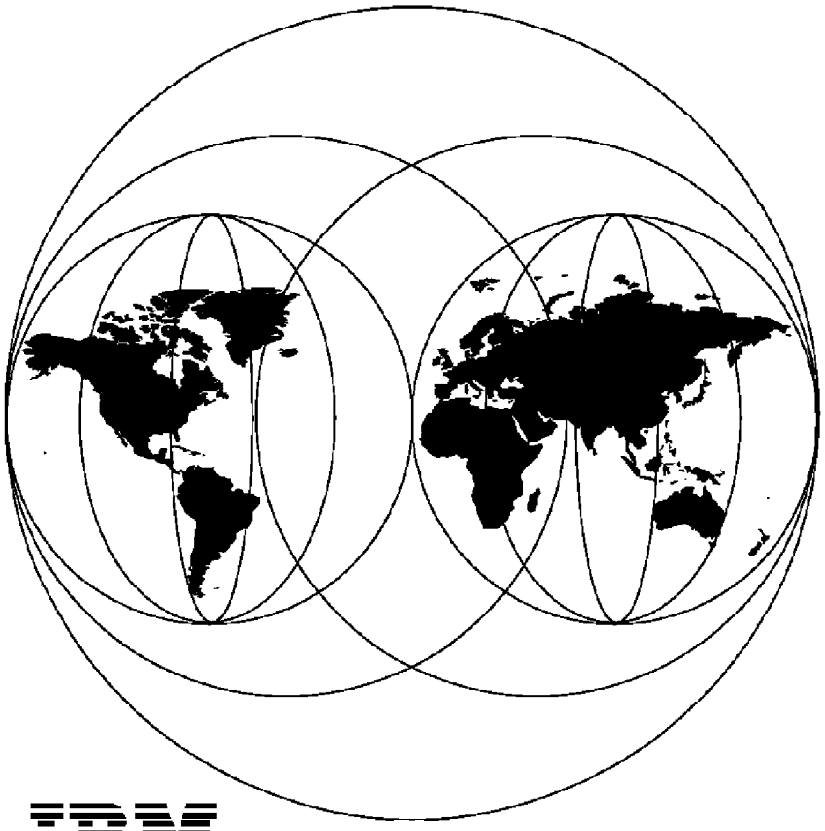
SG24-4627-00

International Technical Support Organization

The Guide to OS/2 Warp Device Drivers

December 1995



IBM

International Technical Support Organization

Boca Raton Center

SG24-4627-00

IBM

International Technical Support Organization

The Guide to OS/2 Warp Device Drivers

December 1995

Take Note!

Before using this information and the product it supports, be sure to read the general information under “Special Notices” on page xix.

First Edition (December 1995)

This edition applies to OS/2 Warp, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect.

Order publications through your IBM representative or the IBM branch office serving your locality. Publications are not stocked at the address given below.

An ITSO Technical Bulletin Evaluation Form for reader's feedback appears facing Chapter 1. If the form has been removed, comments may be addressed to:

IBM Corporation, International Technical Support Organization
Dept. JLPC Building 014, Internal Zip 5220
1000 NW 51st Street
Boca Raton, Florida 33431

Abstract

This document describes the OS/2 Warp device drivers for personal computer devices such as display devices, printer devices, storage devices, PCMCIA devices, multimedia devices and others. The book provides general information about the device drivers and how they are handled by OS/2 Warp as well as information about their installation, configuration, problem determination, and where to obtain the newest device drivers (for example, bulletin boards).

This document was written for IBM support personnel, customer support personnel and others with the need to know. Knowledge of OS/2 Warp and personal computer devices is assumed.

(434 pages)

Contents

Figures

Tables

Special Notices

This publication is intended to help IBM technical professionals and IBM customers to understand the concept of OS/2 Warp device drivers, their installation and configuration. The information in this publication is not intended as the specification of any programming interfaces that are provided by OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect. See the PUBLICATIONS section of the IBM Programming Announcement for OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect for more information about what publications are considered to be product documentation.

References in this publication to IBM products, programs or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent program that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program or service.

Information in this book was developed in conjunction with use of the equipment specified, and is limited in application to those specific hardware and software products and levels.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, Thornwood, NY 10594 USA.

The information contained in this document has not been submitted to any formal IBM test and is distributed AS IS. The information about non-IBM (VENDOR) products in this manual has been supplied by the vendor and IBM assumes no responsibility for its accuracy or completeness. The use of this information or the implementation of any of these techniques is a customer responsibility and depends on the customer's ability to evaluate and integrate them into the customer's operational environment. While each item may have been reviewed by IBM for accuracy in a specific situation, there is no guarantee that the same or similar results will be obtained elsewhere. Customers attempting to adapt these techniques to their own environments do so at their own risk.

The following document contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples contain the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Reference to PTF numbers that have not been released through the normal distribution process does not imply general availability. The purpose of including these reference numbers is to alert IBM customers to specific information relative to the implementation of the PTF when it becomes available to each customer according to the normal IBM PTF distribution process.

The following terms are trademarks of the International Business Machines Corporation in the United States and/or other countries:

IBM

The following terms are trademarks of other companies:

C-bus is a trademark of Corollary, Inc.

PC Direct is a trademark of Ziff Communications Company and is used by IBM Corporation under license.

UNIX is a registered trademark in the United States and other countries licensed exclusively through X/Open Company Limited.

Windows is a trademark of Microsoft Corporation.

Other trademarks are trademarks of their respective companies.

Preface

This document describes the device drivers available for OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect from an installation and a configuration scenario basis.

This document is intended for IBM technical professionals, IBM technical advisors, IBM authorized dealers, IBM customers and others who require a knowledge of OS/2 Warp device drivers.

How This Document Is Organized

The document is organized as follows:

- Chapter 1, “OS/2 Warp Device Driver Overview”

  This chapter provides an overview of OS/2 Warp device drivers, a description of what they are, a description of the different types of device drivers as well as how they they appear in the CONFIG.SYS and in which order.

- Chapter 2, “OS/2 Warp Display Device Drivers”

  This chapter describes the display device drivers in OS/2 Warp with regard to display driver installation, which display drivers are available in OS/2 Warp, configuration of display drivers, and basic problem determination.

- Chapter 3, “OS/2 Warp Printer Device Drivers”

  This chapter provides information on OS/2 Warp printer device drivers and how to configure them. It also describes the printer subsystem and its components such as the spooler and the queue drivers.

- Chapter 4, “OS/2 Warp Storage Device Drivers”

  This chapter describes the storage device drivers in OS/2 Warp with regard to the driver installation, which drivers are available in OS/2 Warp, configuration of device drivers and problem determination.

- Chapter 5, “OS/2 Warp PCMCIA Device Drivers”

  This chapter provides information on PCMCIA device drivers with regard to general information on PCMCIA device drivers, device driver installation, which device drivers are available in OS/2 Warp, configuration of PCMCIA device drivers and problem determination.

- Chapter 6, “OS/2 Warp Multimedia Device Drivers”

  This chapter describes the multimedia device drivers in OS/2 Warp with regard to multimedia driver installation, which multimedia drivers are available in OS/2 Warp, configuration of multimedia drivers, and basic problem determination.

- Chapter 7, “Miscellaneous OS/2 Warp Device Drivers”

  This chapter provides information about miscellaneous device drivers for devices such as the mouse, keyboard, and joystick. It describes the installation and configuration of these device drivers.

- Chapter 8, “Device Driver Maintenance and Recovery”

  This chapter provides information about maintenance and recovery of device drivers. It describes procedures that can be followed for finding malfunctioning device drivers and how to recover from the installation of a corrupt or incorrect device driver, as well as troubleshooting procedures.

- Appendix A, “OS/2 Warp CSD Levels”

  This appendix provides an overview of the existing OS/2 Warp CSD levels.

- Appendix B, “OS/2 Device Driver Sources”

  This appendix describes the sources from which device drivers may be retrieved. The sources discussed here cover the Internet including the World Wide Web and FTP sites, IBM specific sites and bulletin boards.

- Appendix C, “OS/2 Warp Supported Display Adapters and Systems”

  This appendix lists the display adapters and systems supported by each display adapter in OS/2 Warp

- Appendix D, “OS/2 Warp Trap Guidelines”

  This appendix describes how to handle and react to most trap errors and internal processing errors.

- Appendix E, “Appendix F: PCMCIA Additional Information”

  This appendix provides additional and miscellaneous information on PCMCIA device drivers and PCMCIA in general.

- Appendix F, “Installation of Non-Supported CD-ROM Drives”

  This appendix describes how to solve problems with non-supported CD-ROM drives.

- Appendix G, “Information on Included CD-ROM Discs”

This appendix provides information about the CD-ROMs included in the back of this book. One OS/2 Warp Device drivers CD-ROM produced for this book includes the current device drivers for many devices taken from the dealer support in Denmark. The second CD-ROM, the Hobbes OS/2 Archived CD-ROM, published by Walnut Creek CDROM, contains numerous OS/2 programs direct from the Hobbes Internet Software Collection and includes an enormous amount of device drivers.

Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this document.

- *IBM's Official OS/2 Warp FAQs*, SR28-5882-00
- *OS/2 Warp Uncensored*, 1-56884-474-3
- *OS/2 Warp Unleashed*, 0-672-30545-3

International Technical Support Organization Publications

- *OS/2 Warp Generation, Volume 1: OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2, OS/2 Warp Connect and Bonuspak*
- *OS/2 Warp Generation, Volume 2: Exploring LAN Connectivity with OS/2 Warp Connect, GG24-4505*
- *Multimedia in OS/2 Warp, GG24-2516*
- *OS/2 Installation Techniques: The CID Guide*

A complete list of International Technical Support Organization publications, known as redbooks, with a brief description of each, may be found in:

International Technical Support Organization Bibliography of Redbooks, GG24-3070.

To get a catalog of ITSO redbooks, VNET users may type:

```
TOOLS SENDTO WTSCPOK TOOLS REDBOOKS GET REDBOOKS CATALOG
```

A listing of all redbooks, sorted by category, may also be found on MKTTOOLS as ITSOCAT TXT. This package is updated monthly.

How to Order ITSO Redbooks

IBM employees in the USA may order ITSO books and CD-ROMs using PUBORDER. Customers in the USA may order by calling 1-800-879-2755 or by faxing 1-800-445-9269. All major credit cards are accepted. Outside the USA, customers should contact their local IBM office. For guidance on ordering, send a PROFS note to BOOKSHOP at DKIBMVM1 or E-mail to bookshop@dk.ibm.com.

Customers may order hardcopy ITSO books individually or in customized sets, called BOFs, which relate to specific functions of interest. IBM employees and customers may also order ITSO books in online format on CD-ROM collections, which contain redbooks on a variety of products.

ITSO Redbooks on the World Wide Web (WWW)

Internet users may find information about redbooks on the ITSO World Wide Web home page. To access the ITSO Web pages, point your Web browser to the following URL:

```
http://www.redbooks.ibm.com/redbooks
```

IBM employees may access LIST3820s of redbooks as well. The internal Redbooks home page may be found at the following URL:

```
http://w3.itsc.pok.ibm.com/redbooks/redbooks.html
```

Acknowledgments

This project was designed and managed by:

Doris Corel
International Technical Support Organization, Boca Raton Center

This project was assisted and supported by:

Tom Arbuckle
International Technical Support Organization, Boca Raton Center

The authors of this document are:

Pauline Clancy
IBM Canada

James Docherty
IBM Canada

Martin Fischer
IBM Switzerland

This publication is the result of a residency conducted at the International Technical Support Organization, Boca Raton Center.

Thanks to the following people for the invaluable advice and guidance provided in the production of this document:

Roman Brandl
IBM Austria

Lajos Damen
IBM USA

Hans Debruyn
IBM Canada

Connie D'Egidio
IBM Austria

Sam Dettweiler
IBM USA

Mark Fantacone
IBM USA

Steven Kipisz
IBM USA

Randy Kubich
IBM USA

Barbara Odle
IBM USA

Eduardo Costa de Oliveira
IBM Canada

Anders Thue Pedersen
IBM Denmark

Corinna Santa Ana
Walnut Creek CDROM

Michael Steiger
IBM Austria

Jesus Tirso
IBM USA

William Trautman
IBM USA

Kenneth White
IBM USA

Thomas Wilkat
IBM USA

Chapter 1. OS/2 Warp Device Driver Overview

This chapter is an overview of OS/2 Warp device drivers. The term OS/2 Warp will be used as a generic term for the following OS/2 Versions: OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect. If referring to a particular OS/2 version, it will be named specifically.

OS/2 Warp provides comprehensive device driver support for many popular hardware devices available on the market today. If a particular device driver is not included with a release of OS/2 Warp it may be obtained from another source, such as the IBM Bulletin Board System, the IBM PC Company FTP Server on the Internet, CompuServe, the popular Hobbes CD-ROM or Hobbes FTP Server on the Internet, and IBM Support. As new device drivers become available, they will be added to the upcoming refresh package of OS/2 Warp.

OS/2 device drivers are written by and made available from a variety of sources. New and updated device drivers are being introduced frequently. For this reason OS/2 Warp device drivers can be viewed as originating from one of the following sources:

- Device drivers included with a previous version of OS/2 Warp
- Device drivers included with a new release of OS/2 Warp
- Device drivers available from IHVs (independent hardware vendors)
- Device drivers available from ISVs (independent software vendors).

This publication contains the latest information available to the writers at press time.

This chapter describes the different types of OS/2 device drivers and how these device drivers are processed, and shows an example of a CONFIG.SYS file. OS/2 device drivers are categorized and listed without their associated optional parameters and switches. This is done in the appropriate subsequent chapters.

1.1 Description of Device Drivers

Device drivers set up hardware and software components of the system. The three major categories of device drivers in OS/2 Warp are as follows:

- Physical device drivers
- Virtual device drivers
- Presentation drivers

OS/2 switches the Intel 80386, 80486 and 80586 Microprocessor chips into protected mode operation. In this mode of operation, OS/2 Warp can run applications in one of four *ring modes*: RING 0, RING 1, RING 2, and RING 3. See Figure 1 on page 2 for details. These ring modes are integral to the design of the 80x86 architecture.

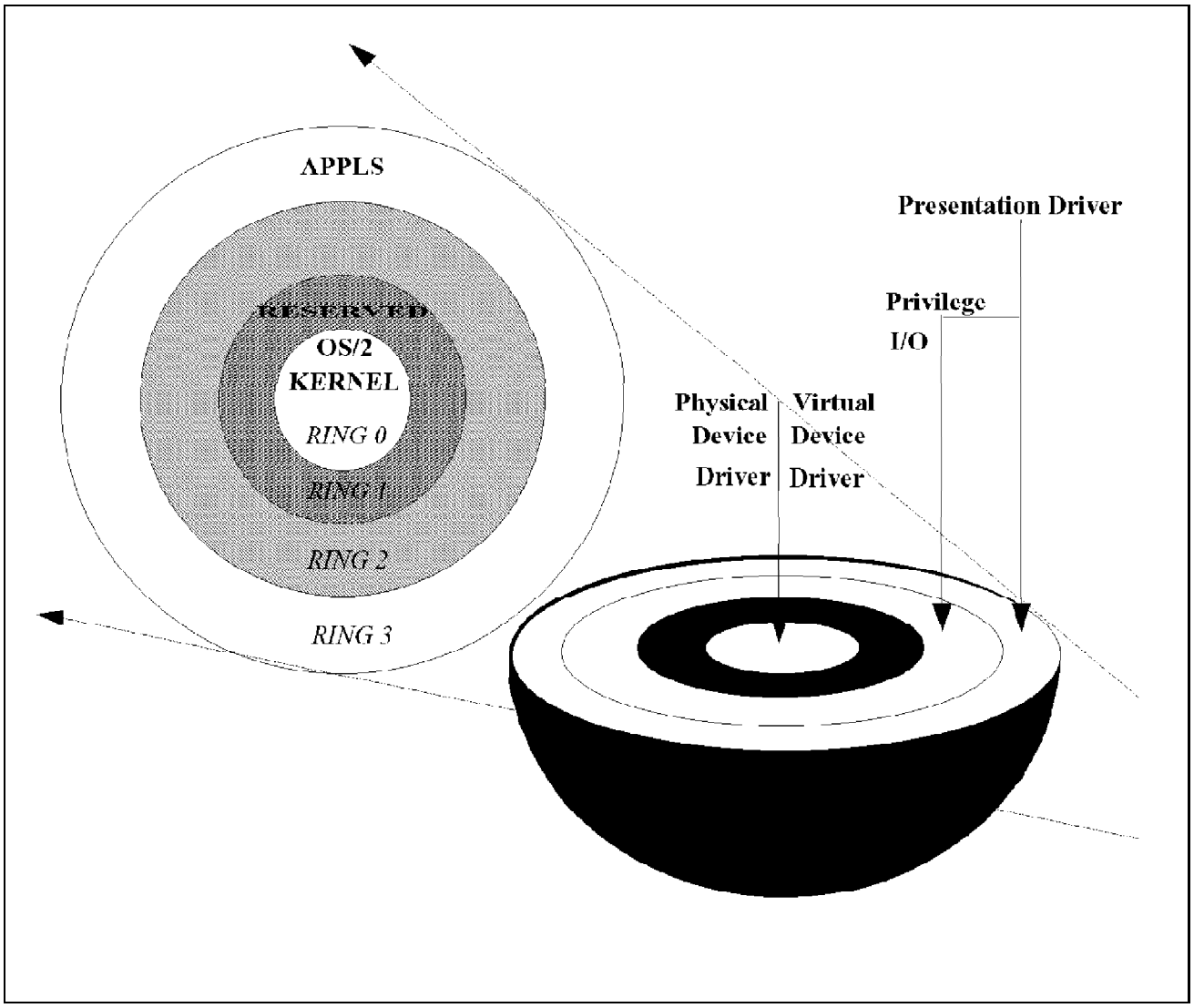


Figure 1. 80386 Ring Layer Architecture

The use of each ring mode is as follows in OS/2 Warp:

- Ring 3 is reserved for normal applications. From Ring 3 the operating system cannot be accessed directly.
- Ring 2 is reserved for I/O program (IOPL-Input/Output Privilege Level) and some 16-bit dynamic link libraries (32-bit DLLs run at Ring 3).

- Ring 1 is reserved by the kernel and is not used.
- Ring 0 is the most protected area. It is used from the operating system kernel. Device drivers run in this ring.

1.1.1 Physical Device Drivers

Physical device drivers are loaded from CONFIG.SYS with the BASEDEV= or the DEVICE= statement. These drivers provide support for standard I/O devices such as a harddisk drive, a printer, and a fax/modem card. Device drivers are initialized at Ring 3 but operate at Ring 0, the most privileged level of the operating system.

Physical device drivers are loaded by two different methods. Some are loaded by the OS/2 kernel, and the others are loaded by entries in the CONFIG.SYS file. Device drivers entered in the CONFIG.SYS file are loaded by either the BASEDEV= statement or the DEVICE= statement. For the purpose of this discussion, physical device drivers will be organized into the following three categories:

- Critical device drivers
- Base device drivers
- Installable device drivers

Critical device drivers

Critical device drivers are absolutely essential to the operation of OS/2 Warp. They are so important they are loaded by the OS/2 kernel (OS2KRNL) during system initialization. If one of these device drivers isn't found and fails to load, OS/2 Warp will not load.

For example, we renamed the RESOURCE.SYS file in the \OS2\BOOT subdirectory and rebooted the system. After the single beep of the Power On Self Test (POST), we received the following message and the system was halted:

```
The system cannot find the file "RESOURCE.SYS".  This devic
program, or data file is not located in the default path or
specified for it in the CONFIG.SYS file.  Install this file
correct directory or correct the appropriate CONFIG.SYS fil
statement.

The system is stopped.  Correct the preceding error and res
system.
```

If you lose one of the following critical device drivers for any reason, you will need to replace it from another machine or unpack it from the install diskettes into the proper subdirectory. The proper subdirectory for these device drivers is \OS2\BOOT.

Device Driver	Device Driver Description
RESOURCE.SYS	OS/2 Resource Manager.
CLOCK01.SYS	System clock device driver for ISA bus personal computers.
CLOCK02.SYS	System clock device driver for MCA bus personal computers.
SCREEN01.SYS	System standard output device driver for ISA bus computers.
SCREEN02.SYS	System standard output device driver for Micro Channel bus computers.
KBDBASE.SYS	This is the base OS/2 keyboard device driver. It receives and processes scan code from IBMKBD.SYS, the hardware specific device driver for the particular keyboard attached to the system unit. KBDBASE.SYS instructs IBMKBD.SYS if there are any updates to the keyboard information.

These device drivers are installed during initial installation and should not be manually modified in any way or deleted from the system. If you receive an error on one of these device drivers, it could be a very serious problem requiring a reinstall of the operating system.

Base device drivers

Base device drivers are primary level support for system devices such as diskette drives, fixed and removable storage devices, system attached printers, and some other hardware devices. These device drivers are loaded with a BASEDEV= statement in the CONFIG.SYS file. These system-level device drivers communicate with the device-level driver that communicates directly to the supported device. BASEDEV statements are interrogated and loaded prior to any other DEVICE statements.

Unlike the DEVICE statement, the BASEDEV= statement cannot contain either drive or path information and

therefore the OS/2 operating system cannot process such information at this stage of the startup sequence.

NOTE:

Support for file systems (File Allocation Table - FAT; and High Performance File System - HPFS) is not initialized at this point in the boot process. See 1.2, “CONFIG.SYS Processing Sequence” on page 14 for details on how the CONFIG.SYS file is read and processed.

OS/2 first searches the root directory of the startup partition for the specified file name, then the \OS2\BOOT directory. If drive or path information is included in a BASEDEV= statement, the following error is generated:

```
The system cannot find the file C:\OS2\BOOT\IBMKBD.SYS.  This
device driver, program, or data file is not located in the default
path or the path specified for it in the CONFIG.SYS file.  Install
this file in the correct directory or correct the appropriate
CONFIG.SYS file statement.
```

The BASEDEV= statement including the path information is not read and CONFIG.SYS processing continues. If the BASEDEV= statement is as critical as the BASEDEV=IBMKBD.SYS (keyboard support) the system will eventually hang. If the base device driver is not critical the system will load successfully with out device support provided by that particular BASEDEV= statement.

For example, if you include BASEDEV=C:\OS2\BOOT\IBM1FLPY.ADD in CONFIG.SYS, you will generate the above described message during the boot sequence. After a few seconds the message disappears and processing continues. The system will boot normally and the Workplace Shell will initialize. When you attempt to access the diskette drives in your computer, either from a command prompt or the Workplace Shell, you will receive one or both of the following error messages:

- System Error SYS0200: The system cannot find the device specified.

  Typing `[C:\]help sys0200` at a command prompt generates this response:

  ```
  SYS0200: The code segment cannot be greater than or equal to 64KB
  help is available for the message ID number requested.
  ```

- Workplace Shell error SYS0038: The system cannot find the A: device.

  Typing [C:\]help 0038 from a command prompt generates the following response: `SYS0038: The system cannot find the *** device.`

```
EXPLANATION: An unknown device was specified.  ACTION: Retry the
command using a correct device name.
```

The following is a list of all base device drivers included with OS/2 Warp:

BASEDEV	Description
IBMKBD.SYS	Device support for the keyboard.
IBM1FLPY.ADD	Device support for diskette drives on non-Micro Channel workstations.
IBM2FLPY.ADD	Device support for diskette drives on Micro Channel workstations.
XDFLOPPY.FLT	Device support for XDF diskettes.
OS2DASD.DMD	General-purpose device support for hard disk drives.
IBMINT13.I13	General-purpose device support for hard disk controllers.
IBM1S506.ADD	Device support for non-SCSI disk drives on non-Micro Channel workstations.
IBM2ADSK.ADD	Device support for non-SCSI disk drives on Micro Channel workstations.
IBM2SCSI.ADD	Device support for Micro Channel SCSI adapters.
DELIVERY.SYS	IBM 32-bit Fast & Wide Microchannel adapters. (IBM2SCSI.ADD must be installed and initialized.)
OS2SCSI.DMD	General-purpose device support for non-disk SCSI devices.
OS2ASPI.DMD	Device manager for devices using Adaptec's Advanced SCSI Programming Interface (ASPI).
AHA152x.ADD	Adaptec ISA SCSI adapters and system board controllers.
AHA154x.ADD	Adaptec ISA SCSI adapters.
AHA164x.ADD	Adaptec MCA SCSI adapters.
AHA174x.ADD	Adaptec EISA SCSI adapters.
AIC7770.ADD	Adaptec 2800 ISA and 2700 EISA SCSI adapters and AIC-7770 system board controller.
AIC-7870.ADD	Adaptec PCI SCSI adapter and 7870 system board controller.
FD8xx.ADD	Future Domain 8-bit SCSI adapters.

FD16-700.ADD Future Domain 16-bit, PCI SCSI, and ISA Fast SCSI adapters.

FD7000EX.ADD Future Domain TMC-7000EX EISA SCSI controllers.

BTSCSI.ADD BusLogic ISA-VL, ISA, MCA, EISA, and PCI SCSI adapter support.

DPT20xx.ADD Distributed Processing Technology (DPT) SCSI adapters.

PRINT01.SYS Device support for locally attached printers on non-Micro Channel workstations. Use the /IRQ parameter to use interrupt driven printing, rather than the default polling method. Polling can use a significant amount of a CPU doing nothing if the printer is slow.

PRINT02.SYS Device support for locally attached printers on Micro Channel workstations.

SBCD2.ADD IBM ISA CD-ROM, Creative Labs OmniCD-ROM, and Panasonic 521/2/3, and 562/3.

IBMIDECD.FLT IBM filter device driver for Enhanced IDE CD-ROM drives.

MITFX001.ADD Mitsumi CRMC-FX001/001D and LU0025/55 CD-ROM drives.

SONY31A.ADD Sony CDU-31A/33A and 7305 CD-ROM drives.

SONY535.ADD Sony CDU-531/6201/6205/535/6205 and 7205 CD-ROM drives.

LMS205.ADD Philips LMS CM205/225 CD-ROM drives.

LMS206.ADD Philips LMS CM205MS/255MS and CM206/226 CD-ROM drives.

PCMCIA.SYS Card services support for PCMCIA devices.

IBM2xxxx.SYS Socket services support for PCMCIA devices.

- IBM2AMB1.SYS - Ambra
- IBM2AST1.SYS - AST
- IBM2CMQ1.SYS - Compaq
- IBM2CAD1.SYS - CompuAdd
- IBM2MAT1.SYS - Panasonic
- IBM2NEC1.SYS - NEC
- IBM2NCR1.SYS - NCR

- IBM2TOS1.SYS - Toshiba
- IBM2ZEN1.SYS - Zenith 2 Lite
- IBM2ZOS1.SYS - ZEOS
- IBM2SSO1.SYS - ThinkPad 750 (ISA bus)
- IBM2SSO2.SYS - ThinkPad 720 (Micro Channel bus)

AUTODRV2.SYS PCMCIA modem driver.

PCM2ATA.ADD PCMCIA Advanced Technology Attach (ATA)/Flash support.

ICMEMMTD.SYS PCMCIA Flash RAM Drive support.

ICMEMCDD.SYS PCMCIA Static RAM Drive support.

CSSCSI.SYS IBM PCMCIA SCSI card support.

DETNE2.SYS Detects NE2000 Ethernet LAN cards and blocks address to prevent conflicts (for example, Mitsumi CD-ROM).

NOTE:

For OS/2 Symetric Multiprocessing (SMP), the Platform Specific Driver (.PSD) provides the strategy and management code to exploit the multiple processors in SMP machines. There is one .PSD for each machine type, as the manufacturers tend to implement SMP in slightly different ways. As of this writing a platform specific driver for OS/2 Warp was not yet generally available.

Installable device driver

Installable device drivers are program files required by OS/2 in order to recognize hardware devices and process information received from or sent to that device. These files use the extension .SYS and may have associated Dynamic Link Libraries (DLLs). Examples of device drivers with a corresponding DLL are ANSI.SYS and ANSI.DLL, which provide extended screen and keyboard support.

Some typical device drivers from the C:\OS2\ subdirectory are:

Driver	Driver Description
RESOURCE.SYS	Scans allocated resources in the system to determine conflicts with I/O port allocation, IRQ levels, BIOS memory allocation, DMA channels, Timer channels, and device drivers.
COM.SYS	Serial device support. Permits programs to use serial ports. The IRQ and I/O port address are configurable via this device driver.
RESERVE.SYS	Used to reserve specific system resources for device drivers that are not Resource Manager aware. Works in conjunction with RESOURCE.SYS.
PMDD.SYS	OS/2 Presentation Manager device driver. It is not required if you only run OS/2 full screen sessions. It also provides pointer draw support for OS/2 PM sessions.
VDISK.SYS	To create a virtual disk drive in RAM memory. The default size is 16 KB. Virtual disks provide extremely fast access to programs and data, but consume RAM memory that cannot be used by applications.
EXTDSKDD.SYS	Assigns a drive letter to a diskette drive.
LOG.SYS	Activates the Systen-Error Logging Service device driver. The /OFF parameter pauses the System-Error Logging Service at initialization. When paused, no error-logging occurs. LOG.SYS is used in conjunction with the RUN=LOGDAEM.EXE statement in CONFIG.SYS.
POINTDD.SYS	Provides mouse pointer draw support.
DOS.SYS	Support for Virtual DOS Machines (VDM's) in OS/2 Warp. If you don't run DOS applications you can remove this device driver.
MOUSE.SYS	Support for pointing devices.
TESTCFG.SYS	Tests the system configuration, for example, queries adapters, during initial installation and subsequent installs; that is, Selective Install or Device Driver Install. Can be removed if not performing install functions, but not recommended.
IBMKBD.SYS	Hardware specific portion of the keyboard device driver. It supports the following keyboards: IBM 101/102 Enhanced keyboards, IBM 3279 130 Enhanced keyboard, Honeywell

101WN, and the Lexmark 101 Enhanced keyboard. Passes scan codes to KBDBASE.SYS.

1.1.2 Virtual Device Drivers

Virtual Device Drivers (VDDs) are installed to allow DOS applications to access hardware devices in the OS/2 protected environment. DOS programs cannot be allowed to monopolize hardware devices for their exclusive use, and OS/2 accomplishes this through a technique known as *hardware virtualization*. It does so using virtual device drivers.

VDDs are 32-bit programs that operate at Ring 0. See Figure 1 on page 2 for details. They communicate with the actual hardware through an OS/2 layer called the Virtual Device Helper (VDH). The VDH monitors the availability of the hardware device and allows the DOS application access when it is free.

All VDDs are loaded from the CONFIG.SYS file and begin with the letter V. They are located in the \OS2\MDOS\ subdirectory on the drive which OS/2 is installed on. The following list shows some virtual device drivers:

Device Driver	Device Driver Description
VAPM.SYS	This driver is used to support Advanced Power Management under DOS. If your system does not have APM, then you don't need this driver and it can be removed from CONFIG.SYS.
VCDROM.SYS	This driver provides DOS CD-ROM support. If you do not use DOS programs that require CD-ROM support, you can remove this driver from CONFIG.SYS.
VCOM.SYS	This driver provides DOS COM support. If you do not use DOS programs that require access to COM ports, you can remove this driver from CONFIG.SYS.
VDPMI.SYS	This driver, along with VDPX.SYS, provides DOS Protected Mode Interface memory support. If you do not use DOS programs that require DPMI you can remove this driver from CONFIG.SYS. Note that this driver is required for Windows.
VDPX.SYS	This driver, along with VDPMI.SYS, provides DOS Protected Mode Interface memory support. If you do not use DOS programs that require DPMI, you can remove this driver from CONFIG.SYS. Note that this driver is required for Windows.

VEMM.SYS This driver provides support for the DOS virtual expanded memory manager. If you do not use DOS programs that require expended memory you can remove this driver from CONFIG.SYS.

VMOUSE.SYS This driver provides mouse support in the DOS and WIN-OS/2 environment. If you do not use DOS or WIN-OS/2 programs that require mouse support, you can remove this driver from CONFIG.SYS.

VSVGA.SYS This driver provides DOS SVGA support. If you do not use DOS or WIN-OS/2 programs, you can remove this driver from CONFIG.SYS.

VPCMCIA.SYS This driver provides DOS PCMCIA support. If you do not use DOS programs that require PCMCIA, you can remove this driver from CONFIG.SYS.

VVGA.SYS This driver provides DOS VGA support. If you do not use DOS or WIN-OS/2 programs you can remove this driver from CONFIG.SYS.

VWIN.SYS This driver provides WIN-OS/2 support. If you do not use WIN-OS/2 programs you can remove this driver from CONFIG.SYS. The VWIN.SYS driver also requires the VDPX.SYS, VDPMI.SYS, and VXMS.SYS to be loaded.

VW32S.SYS This driver provides support for the Win32s APIs under WIN-OS/2. If you do not use WIN-OS/2, or Windows programs that use Win32s, then you can remove this driver from CONFIG.SYS.

VXGA.SYS This driver provides DOS XGA support. If you do not use DOS or WIN-OS/2 programs, you can remove this driver from CONFIG.SYS.

VXMS.SYS /UMB This driver provides support for the DOS virtual extended memory manager. If you do not use DOS programs that require extended memory, you can remove this driver from CONFIG.SYS.

