products outside the warranty period, recertification (functional testing) of a product either in or out of warranty, and procurement of spare parts.
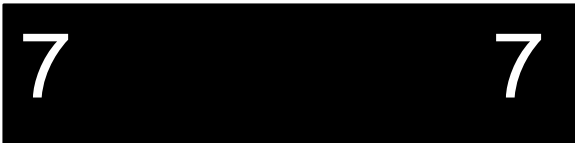
All non-warranty repairs are subject to service charges. RadiSys has determined that pricing repairs based on time and materials is more cost-effective for the customer than a flat-rate repair charge. When product is received, it will be analyzed and, if appropriate, a cost estimate will be communicated to the customer for authorization. After the customer authorizes the repair and billing arrangements have been made, the product will be repaired and returned to the customer.

A recertification service is provided for products either in or out of warranty. This service will verify correct operation of a product by inspection and testing of the product with standard manufacturing tests. There is a product-dependent charge for recertification.

There are only a few components that are generally considered field-repairable, but, because RadiSys understands that some customers want or need the option of repairing their own equipment, all components are available in a spares program. There is a minimum billing charge associated with this program.

Arranging Service

To schedule service for a product, please call RadiSys Technical Support directly at (503) 646-1800. Have the product model and serial numbers available, along with a description of the problem. A Technical Support representative will issue a Returned Materials Authorization (RMA) number, a code number by which we track the product while it is being processed. Once you have received the RMA number, follow the instructions of the Technical Support representative and return the product to us, freight prepaid, with the RMA number clearly marked on the exterior of the package. If possible re-use the original shipping containers and packaging. In any case, be sure you follow good ESD-control practices when handling the product, and ensure that anti-static bags and packing materials with adequate padding and shock-absorbing properties are used.

Ship the product, freight prepaid, to

Product Service Center
RadiSys Corporation
15025 SW Koll Parkway
Beaverton, Oregon 97006-6902
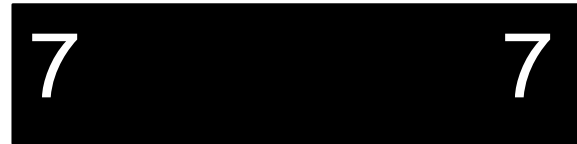
When shipping the product, include the following information: return address, contact names and phone numbers in purchasing and engineering, and a description of the suspected problem. Any ancillary information that might be helpful with the debugging process will be appreciated.

Other Countries

Contact the sales organization from which you purchased your RadiSys product for service and support.
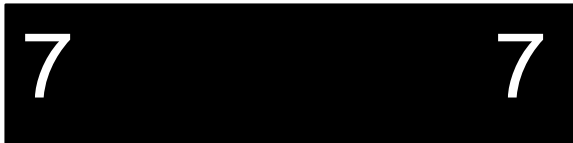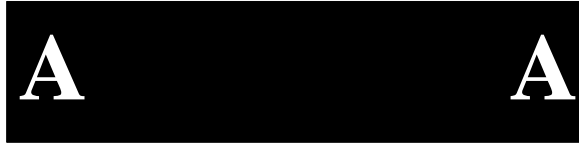
Appendix A - Chip Set and I/O Map

Memory Map

The PicoPower PC/AT chipset supports 25 bits of the 32-bit physical memory address. Memory at addresses between 0 and the theoretical maximum (32 MB system plus 1MB video) of 20FFFFF is mapped as follows:

Address range	Region	Cached?
00000000-0009FFFF	640K "DOS" memory	yes
000A0000-000BFFFF	VGA memory	no
000C0000-000C7FFF	Shadowed VGA BIOS	yes
000C8000-000DFFFF	available	no
000E0000-000E7FFF	Flash Disk window	no
000E8000-000EFFFF	available	no
000F0000-000FFFFF	Shadowed BIOS	yes
00100000-01FFFFFF	DRAM	yes
00200000-020FFFFF	VGA memory	no

Table A-1. Memory Map.

C8000 - 0DFFFF 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.

A   A

I/O Address Maps

The following defines the I/O addresses decoded by the EPC-33/34.

Chipset Registers: PicoPower PC/AT 1 and 2 chips		
I/O Addr	Functional group	Usage
024	Chipset Programming	Index Register
026		Data Register
061	Port B	Misc. functions
070	Port 70	Real time clock
092	Port 92	Misc. functions

Keyboard Controller: S82C42PE chip		
060	Keyboard	Data port
064		Command/status port

Ethernet Port: AT/LANTIC chip		
I/O Addr	Functional group	Usage
280-28F	Ethernet	Various

Serial I/O (COM1:) Port: SMC 37C665 emulates 8250 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

A   **A**
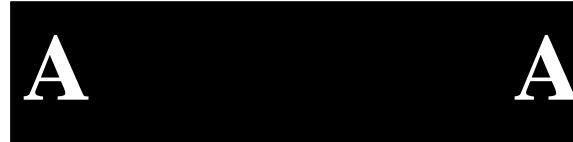
Serial I/O (COM2:) Port:		
SMC FDC37C665 emulates 8250 of PC/AT		
I/O Addr	Functional group	Usage
2F8	COM2: serial port	Receiver/transmitter buffer
		Baud rate divisor latch (LSB)
2F9		Interrupt enable register
		Baud rate divisor latch (MSB)
2FA		Interrupt ID register
2FB		Line control register
2FC		Modem control register
2FD		Line status register
2FE		Modem status register

Super I/O Controller:		
SMC FDC37C665		
I/O Addr	Functional group	Usage
3F0, 3F1	Super I/O Controller	Configuration

Floppy disk drive controller :		
SMC FDC37C665		
I/O Addr	Functional group	Usage
3F2	Floppy disk controller	Digital output register
3F4		Main status register
3F5		Data, status 0-3 registers
3F7		Data rate / digital in registers

Parallel I/O (LPT1 :) Port:		
SMC FDC37C665		
I/O Addr	Functional group	Usage
378	LPT1: parallel port	Data port
379		Status port
37A		Control port
37B		EPP address port
37C		EPP data port 0
37D		EPP data port 1
37E		EPP data port 2
37F		EPP data port 3
778		Parallel port FIFO
		Configuration register A
779		Configuration register B
77A		Extended control register

A   **A**

SRAM subsystem :		
380	SRAM disk	SRAM address low (W)
381		SRAM address middle (W)
382		SRAM address high (W)
384		SRAM data

Watchdog timer :		
388	Watchdog timer	Timeout select / enable reg. (W) Reset timer (R)

Flash Disk:		
389	Flash disk page register	Flash address middle (R/W)
38A		Flash address high (R/W)
38B	Flash disk page size	Window size select (W)
38C	Flash program enable	Programming voltage enable (W) Programming voltage detect (R)

Contrast Adjust :		
38D	Contrast Adjust	DAC input register (W)
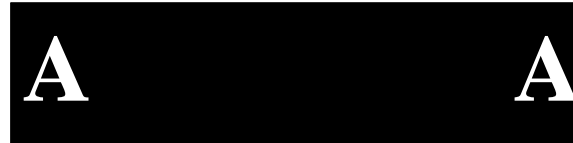
SVGA controller : Cirrus CL-GD7543 ("Viking")		
I/O Addr	**Functional group**	**Usage**
3B4/3D4	VGA Controller	CRT controller index
3B5/3D5		CRT controller ports
3BA/3DA		Input status register 1
3C0		Attribute controller write port
3C1		Attribute controller read port
3C2		Misc. Output (write)
		Input status register 0
3C3		Sleep Mode
3C4		Sequencer index
3C5		Sequencer ports
3C6		Pixel mask
3C7		Pixel address read mode (write)
		DAC state (read)
3C8		Pixel address write mode
3C9		Pixel data
3CA		Feature control
3CC		Misc. Output (read)
3CE		Graphics controller index
3CF		Graphics controller ports

A   **A**

NOTES

Appendix B -
IRQ and DMA Maps

B   B
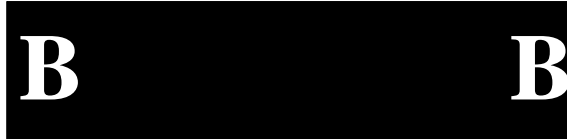
IRQ and DMA maps

On-board Interupt Usage	
IRQ1	Keyboard controller
IRQ2	8259 Expansion interface
IRQ3	COM2: serial port
IRQ4	COM1: serial port
IRQ5	Default Ethernet option
IRQ6	Floppy disk controller
IRQ7	LPT1: parallel port
IRQ8	Real-time clock
IRQ9	(Ethernet option)
IRQ10	(Ethernet option)
IRQ11	
IRQ12	
IRQ13	Floating Point
IRQ14	IDE hard disk
IRQ15	(Ethernet option)
NMI	Watchdog timer

Table B-1. Interrupt Usage .

B   **B**
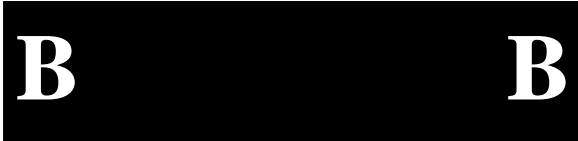
On-board DMA channel usage	
DRQ/~DACK2	Floppy Disk controller
DRQ/~DACK3	Parallel Port

Table B-2. DMA Channel Usage.

Appendix C - Ethernet

C   **C**
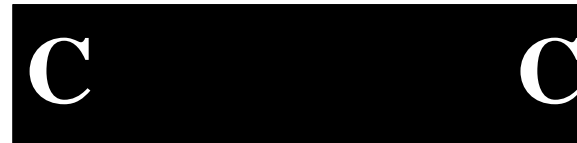
This Appendix describes how to configure the Ethernet adapter on the EPC-33/34, including how to run the **AUTOSET** software and how to configure the Ethernet driver appropriate to your operating system.

AUTOSET Software

The **AUTOSET** program is used to configure the Ethernet controller. Since this may be set up by your supplier, you may never be required to use this program. The software is contained on the optional **Ethernet 1 of 2** software diskette that is an optional item for the EPC-33/34. The **AUTOSET** program must be run from DOS or a DOS shell and enables the following actions:

- Select one adapter to be configured. Up to four adapters may be installed.
- Manually select configuration options (such as I/O base address and IRQ) for a specific installation.

If configuring multiple Ethernet controller cards in a single system, refer to the section, "Configuring Additional Ethernet Controllers."

Installing the Software

Under DOS 5.0 or higher, or in a DOS window, insert the **Ethernet 1 of 2** distribution diskette in the floppy drive and switch the command line to that floppy drive. The DOS **INSTALL.BAT** file creates a subdirectory on the hard disk and copies the collection of software drivers and configuration files from the distribution disks to the hard disk. Type **Install** and press Enter. Note that **AUTOSET** can be run from a floppy disk drive.

The **Ethernet 1 of 2** distribution diskette contains the setup program **AUTOSET**, and a collection of drivers for various network interfaces and operating systems. **Ethernet 2 of 2** contains additional drivers.

The installation program assumes you have DOS in your PATH statement.

Using the AUTOSET

Make sure that network software is **NOT** currently running on the computer system. If network software is running, reboot or unload the network software.

To start the program, move to the Ethernet controller subdirectory and type **AUTOSET**, then press Enter. The Main Menu displays.

The following options are in the Main Menu: Display/Change Adapter Configuration, Diagnostics, and Quit.

To initialize an Ethernet controller for the first time, to change the configuration, or to configure multiple Ethernet controllers, select "Display/Change Adapter Configuration" in the **AUTOSET** Main Menu.

To diagnose problems or verify the configuration, select "Diagnostics."

Note: If more than one Ethernet controller requires configuration for the first time, see the section *Configuring Additional Ethernet Controllers*.

Configuring an Ethernet controller with AUTOSET

For a single Ethernet controller installation, follow these steps:

1. From the **AUTOSET** program, select "Display/Change Adapter Settings" to set up the Ethernet controller just installed.

2. Skip the Novell Configuration prompt. It does not apply to the EPC-33/34.

3. Select the I/O base address. Use the tab key to change the Ethernet controller's I/O base address to any available location. **Note: 300**h is recommended because it allows the use of most network software drivers without modification.

4. Select the Interrupt Assignment. Be sure to avoid any interrupts used by other interfaces in the system.

C   C
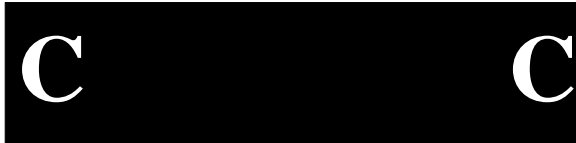
5. Select the Physical Media cabled up: only 10BaseT is available for the EPC-33/34.

6. Select the Adapter architecture. Use "I/O Port" for NE2000 mode, or use "Shared Memory" for Western Digital mode.

7. Skip the Boot PROM prompt. It does not apply to the EPC-33/34.

8. Save the configuration to the on-board memory only if your system is currently not connected to the network. If you are experiencing difficulties, save as *temporary* changes to determine if they work correctly, then run **AUTOSET** again and save the changes as *permanent*.

9. Run Diagnostics to verify the setup. If using Western Digital mode, specify a shared memory base address to be used during diagnostics. Also, to guard against conflicts, exit Diagnostics and check that any EMM386 entries in the **CONFIG.SYS** file and **SYSTEM.INI** file (if using Windows) both exclude the memory assignment to the Ethernet controller. If the system does not pass the Diagnostics, try again, changing the indicated parameters.

10. Press ESC to return to the previous menu.

If only one Ethernet controller is to be installed, the configuration procedure is complete. Exit the **AUTOSET** program and turn to the section *Configuring the Ethernet Drivers*.

The responses entered from the **AUTOSET** configuration menu depicted in the previous figure are discussed in detail below.

Novell Configuration

There are several pre-set Novell Configuration options programmed into the **AUTOSET** program that are not applicable to the EPC-33/34. The Novell Configuration option must be set to None.

C   C
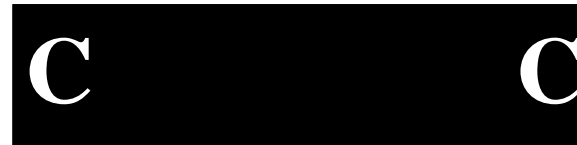
I/O Base Address

The Ethernet controller uses 32 bytes in I/O space. The I/O Base Address **must** be selected using the **AUTOSET** program. The **AUTOSET** program can only access the Ethernet controller when the I/O space occupied by the Ethernet controller does not conflict with I/O space previously assigned. In addition, the network interface drivers used with the Ethernet controller must use the same I/O base address parameter as the Ethernet controller.

The Ethernet controller is programmed at the factory with a default I/O base address of **280**h. If necessary, use the tab key to choose an optional address according to the guidelines set out in the following sections. **AUTOSET** allows selection of the following I/O base addresses: 240h, 280h, 2C0h, 300h, 320h, and 340h.

> **Warning:** If the Ethernet controller is mistakenly programmed to use an I/O address that conflicts with another I/O device, the **AUTOSET** program will not pass the diagnostics test. In this case, disable the other device or select a different I/O address for the Ethernet controller. For example, an Ethernet controller installed in a system that also contains a SCSI controller must not be set to I/O base address **340**h.

Adapter Architecture

The Ethernet controller has up to 16K bytes of shared memory buffer. The default shared memory base on the Ethernet controller is DC00h.

If using the DOS expanded memory manager or Microsoft Windows, be sure to exclude the area of memory reserved for the Ethernet controller base memory.

For instance, if the Ethernet controller shared memory selected is 16K bytes and is located at DC00h, when you finish using **AUTOSET**, include the following statement in the **CONFIG.SYS** file:

DEVICE=C:\DOS\EMM386.EXE X=DC00-DFFF ... *other parameters ...*

For Microsoft Windows, include the following statement in the [386Enh] section of the **SYSTEM.INI** file:

EMMExclude=DC00-DFFF
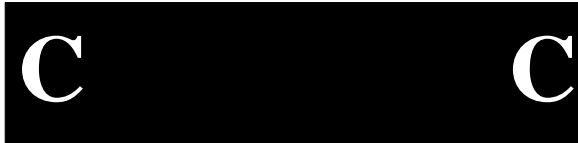
Note that the area excluded may be greater than that required by the Ethernet controller due to other system requirements.

If you are unsure how to make these changes, refer to the *Microsoft DOS User's Guide and Reference* and *Microsoft Windows Operating System* manuals.

Interrupts

Use the tab key to scroll through the displayed options and select one of the listed interrupts. Note that **AUTOSET** lists all interrupts, not simply those that are available. Use the Diagnostics routine in **AUTOSET** to detect invalid interrupts.

Physical Media

The only physical media option for the Ethernet controller on the EPC-33/34 is 10BaseT.

Adapter Architecture

There are two options for the method of data exchange between the CPU and the Ethernet controller. Use the tab key to toggle the displayed option and choose the I/O Port or Shared Memory for data exchange.

       NE2000 and NE2000+ users should select the I/O Port mode.
       WD8003 and WD8013 users should select the Shared Memory mode.

Systems with limited amounts of memory should select I/O Port mode to avoid conflicts with other memory-mapped devices.

Systems with ample memory, where increased performance is important, should select Shared Memory mode.

C   C
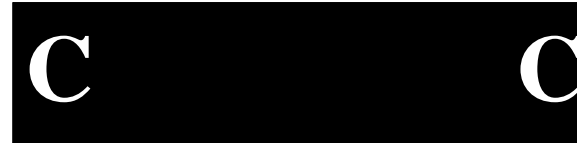
Boot PROM

(Ignore this prompt. The EPC-33/34 does not support the boot PROM option of **AUTOSET**.)

Configuring Additional Ethernet Controllers

To configure multiple Ethernet controllers for use in a single EPC, each Ethernet controller must be inserted in the system and configured, **one at a time**, *before* inserting the next Ethernet controller. Note also that only Ethernet cards using the AT/LANTIC Ethernet chip can be configured using the **AUTOSET** software; more likely, you will have to use different software if configuring multiple adapters. If that is the case, refer to the adapter's manual for more information.

The EPC-33/34's onboard Ethernet controller is shipped with the default I/O base address of 280h. A conflict occurs if more than one unmodified Ethernet controller is installed at a time. If I/O base address 280h is not available, disable the conflicting Ethernet card and re-configure with a new address. A unique I/O address for each Ethernet controller is required so that **AUTOSET** can distinguish which card is to be configured. Two cards cannot share the same I/O base address; if they do, neither will be configurable. If this occurs, remove one card and change the I/O address on the one still in the system, then return the first card.