1.1.3 Presentation Drivers

The Presentation Manager I/O interface for output devices is a high-level interface. This interface is similar to the API call interface, which uses the program stack to communicate with, or pass parameters to, the presentation drivers. These drivers are special-purpose I/O routines operating with I/O privileges at Ring 2 or Ring 3. See Figure 1 on page 2 for details. Their main function is to process function calls made by the Presentation Manager interface on behalf of Presentation Manager applications. Hardcopy presentation drivers, or drivers that directly support file printing, communicate with OS/2 device drivers through the file system emulation functions. Display presentation drivers interface directly with the hardware.

Presentation drivers are dynamic link library modules that are supplied as files and identified by the extension DRV. When the Presentation Manager interface is initialized, the display presentation driver is loaded and enabled automatically. Other presentation drivers (for example, the hardcopy presentation drivers) are loaded and enabled when an application calls the DevOpenDC function to open the device.

Presentation drivers service requests only from applications running in Presentation Manager sessions in OS/2 mode. Output data and requests for information are passed to the presentation driver as function calls to the presentation driver interface. The definition of the call interface is given in terms of the codes, and data is passed to the presentation driver interface through the program stack.

Note

Header and include files are shipped with the OS/2 operating system to provide support for building presentation drivers that are written in C or assembler language. These files contain function prototypes, defined values, and data structures used by the various functions.

1.1.4 OS/2 Multimedia Device Drivers

OS/2 multimedia support is now integral to the installation of the OS/2 Warp operating system. Many systems vary in that they may or may not have built in sound cards and CD-ROM drives, so we present the multimedia device drivers in a separate section.

These device drivers are installed in the CONFIG.SYS file and initialized at boot time just like any installable device driver or virtual device driver. These statements are added to your CONFIG.SYS file automatically if you use

OS/2's install process to detect the presence of multimedia hardware in your system. Multimedia device drivers are located in the \MMOS2\ subdirectory on the drive where OS/2 is installed.

OS/2 Warp multimedia device driver installation and configuration information is found in 6.3, “Multimedia Device Driver Installation” on page 221.

Device Driver	Device Driver Description
ADSHDD.SYS	Audio stream handler device driver (pre-OS/2 Warp; OS/2 2.xx).
AUDIOVDD.SYS	This driver provides DOS and WIN-OS/2 audio support. If you do not use DOS or WIN-OS/2 programs that require audio support you can remove this driver from CONFIG.SYS.
CS4231.SYS	Device driver for Crystal Semiconductor Audio chipset in the IBM ThinkPad 750Cs. (This will vary depending on the hardware in use.)
SB16D2.SYS	This driver provides Sound Blaster support. Depending on the type of card installed, the driver name will vary. Parameters passed to the driver indicate the device number, the DMA channel, the IRQ level, the I/O address, the I/O buffer size, and the name of the driver to be used by the audio subsystem.
SMVDD.SYS	This driver provides DOS and WIN-OS/2 digital video support. If you do not use DOS or WIN-OS/2 that require digital video support you can remove this driver from CONFIG.SYS.
SSMDD.SYS	This driver provides digital video support. Parameters can be used to increase the size if the buffer used by this driver. See the MMPM/2 README file in \MMOS2 for details.
R0STUB.SYS	Protect Mode portion of the audio stream handler (undocumented).
VAUDIO.SYS	Audio Capture Playback Adapter (ACPA) virtual audio device driver for DOS support.
VCSHDD.SYS	Video capture stream handler device driver.

VCS4231.SYS DOS device driver for Crystal Semiconductor Audio chipset in the IBM ThinkPad 750Cs. (This will vary depending on hardware in use.)

1.2 CONFIG.SYS Processing Sequence

When you turn on a Personal Computer it immediately performs the Power On Self Test (POST) to ensure the hardware is working correctly. A single beep indicates there are no hardware errors and the operating system can be loaded. Once the OS/2 kernel is loaded successfully the CONFIG.SYS file is read and executed. Unlike the DOS environment, where the CONFIG.SYS file was read and processed line by line, OS/2 reads the entire CONFIG.SYS file and then organizes all statements into ordered groups for execution.

Early in the boot sequence of OS/2 the OS2KRNL file is loaded and executed. After the kernel is running, OS/2 searches the root directory of the drive OS/2 is installed on for the CONFIG.SYS file. Once CONFIG.SYS is successfully read, OS/2 reorganizes and reorders each line into a new sequence for processing. If CONFIG.SYS in the root directory is damaged or missing, you receive the following error message and the boot process halts:

```
The CONFIG.SYS file in the root directory could not be opened.  A men
screen with alternative CONFIG.SYS files that can be used to boot wi
follow this message.  Press enter to continue...
```

When you press the Enter key OS/2 presents the Recovery Choices screen where you can elect to boot the system from an archived CONFIG.SYS file or one of you own defined alternative CONFIG.SYS files.

The order OS/2 chooses to load all the statements of the CONFIG.SYS is based on internal system requirements and design. First, all base device driver statements are executed according to their file name extensions. Then the LIBPATH statement and all environment variables are created in memory. National language support is next which involves the CODEPAGE, COUNTRY, and DEVINFO statements. Files systems are loaded next, followed by installable device drivers from all DEVICE commands. The SWAPPATH is established next and the swap file is opened on physical storage. OS/2 then initializes the Virtual DOS Machine environment for DOS and Windows programs. CALL and RUN commands are interrogated next prior to executing the Workplace Shell.

Refer to Figure 2 on page 15 for the complete processing order of the CONFIG.SYS.

1. BASEDEV=
2. LIBPATH=/SET=
3. CODEPAGE=/COUNTRY=/DEVINFO=
4. IFS=/DEVICE=
5. SWAPPATH=
6. VDM Support:
   - BREAK=
   - DEVICE=
   - DEVICEHIGH=
   - FCBS=
   - FILES=
   - LASTDRIVE=
   - PROTECTONLY=
   - RMSIZE=
   - SHELL=
7. CALL=/RUN=
8. PROTSHELL=
9. Other... (order not important)

Figure 2. CONFIG.SYS Statement Processing Order

The detailed processing sequence and the drivers within each of those groups, as well as their basic functions, are described in the following list:

- BASEDEV=

  BASEDEV= statements are read first and ordered by the file extension as follows:

  1. .SYS
  2. .BID
  3. .VSD
  4. .TSD
  5. .ADD
  6. .I13
  7. .FLT
  8. .DMD

Note

The extensions .BID, .VSD and .TSD are used to support Microsoft's LADDR layered device driver model, which is now rarely used in OS/2.

- LIBPATH=/SET=

  The LIBPATH= statement is read next. LIBPATH is not an environment variable like the PATH and DPATH statements. It cannot be displayed or modified from an OS/2 command prompt like PATH and DPATH can. If changes are made to CONFIG.SYS, the system must be rebooted to read and load the new LIBPATH statement. When any application searches for dynamic link libraries, it looks in the LIBPATH directory structure first; not in the current directory.

  Note

  If you add a "." to the beginning of the LIBPATH= statement you force OS/2 to search the current directory for DLLs first. The "." represents or points to the address of the current directory. Any time a system application or user program makes a call for a dynamic link library, during the boot sequence or normal operation, this causes the current directory to be searched.

  After all LIBPATH= statements are read OS/2 reads all the SET statements in the order that they appear and initializes environment variables for each SET command.

- CODEPAGE=/COUNTRY=/DEVINFO=

  The National Language Support for screen and keyboard are read next.

- IFS=/DEVICE=

  Installable File Systems (IFS) are read and loaded next including High Performance File System (HPFS), CD-ROM File System (CDFS), and High Performance Optical File System (HPOFS) if required and installed. Storage devices requiring any installable file system cannot be accessed if the appropriate IFS support is not successfully loaded.

- SWAPPATH=

  The SWAPPATH statement points to the location of the SWAPPER.DAT file. It is only read at boot time and if changed, the system must be rebooted.

- VDM Support:

If DOS support is installed, OS/2 initializes parameters that are specific to the Virtual DOS Machine from the CONFIG.SYS file. These statements cannot be removed from CONFIG.SYS but they can be set to minimal values. Refer to the Command Reference in the Information folder for specific details on minimum, maximum, and default values when appropriate.

BREAK=
DEVICE=
DEVICEHIGH=
FCBS=
FILES=
LASTDRIVE=
PROTECTONLY=
RMSIZE=
SHELL=

- CALL=

  The CALL= statement is used to start a program before the Workplace Shell is initialized and loads the Desktop. Programs launched using the CALL= statement in CONFIG.SYS are run synchronously. This means that the first program called must complete before the next CALL= statement is executed. This method allows control to be exercised during the startup sequence prior to initializing the Workplace Shell.

  For instance, if you want to be able to execute a command before the Workplace Shell is initialized, you could put the statement, `CALL=C:\OS2\CMD.EXE` in the CONFIG.SYS file. When this CALL statement is executed an OS/2 Command Prompt window will be opened. You can now enter any command you wish. Click on **EXIT** to close the window and allow the boot process to continue.

  After the Workplace Shell initializes and the Desktop is built, certain files are in a locked for protection from other processes. Any attempt to modify or reconfigure one of these files will fail. The CALL= statement allows access to these files before they are locked by OS/2.

- RUN=

  The RUN= statement is similar to the DETACH command in that it starts a detached process in OS/2. A detached process runs in the background with no access from standard input or to standard output (keyboard or screen). All input must be piped in from another source and all output similarly must be piped or redirected to a file or storage device.

  There are two important aspects of the RUN= statement to be aware of:

- The RUN= statement executes the program before the Workplace Shell is initialized. All that is running at this time in the boot sequence is the base operating system. If your program requires the Workplace Shell or Presentation Manager. services the program will fail to start or possibly cause other errors on the system.
- Programs started with the RUN= statement in CONFIG.SYS are executed asynchronously. This means that each RUN= statement is started in the order that it appears in CONFIG.SYS and all programs started with a RUN= statement execute simultaneously. You can control the order of initial execution, but you cannot control which program will run faster or complete processing first. If control is important, use the CALL command.

• PROTSHELL=

  PROTSHELL= tells OS/2 what Presentation Manager program to use as the Protected Mode Shell. By default OS/2 installs and uses PMSHELL.EXE. PMSHELL.EXE is the first program started after the base operating system is loaded. This is the only Protected Mode Shell program provided with OS/2 Warp, though there might be others from private sources.

  The Protected Mode Shell program is responsible for initializing the Presentation Manager. environment. This initialization process uses some undocumented features in OS/2 Warp, making it difficult to write a new Presentation Manager. Shell for OS/2 Warp.

• Other CONFIG.SYS Statements

  All other CONFIG.SYS statements that do not fit into one of the above groups are not sequence sensitive and are initialized sometime during the OS/2 boot process. See Figure 5 on page 24 for some examples.

1.2.1 Sample CONFIG.SYS File

As an example, here is the CONFIG.SYS file from an IBM PS-ValuePoint 6384-W71 configured with, 486DX/2 processor, 16 MB RAM, 128kb L2 cache, 345 MB hard disk, S3-801/805 SVGA controller, and IBM CD-ROM II. It is first shown as-is after the initial installation. Then it is shown again with all statements organized in the order that OS/2 would sequentially process them.

Note: Please note that additional applications have been installed to a base OS/2 Warp Version 3 installation on this example machine. OS/2 Multiprotocol Transport Services, OS/2 Communications Manager/2, and OS/2 LAN Requester have created their respective subdirectories and added

many lines to the CONFIG.SYS file. If you haven't installed these program products you will not have all the lines in your CONFIG.SYS files shown here.

```
IFS=C:\OS2\HPFS.IFS /CACHE:1024 /CRECL:4 /AUTOCHECK:D
PROTSHELL=C:\OS2\PMSHELL.EXE
SET USER_INI=C:\OS2\OS2.INI
SET SYSTEM_INI=C:\OS2\OS2SYS.INI
SET OS2_SHELL=C:\OS2\CMD.EXE
SET AUTOSTART=PROGRAMS,TASKILIST,FOLDERS,LAUNCHPAD
SET RESTARTOBJECTS=YES
SET SHELLEXCEPTIONHANDLER=OFF
SET AUTOREFRESHFOLDERS=NO
SET OBJECTSNOOZETIME=30
SET RUNWORKPLACE=C:\OS2\PMSHELL.EXE
SET COMSPEC=C:\OS2\CMD.EXE
LIBPATH=.;C:\MPTN\DLL;C:\IBMCOM\DLL;.;C:\IBMLAN\NETLIB;
SET PATH=C:\MPTN\BIN;C:\IBMCOM;C:\IBMLAN\NETPROG;
SET DPATH=C:\IBMCOM;C:\IBMLAN\NETPROG;C:\IBMLAN;
SET PROMPT=[$p]
SET HELP=C:\OS2\HELP;C:\OS2\HELP\TUTORIAL;C:\CMLIB;
SET GLOSSARY=C:\OS2\HELP\GLOSS;
SET IPF_KEYS=SBCS
PRIORITY_DISK_IO=YES
BASEDEV=IBMKBD.SYS
DEVICE=C:\IBMCOM\PROTOCOL\LANPDD.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANVDD.OS2
DEVICE=C:\IBMCOM\LANMSGDD.OS2 /I:C:\IBMCOM
DEVICE=C:\IBMCOM\PROTMAN.OS2 /I:C:\IBMCOM
DEVICE=C:\OS2\BOOT\TESTCFG.SYS
DEVICE=C:\OS2\BOOT\DOS.SYS
DEVICE=C:\OS2\BOOT\PMDD.SYS
BUFFERS=90
IOPL=YES
DISKCACHE=D,LW,AC:C
MAXWAIT=3
MEMMAN=SWAP,PROTECT
SWAPPATH=C:\OS2\SYSTEM 2048 2048
BREAK=OFF
THREADS=256
PRINTMONBUFSIZE=134,1,1
COUNTRY=001,C:\OS2\SYSTEM\COUNTRY.SYS
SET KEYS=ON
SET BOOKSHELF=C:\IBMLAN\NETPROG;C:\OS2\BOOK;C:\CMLIB\BOOK;C:\TCPIP\DOC;
SET SOMIR=C:\OS2\ETC\SOM.IR;C:\OS2\ETC\WPSH.IR;C:\OS2\ETC\WPDSERV.IR
SET SOMDDIR=C:\OS2\ETC\DSOM
REM SET DELDIR=C:\DELETE,512;D:\DELETE,512;
BASEDEV=PRINT01.SYS
BASEDEV=IBM1FLPY.ADD
```

Figure 3 (Part 1 of 3). CONFIG.SYS File As It Appears After Installation

```
BASEDEV=IBM2FLPY.ADD
BASEDEV=IBM1S506.ADD
BASEDEV=XDFLOPPY.FLT
BASEDEV=OS2DASD.DMD
SET EPMPATH=C:\OS2\APPS;
PROTECTONLY=NO
SHELL=C:\OS2\MDOS\COMMAND.COM C:\OS2\MDOS
FCBS=16,8
RMSIZE=640
DEVICE=C:\OS2\MDOS\VEMM.SYS
DOS=LOW,NOUMB
DEVICE=C:\OS2\MDOS\VXMS.SYS /UMB
DEVICE=C:\OS2\MDOS\VDPMI.SYS
DEVICE=C:\OS2\MDOS\VDPX.SYS
DEVICE=C:\OS2\MDOS\VWIN.SYS
DEVICE=C:\OS2\MDOS\VW32S.SYS
BASEDEV=OS2SCSI.DMD
BASEDEV=IBM2SCSI.ADD /V
BASEDEV=AHA154X.ADD /V
DEVICE=C:\OS2\MDOS\VMOUSE.SYS
DEVICE=C:\OS2\BOOT\POINTDD.SYS
DEVICE=C:\OS2\BOOT\MOUSE.SYS
DEVICE=C:\OS2\BOOT\COM.SYS
DEVICE=C:\OS2\MDOS\VCOM.SYS
CODEPAGE=437,850
DEVINFO=KBD,US,C:\OS2\KEYBOARD.DCP
CALL=C:\IBMCOM\PROTOCOL\NETBIND.EXE
RUN=C:\IBMCOM\LANMSGEX.EXE
DEVICE=C:\MPTN\PROTOCOL\MPTN.SYS
DEVICE=C:\MPTN\PROTOCOL\LIPC.SYS
DEVICE=C:\MPTN\PROTOCOL\INET.SYS
DEVICE=C:\MPTN\PROTOCOL\IFNDIS.SYS
DEVICE=C:\MPTN\PROTOCOL\NB.SYS
RUN=C:\MPTN\BIN\CNTRL.EXE /P mptn_os$ mptn_in$ mptn_nb$
CALL=C:\OS2\CMD.EXE /Q /C C:\MPTN\BIN\MPTSTART.CMD
DEVICE=C:\IBMCOM\PROTOCOL\NETBEUI.OS2
DEVICE=C:\IBMLAN\NETPROG\RDRHELP.200
RUN=C:\IBMCOM\PROTOCOL\LANDLL.EXE
RUN=C:\IBMLAN\NETPROG\LSDAEMON.EXE
RUN=C:\OS2\SYSTEM\LOGDAEM.EXE
RUN=C:\OS2\EPW.EXE
RUN=C:\OS2\EPWROUT.EXE 1
DEVICE=C:\OS2\LOG.SYS
DEVICE=C:\IBMLAN\NETPROG\VNETAPI.OS2
RUN=C:\IBMLAN\NETPROG\VNRMINIT.EXE
SET NWDBPATH=C:\IBMLAN\NETPROG
SET DLSINI=C:\IBMLAN\NETPROG\NETGUI.INI
SET INIT_FILE_NAMES=netgui
SET INIT_FILE_RANGES=200
SET WPS_COMMUNICATION=YES
```

Figure 3 (Part 2 of 3). CONFIG.SYS File As It Appears After Installation

```
SET LOCPATH=C:\IBMLAN\XPG4\LOCALE
SET LANG=ENUS437
DEVICE=C:\CMLIB\ACSLANDD.SYS
DEVICE=C:\CMLIB\CMKFMDE.SYS
SET CMPATH=C:\CMLIB
SET lotuspersonal=D:\FLG
DEVINFO=SCR,VGA,C:\OS2\BOOT\VIOTBL.DCP
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGA,BVHSVGA)
DEVICE=C:\OS2\MDOS\VSVGA.SYS
DEVICE=C:\OS2\APPS\SYSIOS2.SYS
REM SET MENUSTYLE=SHORT
SET IBMAV=C:\IBMAV2
RUN=C:\IBMCOM\PROTOCOL\NETBIND.EXE
IFS=C:\IBMLAN\NETPROG\NETWKSTA.200 /I:C:\IBMLAN /N
DEVICE=C:\IBMCOM\PROTOCOL\NETBIOS.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANDD.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANDLLDD.OS2
SET ETC=C:\TCPIP\ETC
SET TMP=C:\TCPIP\TMP
SET READIBM=C:\TCPIP\DOC
SET HOSTNAME=bocares1
DEVICE=C:\IBMCOM\MACS\IBMTOK.OS2
DEVICE=C:\OS2\BOOT\OS2CDROM.DMD /Q
IFS=C:\OS2\BOOT\CDFS.IFS /Q
DEVICE=C:\OS2\MDOS\VCDROM.SYS
```

Figure 3 (Part 3 of 3). CONFIG.SYS File As It Appears After Installation

OS/2 reads the CONFIG.SYS file in Figure 3 on page 19 sorting and grouping all the individual lines according to the sequence in Figure 2 on page 15. After all the lines have been reorganized into specific groups OS/2 Warp begins processing each line.

This whole concept of OS/2 rearranging and organizing lines within the CONFIG.SYS file must be understood. It is easy to relax and think, "I don't have to worry about the order of any device drivers in CONFIG.SYS because OS/2 manages it for me, but care must be taken.

For base device drivers, you need only concern yourself if the filename extensions are the same. For instance, a .SYS driver gets processed before an .ADD driver, regardless of there respective positions. But if you have two .ADD drivers one after the other, this is the order OS/2 will read and process them. It may be necessary for you to switch the position of these base device drivers should you run into problems with devices they support.

In the case of device drivers loaded in CONFIG.SYS with the DEVICE= statement, you must determine if one driver needs to load before another. OS/2 process all DEVICE= statements as they appear without exception.

The example in Figure 4 on page 22 shows the same CONFIG.SYS file after OS/2 Warp has read an reorganized all the lines for processing.

```
BASEDEV=IBMKBD.SYS
BASEDEV=PRINT01.SYS
BASEDEV=IBM1FLPY.ADD
BASEDEV=IBM2FLPY.ADD
BASEDEV=IBM1S506.ADD
BASEDEV=IBM2SCSI.ADD /V
BASEDEV=AHA154X.ADD /V
BASEDEV=XDFLOPPY.FLT
BASEDEV=OS2DASD.DMD
BASEDEV=OS2SCSI.DMD

LIBPATH=.;C:\MPTN\DLL;C:\IBMCOM\DLL;C:\IBMLAN\NETLIB;

SET USER_INI=C:\OS2\OS2.INI
SET SYSTEM_INI=C:\OS2\OS2SYS.INI
SET OS2_SHELL=C:\OS2\CMD.EXE
SET AUTOSTART=PROGRAMS,TASKILIST,FOLDERS,LAUNCHPAD
SET OBJECTSNOOZETIME=30
SET RUNWORKPLACE=C:\OS2\PMSHELL.EXE
SET COMSPEC=C:\OS2\CMD.EXE
SET PATH=C:\MPTN\BIN;C:\IBMCOM;C:\IBMLAN\NETPROG;C:\MUGLIB;
SET DPATH=C:\IBMCOM;C:\IBMLAN\NETPROG;C:\IBMLAN;C:\MUGLIB;
SET PROMPT=[$p]
SET HELP=C:\OS2\HELP;C:\OS2\HELP\TUTORIAL;C:\CMLIB;C:\TCPIP\HELP;
SET GLOSSARY=C:\OS2\HELP\GLOSS;
SET IPF_KEYS=SBCS
SET KEYS=ON
SET BOOKSHELF=C:\IBMLAN\NETPROG;C:\OS2\BOOK;C:\CMLIB\BOOK;
SET SOMIR=C:\OS2\ETC\SOM.IR;C:\OS2\ETC\WPSH.IR;
SET SOMDDIR=C:\OS2\ETC\DSOM
SET DELDIR=C:\DELETE,512;D:\DELETE,512;
SET EPMPATH=C:\OS2\APPS;
SET NWDBPATH=C:\IBMLAN\NETPROG
SET DLSINI=C:\IBMLAN\NETPROG\NETGUI.INI
SET INIT_FILE_NAMES=netgui
SET INIT_FILE_RANGES=200
SET WPS_COMMUNICATION=YES
SET LOCPATH=C:\IBMLAN\XPG4\LOCALE
SET LANG=ENUS437
SET CMPATH=C:\CMLIB
SET lotuspersonal=D:\FLG
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGA,BVHSVGA)
SET MENUSTYLE=SHORT
SET IBMAV=C:\IBMAV2
```

Figure 4 (Part 1 of 3). CONFIG.SYS File As It Is Processed by OS/2 Warp

```
SET ETC=C:\TCPIP\ETC
SET TMP=C:\TCPIP\TMP
SET READIBM=C:\TCPIP\DOC

CODEPAGE=437,850
COUNTRY=001,C:\OS2\SYSTEM\COUNTRY.SYS
DEVINFO=KBD,US,C:\OS2\KEYBOARD.DCP
DEVINFO=SCR,VGA,C:\OS2\BOOT\VIOTBL.DCP

DEVICE=C:\IBMCOM\PROTOCOL\LANPDD.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANVDD.OS2
DEVICE=C:\IBMCOM\LANMSGDD.OS2 /I:C:\IBMCOM
DEVICE=C:\IBMCOM\PROTMAN.OS2 /I:C:\IBMCOM
DEVICE=C:\OS2\BOOT\TESTCFG.SYS
DEVICE=C:\OS2\BOOT\DOS.SYS
DEVICE=C:\OS2\BOOT\PMDD.SYS
DEVICE=C:\MPTN\PROTOCOL\MPTN.SYS
DEVICE=C:\MPTN\PROTOCOL\LIPC.SYS
DEVICE=C:\MPTN\PROTOCOL\INET.SYS
DEVICE=C:\MPTN\PROTOCOL\IFNDIS.SYS
DEVICE=C:\MPTN\PROTOCOL\NB.SYS
DEVICE=C:\IBMCOM\PROTOCOL\NETBEUI.OS2
DEVICE=C:\IBMLAN\NETPROG\RDRHELP.200
DEVICE=C:\OS2\LOG.SYS
DEVICE=C:\IBMLAN\NETPROG\VNETAPI.OS2
DEVICE=C:\CMLIB\ACSLANDD.SYS
DEVICE=C:\CMLIB\CMKFMDE.SYS
DEVICE=C:\OS2\APPS\SYSIOS2.SYS
DEVICE=C:\IBMCOM\PROTOCOL\NETBIOS.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANDD.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANDLLDD.OS2
DEVICE=C:\IBMCOM\MACS\IBMTOK.OS2
DEVICE=C:\OS2\BOOT\OS2CDROM.DMD /Q
DEVICE=C:\OS2\BOOT\POINTDD.SYS
DEVICE=C:\OS2\BOOT\MOUSE.SYS
DEVICE=C:\OS2\BOOT\COM.SYS

IFS=C:\OS2\HPFS.IFS /CACHE:1024 /CRECL:4 /AUTOCHECK:D
IFS=C:\IBMLAN\NETPROG\NETWKSTA.200 /I:C:\IBMLAN /N
IFS=C:\OS2\BOOT\CDFS.IFS /Q

SWAPPATH=C:\OS2\SYSTEM 2048 2048

BREAK=OFF
DEVICE=C:\OS2\MDOS\VEMM.SYS
DEVICE=C:\OS2\MDOS\VXMS.SYS /UMB
DEVICE=C:\OS2\MDOS\VDPMI.SYS
DEVICE=C:\OS2\MDOS\VDPX.SYS
DEVICE=C:\OS2\MDOS\VWIN.SYS
DEVICE=C:\OS2\MDOS\VW32S.SYS
```

Figure 4 (Part 2 of 3). CONFIG.SYS File As It Is Processed by OS/2 Warp

```
DEVICE=C:\OS2\MDOS\VMOUSE.SYS
DEVICE=C:\OS2\MDOS\VCOM.SYS
DEVICE=C:\OS2\MDOS\VSVGA.SYS
DEVICE=C:\OS2\MDOS\VCDROM.SYS
FCBS=16,8
FILES=20
PROTECTONLY=NO
RMSIZE=640
SHELL=C:\OS2\MDOS\COMMAND.COM C:\OS2\MDOS

CALL=C:\IBMCOM\PROTOCOL\NETBIND.EXE
CALL=C:\OS2\CMD.EXE /Q /C C:\MPTN\BIN\MPTSTART.CMD

RUN=C:\IBMCOM\LANMSGEX.EXE
RUN=C:\MPTN\BIN\CNTRL.EXE /P mptn_os$ mptn_in$ mptn_nb$
RUN=C:\IBMCOM\PROTOCOL\LANDLL.EXE
RUN=C:\IBMLAN\NETPROG\LSDAEMON.EXE
RUN=C:\OS2\SYSTEM\LOGDAEM.EXE
RUN=C:\OS2\EPW.EXE
RUN=C:\OS2\EPWROUT.EXE 1
RUN=C:\IBMLAN\NETPROG\VNRMINIT.EXE
RUN=C:\IBMCOM\PROTOCOL\NETBIND.EXE

PROTSHELL=C:\OS2\PMSHELL.EXE
```

Figure 4 (Part 3 of 3). CONFIG.SYS File As It Is Processed by OS/2 Warp

There are some statements in CONFIG.SYS that are not dependent on any particular sequence of events in the boot process. These commands are initialized during the boot process before the Workplace Shell executes and the Desktop appears. Figure 3 on page 19 shows these order independent statements as they appear in CONFIG.SYS.

```
• BUFFERS=90
• THREADS=256
• PRINTMONBUFSIZE=134,1,1
• DOS=LOW,NOUMB
• PRIORITY_DISK_IO=YES
• IOPL=YES
• DISKCACHE=D,LW,AC:C
• MAXWAIT=3
• MEMMAN=SWAP,PROTECT
```

Figure 5. CONFIG.SYS Statements not Order Dependent

Chapter 2. OS/2 Warp Display Device Drivers

This chapter describes the display device drivers in OS/2 Warp with regard to display driver installation, which drivers are available in OS/2 Warp, configuration of device drivers, and basic problem determination.

The term OS/2 Warp will be used as generic term for the following OS/2 Versions: OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect. If a description refers to one specific OS/2 version, it will be mentioned specifically.

Video support is comprised of four principal components under OS/2 Warp:

- Base video handlers
- Video virtual device drivers
- Presentation Manager display drivers
- WIN-OS/2 display drivers

The relationship of these display drivers is shown in Figure 6.

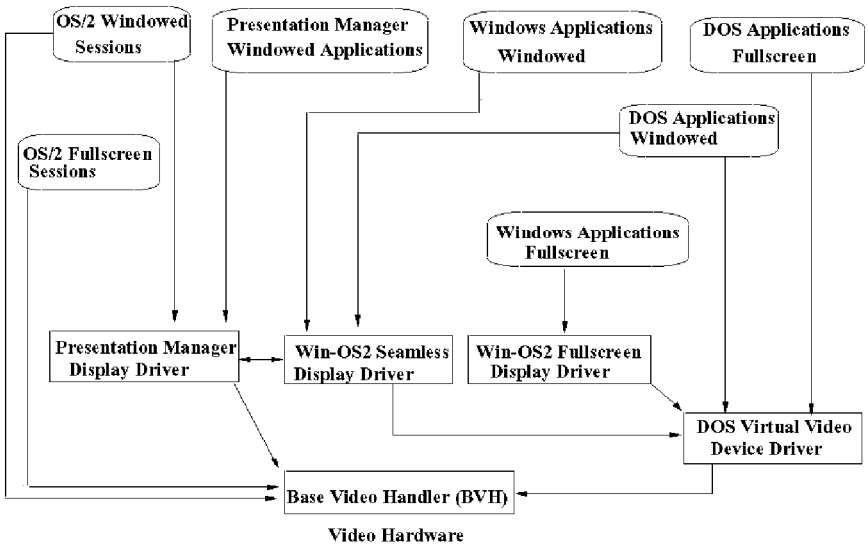


Figure 6. Relationship of OS/2 Warp Display Drivers

2.1 Base Video Handler

The Base Video Handler has two main functions. As video adapters are switched between displaying either text or graphics, the BVH must remember the video mode for the previous session. For example, if you switch from an OS/2 or DOS fullscreen to the OS/2 Desktop, the BVH must keep track of the resolution used in the fullscreen as well as if it were text or graphics being displayed. It also provides support for text display in both a full screen and a windowed PM session. The appropriate BVH for your system is loaded by DLLs (Dynamic Link Libraries) at bootup.

For example, on a machine with an SVGA chipset, your CONFIG.SYS file would have the following lines:

```
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGA,BVHSVGA)
```

The type of video adapter available on your system is specified by the SET `VIDEO_DEVICES` statement. More than one adapter can be specified on this line. The actual name of the BVH to be used is specified in the second line as shown in the above example. Our example of an SVGA system shows that this system uses two BVHs to provide video support. The BVHSVGA builds upon the VGA support offered by BVHVGA to provide SVGA support. XGA and 8514/A are two other adapters that are also able to support more than one video mode and therefore have more than one BVH loaded in the CONFIG.SYS.

OS/2 Warp provides the Base Video Handler files listed in Table 1. The BVH which is appropriate for your system and video mode is loaded into the \OS2\DLL subdirectory:

Table 1 (Page 1 of 2). Base Video Handlers Supplied with OS/2 Warp

Adapter type	**BVH File**
8514/A	BVHVGA.DLL BVH8514A.DLL
CGA	BVHCGA.DLL
EGA	BVHEGA.DLL
Monochrome	BVHMPA.DLL
VGA	BVHVGA.DLL
SVGA	BVHVGA.DLL BVHSVGA.DLL

Table 1 (Page 2 of 2). Base Video Handlers Supplied with OS/2 Warp	
Adapter type	**BVH File**
XGA	BVHVGA.DLL BVHXGA.DLL

In addition, VIDEOPMI.DLL is located in \OS2\DLL. This DLL file contains many device driver functions such as register I/O functions.

2.1.1 Video Virtual Device Drivers

The DOS video virtual device driver is used by DOS applications which are running in a DOS session. Since OS/2 Warp does not allow DOS applications to directly access the hardware, it is necessary to use a VDD to gain access to the hardware. Virtual video device drivers are required when it is necessary for multiple DOS sessions to share one or more video devices. Your CONFIG.SYS will have a statement similar to the following:

```
DEVICE=C:\OS2\MDOS\VVGA.SYS
```

Not all video resolutions are supported when a DOS application is run in a window or in a background session. This is because the VDD must emulate the video adapter so the application can execute as if it had direct access to the hardware. This process is known as hardware virtualization. Since not all the possible video adapter modes are emulated by the video VDDs, a background or windowed DOS application may suspend if it tries to use a graphics mode that is not simulated by the video VDD. Activity will resume as normal in the DOS session when it is switched to full screen mode.

The supported resolutions for DOS applications running in a window or in the background are shown in Table 2.