The software driver for each Ethernet controller must be configured to match that Ethernet controller's actual IRQ and I/O base address.

Diagnostics

Once the LAN adapter is installed and cabled, use the **AUTOSET** diagnostic program to check the adapter installation.

Note that the **AUTOSET** diagnostic program test requires that the adapter be attached to a properly-terminated network. Once the cable is installed, use the **AUTOSET** diagnostic program to check the network interconnection.

Select the Diagnostics option in the **AUTOSET** menu. The Initialization and Diagnostics menu displays. The configuration options currently chosen are listed in parentheses.
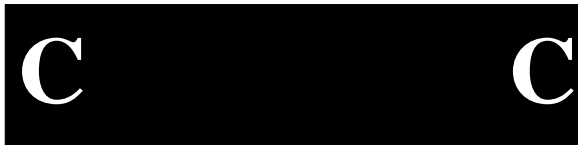
The following displays while several options are checked:

Network Interface Controller (12-byte node address).............. OK
Buffer Memory Check... OK
Check Cable Connection (Cable Connected) .... OK
Interrupt Assignment (5)... OK
Boot PROM Check (No Boot PROM).................................... OK

Press ESC to return to the previous menu. If Diagnostics reveals an error, return to the Display/Change configuration menu and make the necessary changes. Run Diagnostics again.

C   **C**

Error Messages

The **AUTOSET** software has several associated error messages that may display during operation. **AUTOSET** error messages are explained below.

Out of memory error

This message displays only during development and should never display during normal operation. If this message displays, contact RadiSys Technical Support.

No adapter at this address

This message displays when the address selected does not have an Ethernet controller network adapter card attached. Check the hardware to make sure the Ethernet controller is present. If the message continues to display, select another address such as 300h, 280h, etc. If an address change does not fix the problem, the Ethernet controller chip has failed.

No interrupt available for configuration

This message displays when there is no free interrupt to assign to the Ethernet controller. The only solution is to determine where all the interrupts are configured, and to free an interrupt that is redundant or unnecessary, such as COM2 or LPT1.

Cannot initiate an adapter with a disabled interrupt

This message displays when a disabled interrupt has been selected. Retry with a valid interrupt selection.

C   C
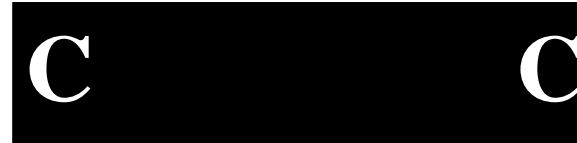
No NIC.   DMA Failure

These messages display when a fault is detected in the AT/LANTIC chip on the Ethernet controller. This is a fatal hardware error. Contact RadiSys Technical Support.

Incorrect PROM ID Byte

This message displays when there is a hardware problem in the EEPROM. I/O mode is thus disabled. Contact RadiSys Technical Support.

(xfer to memory)
(xfer from memory)

Failed after X bytes with X

These messages display if there is a problem during the Buffer Memory test. The first two messages highlight errors in the transfer of data. The third message identifies where the data transfer error occurred. This is a fatal hardware error. Contact RadiSys Technical Support.

Cable Disconnected
Cable Unterminated

These messages indicate faults in the cabling or connection. Check to see if the network cable is in proper working order, properly connected and terminated. If the connections are proper and the termination is acceptable, the cables are faulty. If the cable tests good in another system, the connection is faulty.

No Interrupt

This message displays during the Interrupt Assignment test if the interrupt selected is not active. Return to the setup function and select another interrupt listed as available.

Ethernet Drivers

After the EPC-33/34 is installed, cabled and configured, follow the instructions in this chapter to configure the network interface drivers. The distribution diskettes supplied with the EPC-33/34 contain drivers for IPX, ODI, NDIS and a packet driver under DOS/Windows and OS/2. Also included are complete instructions for using the **AUTOSET** software.

The majority of users running DOS/Windows select the ODI driver in 16-bit mode, if supported by their network software.

Most OS/2 users select the ODI driver.

EPC-33/34 Ethernet support under other operating systems, such as SCO UNIX, LynxOS, VentureCom VENIX, QNX, etc., is built into the operating system itself and does not require additional drivers. Use the instructions provided with the network software package.

The I/O base address, shared memory base address, and IRQ channel used by each LAN adapter must agree with the values for those parameters that are used by the adapter's network interface driver. The method used to change the driver parameters depends on the network operating system software in use.

NetWare IPX Driver for DOS Installation

The Internet Packet Exchange (IPX) drivers provided with the EPC-33/34 distribution diskettes are **NE2000.COM** and **ATLANIC.COM**. The **NE2000.COM** driver is used in 8-bit, NE2000 mode with the IPX interface. Once the EPC-33/34 is configured using **AUTOSET**, and the distribution diskettes are loaded onto the system, use a text editor to modify the **AUTOEXEC.BAT** file, entering these commands at the end of the file:

> **NE2000 /o0**   (run **NE2000 /D** to display available options)
> **NETX.COM**   (provided by network software or operating
>   system distribution diskettes)

C   C
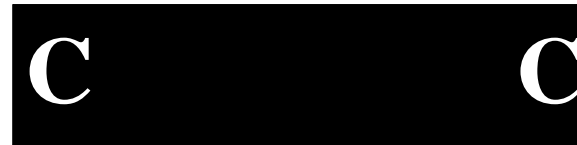
The **NE2000.COM** driver supplied on the EPC-33/34 distribution diskettes is preconfigured for use with the Ethernet 802.3 interface. If your network requires operating **multiple** protocols on top of a single card, use the **ECONGIF** program provided by Novell to change the **NE2000.COM** interface setting to Ethernet II.

The **ATLANIC.COM** driver is used in 16-bit Western Digital mode with the IPX interface. Once the EPC-33/34 is configured using **AUTOSET**, and the distribution diskettes are loaded onto the system, modify the **AUTOEXEC.BAT** file by entering these commands at the end of the file:

> **ATLANIC /o0**   (run **ATLANIC /D** to display available options)
> **NETX.COM**   (provided by network software or operating
>   system distribution diskettes)

ODI Driver for DOS Installation

The Open Data-Link Interface (ODI) adds functionality to NetWare and network computing environments by supporting multiple protocols and multiple LAN adapters in a single workstation. Refer to the Novell *NetWare ODI Shell for DOS* manual for additional installation instructions.

Once the EPC-33/34 is configured using **AUTOSET**, and the distribution diskettes are loaded onto the system, use a text editor to modify the **NET.CFG** file to match the **AUTOSET** parameters. The interrupt, I/O address, mode, and interface type must all match.

Then add the following programs into the **AUTOEXEC.BAT** file:

> **LSL.COM**   Link support layer
> **ATLANTIC.COM**   Multiple Link Interface Driver
> **IPXODI.COM**   IPX/SPX Protocol
> **NETX.COM**   (provided by operating system or workstation
>   distribution diskettes)

While editing the **AUTOEXEC.BAT** file, make sure that the path= statement includes the directory containing the **NET.CFG** file.

The **ATLANTIC.COM** driver is used for the ODI interface in 16-bit Western Digital mode and 16-bit NE2000 mode. The ODI interface does not support IRQ15.
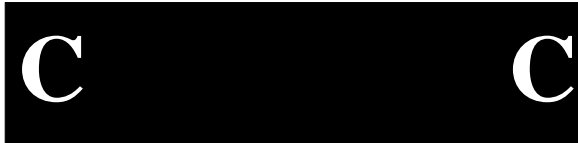
ODI Driver for OS/2 Installation

The steps below outline a typical procedure for accessing the Novell NetWare Requester using the ODI interface running under OS/2:

1. Open a DOS window.
2. Run **AUTOSET**. Set the IRQ=5, I/O port address=300, and select the adapter architecture.
3. Save and exit **AUTOSET**.
4. Install the OS/2 Workstation Service Requester (1 disk) and the OS/2 Utilities (2 disks) supplied with the Novell Network software.
5. Run **INSTALL** from **C:\NETWARE** to select and load **NE2000.SYS**. After the installation **CONFIG.SYS** should contain the following section:

    DEVICE=C:\NETWARE\LSL.SYS
    RUN C:\NETWARE\DDAEMON.EXE
    DEVICE=C:\NETWARE\NE2000.SYS
    DEVICE=C:\NETWARE\IPX.SYS
    DEVICE=C:\NETWARE\SPX.SYS
    RUN C:\NETWARE\SPDAEMON.EXE
    DEVICE=C:\NETWARE\NWREQ.SYS
    IFS=C:\NETWARE\NWIFS.IFS
    RUN=C:\NETWARE\NWDAEMON.EXE

6. Modify/create **NET.CFG** according to the environment. For example:

    Link Driver NE2000
        Frame Ethernet_802.3
        Protocol IPX
        Port 300 f

7. Reboot the system.
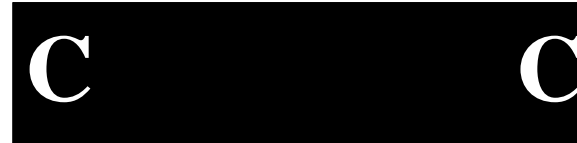
NDIS Driver for DOS Installation

The NDIS **ETHAT2** driver is used for 16-bit Western Digital mode and 16-bit NE2000 mode for the NDIS interface. It is used by various protocol stacks and applications, such as Windows for Workgroups (WFW). NDIS 3.0 protected mode support is already included in WFW. The steps below would be part of a typical setup for NDIS 2.0 real mode.

1. Set up **PROTOCOL.INI** according to the environment. To set up **ETHAT2**

    for NE2000 using IRQ5 and I/O base address 300, refer to the example below.

    [EPC-34]
    DriverName=ETHAT20$
    IOBASE=0x300
    INTERRUPT=5

    [MS$NETBEUI]
    DriverName=netbeui$
    SESSIONS=10
    NCBS=32
    LANABASE=1
    BINDINGS=EPC-34
    [NETBEUI]
    LANABASE=1
    BINDINGS=EPC-34

2. At the command line, enter **NET START WORKSTATION.**

3. At the command line, enter **NET VIEW** to verify access to other computers.

Packet Driver Installation

The diskettes distributed with the EPC-33/34 contain two packet drivers named **ATDRIVE.COM** (for 16-bit NE2000 mode) and **WD8003E.COM** (for 16-bit Western Digital mode). RadiSys also supplies files named **TELBIN** (a Telnet

C   **C**

terminal emulation) and **FTPBIN** (an FTP or File Transfer Program) that work with TCP/IP.

In order to install the packet drivers, first run **AUTOSET** to initialize the adapter (IRQ, I/O port, shared memory base, etc.)

Once **AUTOSET** has been run, install the packet driver. Add the following lines to the end of the **AUTOEXEC.BAT** file:

For WD8003:

REM WD8003 <s/w interrupt> <IRQ> <IO_Base> <shared memory base>
wd8003e 0x60 5 0x240 0xDC000
IPXPKT.COM   (supplied with EPC-33/34 distribution diskettes)
NETX.COM   (supplied with network software or operating system)

For NE2000:

REM ATDrive -i <software interrupt> -b <I/O Base> -q <IRQ> -n
ATDrive -i 60 -b 240 -q 5 -n
IPXPKT.COM   (supplied with EPC-33/34 distribution diskettes)
NETX.COM   (supplied with network software or operating system)
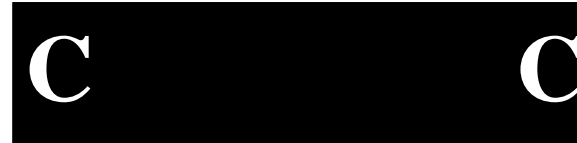
Windows NT Driver Installation

This section explains how to use the NE2000 driver provided with Windows NT to access the network using the EPC-33/34. Be sure to use a 16-bit data width, and run **AUTOSET** first (in DOS) to set up the hardware parameters in I/O Port mode.

1. Log on to Windows NT.
2. Select the Network icon in the Control Panel.
3. Select the Adapters button and install the NE2000 adapter.
4. Select and install the **NE2000.SYS** driver. When completed, restart the system in order for the changes to take effect.
5. Select the File Manager icon. Select "Network Connection" under the Disk Menu. Additional drives that are now available display in the list, verifying the installation.

NOTES

C   **C**
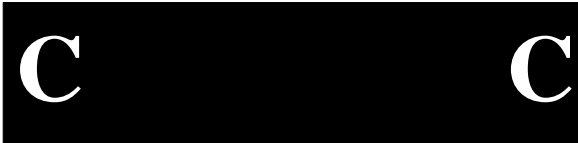
Appendix D -
Video Modes and Supported Panels

The EPC-33/34 will support the following panels:

Sharp   LM64C35P   Passive Color LCD
Sharp   LM64P89   Monochrome LCD
Sharp   LQ10DH11   Color TFT
Sharp   LQ10D131   Color TFT
NEC   NL6448AC   Color TFT

Interface tables for the EPC-33/34 and the above panels are included on the following pages.

D   **D**
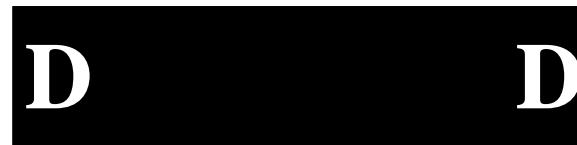
Sharp LM64C35P
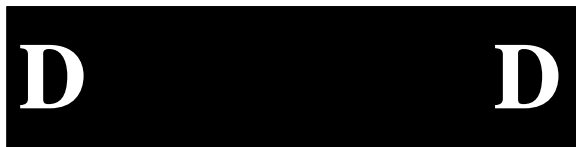
EPC-33/34	Signal Name	LM64C35P	Signal Name
1	FP0	11	DL0
2	FP1	13	DL1
3	FP2	17	DL2
4	FP3	19	DL3
5	FP4	1	DL4
6	FP5	3	DL5
7	FP6	5	DL6
8	FP7	7	DL7
9	FP8	31	DU7
10	FP9	29	DU6
11	FP10	25	DU5
12	FP11	23	DU4
13	FP12	22	DU3
14	FP13	24	DU2
15	FP14	26	DU1
16	FP15	28	DU0
17	GND	2 & 8	GND
18	FPVCLK	10	XCK
19	GND	9 & 15	GND
20	FP18		
21	GND	21 & 27	GND
22	LFS	4	YD
23	MOD		
24	FP23		
25	VSYNC		
26	FPDE		
27	HSYNC		
28	VEE		
29	FP19		
30	VBB		
31	~LITEON		
32	SWVDD	14 & 16	VCC
33	FP20		
34	GND	30	GND
35	LLCLK	6	LP
36	GND		
37	FPVEE	18	DISP
38	FPVCC		
39	FP21		
40	+VADJ		
41	-VADJ		
42	FP17		
43	FP22		
44	FP16		

LCD pin 12 must be externally driven.

Sharp LM64P89

Appendix D - LCD Cabling

EPC-33/34	Signal Name	LM64P89	Signal Name
1	FP0	12	DL0
2	FP1	13	DL1
3	FP2	14	DL2
4	FP3	15	DL3
5	FP4	8	DU0
6	FP5	9	DU1
7	FP6	10	DU2
8	FP7	11	DU3
9	FP8		
10	FP9		
11	FP10		
12	FP11		
13	FP12		
14	FP13		
15	FP14		
16	FP15		
17	GND		
18	FPVCLK	3	CP2
19	GND		
20	FP18		
21	GND	6	GND
22	LFS	1	S
23	MOD		
24	FP23		
25	VSYNC		
26	FPDE		
27	HSYNC		
28	VEE		
29	FP19		
30	VBB		
31	~LITEON		
32	SWVDD	5	VDD
33	FP20		
34	GND		
35	LLCLK	35	CP1
36	GND		
37	FPVEE	4	DISP
38	FPVCC		
39	FP21		
40	+VADJ		
41	-VADJ		
42	FP17		
43	FP22		
44	FP16		

LCD pin 7 must be externally driven.

D D
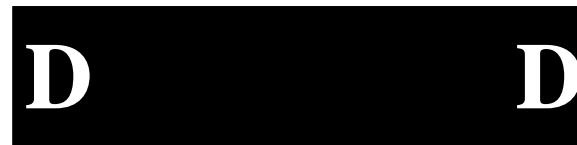
Sharp LQ10DH11

EPC-33/34	Signal Name	LQ10DH11	Signal Name
1	FP0		
2	FP1	12	B0
3	FP2	11	B1
4	FP3	14	B2
5	FP4		
6	FP5	8	G0
7	FP6	7	G1
8	FP7	10	G2
9	FP8		
10	FP9		
11	FP10		
12	FP11		
13	FP12	6	R2
14	FP13	3	R1
15	FP14	4	R0
16	FP15		
17	GND	1 & 5	GND
18	FPVCLK	2	CK
19	GND	9 & 13	GND
20	FP18		
21	GND	15 & 20	GND
22	LFS	18	VSYNC
23	MOD		
24	FP23		
25	VSYNC		
26	FPDE		
27	HSYNC		
28	VEE		
29	FP19		
30	VBB		
31	~LITEON		
32	SWVDD	17	VCC
33	FP20		
34	GND		
35	LLCLK	16	HSYNC
36	GND		
37	FPVEE		
38	FPVCC		
39	FP21		
40	+VADJ		
41	-VADJ		
42	FP17		
43	FP22		
44	FP16		

LCD pins 21 and 22 remain electrically open. LCD pin 19 must be externally driven.