Table 2 (Page 1 of 2). DOS Video Modes Supported by DOS Video VDDs		
BIOS Mode	**Text/Graphics**	**Execute in Background or Window?**
0	40x24 Text	Yes
1	40x25 Text	Yes
2	80x25 Text	Yes
3	80x25 Text	Yes
4	320 x 200 Graphics	Yes
5	320x200 Graphics	Yes
6	640x200 Graphics	Yes

Table 2 (Page 2 of 2). DOS Video Modes Supported by DOS Video VDDs		
BIOS Mode	**Text/Graphics**	**Execute in Background or Window?**
7	80x25 Text	Yes
D	320x200 Graphics	On VGA and 8514/A hardware only
E	640x200 Graphics	On VGA and 8514/A hardware only
F	640x350 Graphics	On VGA and 8514/A hardware only
10	640x350 Graphics	On VGA and 8514/A hardware only
11	640x480 Graphics	On VGA and 8514/A hardware only
12	640x480 Graphics	On VGA and 8514/A hardware only
13	320x200 Graphics	On VGA and 8514/A hardware only

Virtual DOS video support is loaded via statements in the CONFIG.SYS, such as the following for loading SVGA support:

```
DEVICE=C:\OS2\MDOS\VSVGA.SYS
```

VSVGA.SYS is the virtual video device handler for DOS sessions. All calls to change the video mode from a DOS session are handled through this driver.

VSVGA.SYS provides only VGA support until it has been enabled for SVGA support. This is usually done automatically by the installation program if it detects the system has SVGA display support. The program run by the installation program to enable SVGA support is SVGA.EXE which is discussed in 2.2, “Enabling SVGA Support” on page 30. Because VSVGA.SYS contains an adapter-specific code to ensure that VGA modes work properly for a SVGA adapter, even if a user has not enabled SVGA support, they will still need VSVGA.SYS loaded in their CONFIG.SYS.

Virtual Video Drivers (VDD) provided in OS/2 Warp are shown in Table 3.

Table 3 (Page 1 of 2). Virtual Video Device Drivers Supplied With OS/2 Warp	
Adapter type	**Virtual Video Device Driver**
8514/A	VVGA.SYS V8514.SYS
CGA	VCGA.SYS
EGA	VEGA.SYS
Monochrome	VMONO.SYS
VGA	VVGA.SYS
SVGA	VSVGA.SYS

Table 3 (Page 2 of 2). Virtual Video Device Drivers Supplied With OS/2 Warp	
Adapter type	**Virtual Video Device Driver**
XGA	VVGA.SYS VXGA.SYS

2.1.2 Presentation Manager Display Driver

Output from Presentation Manager is converted by the Presentation Manager Display Driver into graphics and text for display on the screen or into memory bitmaps. This driver is also used by DOS applications and OS/2 full screen applications that are running in a windowed session.

The name of the PM display driver is stored in the OS2.INI file under the application name PM_DISPLAYDRIVERS and the key name CURRENTDRIVER. To view the name of the PM driver, use an INI editor and search for the application name and the key name given above.

2.1.3 WIN-OS/2 Display Drivers

OS/2 Warp uses two WIN-OS/2 display drivers: full screen and seamless. If you are working with full screen WIN-OS/2 you can use the original Windows display driver but may need to manually copy the file to the `\os2\mdos\winos2\system` subdirectory and edit the SYSTEM.INI file to point to the correct driver. The section of the SYSTEM.INI file that you will need to edit to add the applicable driver names is shown below:

```
Application name        {boot}
Full screen driver      FDISPLAY.DRV=
Seamless driver         SDISPLAY.DRV=
```

All requests from the WIN-OS/2 display driver are handled just like requests from any other DOS application.

Each seamless windows session is run as a protect-mode DOS session. The seamless session runs a copy of the Windows video display driver, modified to operate seamlessly. Seamless windows drivers write directly to the video display hardware, and must be modified to coordinate and serialize hardware access. As a result, a seamless windows driver actually owns a piece of the PM Desktop. A virtual device driver (VWIN.SYS) is used for communication between PM and seamless WIN-OS/2. Application performance in a WIN-OS/2 window may be slightly slower due to this

constant communication between the Presentation Manager display driver and the WIN-OS/2 display driver.

2.2 Enabling SVGA Support

SVGA.EXE is a DOS-mode program and will not run if you deselect DOS support during Installation or if you install via CID. You can enable SVGA support by running the command: SVGA ON. It *must* be run from a DOS fullscreen. If it is run from a DOS window the video VDD intercepts the calls to set the SVGA modes. Once SVGA ON is run, a file named SVGADATA.PMI (Protect Mode Interface) is generated. This file is unique to each system as it is generated using machine, video display adapter and display configuration information. This is the reason why a new SVGADATA.PMI file must be generated for each machine rather than copying one from a different machine. SVGADATA.PMI will contain information on the video chipset used on the SVGA adapter, the modes supported by the adapter and the values in the video hardware registers for each mode.

SVGA.EXE is run by typing SVGA `<parameter>` from the prompt in a DOS fullscreen. The list of possible parameters is:

SVGA ON Generates the SVGADATA.PMI file which enables OS/2 Warp SVGA support. This information is generated from the data returned from the video ROM (Read-Only Memory) on the video adapter.

SVGA ON DOS Generates PMI information under a native DOS environment. When executed, this creates a SVGADATA.DOS file which you can then rename and copy to the \OS2 directory. This may be necessary if you experience problems using extended SVGA modes or if your SVGA adapter uses DOS device drivers to configure the display.

SVGA ON INIT Generates default display information for some Tseng and Cirrus Logic based display adapters.

SVGA STATUS Returns information on the display adapter type, chipset, DAC (Display and Control) type, video memory and possible supported display modes.

SVGA OFF Deletes the SVGADATA.PMI file which disables extended SVGA graphic support.

Note

Configure your video adapter correctly by following the instructions shipped with your monitor or adapter before using the SVGA utility program to create the SVGADATA.PMI file. The SVGA utility program may be affected by video configuration programs, terminate-and-stay-resident (TSR) programs, and switches and jumpers on the display adapter.

If you suspect a problem with your SVGADATA.PMI file, do the following to generate the file under real DOS:

1. Start real DOS either from diskette or from a Boot Manager partition if you have a DOS partition.
2. At the command prompt, type `SVGA ON DOS`. This will generate a file called SVGADATA.DOS.
3. Once you have done this, reboot your machine using OS/2 Warp
4. Compare this file using an editor (for example, E.EXE or EPM.EXE) with your SVGADATA.PMI file which is generated when you type **SVGA ON** from a DOS fullscreen in OS/2 Warp. If there are differences between the two files, use SVGADATA.DOS but on your OS/2 Warp system. First you must rename the file: `RENAME SVGADATA.DOS SVGADATA.PMI`
5. Shutdown and reboot your machine. This will put the new SVGADATA.PMI into effect.

2.3 Display Device Driver Installation

Installing video drivers can be either the simplest or the most frustrating part of using an operating system. Manual installation of display drivers is not recommended due to the amount of configuration which must be done to enable different video modes between Presentation Manager and text sessions.

To install a new video driver you can use either Selective Install or `DSPINSTL`. DSPINSTL is a slightly faster way to install a video driver but Selective Install is the recommended method because unlike DSPINSTL, it is able to install the CGA and EGA video modes, and will also reinstall the font used (including ISO fonts). DSPINSTL is discussed in 2.3.2, “DSPINSTL” on page 34.

2.3.1 Selective Install

Selective Install is the simplest way to install a video driver. Follow these steps:

1. Open the **OS/2 System** folder.
2. Open **System Setup**.
3. Open **Selective Install**.
4. Select **Primary Display** or **Secondary Display** as shown in Figure 7 on page 33. By default, the installation program will have selected a driver for you based on your adapter chipset.
5. Select the display driver you wish to install. See Figure 8 on page 34.
6. Select **OK**.
7. Follow the instructions on the screen to complete the display driver installation.

Note

You should use the utility program provided by the manufacturer if:

- Your display adapter is produced by Diamond Computer Systems.
- Your display supports only non-interlaced mode.
- Your display does not support VESA standard refresh rates.
- Your display adapter requires software configuration to function properly in DOS.
- You want to configure the refresh rates for your system.

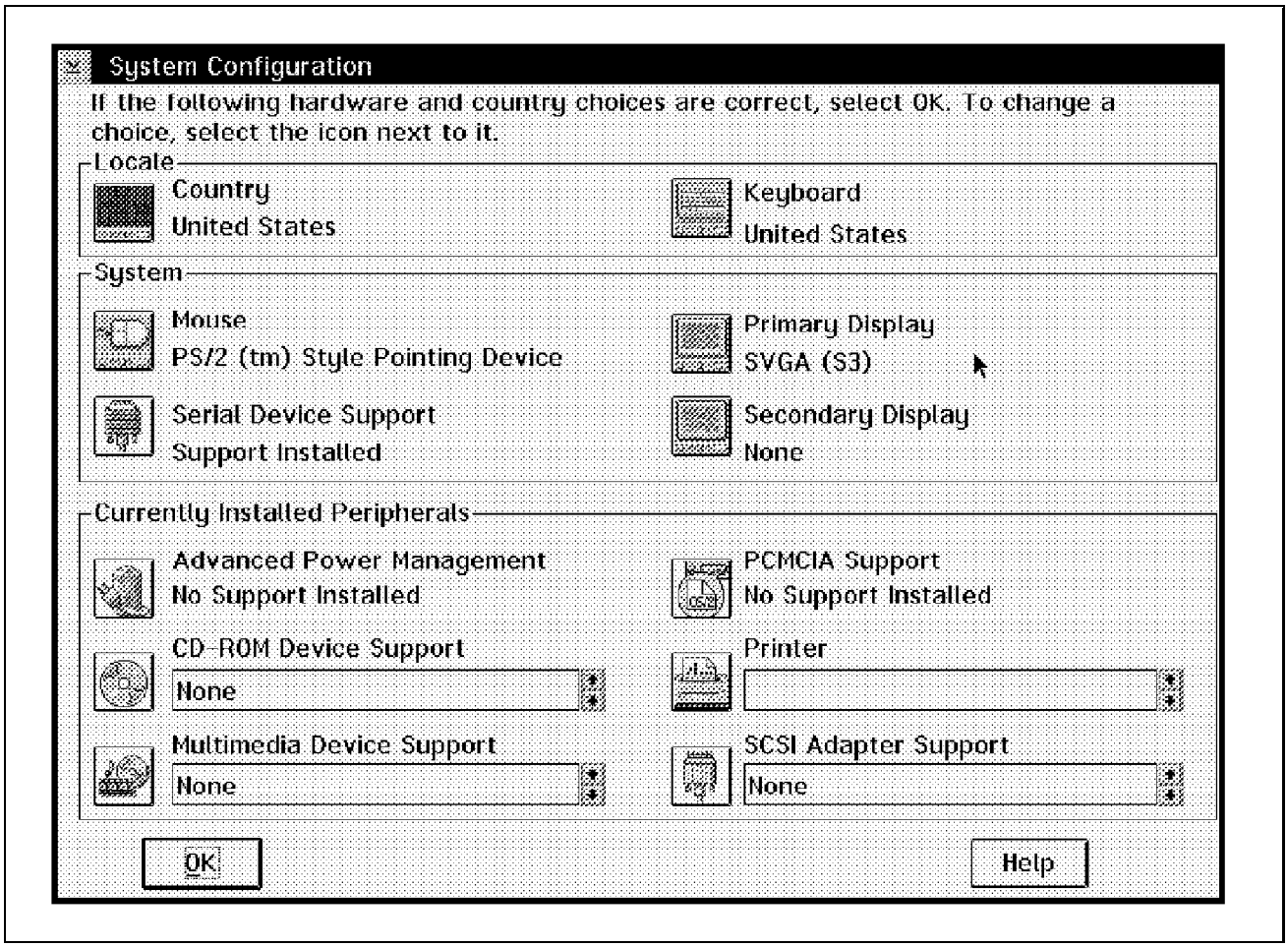


Figure 7. Selective Install

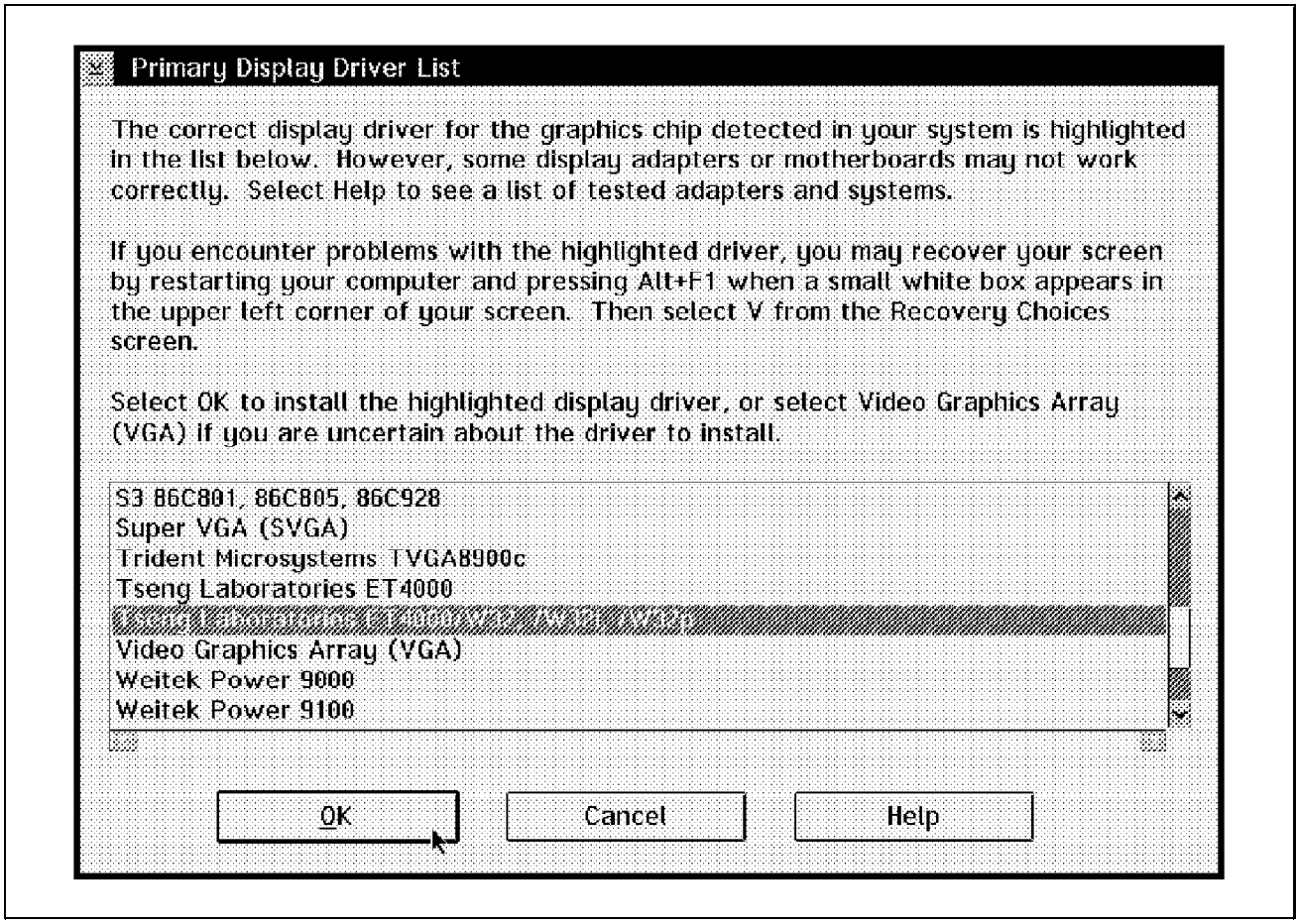


Figure 8. List of Video Chipsets

2.3.2 DSPINSTL

DSPINSTL.EXE can be run from any OS/2 command line. It installs and configures all of the needed display drivers including Base Video Handler, PM display driver, DOS video virtual device driver and WIN-OS/2 display drivers. DSPINSTL is a Presentation Manager program and is located in the \OS2\INSTALL subdirectory.

Some OEM display manufacturers have incorporated a call to DSPINSTL in their install routine. If you are installing OEM display device drivers, check the README file that comes with the individual display device drivers for complete installation instructions.

To run the DSPINSTL program do the following:

1. Open an OS/2 window to get a command prompt.

2. Type `DSPINSTL`.
3. Select **primary display** or **secondary display**.
4. Select an adapter from the list. Please note that you must select a video adapter that your system supports. If you select an adapter that is not installed in your system, you will reboot to an unusable display.
5. Choose whether to install using Defaults for Monitor Type or Install Using Display Adapter Utility Program as shown in Figure 9. You should know the specifications of your system before you run the monitor utility since you may be asked questions regarding your display capabilities during the install.
6. Specify the source directory as shown in Figure 10 on page 36.
7. Once you have specified the source directory, the installation of the video driver takes place. You should shutdown and reboot your machine after the installation is completed.

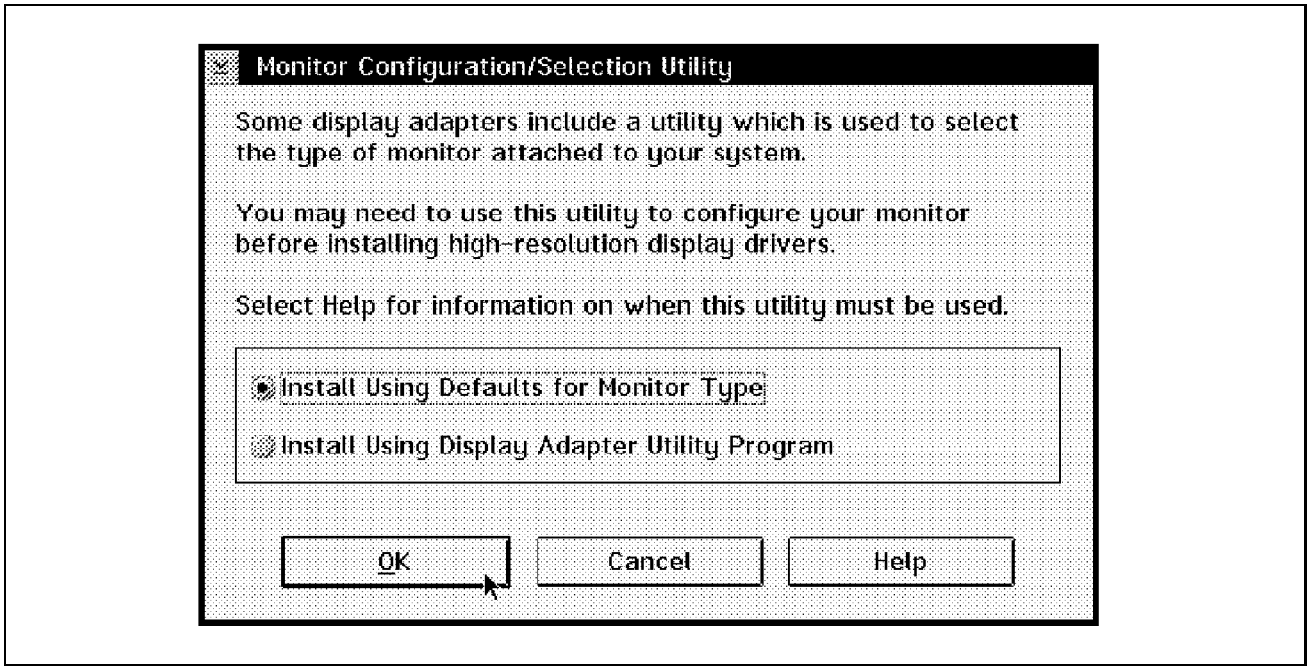


Figure 9. Display Driver Install: Monitor Configuration/Selection Utility

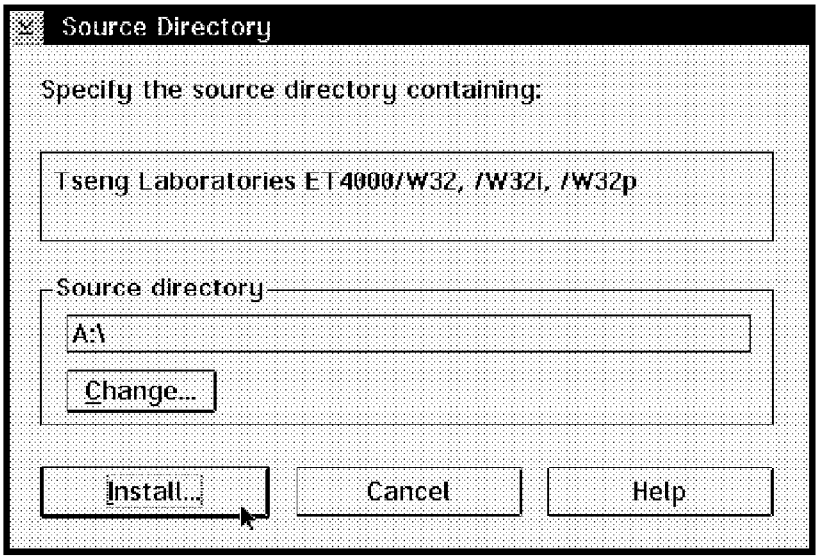


Figure 10. Display Driver Install: Specify Source Directory

2.3.3 Updated Display Device Drivers

In many cases, video problems on your system are caused by using the wrong drivers, a down-level version of drivers or selecting an incorrect resolution. Figure 11 on page 37 provides a short guide to assist you in determining if your video problem is a result of wrong or bad drivers.

There are a number of video drivers available that are newer than the ones shipped with OS/2 Warp. These updated drivers are available off the IBM PCC BBS as well as other BBS locations. For a list of BBBs, please refer to B.3, “Bulletin Boards” on page 330.

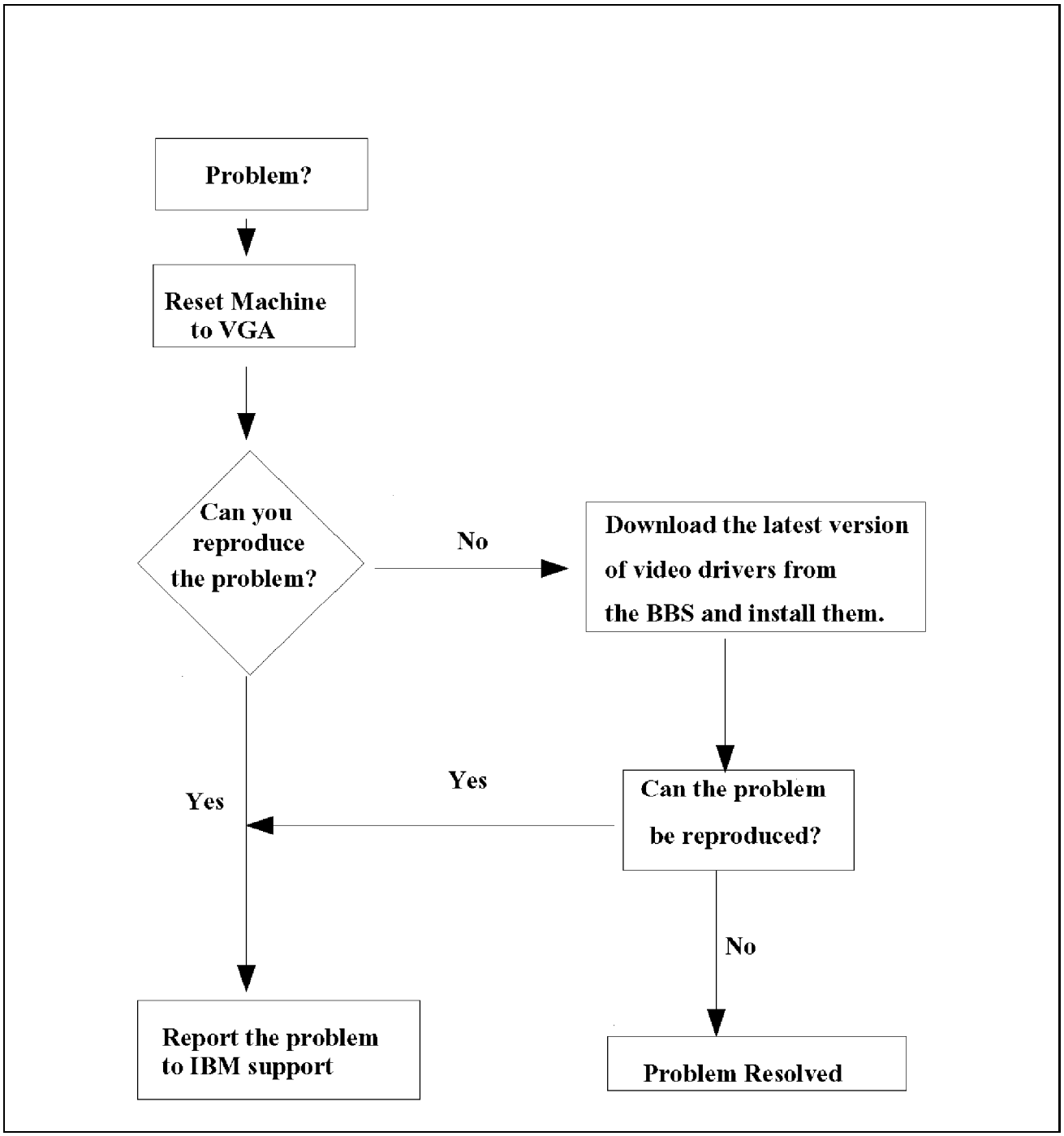


Figure 11. Video Driver Problem Determination

Among the updated drivers are:

- ATI MACH32 which includes fixes for:
  - WIN-OS/2 seamless application hanging

  - System hangs when switching between Desktop and WIN-OS/2 fullscreen
  - Video corruption when bitmaps are displayed in the background
  - GPILINE problem
  - VIOGETSTATE in OS/2 Warp fullscreen session returns incorrect values
  - Erratic mouse movement and video refresh problems
  - SVGA.EXE not does not recognize ATI Mach32 adapters in OS/2 Warp with WIN-OS/2

- ATI MACH64 updated drivers include fixes for the following:
  - VIOGETSTATE in OS/2 fullscreen session returns incorrect values.
  - GPI writes to the Desktop may result in lines drawn outside of the desired area if the coordinates are large. This error only manifests itself if you are running in a high resolution. For example if you do a GpiLine from 0 to 6000 pixels on 1280x1024 resolution, the line gets displayed on the Desktop. If the line is 3000 pixels in length it works okay.
- Cirrus Logic 5426, 5428, 5430 and 5434 updated drivers are available. Incorporated in the drivers are fixes for:
  - Video corruption as a result of toggling between WIN-OS/2 fullscreen and the Desktop.
  - Video corruption as a result of toggling between DOS fullscreen and the Desktop.
  - The underscore character in a 5250 emulator session started under CM/2 V1.11 display outside of the active window.
  - In a WIN-OS/2 seamless session: The edges of windows dragged across an open WIN-OS/2 File Manager window were not being completely repainted.
- An updated S3 Vision 864/868 is available in the S3_864 package. It was updated with fixes for the following:
  - Transparent bitmaps not displaying properly.
  - VIOGETSTATE in OS/2 fullscreen returning incorrect values.
  - 1280x1024x256 resolution not available with December 1994 S3_864 drivers.

- GPI writes to the Desktop may result in lines drawn outside of the desired area if the coordinates are large. This error only manifests itself if you are running in a high resolution. For example if you do a GpiLine from 0 to 6000 pixels on 1280x1024 resolution, the line gets displayed on the Desktop. If the line is 3000 pixels in length, it works okay.
- When viewing a drive using the tree-view, the box surrounding the plus sign (indicating subdirectories) is not drawn. The line that would form the bottom of the box is missing.
- December 1994 S3 drivers do not support the SGS1703 DAC. Installation of drivers on these systems results in booting to a black screen.
- SVGA.EXE does not recognize the S3 864 chipset on IBM PC 750 Pentium 90 ISA/PCI systems.
- PC 750s with S3 864 chips do not work in 1024x768x256 or 1024x768x64K. (SGS1703 DAC)
- PC 730 is missing the Refresh rate and Monitor page from the screen tab under the System icon.
- Video Corruption running OS/2 Warp with WIN-OS/2 and AMIPRO for OS/2 using 1024x768x256 resolution.
- The highest refresh rate available on the PC 700 and 300 series hardware is 1024x768x256 43 Hertz.
- 1280x768x768 is missing from the available resolutions on the PC 700 and PC 300 Series and also on Dell systems with the S3 864 chipset.
- Flicker in fullscreen WIN-OS/2 session at 1024x768x256.
- OS/2 Warp Connect S3 864 drivers fail using 1280x1024 resolution when user selects "default monitor type" on the screen tab of the System icon settings. This only occurs with an IBM 17P monitor. The specifics to support this resolution on a 17P were missing from the MONITOR.DIF file.
- IBM 15P monitor fails running 800x600x256 @75 Hertz. The correct information to allow the monitor to run in 75 Hertz mode is missing from the VIDEO.CFG and MONITOR.DIF files.
- Blinking screen when hotkeying between fullscreen and windowed sessions.
- VIO application which sets blinking and intensity. If the application is run in a fullscreen and you CTRL+ESC out and back into this

session, characters that had been highlighted are now blinking. This does not occur if the application is run in a window.

- The S3_16M which supports S3 86C801, 86C805 and 86C928 includes the following fixes:
  - Black screen when switching from DOS fullscreen session to PCOM 3279 emulator session.
  - WordPerfect 5.0 for Windows hangs in IBMS332.DLL when application is run in a seamless mode on IBM 77S system.
  - VIOGETSTATE in OS/2 fullscreen session returns incorrect values.
  - Horizontal lines are displayed across the screen when scrolling down in DESCRIBE 5.0. ATI 8514 Ultra drivers.
  - S3 STB Pegasus (S3 928) adapter only runs in VGA mode. Running in SVGA results in an unreadable display.
  - SYS3175 in IBMS332.DLL 0004:0001E4A1 when running CM/2 with APL fonts and GDDM installed.
  - Running ARGO BANKPRO from an icon results in the cursor being displayed as a block instead of an underline in SVGA mode.
- TSENG ET4000/W32 includes the following problem fixes:
  - Playing an AVI movie file results in Desktop corruption if the mouse is moved when the file is played. Problem occurs under the following resolutions: 640x480x16M, 800x600x16M, 1024x768x64k.
  - Typed text disappears. The cursor will move with every keystroke, but it will not display the letters. This only occurs with the TSENG ET4000 running in 16KB.
- WD90C33 (Western Digital) includes the following problem fixes:
  - During the installation of SVGA support under OS/2 Warp, the process hangs or produces some video garbage and then hangs. Powergraph, Paradise accelerate VL Plus are among the cards that use this particular chipset.
  - The system hangs intermittently with any Presentation Manager event such as reseizing window, opening folders, starting EPM sessions.
- Weitek Power 9000/9100 which includes fixes for:
  - Selective Install of P9100 drivers results in installation of P9000 drivers.

- Diamond Viper PCI adapter using Weitek drivers experiencing printscreen failures in 66,536 color mode.
- Video corruption after typing CLS in an OS/2 window.

Not all of the problems fixed by the above updated driver packages are previously listed above. If you are experiencing problems and think the problem may be related to your video drivers, first reset your machine back to VGA mode by using the option under the Recovery Choices screen. To get to the Recovery Choices screen, reboot your system. When the small white box appears at the upper left of your screen, press ALT+F1.

After you have reset to VGA mode, try to reproduce the problem. If you cannot reproduce the problem under VGA mode, the display driver needs to be fixed. If you can reproduce the problem under VGA, then the problem most likely lies in another portion of the operating system. Please see Figure 11 on page 37 for a short guide to assist you in resolving any video problems you may encounter.

2.3.4 S3 Trio 64

The S3 Trio 64 chipset is a popular chipset which is now shipped in a number of IBM machines including the PC 300 models as well as OEM machines. The driver for this chipset is **not** shipped with OS/2 Warp. It is available from the IBM PCC BBS as well as the OS/2 Device Driver Repository on the Internet. Refer to B.1.2, “World Wide Web and FTP Sites” on page 327 and B.1.2, “World Wide Web and FTP Sites” on page 327 for a list of sites and BBS numbers. The Trio driver is supported by the IBM PC Company.

At the time of writing this book, the most current available version of the Trio driver is V2.52. Once you have downloaded the driver, you must reset your machine to VGA before installing the driver. Then follow these steps:

1. Open an **OS/2 Command Prompt**
2. Change to the \OS2\INSTALL subdirectory.
3. Type `REN WP9000.DSC WP9000.IBM`
4. Type `REN WP9100.DSC WP9100.IBM`
5. Type `REN ESSTART.DSC ESSTART.IBM` (this file usually does not exist, which usually causes a "system cannot find the file" message to appear. If this occurs proceed to the next step).
6. Insert the first S3 Trio display driver diskette and type `S3INST A: C:` (assuming OS/2 Warp is installed on C:).
7. Follow the instructions. Do a shutdown and reboot.
8. After rebooting, open the **System Setup** icon.
9. Select the **Display Driver** icon.

10. Choose **Primary Display**.
11. Select **32 bit S3 display drivers V2.41** from the list. Even though the drivers are V2.52, the list will say V2.41.
12. Select **Install Using Display Adapter Utility Program** at the **Monitor Configuration** screen. You **must** choose this option, otherwise you may encounter various video problems.
13. Click on the **Locate** button and select **S3TRFRSH.EXE** from the A: drive. Select **OK**. The screen will go black for a few seconds and then the Refresh Rate Utility will appear. Make sure that the refresh rates are the same as they have been set in BIOS. To verify the refresh rates in BIOS, check your system's configuration utility.
14. Exit. You will be asked if the information should be saved in the AUTOEXEC.BAT. Answer **NO**.
15. Select **A:** at the source directory as the next dialogue box. When running the Display Install program you may receive a prompt asking if you want to replace a few files. Answer **YES** to all.
16. The installation will complete. After it is complete, the screen resolution can be changed with the **System** icon in the System Setup folder.