D **D**

Sharp LQ10D131

EPC-33/34	Signal Name	LQ10D131	Signal Name
1	FP0	23	B0
2	FP1	25	B1
3	FP2	29	B2
4	FP3	31	B3
5	FP4	11	G0
6	FP5	13	G1
7	FP6	17	G2
8	FP7	19	G3
9	FP8		
10	FP9		
11	FP10		
12	FP11		
13	FP12	7	R3
14	FP13	5	R2
15	FP14	3	R1
16	FP15	1	R0
17	GND	2	GND
18	FPVCLK	10	CK
19	GND	8 & 9	GND
20	FP18		
21	GND	12 & 15	GND
22	LFS	4	VSYNC
23	MOD		
24	FP23		
25	VSYNC		
26	FPDE	28	ENAB
27	HSYNC		
28	VEE		
29	FP19		
30	VBB		
31	~LITEON		
32	SWVDD	22 & 24	VCC
33	FP20		
34	GND	20 & 21	GND
35	LLCLK	6	HSYNC
36	GND	27 & 30	GND
37	FPVEE		
38	FPVCC		
39	FP21		
40	+VADJ		
41	-VADJ		
42	FP17		
43	FP22		
44	FP16		
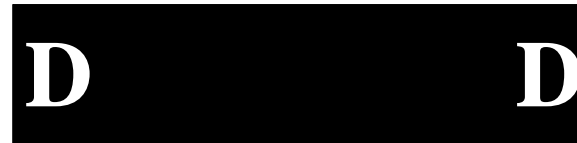
NEC NL6448AC32-01

EPC-33/34	Signal Name	NEC NL644AC32-01	Signal Name

1	FP0	23	B2
2	FP1	24	B3
3	FP2	25	B4
4	FP3	26	B5
5	FP4	16	G2
6	FP5	17	G3
7	FP6	18	G4
8	FP7	19	G5
9	FP8	8	R1
10	FP9	7	R0
11	FP10	15	G1
12	FP11	14	G0
13	FP12	12	R5
14	FP13	11	R4
15	FP14	10	R3
16	FP15	9	R2
17	GND	1	GND
18	FPVCLK	2	CLK
19	GND	3	GND
20	FP18		
21	GND	6	GND
22	LFS	5	VSYNC
23	MOD	22	B1
24	FP23		
25	VSYNC		
26	FPDE	29	DE
27	HSYNC		
28	VEE		
29	FP19		
30	VBB		
31	~LITEON		
32	SWVDD	27 & 28	VCC
33	FP20		
34	GND	13	GND
35	LLCLK	4	HSYNC
36	GND	20	GND
37	FPVEE		
38	FPVCC		
39	FP21	21	B0
40	+VADJ		
41	-VADJ		
42	FP17		
43	FP22		
44	FP16		

D   **D**

Appendix E - VGA

Video Controller Hardware

The EPC-33/34 contains a Super VGA (SVGA) graphics controller using the Cirrus Logic SVGA CL-GD7543 "Viking" chip. This is connected to the CPU local bus to give the best possible graphics performance. SVGA memory is 1024 Kbytes, implemented with two 256Kx16 DRAMs. This provides standard VGA modes on a CRT or flat panel display. The Viking chip provides SVGA modes up to 800x600 on flat panel displays, and CRT displays of 800x600 in 65,536 (64K) colors, and 1024x768 in 256 colors (non-interlaced).

Display Drivers and Utilities Software

The SVGA Driver and Utilities Software is supplied by Cirrus Logic. There are two diskettes: one for DOS and one for Windows 3.1x. Be sure to check for **READ.ME** files on both diskettes before starting the installation. Portions of Appendix E are copyrighted by Cirrus Logic, Inc.

For DOS users, the **CLMODE** utility program is used to configure flat panel options, define the type of monitor attached, and set the video modes supported by the Cirrus Logic chipset. **CLMODE** is supplied with your Cirrus Logic SVGA software. The following section describes these utilities and how to use them.

For Windows users, the **WINMODE** utility is used to configure Windows for use with the Cirrus Logic chipset, just as **CLMODE** works for DOS.

Before You Begin

The following instructions assume that the user is familiar with DOS and certain DOS commands. Please review the associated DOS commands before performing the installation.

Installation

The installation utility is provided to facilitate the smooth installation of the display drivers and utility software. The installation program is menu-driven and allows you to select and install only those display drivers for software and applications currently in use.

It is important to note that some display drivers need to have the associated vendor's application program already installed on the system prior to loading the Cirrus Logic SVGA display drivers. In other cases, the loading of the display driver may be an integral part of the vendor's product installation process. Please review the driver product section below for specific instructions prior to running the installation program.

DOS Installation

The DOS installation utility is located on the diskette labeled **VGA Disk 1 of 2** . To install the desired display drivers and utilities, insert the diskette into the A: drive, then type the following:

> **A:**
> **EINSTALL**

This begins the installation for the English version of the software. Follow the instructions on the screen to install the listed display drivers and Cirrus Logic software. The installation process asks you the destination directory, then proceeds. At any time you may press ESC to abort the installation process and go back to DOS.

Windows Installation

The Windows installation utility is located on the diskette labeled **VGA Disk 2 of 2** . To install the desired Windows display drivers and utilities, you must be running Windows. Insert the diskette into the A: drive, then either use File Manager or the File/Run method to execute **A:\INSTALL.EXE** .

Follow the instructions on the screen to install the listed display drivers. A warning message displays informing you that you should be using the standard Windows VGA or SVGA driver to proceed. Users who are running Windows under OS/2 also receive additional instruction.

You can tailor the installation to your needs by selecting the destination drive and directory. Be sure to enter a directory so that the installation does not simply dump files into your root. Once the software is copied from the distribution diskette, the installation creates a Cirrus Logic group and icon if desired. Finally, the **WINMODE** application starts, seeking information about your current monitor and drivers. Note that you can cancel out of **WINMODE** if necessary.

Contacting Cirrus Logic

If there are any newer versions of the software provided with your SVGA adapter, they will be available on the Cirrus Logic BBS or their Web site.

The BBS is a WILDCAT! BBS. The phone number is (510) 440-9080. It can handle modems running up to 9600 baud. The modem should be set to NO parity, 8 data bits, 1 stop bit. Before you are able to download software, you must join the conference(s) for the product(s) that you are interested in.

The URL for the Cirrus Logic Web site is **HTTP://WWW.CIRRUS.COM.**

CLMODE

The **CLMODE** utility allows the user to configure the panel options, define the type of monitor attached, and set the video modes supported by the Cirrus Logic chipset.

Using CLMODE's Menu-driven Interface

At the DOS prompt type: **CLMODE**

The main popup window consists of a number of buttons. Each button represents a different option or menu. The underlined letter of a button name specifies the hot key combination for that item. For example, press the [ALT] and the underlined letter keys simultaneously or just the underlined letter key to select an option. Note that to use a mouse, a mouse driver should be installed prior to running the **CLMODE** utility in order to use the mouse pointer for button selection.

Configuring the Attached Monitor

Selecting the proper monitor brand and model will allow the Cirrus Logic chipset to display the highest quality output that it is capable of with the attached monitor. The monitor type determines what video modes will be available to your system. It will also determine the vertical refresh rates available. Generally, the higher the refresh, the better the screen will look. A description of the available monitor types is given in the table at the end of this section.

Monitor Brand. Select the Monitor Brand button. The Monitor Brand setup window displays. The current monitor brand is highlighted initially. Use the cursor keys or the mouse to choose the brand of monitor attached. If your brand is not present, you may want to check with Cirrus Logic to see if later versions of the **CLMODE** software support your monitor brand.

Monitor Model. Select the Monitor Model button. When you select the Monitor Model button above, a list of recent models sold under that brand name displays. If your model is not present, you may want to check with Cirrus Logic to see if later versions of the **CLMODE** software support your monitor model.

Monitor Refresh Rates. Once the brand and model are selected, **CLMODE** displays several options for refresh rates at various settings. For some settings, there may be only one refresh rate option available. Note also that some of the higher resolutions may not be supported.

Completing the Configuration

There are six option buttons available once you are satisfied with the brand, model, and refresh selections.

Help. Use the Help button to access detailed information about this screen and the information being requested in **CLMODE**.

Undo. Use the Undo button to return the selections to the default settings.

Option. Use the Option button to access additional flat panel, TV screen, and Simulscreen setup selections. Turn the Panel option on if using a flat panel. Be careful not to set up a CRT as a flat panel. If the screen goes black, cold-start the system.

About. Use the About button to determine the software revision number.

Preview. Select the Preview button to view each of the new video timings that you have selected to verify that they are compatible with your monitor. A list displays with various settings. Select Show to display your selection. After each test screen is displayed, press [Enter] to see the next video mode. If there is a problem, press ESC to return to the dialog box. Try a slower setting for the resolution that did not work and preview your choices again. Press Quit to exit the Preview mode.

Exit. Use the Exit button to exit the application. Your selections are saved. A window displays to ask permission to make changes to the **AUTOEXEC.BAT** file. Answer Yes to have the system automatically insert a line that invokes **CLMODE** with the proper settings.

On many systems the monitor type will be remembered from one session to the next. To test this, select a monitor type and exit the **CLMODE** program. Turn the computer off for ten seconds. After rebooting the computer, run **CLMODE** and verify whether or not the monitor that you selected is still enabled. If it is, it should not ever need to be set again in normal use. If the monitor type was not kept then you should select the option to have **CLMODE** save the monitor type in your **AUTOEXEC.BAT** file. You are given this choice after selecting the Exit button.

Current Controller Status Window

The information in the current controller status window displays the controller type, the BIOS version number, the amount of video memory present, the presence of the EEPROM, and whether the Centering TSR is loaded.

Using CLMODE's Command Line Options

When command line options for **CLMODE.EXE** are given at the DOS prompt, the menu-driven windows will not be displayed. Instead, configuration, monitor type, video mode and refresh rate will be set at the DOS prompt. The command line options for **CLMODE.EXE are** listed below:

CLMODE {modenum} {m{montype} | {s n} }

Where:

{modenum}   mode number

{montype}   monitor type

Valid monitor types:
0 VGA
1 8514
2 SVGA
3 Extended Super VGA
4 Multifrequency
5 Extended Multifrequency
6 Super Multifrequency
7 Extended Super Multifrequency

{montype}   monitor type
t6=x(Hz)   640x480   @ (0 = 60, 1 = 72)
t8=x(Hz)   800x600   @ (0 = 56, 1 = 60, 2 = 72)
t1=x(Hz)   1024x768 @ (0 = 87i, 1 = 60, 2 = 70)
t2=x(Hz)   1280x1024 @ (0 = 87i, 1 = Not available)
s   List status information.

For example, to set video mode 3:

   CLMODE 3

For example, to select custom monitor timings with 640x480 at 60Hz and 800x600 at 72Hz refresh type:

   CLMODE t6=0 t8=2

Typing an invalid option will display the command line help text. Typing [S] as a command line option will display the current **CLMODE** settings.

WINMODE

The **WINMODE** utility runs under Windows 3.1 and allows the user to change the screen resolution, number of available colors, and to select either large or normal size fonts and system resources.

This application assumes that the Windows drivers have been correctly installed and configured using **Windows Setup** .

If you are unsure what resolutions and colors your video card can support, refer to the section of this manual on **CLMODE** for information on how to determine available resolutions.

WINMODE is run by selecting the **WINMODE** icon. The first time that you run **WINMODE**, the settings for the current driver won't be correct, after you set them once, they will be correct from then on.

The following selections are made in **WINMODE**:

Monitor Brand. Select the Monitor Brand button. The Monitor Brand setup window displays. The current monitor brand is highlighted initially. Use the cursor keys or the mouse to choose the brand of monitor attached. If your brand is not present, you may want to check with Cirrus Logic to see if later versions of the **WINMODE** software support your monitor brand.

Monitor Model. Select the Monitor Model button. When you select the Monitor Model button above, a list of recent models sold under that brand name displays. If your model is not present, you may want to check with Cirrus Logic to see if later versions of the **WINMODE** software support your monitor model.

Monitor Refresh Rates. Once the brand and model are selected, **WINMODE** displays several options for refresh rates at various settings. For some settings, there may be only one refresh rate option available. Note also that some of the higher resolutions may not be supported.

Colors. You can choose 16, 256, 32K, or 64K colors.

Resolution. You can choose 640x480, 800x600, 1024x768, or 1280x1024 resolution.

Font Cache Size. You can increase or decrease the font cache size, depending on your needs. The font cache is memory available for saving bitmaps of frequently used fonts. **WINMODE** tries to set the optimum cache size for you, but you can make adjustments as necessary.

Operating System. Choose between DOS-Windows and OS/2-Windows depending on your system.

Font Size. You can choose between large and small fonts. With smaller monitors, the larger fonts are more readible. Small fonts are for large monitors with higher resolutions.

After new options have been selected, click the OK button. You are asked if you are ready to restart Windows in order for your changes to take effect. If you choose 'No', then the changes you made are discarded.

For help on the **WINMODE** utility, select **Help** from the program menu.

Display drivers

The Cirrus Logic video controller is 100% VGA compatible. The display drivers described in this manual are supplied to improve the resolution for each supported software application package.

The installation instructions for each display driver will follow the introduction section. Follow the instructions carefully to be sure that each display driver is correctly installed. All of the installation instructions assume that **VGA Disk 2 of 2** is located in drive A:. If drive B: is used, the instructions should be changed appropriately.

Before You Begin

Not all video modes will be available on all systems. If an extended mode driver is installed for a video mode that is not available, the application program will not function properly. There are a number of things that determine the list of available video modes. Some of these include the current monitor type, the amount of installed memory, and the revision of the controller. To determine which modes are available before beginning the driver installation, it is recommended that the user run the **CLMODE** program and examine the list of available video modes.

Microsoft Windows 3.1

Before Upgrading From a Previous Release

Before installing the new drivers you should use Windows Setup to select the VGA or SVGA video driver so that when you install the new drivers, there is no chance of overwriting the driver that Windows is using to control your screen. Next go to the system directory, and find a file that is named **OEM?.INF** where the question mark is a number. There may be more than one of these. These files are the different **OEMSETUP.INF** files that have been used to configure Windows for different devices. Using a text editor, such as Notepad or Edit, look at them until you find the one that is for the previous version of the Cirrus Logic video drivers and delete it. This is not completely necessary, but if you don't delete old files the drop down box for Setup soon becomes very cluttered with different versions of the same files. Also, in many cases the old files have been overwritten by newer ones, so no longer exist anyway.

Installing Windows 3.1 Display Drivers

If you haven't already installed the **WINMODE** utility program, these instructions will install a single driver for a single resolution. If you want to be able to easily switch between different resolutions, you should install **WINMODE** before this procedure.

To install the Windows 3.1 drivers from the DOS prompt, proceed as follows:

1. Check that Windows 3.1 is already installed on your computer.

2. From your Windows directory, at the DOS prompt, type **SETUP** to run the Windows **SETUP.EXE** program. Follow the instructions on the screen. When you come to the screen which lists the hardware and software components such as display adapter (e.g. VGA, CGA, etc.), keyboard type, mouse type, etc., go to the **Display** selection by using cursor keys to move the highlighted bar and press [Enter].

3. From the next menu listing of display options, scroll to the bottom of the list, and highlight the following text:

   Other (Requires disk provided by a hardware manufacturer)
   Press [Enter], and when prompted, insert the Windows Display Driver diskette into drive A:\ or B:\ and type A:\ or B:\[Enter].

4. You will see the list of drivers and their associated resolutions, such as:
   CIRRUS 7543 V1.0, 1280X1024X16
   CIRRUS 7543 V1.0, 1024X768X16
   CIRRUS 7543 V1.0, 640X480X16
   CIRRUS 7543 V1.0, 640X480X256
   CIRRUS 7543 V1.0, 640X480X64K
   CIRRUS 7543 V1.0, 800X600X16
   CIRRUS 7543 V1.0, 800X600X256

5. Highlight the desired choice by moving the cursor to the correct display driver, and then press [Enter].

6. Continue with the remainder of the setup procedure.

To install the Windows 3.1 drivers from within Windows, proceed as follows:

1. Ensure that Windows 3.1 is already installed on your computer and start Windows.
2. From the **Main** window of the Program Manager run the Windows 3.1 Setup program.
3. Select **Change Systems Settings...** from the **Options** menu of Setup.
4. Click on the down arrow at the right side of the **Display**: line. Scroll to the end of the list of available display drivers and select **Other display (Requires disk from OEM)....**
5. Insert the Windows display driver diskette into drive A: and type A:\ as the pathname, then click on **OK.**
6. You will see the list of available drivers and their associated resolutions, such as:
   CIRRUS 7543 V1.0, 1280X1024X16
   CIRRUS 7543 V1.0, 1024X768X16
   CIRRUS 7543 V1.0, 640X480X16
   CIRRUS 7543 V1.0, 640X480X256
   CIRRUS 7543 V1.0, 640X480X64K
   CIRRUS 7543 V1.0, 800X600X16
   CIRRUS 7543 V1.0, 800X600X256
7. Highlight by moving the cursor to the desired display driver, and then click on **OK.**
8. Continue with the remainder of the setup procedure. The changes will not take effect until Windows is restarted.

Appendix F -
Flash Formatting Software

This Appendix contains instructions for the use of Flash memory on the EPC-33/34. This software is used to format a resident Flash array (RFA) such as the one present on the EPC-33/34. Command line options for the device driver and syntax for the formatting command are included here for completeness.

Included here is an overview of TrueFFS, followed by installation instructions, some conformance information, and a section describing how to use the Flash formatting software. There is information about troubleshooting at the end of this section. Portions of Appendix F are copyrighted by M-Systems, Inc.

An Overview of TrueFFS

TrueFFS provides full disk emulation of Flash memory devices for DOS-compatible machines.

TrueFFS runs on MS-DOS or PC-DOS, Version 2.0 or higher, Windows and DR DOS.

To be active, TrueFFS should be installed and resident on the computer in the form of a device driver or terminate-and-stay-resident (TSR) program. Once TrueFFS is installed, it may be used to read from and write to the Flash medium. In fact, the full DOS functionality available for floppy disks is available for the Flash medium as well. Files can be copied, viewed, or executed, directories can be created, and so on.

F   **F**
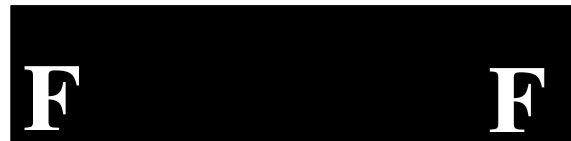
Before the Flash medium can be accessed by TrueFFS, it needs to be formatted. The TrueFFS format is essential for disk emulation capability. The details of this format are completely transparent to the user. TrueFFS medium is formatted with the **TFORMAT** utility (and not the DOS **FORMAT** command).

The formatting required by TrueFFS is a one-time operation for each Flash medium, similar to the formatting of a floppy disk. Removable Flash media formatted by TrueFFS on one machine can be read from and written to on any machine where TrueFFS is installed.

TrueFFS communicates with the Flash device controller or adapter through software drivers called **Card Services** and **Socket Services**. Card Services and Socket Services are accepted standards of the PCMCIA (Personal Computer Memory-Card International Association). **PCMCIA software is not provided with the TrueFFS package,** except in special cases. This software is machine-specific, and therefore should be provided by the computer vendor, controller/adapter vendor, or by the TrueFFS integrator.