The IBM PC 300 series machines may display the following error when you are trying to install the S3 Trio 64 display drivers:

```
Invalid Argument count in a configuration file (.DSC). Check the
configuration file.
```

In order to install the S3 Trio 64 display drivers, you must download and install V2.52 of the display driver. The file names are S3TOS251.EXE (diskette 1) and S3TOS252.EXE (diskette 2). They are located in the IBM PC 300 and 700 section of the BBS.

2.3.5 S3 864 Vision

The S3 Vision driver can be obtained off the PCC BBS (919-517-0001). The driver file names are S3VOS1.EXE and S3VOS2.EXE. Both of these files are self-extracting files. This driver supports the video chipset in a number of machines including:

IBM ValuePoint* (2 MB) models 6472, 6482, and 6484 IBM PC 3xx & 7xx Models 6575, 6585, 6875, 6876, 6885, and 6886.

If you have one of the above machines or an OEM machine with the S3 Vision 864 chipset, download the latest version of these drivers and follow the instructions in the README file regarding their installation.

2.3.6 Updating Display Device Drivers on ThinkPad Machines

The process of updating display device drivers on ThinkPad machines can be a complex one. Figure 12 will aid you in installing video drivers on ThinkPad machines.

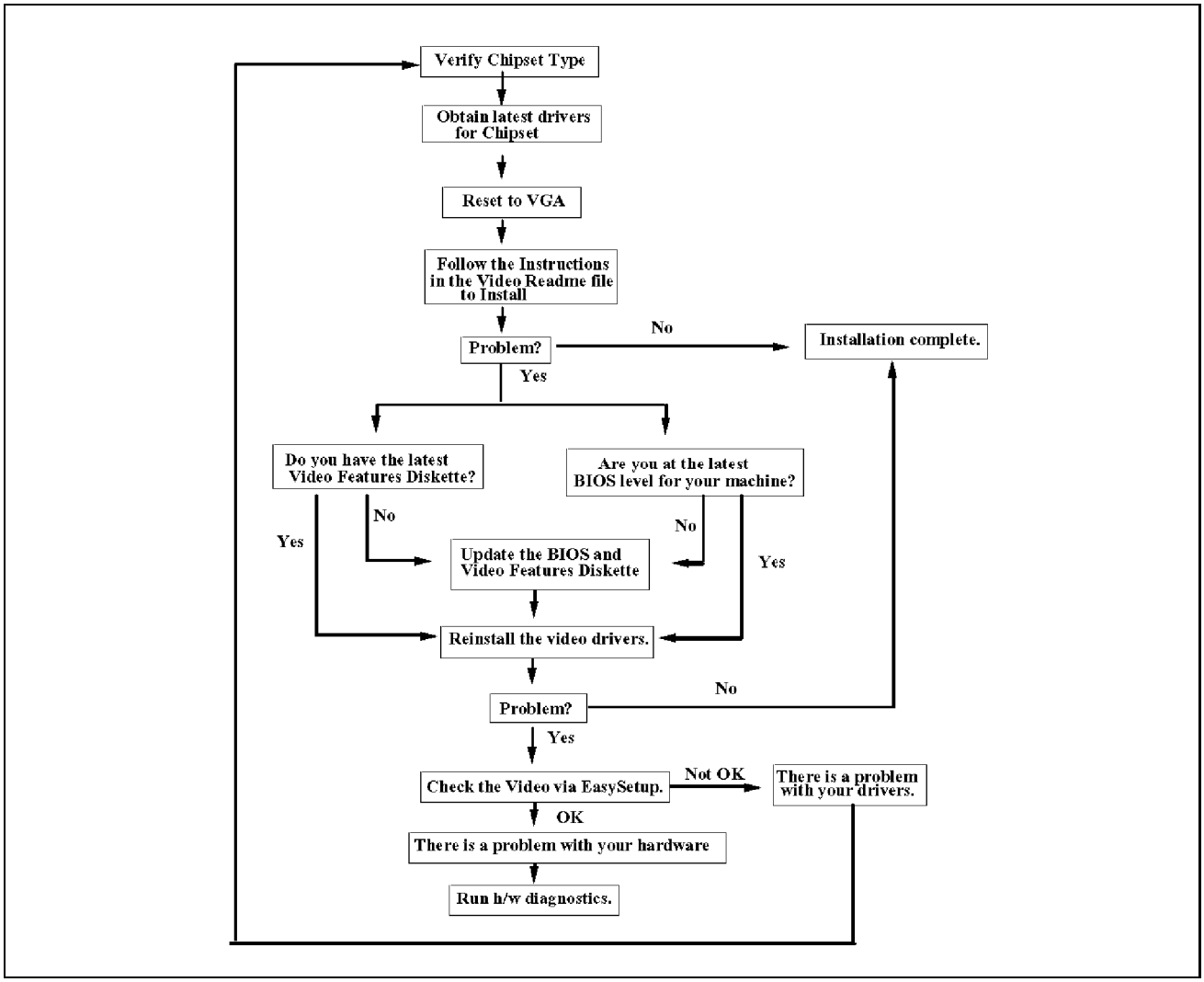


Figure 12. Installing Video Drivers on ThinkPad Machines

All ThinkPad Models do not contain the same video chipset. Your first step then is to determine the chipset shipped with your ThinkPad. Once you have determined the chipset, locate the most recent video drivers for your chipset. In some cases, you may only need to update your Video Feature Diskette. In other cases, you will need to download separate video drivers for your chipset.

Be sure to follow the steps in the README file that is shipped with the video drivers carefully. Do *not* skip any steps. You must reset the machine to VGA (refer to 8.2.2, “Reset Primary Video Back to VGA” on page 297) before adding any updated video drivers. If you encounter problems with either the driver not installing or the driver installing but you are unable to obtain better resolutions, ensure that the following is true:

- You have the correct drivers for your machines chipset
- You have the most recent version of the Video Feature Diskette for your machine model
- You are at the latest BIOS level for your machine
- You have enough VRAM to support higher resolutions

Note.

On laptop computers with Super-Twisted Nematode (STN) display, even though 1 MB video memory is shipped with the system, only 0.5 MB is addressable by the software. The other 0.5 MB is used internally by the controller. This will restrict the number of supported resolutions. Most laptops with STN panels have model numbers ending with *S*.

If all of the above is true, then you may simply need to reset to VGA again and reinstall the drivers. If you are still experiencing problems, check the video via the EasySetup utility on the ThinkPad. If the video appears normal within the EasySetup utility, you have a software problem. This may be a problem with the drivers themselves or you may need an OS/2 FixPak applied to your system. Check with IBM technical support. If the video is distorted or corrupted within the EasySetup utility, then you have a hardware problem and need to contact hardware support.

Note.

OS/2 Warp Version 3 does not install smoothly on the ThinkPad 370 machine because it does not see the correct Western Digital chipset. This problem only occurs if you use the Western Digital video drivers shipped with OS/2 Warp Version 3. Any later version of the video drivers will install without problems. Check with Western Digital or on the IBM PCC BBS for the latest driver version (see B.1.2, “World Wide Web and FTP Sites” on page 327 and B.3, “Bulletin Boards” on page 330 for site listings).

2.3.7 Upgrading Western Digital Drivers on ThinkPad 755

An example of upgrading the video drivers on a ThinkPad is included in this section. The ThinkPad in this example is a 755CSE with a Western Digital 90C24 chipset. We installed with an IBM 15P monitor externally attached to the ThinkPad. If you wish to obtain high resolutions on the external display, you must install the video drivers with only the external display active. If you install the video drivers with both the external and laptop display active or only the laptop display active, then the ThinkPad screen will only be capable of displaying 640x480. In other ThinkPad models, there may be a higher resolution of 800x600 available for the laptop display. You must verify in the user guide shipped with your ThinkPad what the resolution capability of your laptop display is.

1. Boot up the ThinkPad with only the external display active. Run the utility called VINSTALL.EXE from the ThinkPad Video Features Diskette. This utility allows you to specify what type of external display you have attached.
2. Reset the machine to VGA mode before attempting to install the driver.
3. Edit the FRATE.DAT file which is located in the \IBMVESA subdirectory to ensure that it contains the correct information for your external monitor. See the \IBMVESA\TPADVESA.DOC file for instructions regarding how to edit this file.
4. You must have OS/2 DOS support installed in order to install the WD90C24 driver.
5. Copy the VESA program supplied with your system or video adapter and update your AUTOEXEC.BAT file with the following statement to get support for high resolution and high-color modes: x:\IBMVESA\IBMVESA.EXE.
6. Install the ThinkPad Features icon and utility by using the INSTALL2.EXE program located on your Video Features Diskette. This diskette is shipped with your ThinkPad and updated versions of the diskette are available in the sections about mobiles of the PCC BBS. See B.3, “Bulletin Boards” on page 330 for a listing of BBS numbers. Configure your ThinkPad with the utility to support the resolutions and refresh settings you desire. Refer to the README file on the Video Features Diskette for more information.
7. Insert the WD90C24 diskette into drive A. This diskette should have a volume label of WD2431 1.
8. Open an **OS/2 Fullscreen** or **OS/2 Window** command prompt.

9. At the command prompt, type the following command: `A:SETUP A: C:` (where A: is the diskette drive and C: is the drive where OS/2 is installed.)
10. Press Enter.
11. When prompted to do so, remove the diskette from drive A, perform a shutdown, and then restart your computer.
12. Edit the FRATE.DAT file in the \IBMVESA subdirectory again to ensure that your external monitor is set up properly. This file was overwritten when SETUP was run.
13. Open the **OS/2 System Setup** folder.
14. Open the **Display Driver Install** object. When the Display Driver Install window appears, select **Primary Display Driver** and select **OK**.
15. When the Display Driver Select window appears, select **Western Digital 90C24 (IBM BBS)** to install the BBS video driver.
16. When the Monitor Configuration/Selection Utility window appears, the **Install Using Defaults for Monitor Type** choice is preselected. Accept this choice and press **OK**.
17. When the Source Directory pop-up window appears, insert the WD90C24 diskette into drive A. Then select **Install**. At this point, DSPINSTL determines the hardware configuration by creating the \OS2\SVGADATA.PMI file. This process can take several seconds and will black out the screen.
18. When the installation is complete, do the following:
    a. Open the **OS/2 System Setup** folder.
    b. Open the **System Setup** folder.
    c. Open the **System** object.
    d. When the Settings notebook appears, select the **Screen** tab.
    e. Select a resolution. Then close the notebook.
    f. Perform a shutdown and restart your computer.

Note that during the installation of this driver, the DISPLAY.LOG and DSPINSTL.LOG files are created in the \OS2\INSTALL directory. These files identify the OS/2 system files that were updated and indicate whether the installation was successful. The contents of these files will be useful if you need to report an installation problem to IBM.

The following functional restrictions for laptop computers are listed in the WD90C24 README file.

- To change refresh rates on the ThinkPad, edit the file called IBMVESA\FRATE.DAT. See IBMVESA\TPADVESA.DOC for instructions on how to edit this file. You must ensure that the FRATE.DAT file is set up properly for the external display that you have attached.
- On laptop computers with Super-Twisted Nematode (STN) display, even though 1 MB video memory is shipped with the system, only 0.5MB is addressable by the software. The other 0.5 MB is used internally by the controller. This will restrict the number of supported resolutions.
- Many laptops have a built-in internal display capable of only a 640x480 resolution when used as a stand-alone machine. However when connected to an external display, these systems are capable of 800x600 and 1024x768 resolutions. To avoid the need to select the lower resolution prior to switching back to using the laptop display only, the OS/2 Warp device driver for the WD90C24 automatically detects when the internal display is ON and sets the lower resolution (even though a higher resolution may be shown as selected on the Screen page of the System Settings notebook.) However, because the Windows display drivers cannot automatically detect that the internal display is ON, you must:
  1. Open the **System** object.
  2. Select the **Screen** tab.
  3. Change to a lower resolution.
  4. Perform a shutdown and restart your system for the new resolution to take effect. This is only if you wish to use a WIN-OS/2 window or fullscreen session. If you do not need to use a WIN-OS/2 session, you do not need to make the change to the resolution in the System Settings notebook. When the laptop is reconnected to an external display, the originally chosen resolution will be used again.
- When using your laptop disconnected from the external display, the System Settings notebook will most likely show resolutions which are not possible to use on the internal display. On some laptops, all resolutions appear in the System Settings notebook, regardless of which displays were on when the OS/2 Warp display driver was installed. On most laptops, the higher resolutions appear in the System Settings notebook only if the OS/2 Warp display driver was installed while the internal display was OFF.
- An external display attached to your system can use resolutions above 640x480 while an internal display cannot. Whenever you switch to an internal display, you should change the resolution to 640x480x256 while the external display is attached. To change the resolution:
  1. Open the **OS/2 System** folder.
  2. Open the **System Setup** icon.
  3. Open the **System** icon.

4. On the Screen page of the notebook, select **640x480x256**.
5. Close the notebook.
6. Perform a shutdown and restart your computer.

If you do not follow the above steps, the Desktop will automatically switch to the 640x480x256 resolution because the internal display cannot handle the higher resolutions. However, Windows applications running in a WIN-OS/2 window or fullscreen session will have problems because the WIN-OS/2 session settings cannot automatically update from a higher resolution to the 640x480x256 resolution. The OS/2 Warp Desktop will be functional enough to correct this situation by using the above steps. These steps can be done using either the internal or external display.

- MODE 132 does not work.
- MODE 40 on an external display will utilize only half of the screen.
- If your system comes up with a black screen while the external display is attached, press the display toggle keys to correct the problem. If you have an external keyboard attached to your system, refer to the documentation that came with your computer for information about the internal or external display key.
- If you are using an external display, you might occasionally encounter a band (usually black) across the screen when you start the system. To correct this problem, do the following:
  1. Perform a shutdown of your system.
  2. Turn your computer off and then on again.

  On the ThinkPad 755CSE, there is a noticeable moving ripple effect, especially in the gray areas of inactive title bars. This can be circumvented by using different color schemes. In some cases, running Lockup once clears up the problem.

2.3.8 Installing S3 Drivers on 9577 Machines

In the *User's Guide to OS/2 Warp* which is supplied with your OS/2 Warp package, in the Special Hardware Considerations chapter, there is a note regarding installing OS/2 Warp on 9576/77 machines. You must replace the BIOS files on the OS/2 Warp Installation Diskette with the .BIO files on the 9576/77 Reference Diskette in order to begin the installation of OS/2 Warp Once you have installed OS/2 Warp, you must follow these steps in order to install S3 drivers on the machine:

1. Open **Command Prompts**.
2. Open a **DOS Fullscreen** session.
3. Insert the diskette labelled *Local Bus Graphics Device Drivers* in drive A:. This diskette is shipped with your machine.
4. Type `INST7677` and press **Enter**.

5. At the Main Menu select **VESA SVGA BIOS Extension and Configure Display Profile** and press Enter.
6. Select the appropriate display type and press Enter. The *Enhanced Local Bus Graphics Setup Main Menu* appears.
7. Press F3 to exit.
8. Exit the DOS session.
9. Perform a shutdown and reboot your system.
10. Close all the applications running in the background.
11. Open **Command Prompts**. Open an **OS/2 Fullscreen** session.
12. Insert the diskette labeled *Local Bus Graphics Device Driver* in drive A:.
13. From A:, type `A:S3INST A: x:` (where x=drive where OS/2 Warp is installed).
14. Press Enter when prompted.
15. When the process is finished, shut down and reboot your system.
16. Open **Command Prompts** and open an **OS/2 Fullscreen** session.
17. At the command prompt, type `DSPINSTL` and press Enter.
18. Select **Primary Display** and then select **32 Bit Display Drivers**.
19. Install using the monitor defaults.
20. Select **OK**. The monitor will flash when the SVGADATA.PMI file is generated. This file contains information about your display.
21. Select **Install**. Make sure the device driver diskette is in drive A:.
22. When the process is completed, shut down and reboot your system.
23. When the system starts, your resolution is set at 640x480x256. To change the resolution:
    a. Open the **OS/2 System** icon.
    b. Open **System Setup** folder.
    c. Open **System** icon.
    d. Select a resolution from the Screen tab of the notebook.
    e. Close the notebook, shut down and reboot for the new resolution to take effect.

2.4 Supported Display Device Drivers

This section describes which display device drivers are supported in OS/2 Warp. For a complete listing of supported video drivers that are shipped with OS/2 Warp, please see the listing in Appendix C.

Table 4 on page 50 describes some of the video modes supported by Non-accelerated display drivers shipped with OS/2 Warp. non-accelerated chipsets do not have an onboard processor. This forces the system's main processor to plot each point on the display.

Table 4. Non-Accelerated Display Drivers

Manufacturer/Chipset	Resolution Change Method	Resolutions (depends upon adapter)
Video graphics adapter (VGA)/IBM VGA	NA	640x480x16
IBM VGA256c	NA	640x480x256
ATI Technologies ATI28800	Via Selective Install	640x480x256 (1MB VRAM) 800x600 (1MB VRAM) 1024x768 (1MB VRAM)
Cirrus Logic Cl-GD5422, CL-GD5424	Via Selective Install	640x480x256 (1MB RAM) 800x600x256(1MB RAM) 1024x768x256(1MB RAM)
Headland Technologies HT209	Via Selective Install	640x480x256 (1MB VRAM) 800x600x256 (1MB VRAM) 1024x768x256 (1MB VRAM)
Trident Microsystems TVGA8900, TVGA8900B, TVGA8900C	Via Selective Install	640x480x256 (1MB VRAM) 800x600x256 (1MB VRAM) 1024x768x256 (1MB VRAM)
Tseng Labs ET4000	Via Selective Install	640x480x246 (1MB VRAM) 800x600x256 (1MB VRAM) 1024x768x256 (1MB VRAM)
Western Digital WD90C22,C30,C31 (C30 mode only)	Via Selective Install	640x480x256 (1MB VRAM) 800x600x256 (1MB VRAM) 1024x768x256 (1MB VRAM)

2.5 Graphics Accelerator Drivers

Table 5 on page 51 contains a list of video device drivers, manufacturer, chipsets, resolution change method, the resolution, and the number of colors supported by the display adapter. Accelerated video display adapters or chipsets contain a graphics engine which tells the processor where to draw the lines on the display. It operates faster than a non-accelerated display adapter.

Table 5 (Page 1 of 2). Accelerated Video Device Drivers

Manufacturer/chipset	Resolution Change Method	Resolutions (depends upon the adapter)	Colors
Display Adapter 8514/A IBM 8514	NA	1024x7686	256
IBM XGA (Extended Graphics Array)	System Icon	640x480 800x600 1024x768 1280x1024 1280x1024 1360x1024	256, 64K 256, 64K 256, 64K 16, 256 16 (XGA-2) 16
S3 86C801, 86C805, 86C928 (32 bit S3 Display Driver)	System icon	640x480 800x600 1024x768 1280x1024	256,64K, 16M 256, 64K 256, 64k 256
S3 86C864	System Icon	640x480 800x600 1024x768 1280x1024	256, 64K, 16M 256, 64K 256, 64K
Cirrus Logic 5426, 5428, 5429, 5430,5434	System Icon	640x480 800x600 1024x768 1280x1024	256, 64K 16M 256, 64K 256, 64K 256
Western Digital WD90C24, WD90C24A WD90C24A2, 90C31	System Icon	640x480 800x600 1024x768	256, 64K 256, 64K 256
Western Digital WD90C33	System Icon	640x480 800x600 1024x768 1280x1024	256, 64K 256, 64K 256 256
ATI MACH 32	System Icon	640x480 800x600 1024x768 1280x1024	256, 64K, 16M 256, 64K, 16M 256, 64K, 16M 256
ATI MACH 64	System Icon	640x480 800x600 1024x768 1280x1024	256, 64K, 16M 256, 64K 16M 256, 64K 16M 256, 64K

Table 5 (Page 2 of 2). Accelerated Video Device Drivers			
Manufacturer/chipset	**Resolution Change Method**	**Resolutions (depends upon the adapter)**	**Colors**
TSENG ET4000/W32 ETW32i, ETW32p	System Icon	640x480 800x600 1024x768 1280x1024	256, 64K, 16M 256, 64K, 16M 256,64K 256
Weitek Power 9000	System Icon	640x480 640x480 800x600 1024x768 1280x1024	256, 64K, 16M 256, 64K, 16M 256, 64K, 16M 256, 64K, 16M

2.6 Video Memory Requirements

Table 6 provides information to aid a user in deciding which resolution they should use when running OS/2 Warp. The amount of memory required for each resolution is provided as a guide.

Table 6. VRAM Requirements		
Resolutions	**Number of Colors**	**Video Memory Required**
640x480	256	1MB
800x600	256	1MB
1024x768	256	1MB
1280x1024	256	2MB
1600x1200	256	4MB
640x480	64K	1MB
800x600	64K	2MB
1024x768	64K	2MB
1280x1024	64K	4MB
640x480	16M	1MB or 2MB
800x600	16M	2MB
1024x768	16M	4MB

A screen resolution of 640x480 is usually the minimum resolution you would want to work with. You must take into account factors such as what the machine is being used for. If you have a server which is being used as a workstation and on which graphics is not very important, you can avoid adding VRAM in order to get higher resolution and color support. Selecting more colors than you need uses more memory and can slow video performance.

If you work heavily with graphics-intensive programs, you will likely wish to add additional VRAM in order to increase the resolution that you can display. If you are working with multimedia applications, you will probably wish to have additional colors available. At the time this book was written, it is not yet possible to display live motion video at 1024x768 resolution in anything other than a small box on the screen. All of these considerations depend on what your workstation is being used for.

Operating at higher resolutions requires more information to be stored in the video memory buffer. The same is true as you increase the number of colors that you wish to work with. As the number of colors goes up, the amount of information in the video memory buffer increases. A higher resolution does not give you a larger display picture. Instead, it increases the dot density at at the same size. Some objects, such as icons, display at a fixed pixel resolution that creates a smaller icon and text at higher resolutions. Table 6 on page 52 is a guide to assist you in determining what type of resolution you should use when running OS/2 Warp.

2.7 Configuration of Display Device Drivers

During its installation, OS/2 Warp queries the system hardware to determine what type of video adapter or chipset is present. It then will install the appropriate video device driver. After rebooting, you may decide that you wish do some reconfiguration of the video driver such as selecting a different resolution or specifying the monitor type attached to your system.

Resolution is an indication of the number of pixels that appear on your screen. The higher the number of pixels, the more detail that shows on your screen but also generally speaking, the slower the image is drawn on the screen. Using a video adapter with on board memory and using an accelerated chipset will help speed up the drawing of the image.

It is very important to note that both your monitor and your display adapter or chipset must be capable of supporting the resolution that you select. The

number of colors that are available to be selected in each video mode depends on the amount of video memory your video card has on board, not on the capability of the monitor. If you try to select a resolution or Hertz rate higher than your monitor can support, you may end up with distorted images or even a damaged monitor. Ensure that you read the documentation shipped with your monitor and your system regarding the video modes supported.

If you experience a flickering screen, it means that you can see changes in the screen as it is refreshed or redrawn. The flickering is related to the Hertz rate of the monitor. The Hertz rate is the number of times per second that a screen refreshes. A Hertz rate of 60 Hz means that the screen is refreshed 60 times per second. The higher the refresh rate is, the less likely you are able to see the screen redraw. The type of monitor that you have limits the acceptable screen resolution and Hertz rate combinations that you might wish to select. In other words, you may have a choice of high resolutions and Hertz rate available to you but because of your video adapter/monitor combination, it is better for you to select a lower resolution and Hertz rate combination. Always refer to your hardware documentation for information on what resolutions and Hertz rate it supports.

To change the resolution or vertical Hertz rate on your system, follow these steps:

1. Open the **OS/2 System** folder.
2. Open the **System Setup** icon.
3. Open the **System** icon as shown in Figure 13.

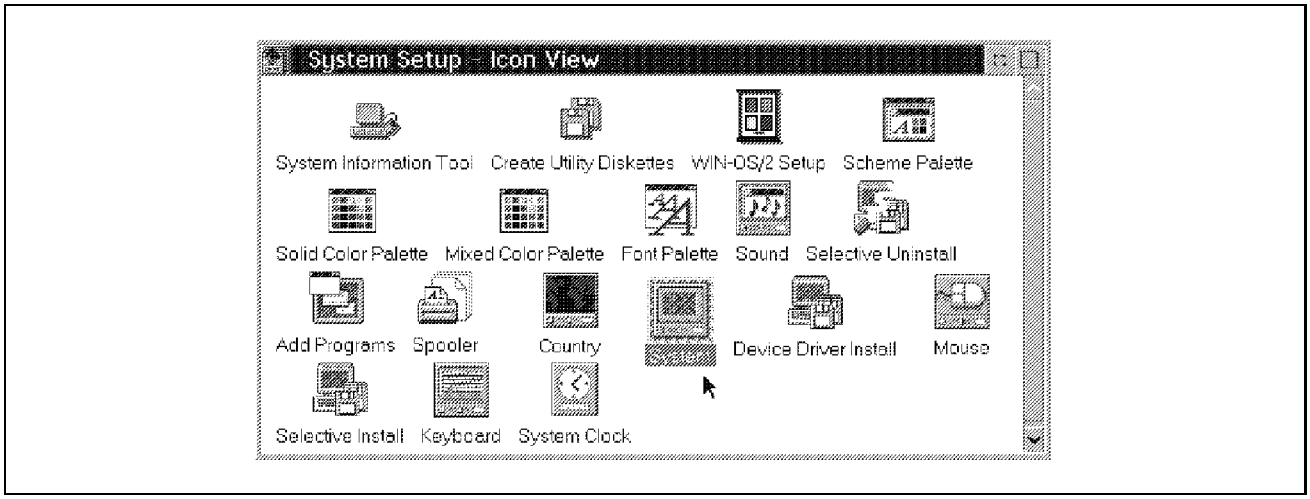


Figure 13. Selecting System Icon from System Setup Folder

4. You are presented with the System Settings notebook as shown in Figure 14 on page 55. The first tab of the System Setting notebook is the *Screen* tab.

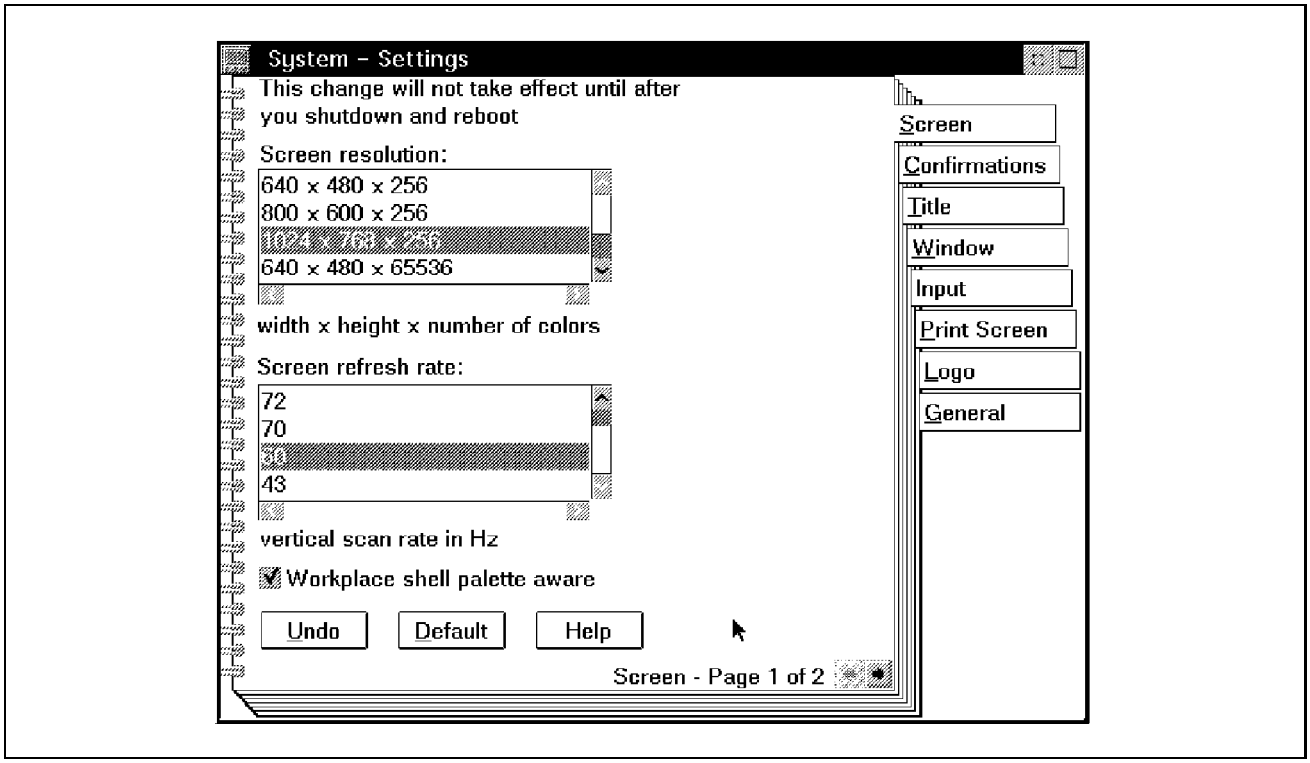


Figure 14. System Setup: Changing Resolution and Hertz Rate

The resolutions supported by your display adapter are listed in the Screen Resolution field. The current resolution is highlighted.

5. To change the resolution:
   a. Select the resolution you want in the Screen Resolution field.
   b. Perform a shutdown and reboot your system to enable the resolution that you selected. The resolution will not be enabled until the system is restarted.
6. Switch to page 2 of the Screen settings. On this page, as shown in Figure 15 on page 56, you are able to set what type of display you have attached to your system. If your display is not listed, leave the setting at DEFAULT.

Note

If there is no page 2 and therefore you cannot select the monitor type, check to see if a DOS-based utility was shipped with your adapter. As you install your video driver, you are given the choice to use this utility program instead of using the default program. The program may be called VMODE or CLMODE or go by an entirely different name. Check the documentation that shipped with your video adapter for information and instructions regarding any video utility that may be provided.

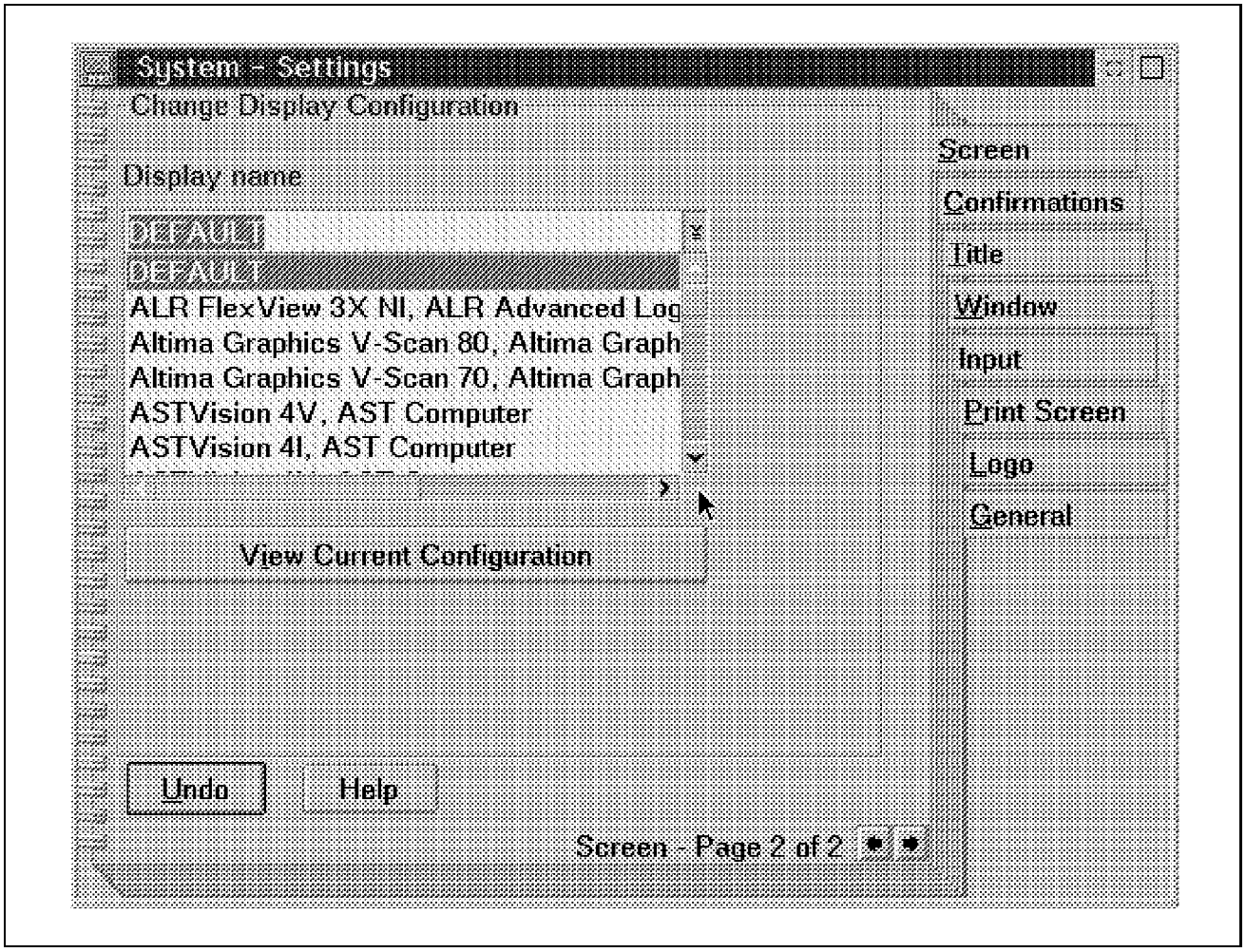


Figure 15. System Setup: Selecting Display Type

7. After you have selected a display type, you will get a warning message as shown in Figure 16 on page 57. This gives you the opportunity to

undo the change you have made if you have not yet verified that your monitor supports the resolution or hertz rate that you have selected.

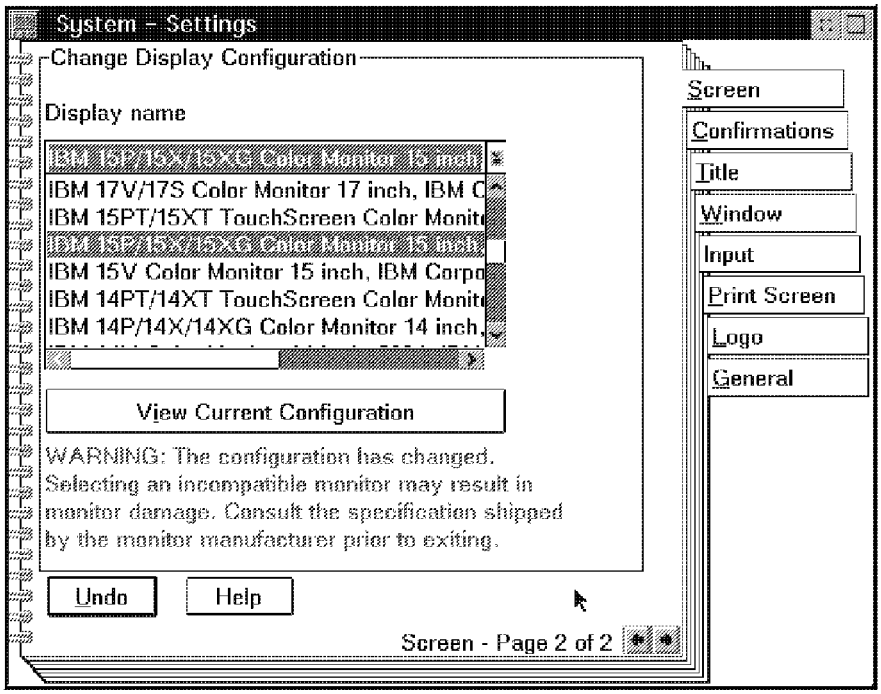


Figure 16. System Setup: Selecting Display Type--Warning Message

8. Also on page 2 of the Screen tab, you can select **View Current Configuration**. This gives a more detailed description of the currently selected display's capabilities. It contains information such as supported resolutions and the maximum vertical and horizontal scan rate as specified in the data sheet supplied by the display manufacturer to IBM. The sample shown in Figure 17 on page 58 was taken from an IBM 15P monitor attached to an IBM ValuePoint 6384 W71 system.

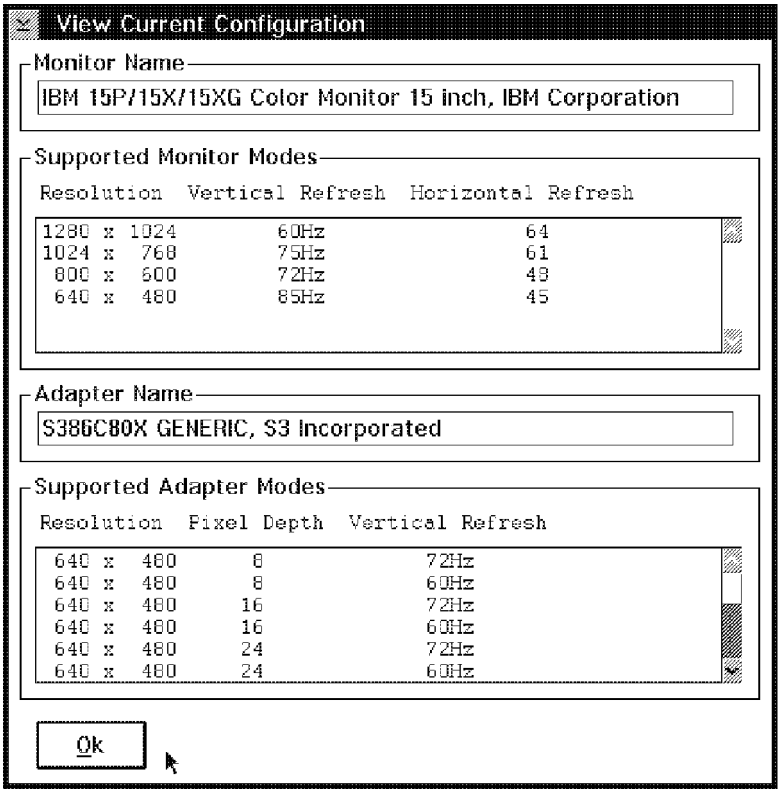


Figure 17. System Setup: View Current Configuration

Note.

If you change the screen resolution, the resolution used for WIN-OS/2 is also changed automatically. This only occurs if the resolution is changed via the System icon in the System Setup folder as shown in Figure 14 on page 55. If the Presentation Manager driver is changed manually (which is not recommended), the WIN-OS/2 display driver is not updated. If you experience problems in the WIN-OS/2 environment after doing a manual display driver change, you will need to manually update the WIN-OS/2 display driver as well. This is done by changing the applicable statements in the SYSTEM.INI file as well as updating the WIN-OS/2 drivers on the system.

If you only have a couple of resolutions available to be selected from on page 2 of the Screen tab in the System Settings notebook and you have installed the latest video drivers and followed the instructions in the drivers README file correctly, it may be because:

- Your video adapter does not have enough VRAM to access the highest resolution and color modes.
- The video adapter hardware may be configured for a lower resolution monitor. The procedure for setting the adapter varies according to the vendor. Some vendors use jumpers or switches while others, like ATI, use a monitor utility program contained on a diskette supplied with the adapter. One option in the utility program sets the monitor type. After setting the monitor type to a higher resolution model, shutting down and rebooting, OS/2 Warp will display a wider range of resolutions to choose between.

If the Screen tab of the System Settings notebook is not present or if there is only one resolution listed, you must install a new display driver to change the screen resolution. Installation of display drivers is covered in 2.3, "Display Device Driver Installation" on page 31. Non-accelerated drivers such as the Tseng ET4000 require you to run *Selective Install* in order to change display resolutions.

2.7.1 Enabling SVGA in WIN-OS/2 Fullscreen Sessions

If you wish to enable only WIN-OS/2 sessions to run in SVGA mode while the Desktop runs in VGA mode, follow the instructions given below. Follow the instructions very carefully. Otherwise, you could cause your WIN-OS/2 sessions to be inoperable.

1. Use **Selective Install** to install VGA (640x480) support.
2. Back up the SYSTEM.INI and WIN.INI files as follows:
   a. Open **OS/2 System**.
   b. Open **Command Prompts**.
   c. Open **OS/2 Full Screen**.
   d. At the C: prompt, do the following:
      Type: `CD\OS2\MDOS\WINOS2` and press Enter.
      Type: `COPY WIN.INI WIN.BAK` and press Enter.
      Type: `COPY SYSTEM.INI SYSTEM.BAK` and press Enter.
3. Check the OS2\MDOS\WINOS2\SYSTEM directory for the desired high-resolution display device driver.

   - If the device driver is already on the system, go to step 4.
   - If the device driver is not found, use your OS/2 Warp or Windows installation diskettes to copy the driver to the \OS2\MDOS\WINOS2\SYSTEM directory.

   For example, to use the OS/2 Warp diskettes and install the 8514.DRV high-resolution device driver:

a. Search the OS/2 Warp installation diskettes for the WIN8514 and *F.FON files and then do the following:
   Type: `DIR A:WIN8514` and press Enter.
   Type: `DIR A:*F.FON` and press Enter. After you find the files, you have to unpack them. The files are packed with their standard target directory coded into the packed file.
b. Copy the file to the system disk in the proper directory, using the UNPACK utility program (UNPACK.EXE).
   Type: `UNPACK A:WIN8514` and press Enter.
   Type: `UNPACK A:*F.FON` and press Enter. The SVGA driver and font files are now unpacked and in the correct directory.

4. Edit the SYSTEM.INI file and find the following line: FDISPLAY.DRV=VGA.DRV. This line specifies the device driver used in WIN-OS/2 fullscreen sessions.

> **NOTE**
>
> DISPLAY.DRV is the driver used for Microsoft Windows.
> FDISPLAY.DRV is the driver used for WIN-OS/2 fullscreen sessions.
> SDISPLAY.DRV is the driver used for WIN-OS/2 window sessions.

5. Change this line to point to the high resolution device driver that was unloaded in the steps above. In this example, the device driver is 8514.DRV. The modified line should look like the following:
   `FDISPLAY.DRV=8514.DRV`
6. Change the SYSTEM.INI font entries:
   - In SYSTEM.INI these entries are:

     ```
     FIXEDFON.FON=VGAFIX.FON
     OEMFONTS.FON=VGAOEM.FON
     FONTS.FON=VGASYS.FON
     ```

   - For 8514/A these entries must be changed to:

     ```
     FIXEDFON.FON=8514FIX.FON
     OEMFONTS.FON=8514OEM.FON
     FONTS.FON=8514SYS.FON
     ```

   - Save the changes to the SYSTEM.INI FILE.
7. Change the WIN.INI font entries to read:

   ```
   SYMBOL 8,10,12,14,18,24 (VGA RES)=SYMBOLE.FON
   MS SANS SERIF 8,10,12,14,18,24 (VGA RES)=SSERIFE.FON
   MS SERIF 8,10,12,14,18,24 (VGA RES)=SERIFG.FON
   SMALL FONTS(8514 RES)=COURG.FON
   COURIER 10,12,15 (8514 RES)=COURG.FON
   ```

- Save the changes to the SYSTEM.INI file.

8. The system is ready to run Windows programs in WIN-OS/2 fullscreen sessions in high resolution mode.

A package is available from an ftp site: (ftp://nnchen.penn.boulder.ibm.com), called WIN-RES which allows switching WIN-OS/2 between different resolutions. It is employee-written software and therefore is supplied on an "as-is" basis.

2.7.2 DMQS (Display Mode Query and Set)

DMQS is a feature of XGA-2 display adapters. Under OS/2 Warp, the adapter sends information to the operating system which helps identify the attached display automatically. DMQS reads four ID pins which are part of the display connector and it uses two additional signals to produce a 16 bit display identification. The additional signals are the horizontal and vertical sync signals. This 16 bit display identification allows more displays to be defined. Under the four pin identification scheme, only a total of 16 different displays can be defined. With DMQS, up to 65535 displays can be identified if their descriptor files are available.

If you have a system with an XGA-2 adapter and you install OS/2 Warp, you will see that a directory called XGA$DMQS is created. Inside this directory are a number of monitor configuration files. The configuration file that is used is selected based upon the information provided by the display when OS/2 Warp queries the system.

If you wish to override the DMQS file selected, you must do the following:

- Open the **System Setup** folder.
- Open the **System** icon.
- Go to page 2 on the Screen tab.
- Select the display that is attached to your system and the video resolution on this page.

You should only do this if you are sure that you are making a correct change. If you select an unsupported mode, you may damage your display. If you do a DMQS override as described above, a file called XGASETUP.PRO is created in the \XGA$DMQS subdirectory. Deleting this file will change your display settings back their original state.

Note

To obtain high resolution support with an XGA-2 adapter, obtain V2.12 of the XGA-2 drivers from the IBM PCC BBS. Internal IBM employees can obtain the diskette from tools:

```
TOOLS SENDTO BCRVM1 SERC DISPLAY GET XGAV212 PACKAGE
```

To install the XGA V2.12 drivers you must do the following:

If you have DOS/Windows V3.1 installed:

1. Follow the instructions in the READ.ME file in the \WIN31 subdirectory of the XGA V2.12 driver diskette to install the drivers.
2. Once they are installed, from a DOS fullscreen, type `.CD \OS2\MDOS\WINOS2`
3. Type `E SYSTEM.INI`.
4. Change the `display.DRV=xga.DRV` so that it points to the full path of your `XGA212.DRV` instead of XGA.DRV.
5. Copy the following files from your \WINDOWS\SYSTEM subdirectory to your \WINOS2\SYSTEM subdirectory:
   - XGACONF.CPL
   - XGACONF.HLP
   - XGAMSG.GML
   - 8515*.FON
6. Copy the \WINOS2\SYSTEM\XGA*.FON files to 8514*.FON. Do this one at a time.
7. Start WIN-OS/2 Fullscreen and run the XGA Setup utility in the Control Panel. Do not run XGA Setup seamless.
8. Rename the file \OS2\DLL\WINPRF.DLL to something else. This is so it does not change your WIN-OS/2 when you alter your OS/2 Warp system settings.

If you do *not* have DOS/Windows 3.1 installed, follow the same instructions given above but you must *manually* expand the following files from the \WINV31 subdirectory of the XGA V2.12 driver diskette:

1. Open **Command Prompts**.
2. Open **DOS Window**.
3. Type `expand a:\winv31\xgaconf.cpl x:\os2\mdos\winos \system\xgaconf.cpl`
4. Type `expand a:\winv31\xgaconf.hlp x:\os2\mdos\winos \system\xgaconf.hlp`
5. Type `expand a:\winv31\xgamsg.gml x:\os2\mdos\winos2 system\xgamsg`
6. Type `expand a:\winv31\xga212.drv x:\os2\mods\winos2 system\xga212`

Please note:

- You must use the EXPAND.EXE file provided on the XGA V2.12 driver diskette, not the one provided with OS/2 Warp or your driver will not work properly.
- You need to run the install program from the driver diskette in order to get the DQMS files copied.
- INSTALL.EXE modifies c:\AUTOEXEC.BAT and adds the line SET DQMSPATH=<where you installed DQMS files> but if OS/2 Warp is installed on another drive, you need to add the line to the AUTOEXEC.BAT file on that drive (or the one that WIN-OS/2 is using). If you do not, when you click on **XGA SETUP**, you will get an error message about the files not being installed.
- If you specify a full path name on the *display=* line of SYSTEM.INI, under OS/2 Warp Connect with WIN-OS/2 the driver fails to load. Specify *display=xga212.drv* instead.

2.8 CID Installation of Display Device Drivers

CID (Configuration, Installation and Distribution) is an installation method that was introduced by IBM in 1992. It has many benefits. Among them is the elimination of the necessity for human intervention during the installation of software on a workstation as well as the capability to contain all the necessary installation code at a central site. Please refer to *OS/2 Installation Techniques: The CID Guide*, GG24-4295 for complete description of CID.

The utility called during the CID installation of SVGA is DSPINSTL.EXE. It is:

- An OS/2 utility for installing display drivers
- Profile driven (uses .DSC, .DSP files)
- Extensible with Action DLLs
- Supports display drivers spanning multiple diskettes
- Updates CONFIG.SYS, OS/2 type and Windows-type INI files
- Supports packed/unpacked files
- Can replace locked DLLs and EXEs

CID installation of SVGA requires Presentation Manager (PM) functions an SVGA.EXE, which is a DOS utility. It is therefore necessary to have both PM and DOS support installed before running DSPINSTL.EXE to install SVGA support.

Because of this requirement, OS/2 Warp must be completely installed and rebooted before SVGA can be installed via CID. OS/2 Warp is the first version

of OS/2 that supports CID installation of SVGA. Therefore, DSPINSTL.EXE, SVGA.DLL and SVGAINST.DLL must be OS/2 Warp versions to work with CID. DSPINSTL.EXE is located in the \OS2\INSTALL directory.

The README.CID file, located on the OS/2 Warp installation diskette, contains helpful information regarding CID installs and OS/2 Warp.

The syntax of the DSPINSTL command is as follows:

```
DSPINSTL /PD:DSC_file /S:source_path
/T:target_drive /RES:resolution /U:

  The following describes the DSPINSTL parameters:

   /PD:DSC_file - The fully qualified .DSC (Display Configura-
                       tion) file name.

   /S:source_path  - The fully qualified path to the OS/2 Warp image

   /T:target_drive - The target drive or bootdrive.

   /RES:resolution - The resolution to come up in after reboot.
```

Notes:

1. If a resolution is specified that is not supported in the SVGADATA.PMI file then an error will occur.
2. If a resolution is specified that is in the .PMI and not supported by the driver, then the driver should default to low resolution.

A /RES: parameter is required for CID. If the /RES: is not valid or it is not supported by the .PMI file, then nothing is written to the OS2.INI and the driver will default to low resolution (640x480x256). If the /RES: is not specified, a Monitor Configuration panel will appear requiring user interaction.

2.8.1 Sample Installation of S3 Support Via CID

This sections shows a sample installation of S3 video support via the CID process. First, you must ensure that:

1. The server must contain a directory named S3_DRVS on the same drive where the OS/2 Warp disk images reside. The S3_DRVS directory must contain all of the files from the S3 Video Driver diskettes.
2. OS/2 must have been successfully installed on the client using the CID method.

```
/*****************************************************/
/*         LCU PRODUCT DATA SECTION                  */
/*****************************************************/

                  .
                  .
                  .

x.s3video = 15
x.15.name='S3 Video'
x.15.statevar = 'CAS_' || x.15.name
x.15.instprog = 'x:\img\s3_drvs\S3INST.CMD',
             ' x:\img\s3_drvs ' || bootdrive || ' /cid'
x.15.rspdir   = ''
x.15.default  = ''

x.s3dspinstl = 16
x.16.name='S3 CID Dspinstl'
x.16.statevar = 'CAS_' || x.16.name
x.16.instprog = bootdrive || '\os2\install\DSPINSTL.exe',
             ' /pd:' || bootdrive || '\os2\install\PSS3CID.dsc',
             ' /s:x:\s3_drvs',
             ' /t:' || bootdrive,
             ' /mc:8',
             ' /RES:640x480x256',
             ' /U'
x.16.rspdir   = ''
x.16.default  = ''
/*-----------------------------------------------------*/
/*       NUMBER OF PROGRAMS SET UP IN THE        */
/*            PRODUCT DATA SECTION             */
/*-----------------------------------------------------*/

NUM_INSTALL_PROGS = 16

/*****************************************************/
/*               INSTALLATION SECTION          */
/*****************************************************/
                  .
                  .
   when OVERALL_STATE = 2 then do
     RunInstall(x.s3video)
     Call RebootAndGotoState (3)
   end
   when OVERALL_STATE = 3 then do
     if RunInstall(x.s3dspinstl) == BAD_RC then exit
     Call CheckBoot
   end
                  .
                  .
end
exit
/*****************************************************/
          END OF LCU INFORMATION TO BE ADDED
/*****************************************************/
```

Figure 18. Sample LCU File

To install the S3 video driver using CID, use the information in Figure 18 to modify your LCU command file.

This information is meant as a guide, your LU command file might be different.

Note

Monitor type and hertz rate cannot be set via the CID process at the time this book was written.

2.8.2 Display Configuration Files (.DSC)

Display Configuration Files (.DSC extensions) are ASCII files that contain commands for installing the required video drivers for each resolution available for the specific chipset the .DSC file is written against. The .DSC files are located in the \OS2\INSTALL subdirectory. Each .DSC maps the way to a different file called the Display Profile (.DSP extension). The .DSP files contain detailed instructions for installing the display drivers and configuring the new video mode.

A listing of .DSC files shipped with OS/2 Warp is shown in Table 7.

Note

Resolutions supported by each driver depend on factors such as:

1. Amount of video memory
2. Resolutions supported by driver

Table 7 (Page 1 of 3). Listing of Display .DSC files in OS/2 Warp

Display Adapter or Chipset	Descriptor file name	Chipset Supported
Headland Technology HT209	PSHEAD.DSC	HT205 HT208 HT209
Trident Microsystems TVGA8900c	PSTRID.DSC	TR8800 TR8900
Tseng Laboratories ET4000	PSTSENG.DSC	ET3000 ET4000

Table 7 (Page 2 of 3). Listing of Display .DSC files in OS/2 Warp

Display Adapter or Chipset	**Descriptor file name**	**Chipset Supported**
Tseng Laboratories ET4000/W32, /W32i, /W32p	TLIW32.DSC	ET4000W32 ET4000W32I A ET4000W32I B ET4000W32I C ET4000W32P A ET4000W32P B ET4000W32P C
Western Digital WD90C11, C30, C31 (C30 mode only)	PSWD.DSC	PVGA1 A WD9000 WD9011 WD9030 WD9026 WD9027
Western Digital 90C32	PSWDC31.DSC	WD9031
Western Digital 90C24	PSWDC24.DSC	WD9024
Western Digital 90C33	WDC33.DSC	WD9033
ATI MACH8, ATI 28800	PSATI.DSC	18800 28800 38800 (8514 CHIP not SVGA)
ATI Mach32	ATIM32.DSC	68800
ATI Mach64	ATIM64.DSC	88800
IBM VGA 256c	PSSPDW.DSC	IBM SVGA CHIP
Cirrus Logic 5422, 5424	PSCL.DSC	5420 5422 5424
Cirrus Logic 5426, 5428,5430,5434	CL54X.DSC	5426 5428 5429 543X 5434
S3 86C801, 86C805, 86C928	PSS3.DSC	86C805 86C928
S3 864 S3 864 (16M Colors with 1MB of VRAM)	S3864.DSC S38641M.DSC	86C864 86C964
Weitek Power 9000	WP9000.DSC	P9000

Table 7 (Page 3 of 3). Listing of Display .DSC files in OS/2 Warp		
Display Adapter or Chipset	**Descriptor file name**	**Chipset Supported**
Weitek Power 9100	WP9100.DSC	W5186 W5286 P9100

Each .DSC file uses what is termed as &quote.chain elements&quote.. Each chain element includes the following information:

- DSP key: This identifies the Display Profile (.DSP) to process.
- General Prompt: Title used in the source directory window.
- Diskette Prompt: Title used on diskette insertion window.
- Volume Label: Option volume label used to verify the correct diskette or subdirectory.
- Resolution: The optional string which indicates a display driver resolution.

When setting up the CID tree for installing SVGA driver, the correct directory structure must be created. The volume label denotes the subdirectory to create. For example, if the volume label is DISP 1, the correct subdirectory to create would be \DISP_1 of the source directory. The DSP key, which identifies the Display Profile (.DSP) to process, must be located in this subdirectory. Once the volume label is verified, the.DSPs are searched for a matching DSP key denote in the chain element. Once a matching key is found, .DSP describes the installation steps for that source directory. The .DSP describes what files to unpack and what updates to make to the CONFIG.SYS and .INI files.

The next step is to determine what action routine DLL the .DSC file specifies. On the second line of the .DSC file is the name of the action routine DLL. If there are empty quotes (" "), this means that an action routine is not used. You should check what action routine DLL is being used because it must be an OS/2 Warp version or later in order to be enabled for CID. Most IHV/ISVs use IBM action routine .DLLs with no changes.

When the .DSC file is read, the action routine DLL is processed. If a resolution string is passed to DSPINSTL.EXE with the /RES: parameter, DSPINSTL.EXE passes it to the action routine DLL for processing. The resolution string tells the action routine DLL to bypass the Monitor Configuration Panel and run SVGA.EXE ON INIT which generates a SVGADATA.PMI file under a DOS VDM. The SVGADATA.PMI file contains information about the resolution supported by the SVGA card. The .PMI file

is scanned for each resolution by searching for the [GRAPHIC MODE] sections. If the resolution is valid and supported, this information is written to the OS2.INI file to tell the SVGA driver what resolution to default to.

Once the action routine DLL is finished processing, each chain element in the .DSC file is processed. DSPINSTL.EXE searches in the subdirectory specified by the volume label for a matching DSP key. Once found, the DSP file is processed. After the DSP file is processed, the next chain element is processed and so on.

Using the example of CID installing TSENG W32p video support, we first look at TLIW32.DSC. A partial excerpt from this file is shown in the Figure 19 on page 70.

```
* Title "Tseng Laboratories, Inc. ET4000/W32/W32i/W32p"
"Tseng Laboratories ET4000/W32, /W32i, /W32p"
* Action routine DLL
"SVGA.DLL"
* Type key
"SVGA"
**********************
 chain element = key, general prompt, diskette prompt, vol label,
              resolution
* DSP key
"TLIW32A"
* General prompt
"Tseng Laboratories ET4000/W32, /W32i, /W32p"
* diskette prompt
"Display Driver Diskette 1"
* volume label
"DISP 1"
* Multi-resolution driver
""

* One of the two following chain elements will be commented out
* they are exclusive of one another (WFW or Fullpack)
* * FOR Fullpack (COMMENT OUT FOR WFW)
* * DSP key
"TLIW32I"
* General prompt
"Tseng Laboratories ET4000/W32, /W32i, /W32p"
* diskette prompt
"Display Driver Diskette 2"
* volume label
"DISP 2"
* Multi-resolution driver
""
* * FOR WFW (COMMENT OUT FOR FULLPACK)
* * DSP key
* "TLIW32M"
* * General prompt
* [ 26
* * diskette prompt
* [ 2
* * volume label
* "DISP 2"
* * Multi-resolution driver
* ""

* DSP key
"TLIW32B"
* General prompt
"Tseng Laboratories ET4000/W32, /W32i, /W32p"
* diskette prompt
"Display Driver Diskette 2"
* volume label
DISP 2
* Multi-resolution driver
""
```

Figure 19. TLIW32.DSC

You now would need to do the following steps:

1. Create the following two subdirectories off x:\TSENG:
   x:\TSENG\DISP_1
   x:\TSENG\DISP_2
2. Copy the entire contents of Display driver diskette 1 to x:\TSENG\DISP_.
3. Copy the entire contents of Display driver diskette 2 to x:\TSENG\DISP_.
4. Run DSPINSTL.EXE as follows:
   /PD:C:\OS2\INSTALL\TLIW32.DSC
   /S:X:\TSENG
   /T:C:
   /RES:1024X768X256
   /L1:C:\OS2\INSTALL\DSPINSTL.LOG

Note: The /L parameter is a logging parameter which is optional. It creates a log file which is discussed in 2.8.3, “CID Log File.”

2.8.3 CID Log File

If something goes wrong, look in the log file. It contains information regarding what parameters were passed in and what .DSC and .DSP files were used. It also logs any errors that were encountered during the installation. If the driver defaults to low resolution, check the SVGADATA.PMI file to see whether the resolution passed with the /RES: parameter is a valid resolution. Also, after installation of the device driver and *before* rebooting, look in the OS2.INI file for the following values: `PM_DISPLAYDRIVERS DSPDEFAULTRESOLUTION (value)`. Check the value to make sure the proper hex values were written. If you cannot find these values in the OS2.INI file, it is likely that you are using a pre-Warp version of an action routine DLL. Replace the action routine DLL with a compatible OS/2 Warp version and try again. To determine what action routine DLL is being used, look at the second line of the the .DSC file. This is where the action routine DLL name is specified. If you see empty quotes (""), this means that an action routine DLL is not being used. In Figure 19 on page 70, the name of the action routine DLL is SVGA.DLL. To verify if you have an OS/2 Warp or a pre-Warp version, check the file date and size.

2.8.4 Other CID Examples

If you have downloaded an updated video driver for OS/2 Warp, check its README file for information regarding CID installation of the driver. The following video driver updates, which were mentioned previously in this chapter, all contain CID install instructions and sample LCU (LAN CID Utility) command files:

- ATI MACH32
- ATI MACH64
- CIRRUS LOGIC (5426, 5428, 5430 AND 5434)
- S3_864
- S3_16M
- S3 Trio 64
- TSENG ET4000/W32
- WD90C33 (Western Digital)
- Weitek Power 9000/9100

All of these updated drivers are available from the IBM PCC BBS. Check the manufacturer's BBS to verify if there are later versions of these packages. Refer to B.3, “Bulletin Boards” on page 330 for a listing of BBS numbers. If your chipset is not one of the ones listed above, check with your manufacturer regarding CID installation instructions.

2.9 Known Problems and Resolutions

Table 8 is a list of some known problems and resolutions regarding display drivers in OS/2 Warp. It is not a complete list and is subject to change as new versions of video device drivers are released both within IBM and by the respective video chipset manufacturers.

Table 8 (Page 1 of 3). Known Video Problems and Resolutions

Problem	Resolution
ATI Graphics Pro Turbo and the Win Turbo which utilize VRAM and a MACH64 chipset running under OS/2 Warp with WIN-OS/2 cause video corruption in WIN-OS/2 fullscreen sessions only.	1. Open an OS/2 command prompt. 2. Change to the \OS2\MDOS\WINOS2 subdirectory. 3. Type E SYSTEM.INI and press Enter. 4. Add the line **BLOCKWRITE=OFF** under the .MACX subheader. 5. Save the file and exit. 6. Restart the WIN-OS/2 fullscreen session.
ATI driver gives no selection for 800x600x65K on system with 1MB of VRAM and the ATI Mach32 driver.	800x600x65K is not supported because many revisions of the Mach32 chip have a hardware problem with the pitch at this mode. (APAR PJ16538)

Table 8 (Page 2 of 3). Known Video Problems and Resolutions

Problem	Resolution
Sessions crashing or trap errors when using the Diamond Stealth 64 with S3 864 drivers.	At the present time, this configuration is *not* supported by IBM. A possible workaround is: 1. Boot with OS/2 Warp Installation and Diskette 1. Do not boot using ALT+F1. 2. Make a temp subdirectory in the \OS2 subdirectory. 3. Insert the Stealth Disk 1 into the A: drive. 4. Change to \OS2\TEMP subdirectory. 5. Type `COPY A:S3VIDEO`. 6. Decompress the file using UNPACK.EXE which is already on your hard drive. 7. Type `COPY *.DLL x:\OS2\DLL` 8. Type `COPY *.SYS x:\OS2\MDOS` 9. Perform a shutdown and reboot your machine.
Unable to install high resolution options on machines with S3 or other SVGA chipsets.	Obtain the most recent Video device driver for OS/2 Warp from either the IBM PCC BBS or from the chipset manufacturer. Reset to VGA mode before following the instructions in your device driver README file to install.
Unable to install OS/2 Warp on a system using a Hercules Graphite HG720 video chipset. Chipset was made by AGX.	This video chipset is not currently compatible with OS/2 Warp because the chipset manufacturer went out of business before drivers could be developed for it. Contact Hercules for more information.
Selecting 1280x1024x768 using the S3 864 drivers (5/30/95) with an IBM 17P monitor attached results in a blank screen.	Obtain an updated MONITOR.DIF (7/13/95) from 407-443-8000 and replace the existing one on your system. 1. Open **System Setup** folder. 2. Open **System** icon. 3. Select page 2 of the Screen tab. 4. Select a monitor type of **Default**. 5. Close the notebook. 6. Reopen the notebook by selecting the **System** icon again. 7. Select the correct monitor type and close the notebook. 8. Answer *Yes* when you are prompted to run SVGA.EXE. This creates a new SVGADATA.PMI file with the correct monitor information in it for the 17P monitor. 9. If you are not prompted to run SVGA.EXE, you must run it by opening a DOS fullscreen session and typing *SVGA ON* at the prompt.

Table 8 (Page 3 of 3). Known Video Problems and Resolutions

Problem	Resolution
Selecting a resolution of 1024x768x256 with a Tseng ET4000 chipset (W32, W32i, W32p), does not allow you to select a refresh rate above 60 MHz.	1. Open a **DOS Fullscreen**. 2. Change to the \OS2 subdirectory. 3. Type `SVGA monitor DOS`. 4. Select Auto and you will be back at the DOS prompt. 5. Type `rename SVGADATA.PMI SVGADATA.BAK`. 6. Type `rename SVGADATA.DOS SVGADATA.PMI`. 7. Close the DOS session and reopen the **System** icon. You will be able to pick a higher refresh rate than 60MHz.
Unable to install an IBM video device driver because of an invalid argument count in the .DSC files.	This solution is only for IBM video device drivers. • Open an **OS/2 Command Prompt**. • Type `CD OS\INSTALL` and press Enter. • Type `MD TEMP` and press Enter. • Type `COPY *.* x:\OS2\INSTALL\TEMP` and press Enter (x=the drive where OS/2 Warp is installed). • Type the following lines, pressing Enter after each line. `DEL *.DSC DEL INSTALL.EXE DEL DSPINSTL.EXE` For the following steps, use the diskettes or CD according to information below: - For OS/2 Warp Version 3, use Disk 0, Disk 4 and Disk 6. - For OS/2 Warp with WIN-OS/2, use Disk 1, Disk 4 and Disk 6. - For OS/2 Warp Connect, use Disk 1, Disk 4 and Disk 6. - For the CD-ROM versions, use the OS/2 CD, do not use diskettes. • Unpack the bundle files located on the above diskettes. 1. For the CD-ROM version, insert the OS/2 Warp CD in the CD-ROM drive and type: `UNPACK x:\OS2IMAGE\DISK_n\BUNDLE y:` Where x=CD-ROM drive letter n=Disk number from above y=OS/2 Warp drive letter. 2. For the diskette version, insert the appropriate diskette (see information above) and type: `UNPACK A:\BUNDLE y:` • Reinstall the video device driver. Follow the instructions that are shipped with the video device driver to install.