TrueFFS includes built-in Flash programming for almost all Flash chips that are commercially available. Each new TrueFFS release will contain additional support for Flash chips that are recent arrivals to the market.

The EPC-33/34 TrueFFS package contains the following device drivers:

RADSS.COM	DOS-loadable device driver specifically for RadiSys hardware. It must load prior to **TFFS.COM** on RadiSys products.
TFFS.COM	DOS-loadable device driver for Flash devices. The functionality provided by this module is similar to the DOS functionality of a floppy disk drive. It is suitable for accessing removable, non-bootable Flash media.

A unique and important part of the TrueFFS medium format is the **boot-image**. The boot-image is a special partition on the Flash medium that contains a fixed image. This partition has several applications, most of which deal with the way the Flash medium and TrueFFS react upon boot.

F   **F**
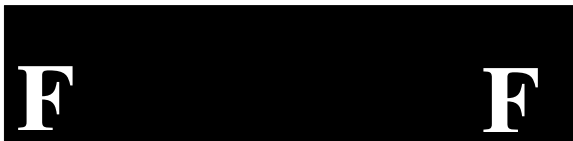
Installation

The TrueFFS standard installation requires the following actions:

- Copy the **RADSS.COM** and **TFFS.COM** drivers and the **TFORMAT** utility to a directory on your fixed disk; and

- Make changes in the BIOS Setups depending on whether your Flash module is to be a bootable image; and

- Install the **RADSS.COM** and **TFFS.COM** drivers in your **CONFIG.SYS** file.

RADSS.COM and **TFFS.COM** are DOS-installable device drivers, installed by the **CONFIG.SYS** file with the following lines:

DEVICE=<*path*>RADSS.COM
DEVICE=<*path*>TFFS.COM

Both **RADSS.COM** and **TFFS.COM** are also DOS-executable programs, which may be run from the command-line. However, they will successfully install from the DOS command-line only if the /DRIVE switch is specified.

Basically, there are two installations to consider: if you are creating a bootable disk image, and if you are creating a non-bootable image.

To create a ***bootable Flash drive***, follow the steps below.

1. Reboot the system and enter the BIOS Setups.

2. In the Advanced setups, cursor down to the RFA Memory Window line and make sure that it is Enabled.

3. Cursor down to the BIOS Extension Base Address and make sure that the BIOS Extension is ***Installed***. Exit the BIOS Setups by saving.

4. After booting, and from the command line, edit your **CONFIG.SYS** file. First, if you are running EMM386 or a similar memory manager, exclude the region E000 to E7FF with the tag X=E000-E7FF. Save and exit.

F   **F**
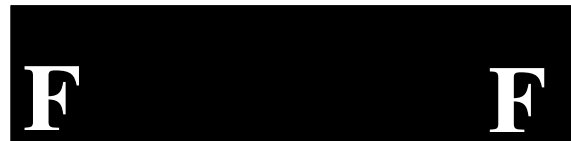
5.   Insert a blank floppy diskette in drive a: and format the floppy as a bootable system drive using the command **FORMAT A: /s**

6.   Copy the **TFORMAT** utility to this new bootable diskette.

7.   Reboot to the floppy. If you have any problems, make sure in your BIOS Setups the Boot Sequence menu is set for A: then C:.

8.   From the A: prompt, type the following comand:

TFORMAT C: /s:!

9.   Once the *Flash* is formatted and has a boot record created, type the following command:

SYS C:

10.   Remove the floppy disk from the drive and reboot.

For *non-bootable disk images*, perform the following steps:

1.   Reboot the system and enter the BIOS Setups.

2.   In the Advanced setups, cursor down to the RFA memory Window line and make sure that it is Enabled.

3.   Cursor down to the BIOS Extension Base Address entry and make sure that the BIOS Extension is Not Installed. Exit the BIOS Setups by saving.

4.   After booting, and from the command line, edit your **CONFIG.SYS** file. First, if you are running EMM386 or a similar memory manager, exclude the region E000 to E7FF with the tag X=E000-E7FF.

5.   While still in **CONFIG.SYS**, the second thing you must do is enter the two device drivers. Somewhere near the beginning of the file insert the following two statements:

DEVICE=<*path*>RADSS.COM
DEVICE=<*path*>TFFS.COM

The DEVICE line may be placed anywhere in the **CONFIG.SYS** file. However, **RADSS.COM** *must* come before **TFFS.COM**.
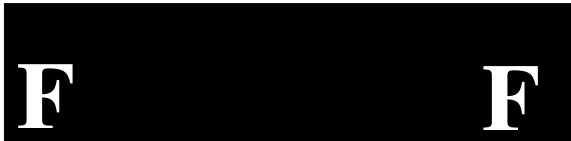
6.   Exit **CONFIG.SYS** and make sure that the path statement you entered for the device drivers is accurate. If not, create the appropriate directory and copy the files from the distribution disk into that directory.

7.   Reboot.

8.   Use the **TFORMAT** utility to format the *Flash* drive. If it is the D: drive, use the following command:

TFORMAT D:

TFORMAT - The TrueFFS Format Utility

Before TrueFFS can access a Flash medium, the medium must be formatted, just as a floppy disk must be formatted. Formatting initializes the medium and writes to it a new and empty DOS file system. When formatting is complete, the medium contains only a root directory.

The DOS **FORMAT** command cannot be used for formatting Flash media driven by **TFFS.COM**.

The medium may be formatted more than once. However, all data on the medium is destroyed each time it is formatted. When reformatting, the boot-image is **retained** by default, although it may be deleted or reallocated by various **TFORMAT** options.

F   **F**
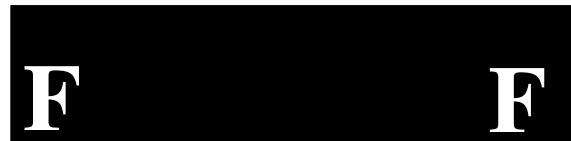
The syntax of the **TFORMAT** command is:

```
TFORMAT  { drive-letter }
    [ /S:boot-image-file-name ]
    [ /S:drive-letter:]
    [ /S:! ]
    [ /S:* ]
    [ /BOOTSIZE:boot-image-size ]
    [ /USE:nnn ]
    [ /LOWMEM:size ]
    [ /LABEL:label ]
    [ /DOSVER:dos-major-version ]
    [ /SIZE:size ]
    [ /SPARE:n ]
    [ /Y ]
```

Note	An equal sign (=) may be used wherever a colon (:) is required.
	Examples: **TFORMAT E:** **TFORMAT 2 /S:expbios.bin /LOWMEM:128K** **TFORMAT D: /SIZE=8M**

F   **F**

All sizes specified in **TFORMAT** options are in bytes if specified as simple numbers, in KBytes if specified with the suffix **K**, or in megabytes if specified with the suffix **M**.

The **TFORMAT** options are the following:

drive-letter	DOS drive letter of the TrueFFS drive.
/S:boot-image-file-name	Create a boot-image partition with a boot-image copied from the file specified. The partition size will be the smallest that may contain the file contents, unless overridden by the /BOOTSIZE parameter described below.
/S:drive-letter:	Create a boot-image partition, with a boot-image copied from a memory card residing on
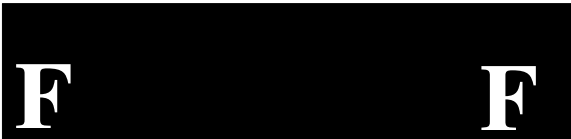
a different TrueFFS drive. The amount copied from the socket must be specified by the /BOOTSIZE parameter. The partition size will be the smallest that may contain the boot-image.

This variation of the /S parameter is useful to create boot-images which are clones of another memory card.

/S:!

Do not create a boot-image partition. This option is necessary if, upon reformatting, an existing boot-image partition is to be deleted.

/S:*

Retain the previous boot-image partition. This is the default action. If no boot-image existed previously, this option acts like the /S:0 parameter.

/BOOTSIZE:*boot-image-size*

The size of the boot-image partition in bytes. This parameter must be specified when copying a boot-image from another socket. Otherwise it is defaulted as follows:

/S:*file-name*   Number of bytes in the file

/S:!   0

/S:*   Old partition size

/USE:*nnn*

Percentage of available space on the Flash medium to be used for file storage. *nnn* can be any number from 1 to 100. Default is 99 (99%).

The value of this option may affect the write performance of TrueFFS. For more details, see *Performance Considerations*, later in this manual.

/LOWMEM:*size*

The low-memory part of the TrueFFS DOS medium may be handled using a faster access mechanism than the rest of the medium.
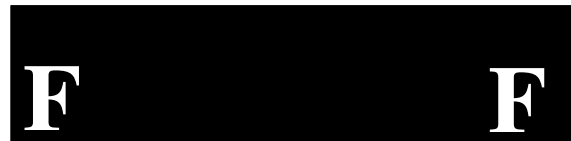
Since the FAT and root directory reside in low sector numbers, this may improve performance. However, this option has an overhead in TrueFFS memory requirements.

For more details, see *Performance Considerations*, later in this manual.

The default is 64 KBytes. In principle, it is possible to specify a size that will span the entire medium, if the memory required to handle this is available.