2.9.1 9576 and 9577 Model S and I Display Problems

If you are experiencing display problems with a 9576 or 9577 system, you may need to obtain a driver called SFFDD.SYS for your system. To determine if you need this updated driver, each of the following items must be true of your system:

- A 9576i, 9577i, 9576s or a 9577s running OS/2 Warp.
- The 9576 or 9577 must have a submodel of xUx, xNx, or xTx (where x=any letter or number).
- The display screen is flashing or exhibiting a *Checkerboard* pattern. This pattern is usually displayed in yellow but may occur in any color.

First, review the system's hardware configuration and remove any IRQ or DMA conflicts. There are a number of utilities that will aid you in determining if you have an IRQ conflict. Among them is RMVIEW which is described in 8.5.2, “RMVIEW” on page 316. If no conflicts exist, and the problem continues, contact the IBM PC Company at 1-800-772-2227 to obtain the SFFDD.SYS driver. This driver must be copied to the root directory of the harddrive which contains OS/2 Warp. Once you have copied the driver, add the following line to your CONFIG.SYS:

```
DEVICE=x:\SFFDD.SYS
```

Reboot your system.

Attention

This file is not generally available because installation on any machine other than the specific machine types identified will cause problems.

This driver allows the system to switch from SVGA mode to VGA mode when a trap or an IPE (Internal Processing Error) occurs. What is occurring on the specific submodels of 9576 and 9577 machines noted is that the machine is operating in SVGA mode and a trap or an IPE is trying to display on the screen but the display cannot switch back to VGA mode to display the error information.

2.10 Dual Display System Using Image Adapter A/A

This section describes the procedure to install the driver for this adapter and provides some hints and tips on how to configure your system for OS/2 Warp.

The required version of the IAA/A driver is Version 2.11 or later for OS/2 Warp. Because of the uniqueness of this card, a special install program has been written for this adapter to install the proper driver. Selective Install will *not* install all the necessary components and therefore you should always run the special install procedure if you have an Image Adapter A/A card installed on your system.

With the new IAA/A device driver, the IARSPINS.EXE program is used to enable response file installation.

2.10.1 Restrictions

Be aware of the following restrictions before installing the IAA/A 32-bit driver:

- Do not use Version 2.11 of the IAA/A driver on OS/2 Warp systems which have a revision level lower than 6.514.
- You cannot install this driver if you have the 16-bit PM driver installed on the system.
- Seamless WIN-OS/2 is not supported. Run Windows applications in WIN-OS/2 full screen mode if you have installed this driver.
- To prevent problems when copying data from some WIN-OS/2 applications to PM applications through the clipboard, add the following statement to the STARTUP.CMD file: `DETACH C:\OS2\IBMIAA\IAACLIP.EXE`
- CID installation is still preliminary.
- Virtual Screen Mode is not supported with Image Adapter A/A with only 1 MB VRAM attached.
- Video for Windows video playback may not be shown when Video Mode is configured to "Full Screen" because display modes which are not supported by IAA/A may be used.

2.10.2 Switching to VGA Mode

Note

If your system is configured for the IAA/A 16-bit PM driver (Version 2.01 or lower) you must revert to VGA mode before installing the IAA/A 32-bit driver.

Follow the steps below to switch the system to VGA mode. Also refer to 8.2.2, “Reset Primary Video Back to VGA” on page 297 for information about switching to VGA mode via the Archive and Recovery method.

1. Type `DIR C:\OS2\DLL\DISPLAY.DLL`. at a command prompt (where C: is the drive where OS/2 Warp is installed), and then press Enter.
   a. If the size of DISPLAY.DLL is about 80 KB, you can proceed to step 4.
   b. If the size of the DISPLAY.DLL is not around 80 KB, then follow the steps below to change to VGA mode.
2. Type `.SETVGA C:`. and press Enter. If OS/2 Warp was preloaded on your computer, type SETVGA `C: /P` and press Enter.
3. Perform one of the following steps:
   - If OS/2 was installed from diskettes:
     a. Insert OS/2 Diskette 3 into drive A.
     b. Type `UNPACK A:BUNDLE C: /N:DISPLAY.DLL` and press Enter.
   - If OS/2 was installed from CD-ROM:
     a. Insert OS/2 : into CD-ROM drive.
     b. Type `UNPACK E:\OS2SE21\DISK_3\BUNDLE C: /N:DISPLAY.DLL` (whe E: is the CD-ROM drive), and press Enter.
   - If OS/2 was installed from a server:
     a. Log on to the network and access the server disk for OS/2 Warp installation.
     b. Type `UNPACK L:\OS2PATH\DISK_3\BUNDLE C: /N: DISPLAY.DLL` and press Enter.
4. Restart OS/2 Warp from diskette using the Installation Diskette and Diskette 1.
5. At the Welcome to OS/2 screen, press F3 to display a command prompt.
6. Type `MOVE C:\DISPLAY.DLL C:\OS2\DLL` and press Enter.

7. Remove diskette from drive A.
8. Press Crtl-Alt-Del to restart the system.
9. Repeat step 1 to verify which driver is in use.

2.10.3 Installing IAA/A 32-Bit PM Driver

To install the 32-bit driver, follow the steps below:

1. Make sure your system is not configured for the IAA/A 16-bit driver.
2. Open an OS/2 command prompt.
3. Insert the IAA/A 32-bit driver diskette into drive A.
4. Type `A:` and press Enter to change to drive A.
5. Type `IAINSTAL /(N)W /(N)D` and press Enter, where:

   /W Installs IAA/A High-Resolution WIN-OS/2 Support.

   /NW Does not install IAA/A High-Resolution WIN-OS/2 Support.

   Note

   If you previously installed IAA/A High-Resolution WIN-OS/2, do *not* select this option, otherwise, WIN-OS/2 session will not start. Use this option if your application accesses the IAA/A resources directly through the Device Escape function.

   /D Sets the configuration for Dual display.

   You will need the OS/2 Warp Display Driver diskette 1 if you choose this option.

   You can still set the Dual Screen mode to OFF and use IAA/A for the primary display with this option. To do this, start IAOPTION.EXE and clear the Dual Screen button in its menu.

   /ND Sets the configuration for Single Display.

   If you have installed IAA drivers with this option, you cannot choose Dual Screen Mode from the IAOPTION.EXE menu.
6. Insert the IAA/A Display Support Diskette when prompted and press Enter.
7. Insert Display Driver Diskette 1 into drive A when prompted and press Enter. This is not required if you are installing with the /ND option.
8. When you see the Installation Completed message, exit the prompt.
9. Restart your system. It should start with the IAA/A configuration.

Note

Before starting an IAA WIN-OS/2 session, make sure the VIDEO_SWITCH_NOTIFICATION setting is ON for the IAA/A WIN-OS/2 screen switch to work properly.

2.10.4 Uninstall 32-bit Image Adapter A/A Display Driver

1. Open an OS/2 Full Screen or OS/2 Window.
2. Insert the IAA/A 32-bit PM Driver Diskette into drive A. Then change the drive to A.
3. Type `IAREMOVE` and press Enter.
4. A notice about IAREMOVE.EXE appears. If you do not want to change the display configuration, press N and exit. If you want to change the display configuration, press Y and continue with step 5.
5. If you press Y, DSPINSTL.EXE will be started and the Display Driver Install dialog will appear. Change the Primary and Secondary display configuration to what you want other than IAA. Then select **OK.**
6. The Source Directory dialog appears. It will display the path where OS/2 Warp was installed. If you want to change the source directory path, select the **Change** button and change the source path to the correct one. Then select the **Install button**.
7. When the message `Uninstallation completed` appears, exit the prompt.
8. Remove the diskette from drive A and restart your system.

2.10.5 Changing the WIN-OS/2 Driver to VGA

- If your system is configured for VGA, install IAA/A display drivers with the /NW option.
- If your system is previously configured for the IAA/A PM driver, follow the procedure outlined in 2.10.2, “Switching to VGA Mode” on page 77. Then install the IAA/A display drivers with the /NW option.

2.10.6 Changing the WIN-OS/2 Driver to XGA

1. If your system is previously configured for the IAA/A PM driver, follow the procedure outlined in 2.10.2, “Switching to VGA Mode” on page 77.
2. If OS/2 Warp was installed without DOS or WIN-OS/2 support, install DOS and WIN-OS/2 support using Selective Install.

   Note

   Do *not* use the following instructions without DOS and &winos2. support.

3. Install the XGA drivers using Selective Install.
4. Install 32-bit IAA/A drivers using IAINSTAL.EXE with /NW /D options.
5. Shut down and restart OS/2 Warp.
6. Follow the steps below to change the CONFIG.SYS manually:
   a. Open the CONFIG.SYS file using the OS/2 Editor.
   b. Find the DEVICE= line with IAOS2RFS.SYS. Now add the following three lines: `DEVICE=X:\OS2\IAOS2RFS.SYS (/DisplayID= ...)`
      `BASEDEV=XGA.SYS DEVICE=X:\OS2\XGARING0.SYS`
   c. Find the SET VIDEO_DEVICES= line and comment it out. Then add SET VIDEO_DEVICES= and SET VIO_XGA= as follows: `rem SET`
      `VIDEO_DEVICES=VIO_VGA,VIO_IAA SET VIDEO_DEVICES=VIO_XGA,VIO_I`
      `VIO_XGA=DEVICE(BVHVGA,BVHXGA)`
   d. Find the following two lines for VVGA.SYS and VIAA.SYS. Then add the following line for VXGA.SYS: `DEVICE=X:\OS2\MDOS\VVGA.SYS /DUAL`
      `DEVICE=X:\OS2\MDOS\VIAA.SYS DEVICE=X:\OS2\MDOS\VXGA.SYS /DUAL`
   e. Save the CONFIG.SYS file.
   f. Shut down and restart OS/2 Warp.

The new IAA/A driver automatically detects the attached monitor and finds the correct Display Data File. Each driver expects the default directory path to find Display Data File if no special path is specified. The default for OS/2 Warp is C:\OS2\IBMIAA (where C: is the drive where OS/2 Warp is installed).

You can specify your own Display Data File name and Display Data File directory by using the /DisplayID= and DisplayPath= parameters.

2.10.7 Changing the PM Setting

Note

If your system is configured for the IAA/A 16-bit driver (Version 2.01 or lower), an old object folder named &quote.Mail&quote. with an old OPTION.EXE icon may exist in the folder. Do *not* change the PM setting with this old program. You can delete the icon and the folder for this old program.

The installation program creates a folder IBM IAA Option on your Desktop and puts a program object named Image Adapter A/A Option Program in it. Start the program to change your PM settings.

The main dialog box of this program contains the following:

- Display

  Attached display type. If this is incorrect, you need to edit the CONFIG.SYS file and add the proper /DisplayID= option to IAOS2RFS.SYS. For details, see the README file on the Display Support diskette.

- Resolution and Bits per Pixel

  A list of screen modes available with your hardware configuration is shown. Bits per pixel is specified as 1, 4, 4+ or 8.

  1 bpp : 2 colors

  4 bpp : 16 colors

  4+ bpp : 16 grays

  8 bpp : 256 colors

  You can select a favorite mode, which will take effect when you restart OS/2 Warp.

- Virtual Resolution

  Size of Virtual Desktop. If you select **Disabled**, the Desktop size is the same as the screen size, selected in Resolution and Bits per Pixel. To enable, select a mode that is larger than the screen size. Available modes are subject to restriction by VRAM size on your IAA/A card, selected BPP, and selected screen size. If you select an incorrect virtual resolution, the Option Program displays a warning when the OK button is selected.

If you are not familiar with the concept of Virtual Desktop, just enable and try it! Move the mouse pointer to each edge of the screen (and beyond the edge) and see what happens.

- Font Resolution

  Screen resolution (pixels per inch) is used to calculate the fonts size.

- Dual Screen

  Check this option if you are using two display systems. (Note: You need to install the IAA/A driver using the /D option to use this option.) If this option is checked, the IAA/A attached monitor does not display the VGA screen when you switch to, for example, an OS/2 full screen prompt. That monitor would continue to display the PM screen, while another monitor shows the VGA screen.

- Minimum Memory Usage

  Check this option only when you want to use applications which use IAA/A on-board memory.

2.11 DOS Video Settings

If you experience screen corruption under WIN-OS/2 after switching to the OS/2 Warp Desktop and back, set the DOS setting *VIDEO_SWITCH_NOTIFICATION* to **OFF**. To do this, follow these steps:

1. Open the **OS/2 System** folder.
2. Open the **Command Prompts** folder.
3. Open the **Setting** notebook for **WIN-OS/2 Fullscreen** by selecting the object and clicking on the right mouse button. Select **Settings** from the pop-up menu.
4. Select the **Session** tab of the notebook and highlight the **WIN-OS/2 Settings** pushbutton. Press Enter. This page of the Setting notebook is shown in Figure 20 on page 83.
5. Select **DOS Video Settings** as shown in Figure 21 on page 83. Select **OK**.
6. Highlight **VIDEO_SWITCH_NOTIFICATION** and select **ON**. See Figure 22 on page 84.
7. SAVE the new setting and exit.

The same procedure as given above is followed if you wish to change video settings for a DOS Fullscreen or DOS Window. In step 3, you would instead select the settings notebook for the object (DOS Fullscreen or DOS Window) for which you wish to change the change the video settings.

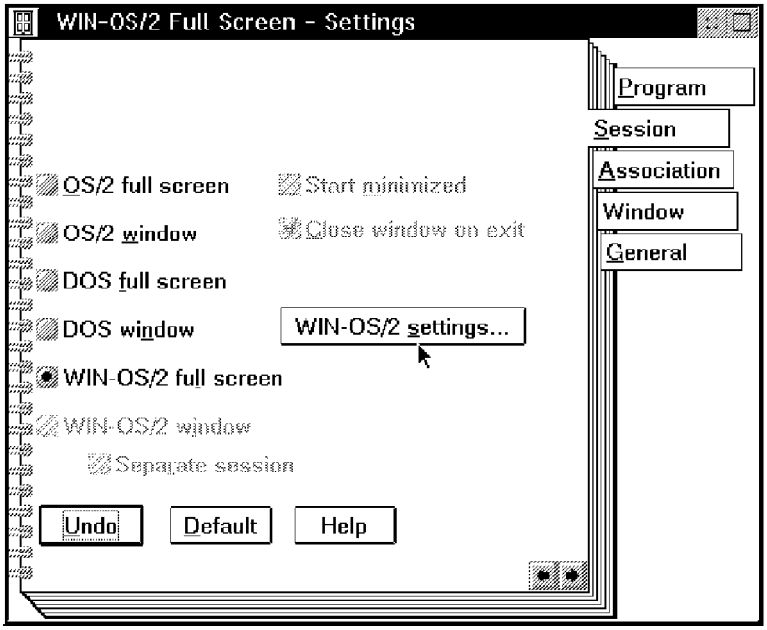


Figure 20. Selecting WIN-OS/2 Settings

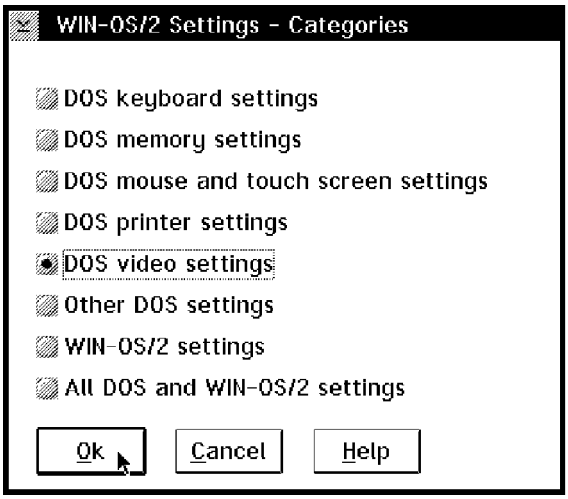


Figure 21. Selecting DOS Video Settings

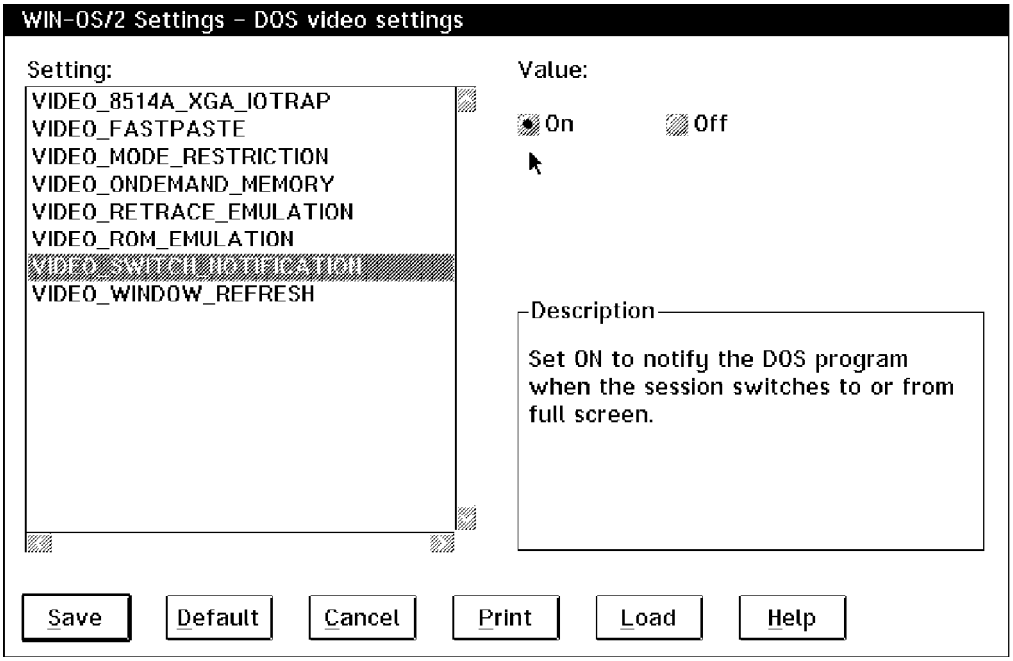


Figure 22. Setting Video Switch Notification

The other video settings that can also be changed are shown in Figure 22. A description of each setting's function is included on the Settings page. If you are experiencing video problems in DOS or WIN-OS/2 sessions that you do not think are driver related, changing a video switch setting may be the resolution to your problem.

Chapter 3. OS/2 Warp Printer Device Drivers

This chapter describes how you can install printer drivers in OS/2 Warp and how to configure them. It also gives you a short overview of the OS/2 Warp print subsystem and its components. The OS/2 Warp spooler and the queue drivers with their settings in CONFIG.SYS will also be discussed. Finally, there will be a list with some hints and performance tips at the end of this chapter.

3.1 Overview of the OS/2 Printer Subsystem

A printer object is the main controlling object of the print subsystem. When you print a data file in OS/2 Warp, it is sent to a printer object and becomes a print job. Therefore a printer object shows an ordered list of print jobs.

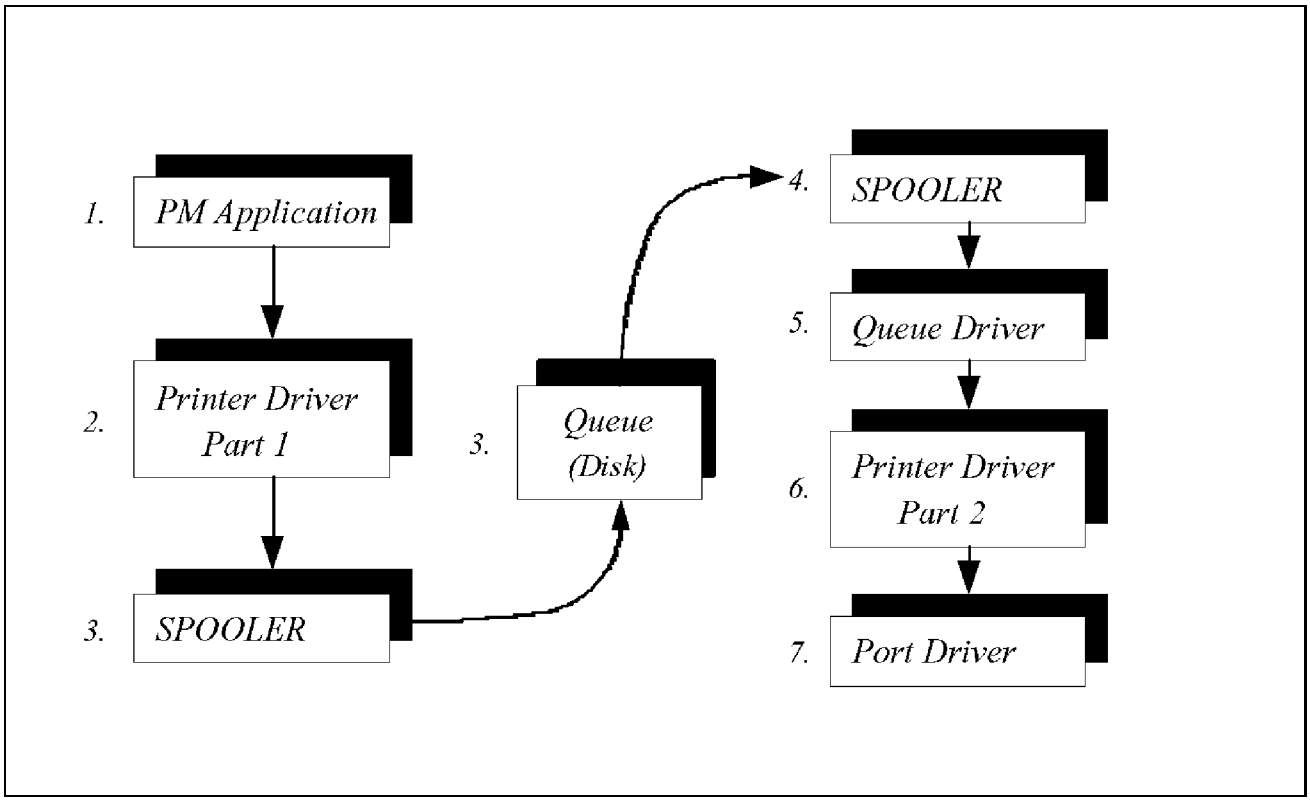


Figure 23. Dataflow in the OS/2 Printer Subsystem

The chart in Figure 23 represents an overview of the data flow in the OS/2 Warp printer subsystem. The following describes how the components work,

that are involved in a print process, beginning with the activation of the print process from an OS/2 Warp application.

1. When a print job is started from a PM application it is sent to the printer driver.
2. The printer driver provides hardware-specific information needed in order to use the printer. In a first part, it produces a file in the spooler's queue.
3. The spooler (Simultaneous Print Operation On Line) ensures that jobs from different applications will not accidentally be intermixed. The spooler also writes each print job first to the hard disk and waits until the printer is ready to process them. A major advantage of the spooler is that you can still use your applications while printing a job.
4. The spooler's queue processor (for example PMPRINT) checks if the properties of the job match the printer properties. If it does, it will send the data to the queue driver.
5. The queue driver, which is a software processor, takes the print job from the queue, and sends it to the printer driver.
6. In a second part the printer driver generates printer specific data (for example PostScript code or PCL 5 code). It will then send this data to the port driver.
7. The port driver provides support for the transmission of data through ports such as serial or parallel port. It sends the data received from the printer driver to the printer.

3.2 Printer Device Driver Installation

This chapter describes different ways to install a printer device driver under OS/2 Warp. It explains how you can create a printer object on the Workplace Shell and how to install a WIN-OS/2 printer. Finally a short description of a CID installation will end this section.

3.2.1 Creating a Printer Object under OS/2 Warp

There are basically five ways to create a printer object under OS/2 Warp:

- Create a printer object during installation of OS/2 Warp.
- Create a printer object using selective install.
- Create a printer object from a template.
- Create a printer object from an existing printer object.
- Create a printer object from a printer driver.

3.2.1.1 Create a Printer Object During installation of OS/2 Warp

During the installation of the operating system, OS/2 Warp asks you if you want to install a printer. Afterwards, a dialog window shows a list of supported printers and a list of possible port names. Select the printer driver you want to install. The installation program then installs the selected printer driver as well as the appropriate WIN-OS/2 driver (if one exists). You will then be asked to reboot the system. After the reboot OS/2 Warp creates the printer object on the Desktop and automatically adds the name of the printer to the printer object.

You can install multiple printer device drivers during system installation by clicking on the **Install Additional Printers** push button (see Figure 26 on page 89).

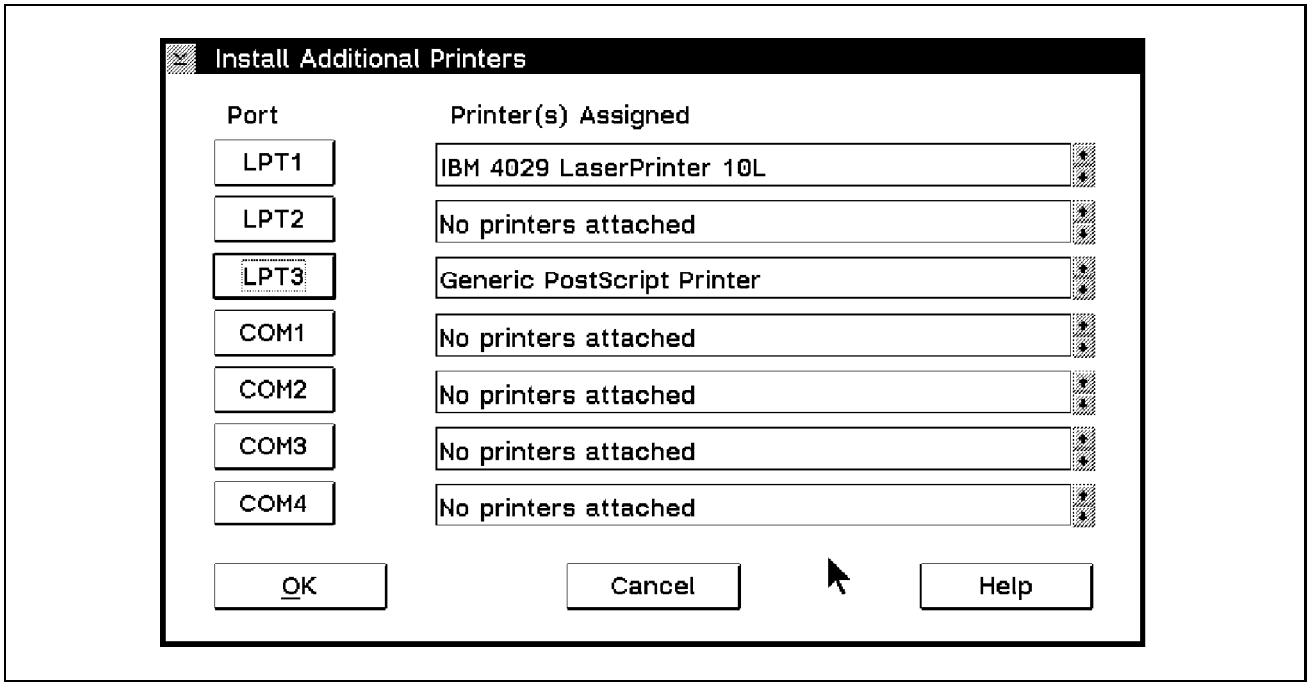


Figure 24. The Additional Printer Install Dialog

You can then select the additional driver as well as the parallel port you want to connect to.

After you have successfully installed your printer, an icon will be displayed on the desktop. The icon will look different, depending on the type of printer. For example, an IBM 4039 laser printer will have a laser printer icon, and an IBM 4201 Proprinter will have a dot matrix icon.

You can still install printer drivers after the system installation using the method described in 3.2.1.3, “Create a Printer Object from a Template” on page 89.

3.2.1.2 Create a Printer Object Using Selective Install

You can use the selective install function to change your existing printer object or to install additional printers. The procedure is described below:

- Open the **System** folder.
- Open the **System Setup** folder.
- Double-click at the **Selective Install** icon. The selective install dialog appears as seen in Figure 25.

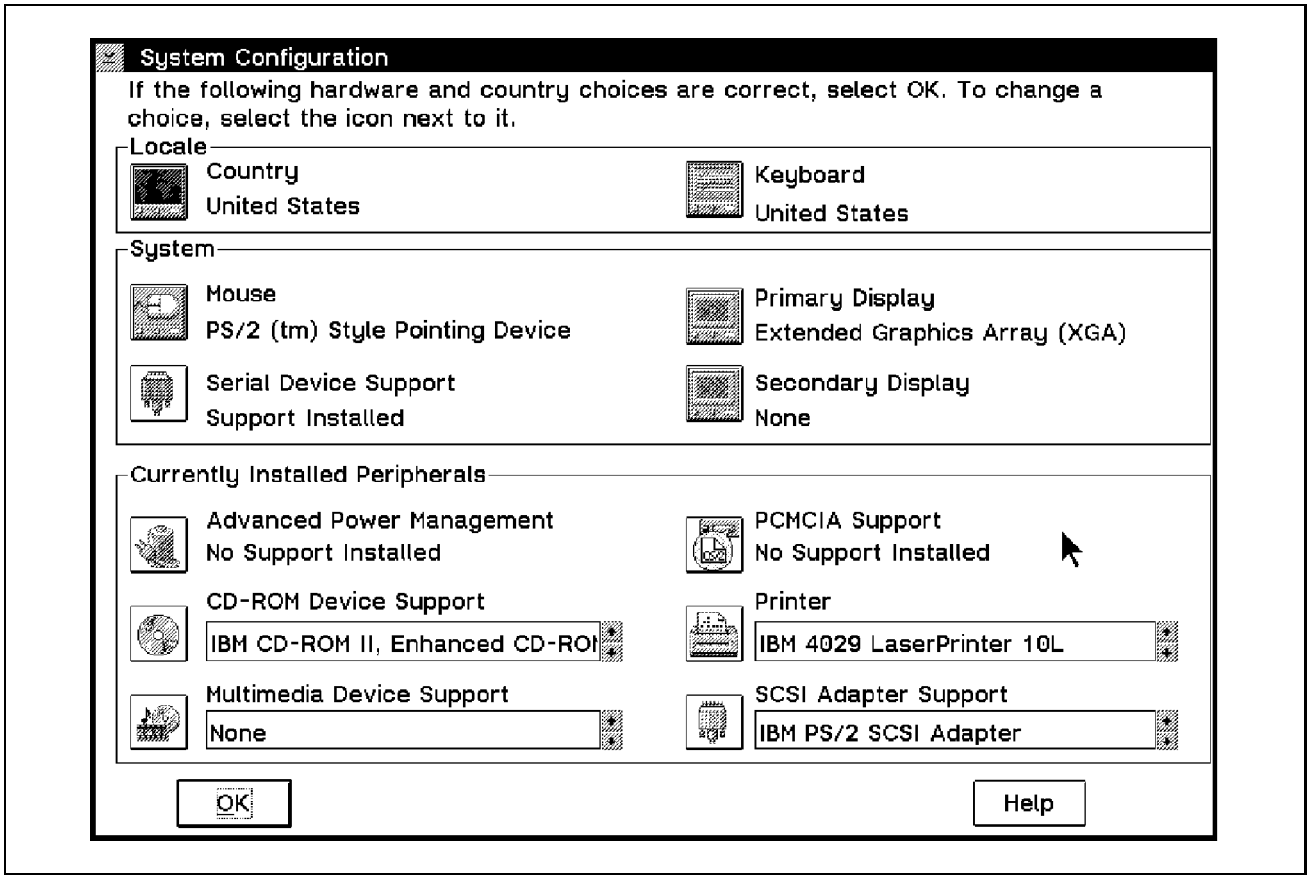


Figure 25. The Selective Install Dialog

- Click on the **Printer** icon in the lower right corner. The Select System Default Printer dialog appears (see Figure 26 on page 89).

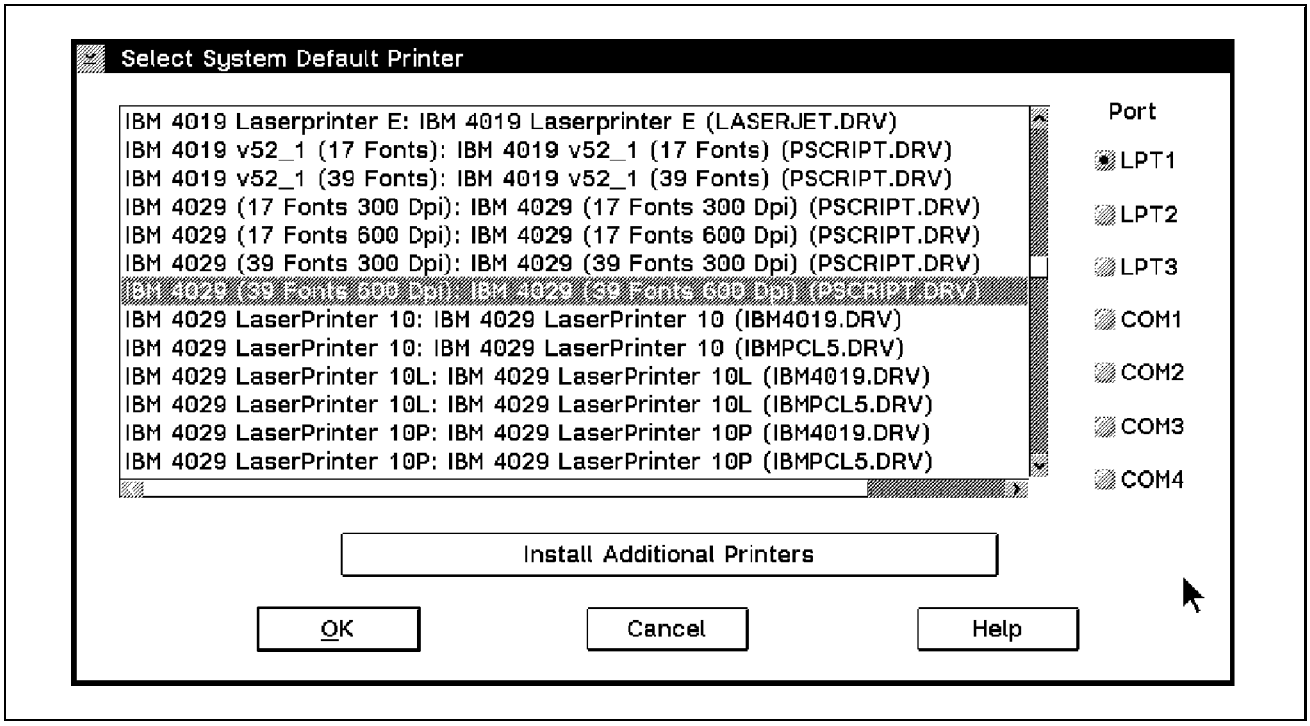


Figure 26. The System Default Printer Dialog

- Select the printer model you want to install from the list and click on **OK**.

  Note: If you want to install additional printers, click on the **Install Additional Printers** button. You can select the additional printer as well as the printer port to connect to (see Figure 24 on page 87).

- Select **Install**.
- Specify the source directory where the printer driver resides.
- Select **Install**.

OS/2 Warp now installs the selected printer.

3.2.1.3 Create a Printer Object from a Template

Another way to create a printer object is to use a template from the template folder on the OS/2 Warp Desktop. It is an easy way to install and configure additional printers. The following steps describe such an installation:

1. Open the **Templates** folder.
2. Point to the **Printer** template.
3. Press and hold mouse button 2 while moving the printer template to the OS/2 Desktop.

4. The **Create a Printer** dialog appears on the screen as seen in Figure 27 on page 90.

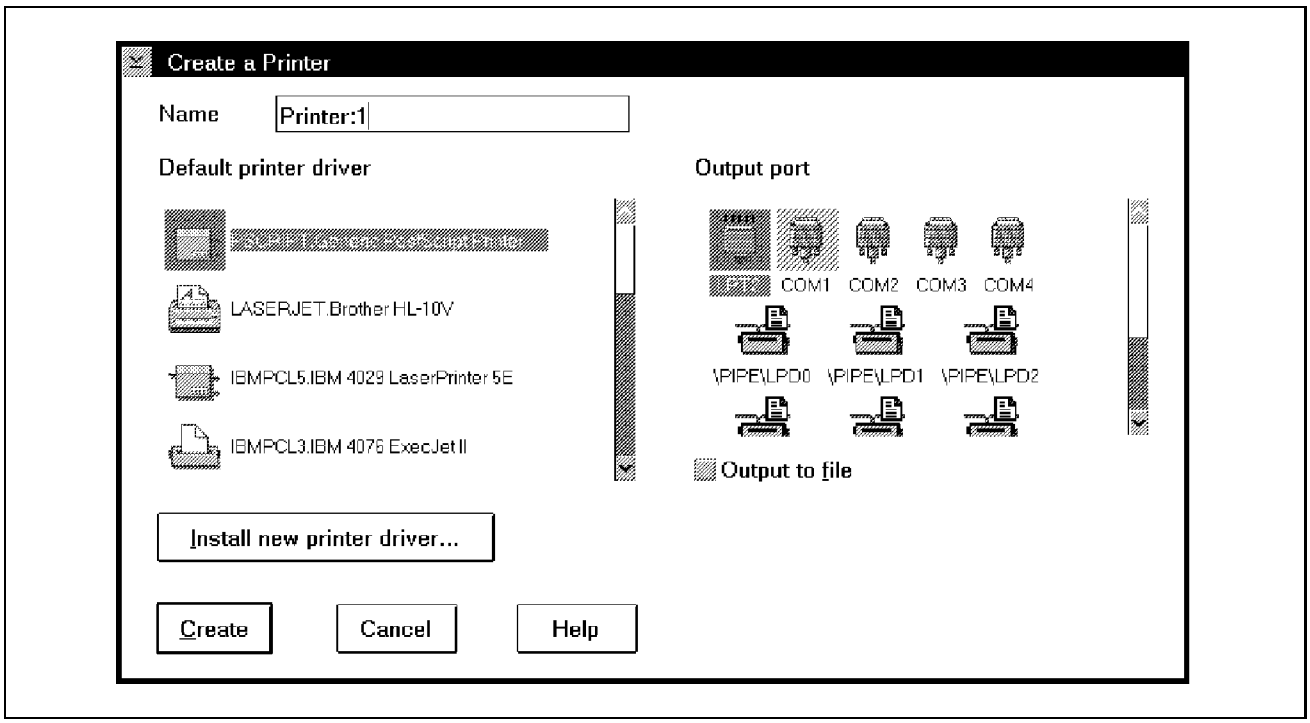


Figure 27. The Create a Printer Dialog

5. Accept the default name or type a new name for the printer in the Name field.
6. Select the printer driver that corresponds to your printer model from the list displayed. If your printer driver is not listed, select **Install new printer driver**. Figure 30 on page 93 shows the window that will be displayed. Select your printer model and select **Install**.
7. Select the port to which the printer is connected in the screenshot in Figure 27, you can also select network printer ports, which refer to a printer on a server.
8. If you want to print to a file, select the **Output to file** option. After selecting this option, a window appears in which you can type the name of the file that contains your print job.

   Note: Only PM applications can use this feature.
9. Select **Create**.
10. Depending on if your printer is supported by WIN-OS/2, the following appears: `Do you want to install an equivalent WIN-OS/2 printer`

configuration. Select **Yes** if you want to install an equivalent WIN-OS/2 printer. For more information about installing WIN-OS/2 printer, see 3.2.2, “Installing a Printer Driver under WIN-OS/2” on page 94.

3.2.1.4 Create a Printer Object from an Existing Printer Object

You can also create a new printer object using the *Create another* or *Copy* function displayed in the pop-up menu of a printer object:

- Select a printer object and press mouse button 2.
- Select **Create another** from the pop-up menu displayed.
- You will see the Create a Printer dialog box as shown in Figure 27 on page 90.
- Follow the instructions from point five until ten described in 3.2.1.3, “Create a Printer Object from a Template” on page 89.

OS/2 Warp will then create a printer object on the Desktop.

3.2.1.5 Create a Printer Object from a Printer Driver

To create a printer object directly from the printer driver, follow the instructions below:

- Open a directory containing a printer driver (*.DRV files). For example C:\OS2\DLL\IBM4019.
- Double-click on the **Printer Driver** icon. You will see a window, listing the different printer models supported by the driver (see Figure 28)

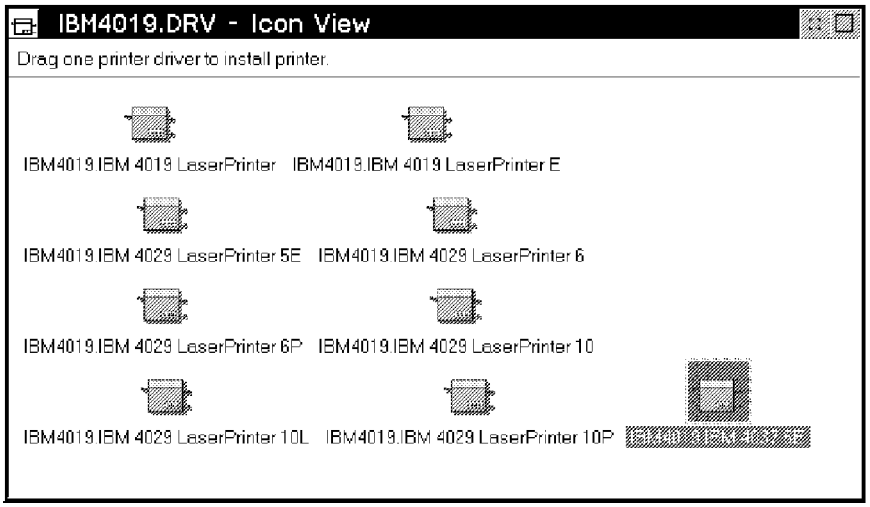


Figure 28. Installing a Printer Using The Printer Driver

- Drag the desired printer object to your Desktop or any other folder of your choice.

OS/2 Warp now installs the printer driver and creates a printer object. OS/2 Warp automatically chooses the next available port names.

3.2.1.6 Installing a New Printer Driver

To install a new printer driver, follow the steps described below:

- Point at any printer object and press mouse button two.
- Select **Settings**.
- Select **Printer Driver**.
- Click on a printer driver symbol with mouse button two. The printer driver settings dialog appears as shown in Figure 29.

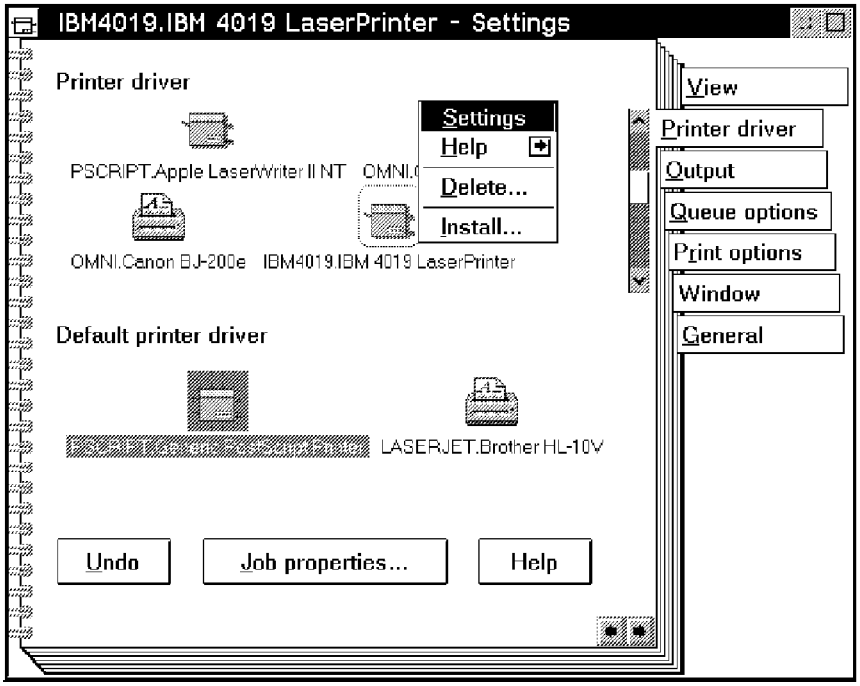


Figure 29. Printer Driver Settings Dialog

- Select **Install**. The Install New Printer Driver dialog appears as seen in Figure 30 on page 93.

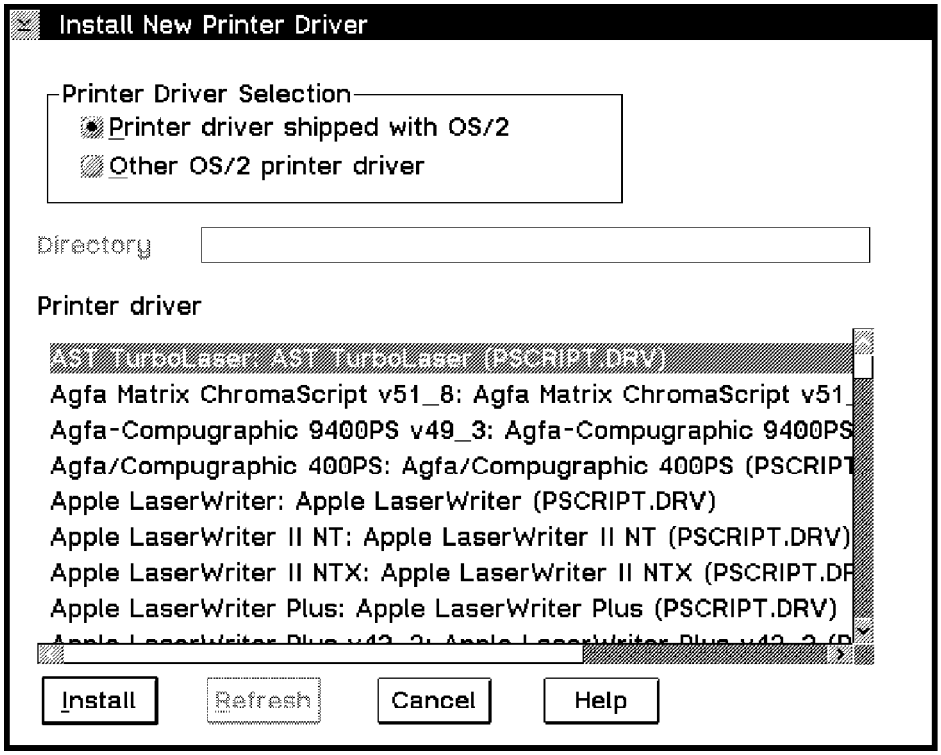


Figure 30. The Install New Printer Driver Dialog

- Select one of the printer drivers you wish to install and select **Install**.

  If you want to install a printer driver from another source, such as the manufacturer of your printer or a bulletin board, select the **Other OS/2 printer driver** radio button. Specify the directory where the driver resides and select **Refresh**.

- Insert the diskette with the printer driver and select **OK**.

The list of supported printers shipped with OS/2 Warp is read from the file in the directory :\OS2\INSTALL\PRDESC.LST. This list appears in the Install New Printer Driver dialog as seen in Figure 30.

3.2.1.7 Determine the Printer Driver Version

To determine which version of an OS/2 printer you are currently using, follow these steps:

- Open the printer object Settings notebook.
- Select **Printer Driver**.
- Double-click on any printer driver icon. The printer properties will be displayed as seen in Figure 31 on page 94.

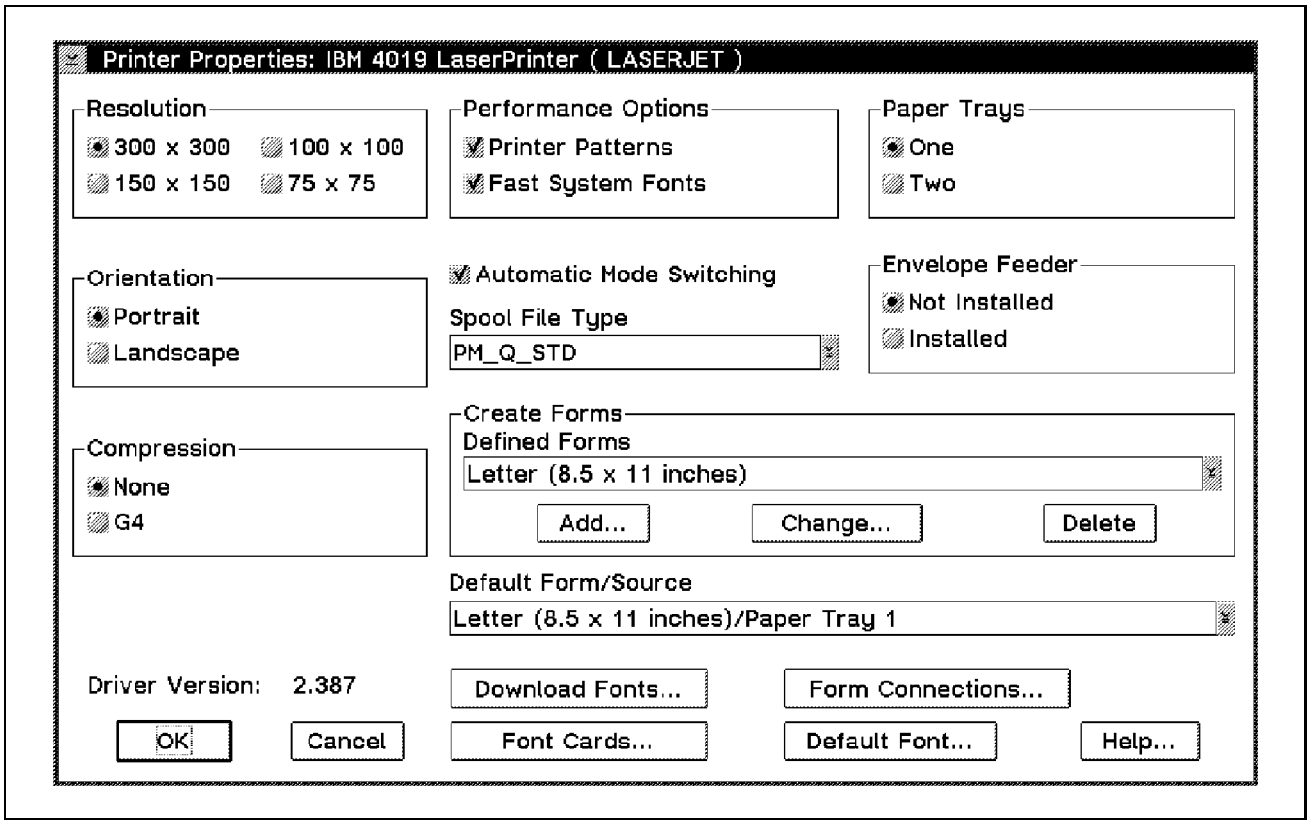


Figure 31. Example of Printer Properties of an IBM 4019

- In Figure 31 you see the printer driver version (2.218) of the 4019 Laser Printer in the lower left corner, above the **OK** button.

3.2.2 Installing a Printer Driver under WIN-OS/2

WIN-OS/2 applications use the Windows printer device drivers to format their output for your printer type. These applications don't use the OS/2 Warp Presentation Manager printer drivers. The OS/2 Warp print spooler receives data from WIN-OS/2 printer drivers in binary format and treats it as if it came from any other DOS-based application.

3.2.2.1 Installing a WIN-OS/2 Printer Driver under OS/2 Warp

During the installation procedure of a printer object you might be asked if you want to install an equivalent WIN-OS/2 printer. This question is only displayed if an equivalent WIN-OS/2 printer driver exists. OS/2 reads this information in the DRVMAP.INF file located either in the \OS2\MDOS\WINOS2 directory (if you have OS/2 Warp with WIN-OS/2) or in the \WINDOWS\SYSTEM directory (if you run OS/2 Warp). WIN-OS/2 printer

drivers are equal to Windows 3.11 printer drivers, which has the advantage that you can use any Windows 3.11 printer driver for WIN-OS/2.

By selecting **Yes** to the question *Do you want to install an equivalent WIN-OS/2 printer configuration*, OS/2 automatically updates the WIN.INI file and the Windows printer driver will be installed. If you don't want to install the WIN-OS/2 driver, select **No**. When selecting the port to connect to, you should select ports with names like LPT1.OS2 instead of LPT1 in order to get better performance. To ensure this, select **Printers** from the Windows Control Panel. Click on the **Connect** button. You will see a list of ports from which you should select one ending in .OS2.

Attention

Always ensure that the WIN-OS/2 configuration of both serial and parallel ports matches the OS/2 port configuration.

For example: If an IBM 4019 Laser Printer is configured in WIN-OS/2 for output to LPT1.OS2 and OS/2 Warp uses the LPT1 port for an IBM 4039 Laser Printer, data for the IBM 4019 is directed to the IBM 4039.

If OS/2 Warp is unable to create an equivalent WIN-OS/2 configuration, you have to install a WIN-OS/2 printer by yourself. This can be done by using a Windows printer device driver, which you have to install from the WIN-OS/2 Control Panel. If a Windows driver is not available you should use the IBMNULL printer driver.

3.2.2.2 Installing a WIN-OS/2 Printer Driver under WIN-OS/2

If you need to add a WIN-OS/2 printer driver after the installation of OS/2 and you don't want to create a new printer object under OS/2 Warp use the Windows Control Panel as described below:

- Start a WIN-OS/2 session.
- Select **Control Panel**.
- Select **Printers**.
- Click on **Add**. A list of printer will be displayed as seen in Figure 32 on page 96.

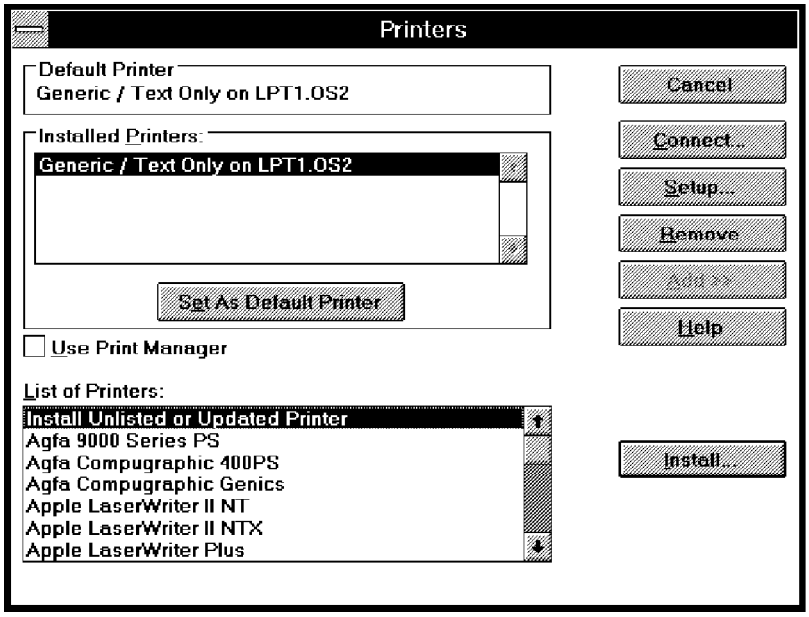


Figure 32. Installing a WIN-OS/2 Printer Driver Under WIN-OS/2

- Choose your printer and select **Install**.
- Insert the diskette which contains the printer driver or specify a path, where the driver can be found.

3.2.2.3 WIN-OS/2 Print Manager settings

An advantage of the spooler of OS/2 Warp is that it can manage multiple printer objects. You should therefore always leave the OS/2 spooler enabled, even if you print only from WIN-OS/2. By doing this, print jobs do not show up in the WIN-OS/2 Print Manager, but in the equivalent OS/2 Warp Workplace Shell printer object instead.

When running WIN-OS/2 applications, you should not use the WIN-OS/2 Print Manager because OS/2 Warp already manages print jobs as seen in 3.1, “Overview of the OS/2 Printer Subsystem” on page 85. You also have the advantage of the OS/2 Warp spooler, which provides much faster job handling.

Note

The only situation in which you should keep the Print Manager enabled is if you need to see print jobs sent to COM1 to COM4. Print jobs sent to LPT1 to LPT3 will not be spooled twice because OS/2 captures the data before it arrives at the WIN-OS/2 Print Manager.

3.2.3 CID Installation of a Printer Driver

CID (configuration, installation and distribution) provides remote unattended installation of system software. The two primary enhancements to the installation process brought about by CID are:

In this section we will discuss specifically the remote installation of a printer. If you want to have further information, please refer to *OS/2 Installation Techniques: The CID Guide*.

3.2.3.1 The Remote Printer Installation Program

RINSTPRN makes it possible to install multiple printers and queues via a response file instead of going through many dialogs. It performs the automated installation of printers, queues and ports and configures communication ports. It also provides the administrator with the ability to make final adjustments on the client's workstation, including printer driver-specific information such as job and printer properties, fonts and options during the automated process.

You can execute RINSTPRN from the command line or integrate it in any command file (*.CMD). You have to specify certain parameters called keywords in order to run the program. A list of the all the provided keywords is shown below:

- **/DSC:** This keyword defines the name of the printer description list. An OS/2 path name including drive letter can be used.
  Example: `RINSTPRN /DSC:X:\IMG\PMDD1\PRDESC.LS`

- **/DRV:** This keyword defines the name of the printer driver list. An OS/2 path name including drive letter can be used.
  Example: `RINSTPRN /DRV:X:\IMG\PMDD1\PRDRV.LST`

- **/L1:** This keyword defines the location of the log file into which the RINSTPRN program logs its response file analysis, activities, and execution results.
  Example: `RINSTPRN /L1:C:\RINSTPRN.LOG`

- **/R:** This keyword defines the location of the printer install response file. Example: `RINSTPRN /R:X:-RSP-PRINTER\PRINTER.RSP`

- **/S:** This keyword defines the source drive and directory where the drivers and fonts to be installed are located.
  Example: `RINSTPRN /S:A:`

- **/T:** This keyword defines the target drive where the OS/2 system is installed. Use this keyword if OS/2 has been installed to a logical partition. Example: `RINSTPRN /T:D:`

- **/WPR:** This keyword defines the name of the WIN-OS/2 printer setup file. Example: `RINSTPRN /WPR:X:\EXE\CONTROL.INF`

- **/WDR:** This keyword defines the name of map file between OS/2 and WIN-OS/2 device drivers.
  Example: `RINSTPRN /WDR:X:\EXE\DRVMAP.INF`

- **/WT:** This keyword defines the target drive where WIN-OS/2 is installed. Use this keyword if WIN-OS/2 has been installed to a logical partition. Example:

  ```
  RINSTPRN /WT:D
  ```

The following complete example looks for a printer response file on redirected drive Z: with the name PRINTER.RSP. The PRDRV.LST and the PRDESC.LST file are located on Z:\PMDD-1. The WIN-OS/2 printer setup file is located on Z: and has the name CONTROL.INF. The map file of the WIN-OS/2 printer driver has the name DRVMAP.INF and is located on the Z: drive. The USERnnnn.LOG file will be written to the redirected drive Z:. OS/2 and WIN-OS/2 are installed on drive D.

Example:

```
RINSTPRN /R:Z:\PRINTER.RSP /DRV:Z:\PMDD-1\PRDRV.LST
/DSC:Z:\PMDD-1\PRDESC.LST /L1:Z:\USERnnnn.LOG
/S:Z: /WPR:Z:\CONTROL.INF /WDR:Z:\DRVMAP.INF /WT:D
```

3.2.3.2 Printer Response File

As we have seen above, the installation program needs a response file which contains all the required information to install a printer. A response file can be produced by using a standard editor such as the OS/2 Warp system editor. The keywords don't have to be in a certain order but only one keyword is allowed per line. Up to 20 printers and 60 queues and an unlimited number of network printers can be defined for one workstation. The supported keywords for the response file are listed in Table 9.

Table 9 (Page 1 of 4). Printer Response File Keywords

Parameter	**Description**
AdditionalPrinter	Define additional printer drivers. `Additionalprinter=<driver-number>` `<driver-number>` is the number of the printer driver in PRDESC.LST Example: `AdditionalPrinter=24 27`
CommPort	Specify communication port settings `CommPort<x>=<b>,<p>,<d>,<s>,<h>` `<x>` Communication port number between 1 and 3 `<b>` Baud rate `<p>` Parity, 0=Odd, E=Even, N=None `<d>` Data Bits, values from 5 to 8 `<s>` Stop Bits values 1, 1.5, 2 `<h>` Handshake, H=Hardware, N=None Default is: `1200,0,7,1,N` Example: `CommPort1=9600,N,8,1,H`
DefaultPrinter	Specifies the suffix number from the printer keyword of the printer that should be the default printer. `DefaultPrinter=<printer-number>` `<printer-number>` is the valid printer suffix number Example: `DefaultPrinter=1`
DefaultQueue	Specifies the suffix number of the queue keyword of the queue that should be the default queue. `DefaultQueue=<queue-number>` `<queue-number>` is the valid queue suffix number Example: `DefaultQueue=1`

Table 9 (Page 2 of 4). Printer Response File Keywords

Parameter	Description

NetQueue	Defines a link to a queue on a network computer
	`NetQueue=<network-type>:\\<computer-name>\<queue-name>, <printer-driver> {,",printer-description>"} {,<queue-processor>} cms {,<property-file>}`
	`<network-type>` is the LAN type you have installed LS = IBM LAN Server and NW = Novell Netware
	`<computer-name>` Name of the computer
	`<queue-name>` Name of the queue
	`<printer-driver>` printer driver number
	`<printer-description>` Description for the printer
	`<queue-processor>` Name of the queue processor
	`<property-file>` Name of the property file
	
	Example:
	`NetQueue=LS:\\PRNTSRV\PSCRIPT1, 124, "IBM 4029 Laser Printer", IBM4029.PJP`

Printer	Define a printer `Printer<x>=<driver-number>` `<x>` printer number between 1 and 20 `<driver-number>` is the number of the printer driver in PRDESC.LST Example: `Printer1=24 27`
PrinterDesc	Define a printer description `PrinterDesc<x>=<printer-description>` `<x>` printer number between 1 and 20 `<printer-description>` any ASCII string up to 60 character Example: `PrinterDesc1=My favorite IBM 4019 printer`
PrinterName	Define a printer name `PrinterName<x>=<printer-name>` `<x>` printer number between 1 and 20 `<driver-number>` any ASCII string up to 8 characters Example: `PrinterName1=MY4019`
PrinterPort	Define a printer port `PrinterPort<x>=<port>` `<x>` Printer port number between 1 and 20 `<port>` LPT1 - LPT12, COM1 - COM3 Example: `PrinterPort1=LPT1`

Table 9 (Page 3 of 4). Printer Response File Keywords

Parameter	Description
Properties	Define printer and job properties `Properties=<printer-number>,<queue-number>,<prooperty-file>` `ter-number>` number of the printer `<queue-number>` number of the queue `<property-file>` name of the property file, created with the BACKPRN program Example: `Properties=1, 2, PSCRIPT.PJP`
Queue	Define a queue `Queue<y>=<printer-number> <driver-index>` `<y>` queue number between 1 and 60 `<printer-number>` suffixed number of the appropriate printer `<driver-index>` index in the driver list Example: `Queue1=1,2`
QueueDesc	Define a queue description `QueueDesc<y>=<queue-description>` `<y>` queue number between 1 and 60 `<queue-description>` ASCII string up to 60 characters Example: `Queue1=Queue for my IBM 4019`
QueueName	Define a queue name `QueueName<y>=<queue-name>` `<y>` queue number between 1 and 60 `<printer-number>` ASCII string up to 8 characters Example: `QueueName1=MY4019Q`
QueueProc	Define a queue processor `QueueProc<y>=<queue-processor>` `<y>` queue number between 1 and 60 `<printer-number>` queue processor name (PMPRINT or PMPLOT Example: `QueueProc1=PMPRINT`

Table 9 (Page 4 of 4). Printer Response File Keywords

Parameter	Description

WinPrinter	Define a WIN-OS/2 printer
	`WinPrinter=<printer-number>`
	`WinPrinter="<printer-driver>",<port>`
	`<printer-number>` name of an OS/2 printer defined prior
	`<printer-driver>` WIN-OS/2 driver name appropriate printer
	`<port>` is a WIN-OS/2 printer port
	
	Example 1: `WinPrinter=1, 2`
	Example 2: `WinPrinter="IBM Personal Page Printer II-031" ,LPT4.OS2`

Note:

Each keyword is optional and can be used in any order. Only one keyword is allowed per line. Keywords are followed immediately by an &quote.=&quote. sign and a key value.

This is just a short summary of the keywords for a response file. If you need additional information please refer to *OS/2 Installation Techniques: The CID Guide*

3.2.4 How to Update Printer Drivers

You may want to update a printer driver for a variety of reasons. You may want to update it if you have a newer version from a bulletin board or if the existing driver causes problems. In either case, you should always first delete the old driver. To do this, perform the following steps:

- Open the **Settings** page of any printer object.
- Click on **Printer Driver**.
- Point on a printer driver and press mouse button 2.
- Select **Delete**. The Delete Object Confirmation window appears as seen in Figure 33 on page 103.

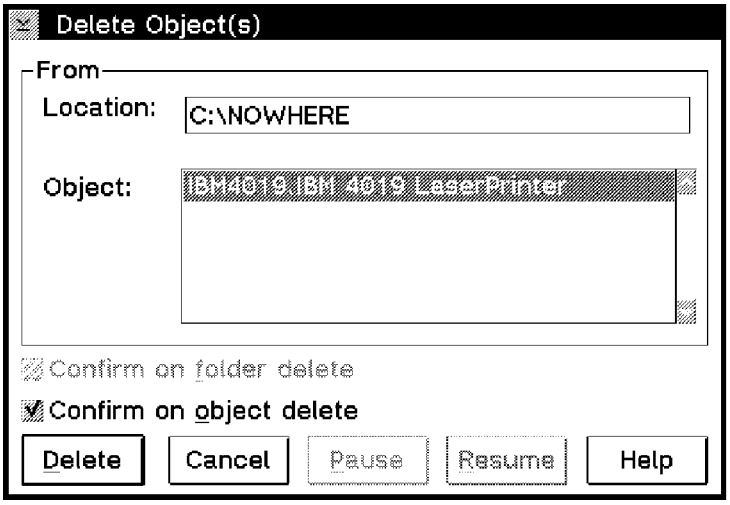


Figure 33. The Delete Object Confirmation Window

- Make sure you selected the right driver and select **Delete**.

To complete the update, simply follow the instructions in 3.2.1.6, “Installing a New Printer Driver” on page 92.

3.3 Supported Printer Device Drivers

This section describes which printer device drivers are supported in OS/2 Warp.

OS/2 Warp provides support for 14 different types of printer:

- IBMNULL
- EPSON for generic compatible printer
- HPDIPM for HP DeskJet printers
- IBM4019 for IBM 4019 printers
- IBM42XX for IBM 42xx printers
- IBM52012 for IBM 52012 printers
- IBM52XX for IBM 52xx printers
- IBMPCL3 for printers that support PCL 3
- IBMPCL5 for printers that support PCL 5
- LASERJET for LaserJet compatible printers
- POSTSCRIPT for PostScript compatible printers
- SMGXPGET for the PaintJet printers
- PLOTTERS for plotter devices
- OMNI for Epson, DeskJet and PaintJet printers

All printers for OS/2 Warp are 32-bit with the exception of Epson, DeskJet and PaintJet. Although the OMNI driver supports these three printers, they are being maintained for backward compatibility. The file \OS2\INSTALL\PRDESC.LST contains the list of the printers you see when you install a printer device driver under OS/2 Warp. However, for a complete list of all supported printers, please refer to B.2.2, “IBM PCM Table” on page 330 or to B.3, “Bulletin Boards” on page 330.