/SIZE:*size*	The size of the Flash medium to be formatted (including the boot-image). By default the entire medium is formatted by **TFORMAT**. This option may be used to limit the formatted size to a smaller size.
/LABEL:*label*	A string to be used as the DOS label of the formatted medium.
/DOSVER:*dos-major-version*	Format for a target system running the specified DOS version. The default is the current DOS version (the one on which **TFORMAT** is executed). E.g. **/DOSVER:3** formats for DOS 3.x. Valid values are 1 to 6.
/SPARE:*n*	Leave *n* Flash erase units as spare units for garbage collection. The default is 1. At least one unit should be specified for the Flash medium to operate as a true read-write device.

More than one spare unit may be specified to format media that have bad Flash units. In such a case the number of spare units should exceed the number of bad units by at least 1. It is also possible to specify more than one spare unit in anticipation of Flash units becoming bad in the future.

A value of 0 spare units may be specified to create a **WORM** (Write-Once-Read-Many) disk. When formatting with this option, the Flash medium can be written **once only**, after

F   **F**
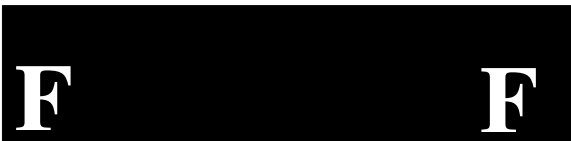
which it will become a read-only medium. TrueFFS will report that the medium is write-protected when space for writing is exhausted. This option provides very limited functionality, and should not be used except in special cases. The option has the advantage of lowering the formatting overhead of TrueFFS, since a spare Flash erase zone is not needed for space reclamation.

/Y   Do not pause for confirmation before beginning to format.

Compatibility Issues

TrueFFS and DOS

TrueFFS is compatible with all DOS disk and file operations. Absolute sector reads (int 25) and absolute sector writes (int 26) are supported. Among DOS utilities, all will operate correctly except **UNDELETE**. The **UNDELETE** program will not succeed in reconstructing TrueFFS deleted files.

The DOS **FORMAT** command will not work with **TFFS.COM** or **RADSS.COM**. **TFORMAT** should be used instead for formatting.

The DOS **CHKDSK** command may be successfully used to analyze and correct DOS format problems.

TrueFFS and SMARTDrive

Microsoft's SMARTDrive, Norton Cache and other disk-caching utilities may be used to speed TrueFFS operations.

TrueFFS read operations are very fast without disk-caching. The installation of a cache will usually not improve TrueFFS read speed. For write operations, disk-caching utilities use a write-behind strategy, and so will boost the apparent write speed very significantly, especially if the Flash medium is written to only occasionally.

F   **F**
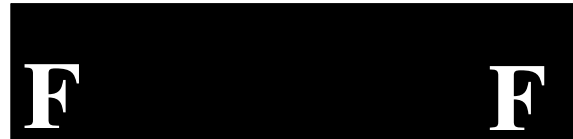
When SMARTDrive is installed, you should be aware of the following:

- Because of the cache write-behind strategy, your data may still be in the process of being written several seconds after the writing application has terminated. In this case, your computer may respond sluggishly to commands for a while, because it is still busy with previous operations.

- In case a write-fault occurs, SMARTDrive provides no option other than to retry the operation. If a retry does not succeed, there is no other course but to reboot.

TrueFFS and Compression

TrueFFS media may be compressed by any compression programs that handle DOS disks (Double-Space, Stacker, Double-Disk, Super-Stor and others).

The write speed of these tools may be lower than expected for the following reason: most compression programs operate by allocating a Compressed Volume File (CVF) spanning nearly the entire disk. Since TrueFFS write performance is influenced by the amount of available space on the medium, the (false) appearance of the medium being full will degrade its performance.

To achieve adequate write speed with compression, it is recommended that you first reformat the TrueFFS medium with a usage factor of 90%, i.e. use the parameter **/USE=90** in **TFORMAT**. This compares to the default **TFORMAT** value of 99%.

TrueFFS and Memory Managers

TrueFFS usually accesses the Flash medium through a memory window in upper DOS memory (segment range A000 to FFFF). Memory managers such as Microsoft's EMM386, MemMaker and Quarterdeck's QEMM manage this memory range and may use it for other purposes.

A memory manager may be installed and be unaware of the use made by TrueFFS of a memory window. It may map it to RAM and thus disconnect TrueFFS access to its Flash medium. Should this happen, TrueFFS will issue the error **NON-DOS DISK** or **UNRECOGNIZED MEDIA TYPE** when it is used.

To remedy this problem, exclude the memory window used by TrueFFS from the range of memory handled by the memory manager.

F   **F**
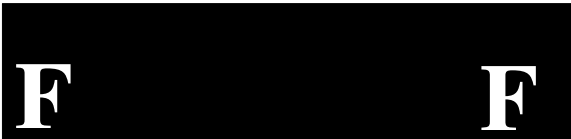
Performance Issues

TrueFFS performance in large part reflects the performance of the underlying Flash technology: reading from Flash chips is extremely fast. In comparison, Flash write (programming) and Flash erase are slow by one or two orders of magnitude.

TrueFFS usually displays blazing fast read speeds, which are much faster than the customary speed of ordinary magnetic hard disks. Write speeds are similar to the write speeds of magnetic disks: the TrueFFS write speed is a combination of the Flash program speed and the Flash erase speed.

The TrueFFS write speed is not a constant. It depends on the amount of free space (unused by user data) on the Flash medium. The more free space there is, the less often TrueFFS needs to erase Flash components. In the extreme situation when there is no free space, TrueFFS must erase frequently, resulting in a decline in overall write performance on the TrueFFS drive. For this reason, the default formatting capacity used by **TFORMAT** is 99%, which always leaves at least 1% free. You may want to change this value to 90%, for example, by specifying **/USE=90** in the **TFORMAT** command, thereby sacrificing another 9% of disk capacity, but ensuring good write performance at all times.

The amount of free space TrueFFS sees, and that affects performance, is the space not used by files. Some applications, such as database managers, work by allocating a large file (possibly encompassing the entire volume), managing space within this file using their own methods. Such applications will work **unnecessarily** slow in TrueFFS, as a result of the fact that TrueFFS is not aware of the free space within the database.

F   **F**
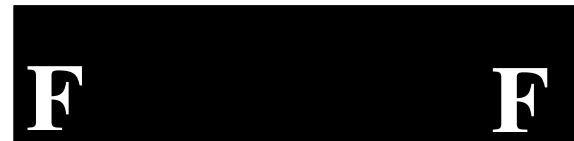
Trouble-Shooting

The following DOS error messages may occur when working with TrueFFS drives. They are usually followed by an **ABORT, RETRY, IGNORE ?** question.

> **MEDIUM IS WRITE PROTECTED**
>
> > This indicates a failure by the hardware to turn on a 12-Volt current which is needed when writing to Flash. This may be the result of an inadequate power supply.

```
UNKNOWN MEDIA
```
or
```
NON DOS FORMAT
```

The Flash device you have accessed may not be properly formatted. If so, and you have previously formatted the card for Flash software other than TrueFFS, the device needs to be reformatted with the **TFORMAT** command to work with TrueFFS.

It may be that some drivers installed on your computer use overlapping memory resources with TrueFFS, and hinder its access to the hardware. Check whether any other installed driver uses overlapping resources. Also, if you are using a memory management driver such as Microsoft's EMM386, Quarterdeck's QEMM or Microsoft's MemMaker, make sure to exclude memory areas used by TrueFFS.

```
ERROR WRITING DRIVE XX
```

A physical Flash write fault occurred several times in succession. The last write or delete operation did not succeed.

Answer "R" (Retry) to the Retry, Abort, Ignore query. If the error persists, answer "A" (Abort) until you return to the DOS prompt or to your application.

The cause may be one of the following:

- The power supply is inadequate, and cannot sustain a Flash write.

- The Flash components are worn out (this will occur only after prolonged use), or possess some other physical fault. This situation can be recognized by faults occurring sporadically.

- The TrueFFS format is damaged. In this case TrueFFS automatically assumes the read-only mode to prevent further damage.

F   **F**
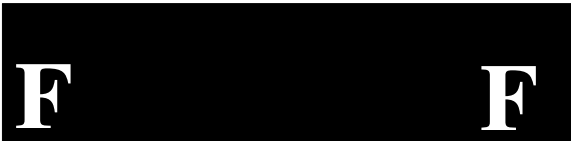
Appendix G -
Enabling the SRAM

In order to enable the EPC-33/34's SRAM, you must format the SRAM using **SRAMFMT.EXE,** then load the device driver **SRAMDISK.SYS** and reboot.

SRAM Formatting Software

SRAM data integrity may be jeopardized when power is removed during a series of write operations to the SRAM. For this reason, **SRAMFMT** 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 MS Scandisk or Norton Utilities.

USAGE: SRAMFMT

Formats the SRAM and prepares it for usage.

Note that it is necessary to flush the DOS buffer areas prior to accessing newly formatted disks. This is accomplished by rebooting.

G   **G**

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.

SRAM Disk Device Driver

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

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.

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

DEVICE=[path]SRAMDISK.SYS

The *path* you insert depends on what directory you create when you copy the **SRAMFMT** 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

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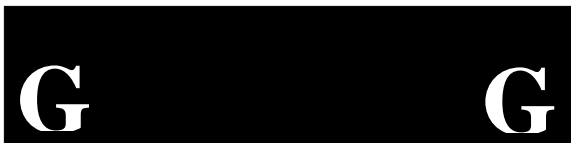
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