3.3.1 What to Do if Your Printer is not Supported

If your printer is not supported by OS/2 Warp, but it does support a printer in emulation mode, install the corresponding driver. For example an IBM 4072 can emulate Epson printers. In this case install the driver for an Epson printer and switch the printer to the Epson emulation mode (you can do this from the control panel of the printer). Some printer even switch automatically between different emulations, depending on the data stream they receive.

Another hint is to look for newer printer driver releases. Most of the printer manufacturer update their printer driver frequently. Check out the the PCC BBS under \PUB\OS2\DRIVERS for up-to-date printer drivers. For addresses and phone numbers refer to Appendix B, “OS/2 Device Driver Sources” on page 325. Table 10 shows a list of additional printer models which are supported with the appropriate driver versions.

Table 10 (Page 1 of 2). New Printer Devices Supported with New Printer Drivers Releases

Printer driver	**Printer model**
PSCRIPT.DRV Ver. 30.452	HP DeskJet 1600CM HP LaserJet III v52_2 HP LaserJet 5P/5MP Postscript TI Microlaser POWER PRO TI Microlaser PRO 300 TI Microlaser PRO E
LASERJET.DRV Ver.30.453	Oki OL400ex Oki OL410ex Okidata OL400e Okidata OL410e
PLOTTERS.DRV Ver.30.453	DesignJet 230 DesignJet 250C

Table 10 (Page 2 of 2). New Printer Devices Supported with New Printer Drivers Releases	
Printer driver	**Printer model**
OMNI.DRV Ver. 30.453	Canon BJ-30 Canon BJ-70 HP DeskJet 660C HP DeskJet 850C Epson STYLUS PRO Epson STYLUS PRO XL

Try also to contact your printer manufacturer directly by calling their mailboxes if you can't get the desired drivers from one of the public BBS. Some good sources are listed in B.1.2, “World Wide Web and FTP Sites” on page 327. You can find most of the OS/2 drivers in directories like \PUB\OS2\DRIVERS, depending on the mailbox or FTP site you choose.

3.4 Configuration of Printer Device Drivers

This section describes how to configure the different components of the OS/2 Warp print subsystem. The difference between printer sharing and printer pooling will be discussed as well as the polling support for the PRINTxx.SYS drivers. Afterwards, spooler and queue driver installations and configurations will be explained.

3.4.1 Printer Driver Settings

OS/2 Warp Version 3 introduces a new graphical interface for some of the new printer drivers. This interface is found through the printer settings (click with mouse button 2 on any printer object and select **Settings**) and allows the user to set the physical characteristic of the printer. For example, the OMNI driver has two choices: Information and Forms.

Information provides some general information about the particular driver, such as the vendor or the level of code.

Forms allows the user to set the tray type, the paper size, and media types. Other tabs become visible on this page to allow the user to amend the tray type or adjust the paper size to meet specific requirements.

The layout of the settings page for several of the printer drivers has changed to provide the user with an easier interface and allows the user to access the various printer options easily.

3.4.2 Printer Sharing

Printer sharing is the term used when multiple printer objects are connected to a single printer. Figure 34 shows this situation.

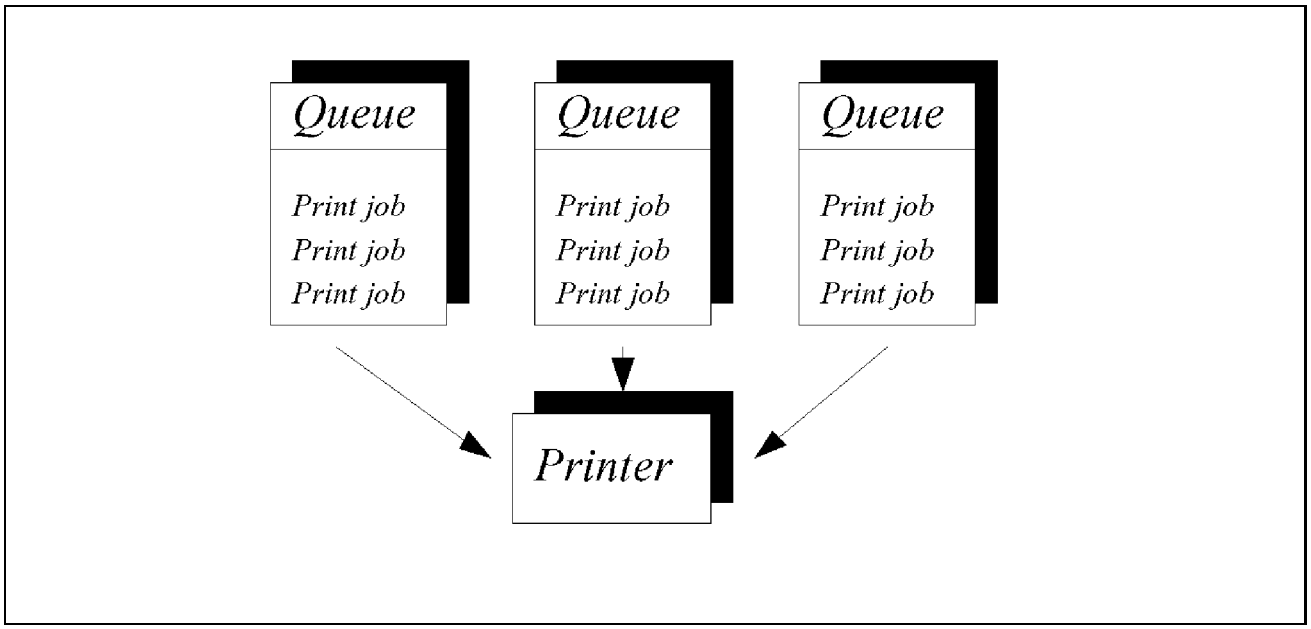


Figure 34. Printer Sharing Diagram

The advantage of printer sharing is that one printer object can be configured with one set of printer properties, and another printer object can be set up with a different set of printer properties. This means, for example, that one printer object can be configured to print in landscape mode, while another printer object can be configured to print in portrait mode.

Note

The **Share Access** option on the Parallel Port Settings dialog allows DOS applications to share the same port. You should turn off this option, if you see output from different applications being intermixed.

To turn on the share access option follow the step described below:

- Open the **Settings** page from any printer object.

- Select **Output**.
- Point at an output port and press mouse button 2.
- Select **Settings**. The Parallel Port Settings Dialog appears as seen in Figure 35.

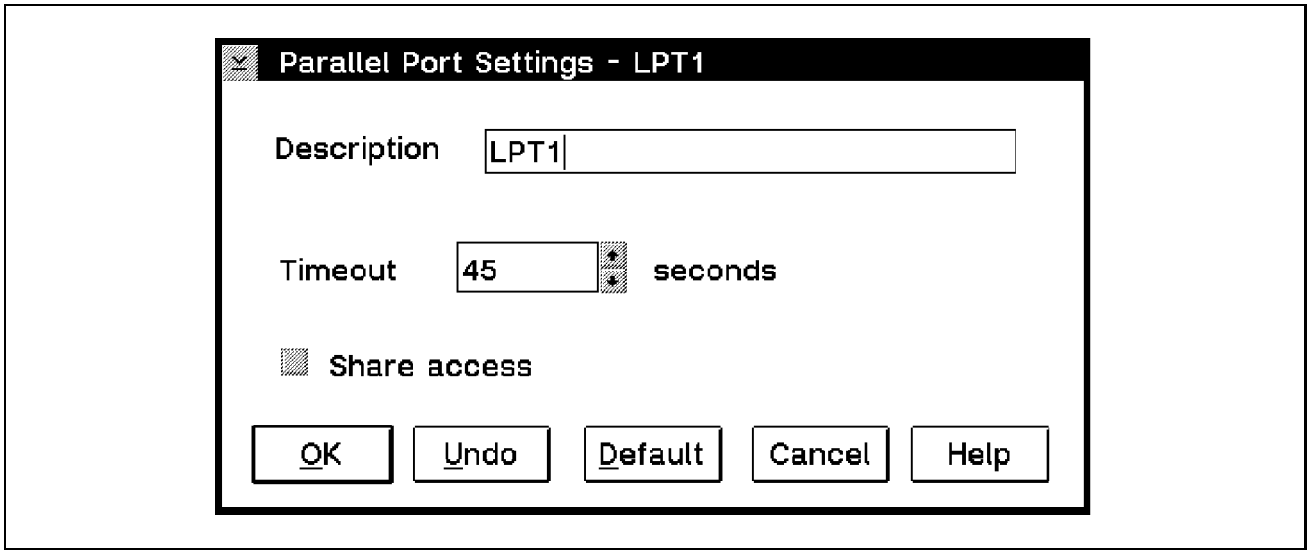


Figure 35. Parallel Port Settings Dialog

- Select **Share access**.
- Select **OK**.

The timeout option specifies the printer delay before the computer reports it as an error. Laser printers, especially PostScript printer, need more time to process a print job, therefore the value should be higher. The recommended values for the timeout option are:

- 10 seconds for a matrix printer
- 45 seconds for a laser printer
- 120 seconds for a PostScript printer

3.4.3 Printer Pooling

Printer pooling is the term used when a printer object has more than one port selected on the *Output* page of its Settings notebook. The diagram in Figure 36 on page 108 shows this configuration. Print jobs sent to this printer object can be printed to any of the selected ports for load balancing. The spooler will print the next job on the first available port, increasing the number of jobs that can print at any one time.

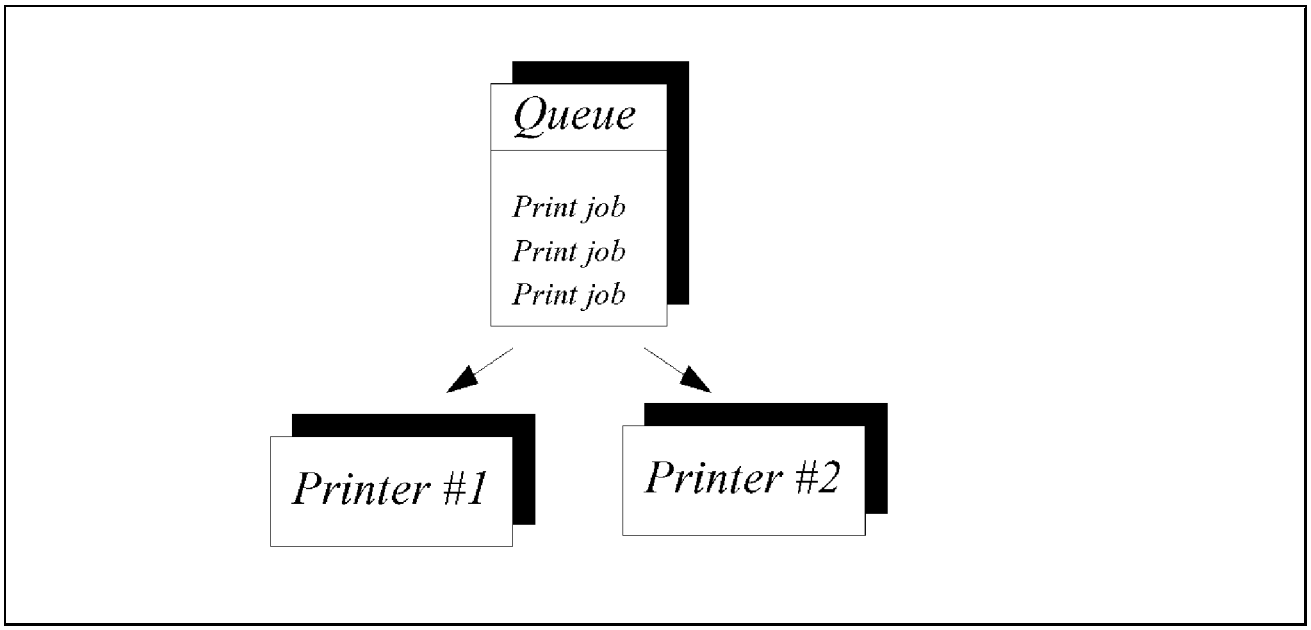


Figure 36. Printer Pooling Diagram

To enable this function, change to the *Settings* page of any printer object and select **Output**. Now select more than one printer port, by simply pressing and holding mouse button 1, while pointing at the ports.

3.4.4 Polling Support

Generally, there are three parallel protocols for the transfer of data available:

- Character hardware interrupt driven
- Block hardware interrupt driven
- Polling

Both of the first two methods are interrupt driven and were already supported by earlier OS/2 versions. OS/2 Warp now supports a third protocol called *Polling*. It was introduced in order to fix problems with some earlier ports, which didn't support interrupt sharing. With the use of polling, interrupt sharing is no longer necessary and it frees another interrupt (interrupt 5 and/or interrupt 7) for use with other devices, such as sound cards. It also increases the data transfer speed dramatically (approximately factor five). But since more instructions are executed for one character, the processor loses time which could be used elsewhere, depending on the priority of other tasks.

3.4.4.1 PRINTxx.SYS Switches

The OS/2 printer driver PRINTxx.SYS is polling enabled. However, in CONFIG.SYS you can specify the /IRQ argument by typing:

```
BASEDEV=PRINTxx.SYS /IRQ
```

This enables the interrupt driven method. A description of the switches for the PRINTxx.SYS driver is shown in Table 11.

Table 11. PRINTxx.SYS Switches

Driver name	Switches
PRINT01.SYS for non-Micro Channel systems	• (none) - default for PRINT01.SYS driver is to use polling (for LPT1-LPT3). • /IRQ - the driver will print using the interrupt methods. Printing (for LPT1-LPT3) will either use INT5, INT7 or timer interrupts.
PRINT02.SYS for Micro Channel systems	• (none) - default for PRINT02.SYS driver is to use polling unless Direct Memory Access (DMA) is available for the device. If DMA is present, then the interrupt method (DMA with interrupts) will be used. DMA support has the advantage of not tying up the processor. • /IRQ - the driver will print using the interrupt methods. Printing (for LPT1-LPT3) will use INT7 and will use DMA if available.

When using the polling parallel driver, always enable the spooler. OS/2 Warp writes each print job first to the hard disk if you have the spooler enabled. This means that your application will not have to wait until the printer is ready.

3.4.4.2 Using the Polling Parallel Driver

When using the polling parallel driver, which is the default setting in OS/2 Warp, you should pay attention to some of the following points in order to get a good performance:

- Always activate the spooler
- Use as short a timeout interval as possible (default is approximately two minutes).
- If using the polling driver causes a background task (such as downloading a file via COM port) to run too slowly:
  - Use the spooler and lower the print priority. You can find the spooler icon in the System Setup folder.
  - Raise the background priority.
- If maximum print performance is desired, set the spooler priority value to its highest value. Make sure the spooler is enabled.

- If a printer goes offline and cannot be restored and you want to close the application which tries to print, perform the following steps:
  - Cancel job and wait for timeout.
  - Perform a shutdown.
- If you want to force polling on a DMA-enabled ports, install PRINT01.SYS instead of PRINT02.SYS in CONFIG.SYS as seen in 3.4.4.1, “PRINTxx.SYS Switches” on page 109.

3.4.4.3 Problems with the Polling Driver

Some printers may not work correctly when using the polling driver. Usually, this is the result of an unusual timing characteristic of the printer. While the polling driver has been implemented to accommodate a wide variations in interface usage and timings, some printers may slip outside the window that the polling driver accepts. In this case, use the /IRQ parameter as described in 3.4.4.1, “PRINTxx.SYS Switches” on page 109.

3.4.5 Spooler

The spooler object can be found in the System Setup folder under the OS/2 System folder. It enables control over the spooler, which is responsible for queuing and de-queuing all print jobs. The spooler object can only be moved, shadowed or opened, but it has some unique features like disabling and enabling the spooler.

3.4.5.1 Spooler Settings

In the spooler settings you can adjust values like the priority of the spooler and the spool path.

To access the spooler settings, follow the steps below:

- Open the **System** folder.
- Open the **System Setup** folder.
- Select **Spooler**.
- The Spooler Settings page appears as seen in Figure 37 on page 111.

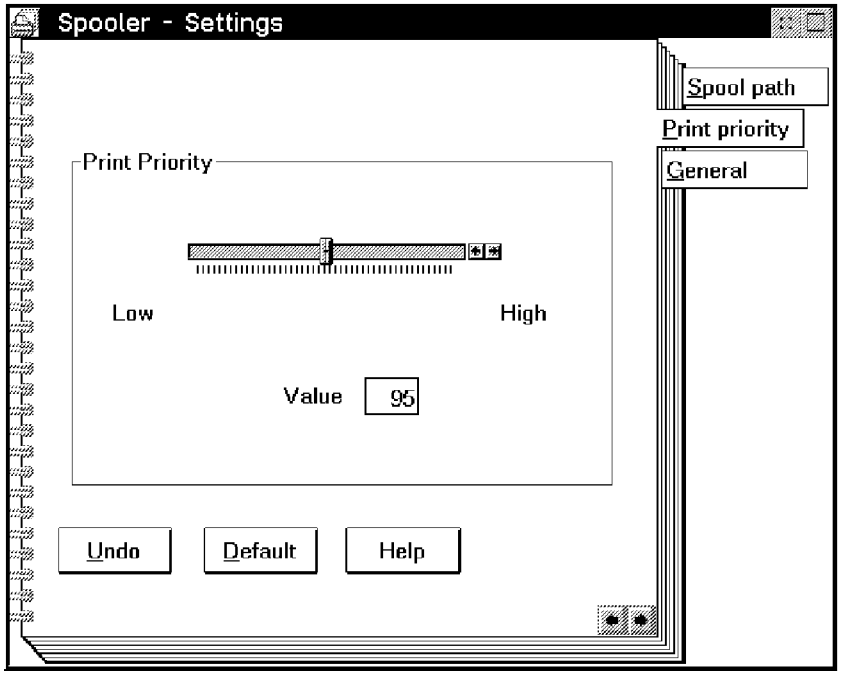


Figure 37. Print Priority Setting Page of The Spooler Object

The spooler object has two settings pages:

- **Spool path**

  This is the path where all the print jobs are stored (in subdirectories under this path). If you are running out of space, you can move this spool path to another disk that has more space.

- **Print priority**

  This contains a slider that enables you to change the priority of print jobs in OS/2. The higher the value the higher the priority given to the print subsystem. For general use, the default priority is 95 and should not be changed. For print servers, the value can be increased to 150 and more, although the rest of OS/2 (for example the user interface) will slow down while print jobs are running. Figure 37 shows an example of the priority setting page.

3.4.5.2 Redirection

The spooler can be configured so that jobs assigned to a parallel printer port (for example LPT1) can be redirected to a serial printer port (for example COM1) or to any other available free port. To redirect a port follow these steps:

- Open the **Settings** page of a printer object.
- Select **Output**.
- Select a free port and press mouse button 2.
- Select **Redirection**.
- Choose a printer port.

The change takes effect immediately.

Redirection can also be done from a command line by typing the SPOOL command:

```
SPOOL /D:LPT1 /O:COM1
```

where LPT1 is the input device and COM1 is the output device. This command redirects every print job sent to the LPT1 port to the COM1 port. The spooler acknowledges the command as seen below:

```
SPOOL is running. Print data will be redirected from
device LPT1 to device COM1.
```

To print a job to the COM1 port, type:

```
PRINT SAMPLE.DOC /D:LPT1
```

The spooler now redirects this print job to the COM1 port.

To check the ports which are redirected simply type:

```
SPOOL /Q
```

at the command prompt. The spooler lists the status of each port. For example:

```
The spooler is enabled.
Print data is redirected from device LPT1 to device COM1.
Print data is redirected from device LPT2 to device LPT2.
Print data is redirected from device LPT3 to device LPT3.
```

3.4.5.3 Disabling the Spooler

The spooler can be disabled with the **Disable Spooler** option on the pop-up menu of the spooler object as seen in Figure 38.

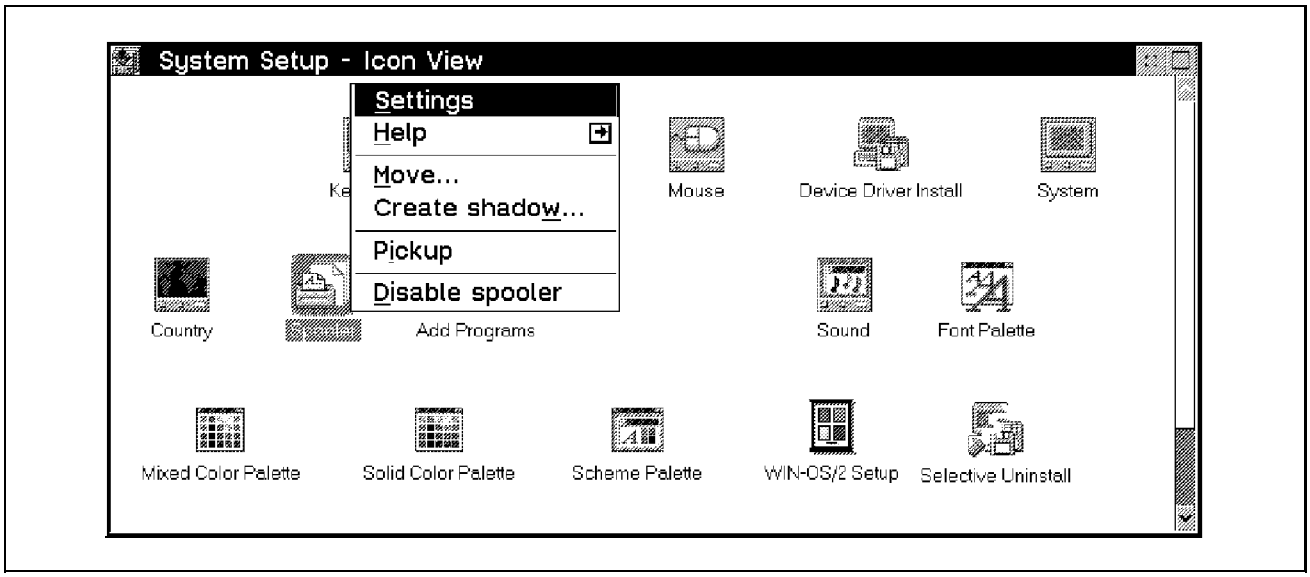


Figure 38. Pop-Up Menu of the Spooler Object

A reason to disable the spooler could be that you are using only WIN-OS/2 applications, and you want to see all print jobs in the WIN-OS/2 Print Manager rather than a printer object.

Note

Disabling the spooler in OS/2 Warp takes effect immediately. You don't have to shutdown the whole system as in prior OS/2 versions.

When the spooler is disabled, print jobs from different sources can appear on the same sheet of paper because OS/2 Warp has no way of keeping the print jobs separate without the spooler.

3.4.5.4 Enabling the Spooler

You can enable the spooler from the pop-up menu of the spooler object. This option is only shown if the spooler is disabled. This action takes place immediately.

3.4.6 Queue Driver

Each printer object has a queue with a queue driver that separates incoming print jobs from each other. The queue driver is called by the spooler to pass print jobs on to the printer driver. It ensures that the print job in the queue conforms to the printer properties described in the settings of the printer driver object. There are two queue drivers shipped with OS/2 Warp:

- **PMPRINT**

  This is the default queue driver.

- **PMPLOT**

  Use this driver when sending print jobs to a plotter to reverse clip the data. Reverse clipping is a process that clips overlapping areas so that the correct output is produced.

These two queue drivers create a presentation space (PS) and a device context for use with the printer driver.
A PS is a PM object type used to contain text and graphics for printouts. Data in the PS is not stored in a device-specific format.
The device context assigned to a PS is the operating system component that converts PS data into a format that can be printed on a particular device.

3.4.6.1 Installing a Queue Driver Object

Normally there is no need to install a queue driver object separately because it is already part of a printer object. However, if your printer device requires a special queue driver you should follow the steps below:

- Select the appropriate printer object.
- Click mouse button 2.
- Select **Settings**.
- Select the **Queue options** tab.
- Select the queue driver.
- Click mouse button 2. You will see a window as shown in Figure 39 on page 115.

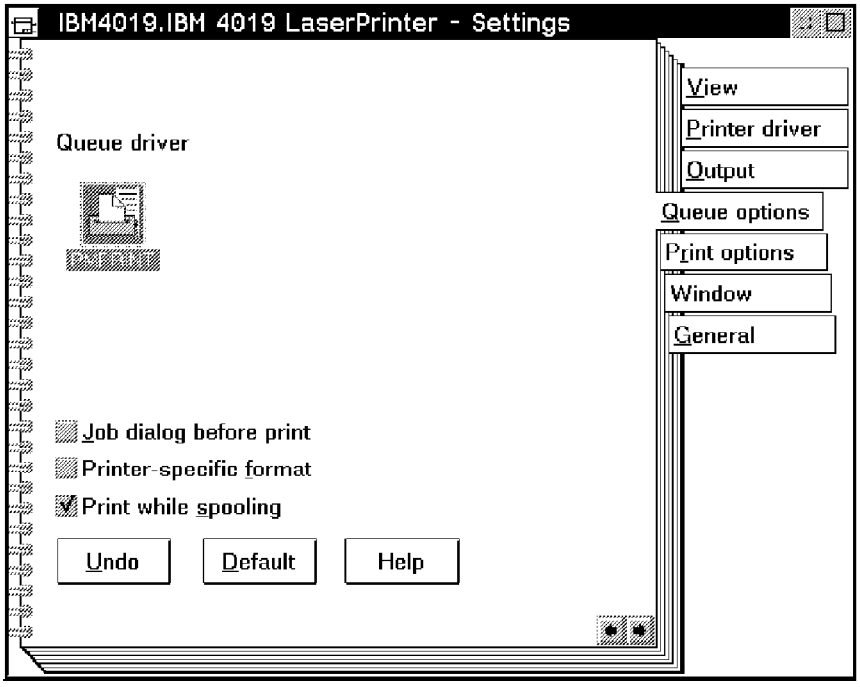


Figure 39. Installing a Queue Driver Object

- Select **Install**.
- Insert the diskette containing the queue drivers in drive A or type the appropriate drive and path in the directory field.
- Select **Refresh.**
- Select one or more new queue drivers from the Queue driver field.
- Select **Install**.

3.4.6.2 Queue Driver Object Settings

The two system queue drivers, PMPRINT and PMPLOT, have no settings, so the open settings pop-up menu option is not available. Queue drivers from other sources may have a settings notebook.

3.4.7 IRQ-Settings

Unlike DOS, OS/2 Warp uses interrupts for printing. You cannot change interrupts nor port I/O addresses manually. This is because OS/2 Warp automatically assigns LPT1 to the highest available printer port I/O address in the system.

Sharing interrupts can cause problems for ISA systems. The ISA bus utilizes edge-triggered interrupts, whereas MCA and some EISA systems use

level-sensing interrupts. The disadvantage of an edge-triggered interrupt is that it can be sensed only for a very short time. If an interrupt arrives while another is being processed, then the second interrupt will be lost. This is especially the case under a multitasking environment such as OS/2 Warp, because it is able to use several devices simultaneously. This can lead to various difficulties such as unreliable printing or the disappearance of characters in a communication session.

A similar problem is shared I/O port addresses. The various hardware adapters in a system must be assigned unique addresses. Consider what might happen, for example, if the commands meant for the printer are sent to the floppy drive.

Attention

Ensure that every adapter and every port in the system possesses its own unique IRQ and I/O port address assignments.

Table 12 shows standard I/O port addresses and IRQ settings for systems with two parallel ports:

Table 12. Setup for Systems with Two Parallel Ports

Port Address	ISA	EISA	Micro Channel
LPT1	3BC/IRQ7	3BC/IRQ5 or IRQ7	3BC/IRQ7
LPT2	278/IRQ5	378/IRQ5 or IRQ7	378/IRQ7

Table 13 shows standard I/O port addresses and IRQ settings for systems with three parallel ports:

Table 13. Setup for Systems with Three Parallel Ports

Port Address	ISA	EISA	Micro Channel
LPT1	3BC/IRQ7	3BC/IRQ5 or IRQ7	3BC/IRQ7
LPT2	378/IRQ5	378/IRQ5 or IRQ7	378/IRQ7
LPT3	278/IRQ5	278/IRQ5 or IRQ7	278/IRQ7

You might notice that in a system with three parallel ports, LPT2 and LPT3 are assigned to the same interrupt (IRQ7). If you want to print on both LPT2 and LPT3 at once, a conflict will occur as described above. OS/2 Warp will

attempt to handle this conflict by switching between the I/O requests, suspending one port while data is transferred via the other port. This method of printer sharing may cause problems and decreases print performance. Therefore it is not recommended unless such an arrangement cannot be avoided.
An example of both parallel and serial configuration is shown in Table 14.

Table 14. Example of a Configuration for Parallel and Serial Ports

Port Name	**I/O Address**	**Interrupt**
COM1	3F8h	IRQ4
COM2	2F8h	IRQ3
COM3	3E8h	IRQ5 (not used by LPT2)
COM4	2E8h	IRQ10
LPT1	3BCh	IRQ7

Also pay attention to the configuration of the serial ports. In contrast to the parallel port, you can change the interrupts and port addresses of the serial port by modifying the COM.SYS statement in CONFIG.SYS see 7.3.2, “Configuration of Serial Port Drivers” on page 285.

3.5 Miscellaneous

In this section, other printer driver performance enhancements and problem determination will be discussed.

3.5.1 Printing Performance Tips

You can get performance gains by just changing a switch or an option to another setting. A list of performance enhancement tips for the OS/2 and WIN-OS/2 print subsystem is shown below:

- For the LaserJet and IBM 4019 printer drivers, you should select the **Fast System Fonts** checkbox (this is the default). If you have overlapping text and graphics, you may get printing errors. In this case, you can get better results by disabling this option, at the expense of performance.

- If you are printing a draft document, select a lower resolution in the **Printer Driver Properties** dialog box (for example 150 dpi instead of 300 dpi).

- For better application response time and less disk space usage, ensure that you don't select **Printer specific format** in the printer object settings page.

- If printing from a WIN-OS/2 application is slow but acceptable elsewhere, you should increase the DPMI memory to 4 MB or 6 MB. To do this, open the settings page of the WIN-OS/2 application and select **Session**. Click on **WIN-OS/2 Settings**. Now increase the DPMI parameter to 4 MB or 6 MB.

- Make sure you selected one of the .OS2 ports (for example LPT1.OS2) for printing in a WIN-OS/2 application, because this directs the data flow directly to the OS/2 Warp spooler.

- If you have a PS/2 system that supports DMA (Direct Memory Access) access parallel ports, you should configure the parallel port adapter arbitration level to SHARED7 (enabled) to get a DMA printing.

- Increase the OS/2 spooler priority (see 3.4.5.1, “Spooler Settings” on page 110).

3.5.2 Problem Determination

Many printer problems are caused by configuring the wrong driver. Interrupt sharing is also a source of trouble. Remember that each interrupt and I/O port address has to be unique! If you have an adapter that has the same interrupt level as the parallel port, you have to change the interrupt either for the parallel port or the adapter. Table 15 lists some of the most common printing problems.

Table 15 (Page 1 of 3). Problem Determination Table

Problem description	**Action**
SYS0004 - Cannot write to LPT1 or PMV8007 - The printer is switched off or LPT1 not responding	Verify you have a printer object and it is set up properly. Make sure the printer is turned on.

Table 15 (Page 2 of 3). Problem Determination Table

Problem description	**Action**
One or more ports of a printer object are in use, but no printer is associated with those ports. Or: Multiple printer queues appear in a program, but there is only one printer object defined on the Desktop.	The OS2.INI and OS2SYS.INI files have been damaged. Re-create the .INI files.
There is no output from a PostScript printer.	Verify that the default printer driver has the letters PSCRIPT in its name. Make sure that the output file is formatted for PostScript.
Your printer is not on the list of supported printers, showed during installation.	Try to run your printer in an emulation mode of an OS/2 printer driver, or use the IBMNULL driver.
You have a DOS program that uses its own internal printer driver.	Ensure that you use the IBMNULL driver. This ensures that data from the program will not be changed.
Printer is not responding, no output or corrupt printer output after installing OS/2 Warp. User can print from DOS.	Switch off the polling support for the PRINT01.SYS driver by using the /IRQ argument (see 3.4.4.1, “PRINTxx.SYS Switches” on page 109).
The first one or more characters of your printout are incorrect.	Make sure you installed the correct printer driver and that your printer fully emulates the selected drivers.
When printing to a 4029 printer and using the IBMPCL5.DRV the print may look garbled or smeared.	The 4029 comes only with PCL3 support. If you want to print PCL5 on this printer you need to upgrade your printer to PCL 5 emulation. This can be done by plugging a daughter card into the main board. If you don't want to upgrade, you must install the IBMPCL3 driver.
Printing is slower than in OS/2 2.1 or OS/2 2.11 or: Printing interrupted by other processes or: Printing uses excessive CPU resources.	Set LPT1 to IRQ 7 and LPT2 to IRQ 5. You may also try to disable the polling support (see 3.4.4, “Polling Support” on page 108).
The Fonts Tab within printer properties of the OS/2 Warp OMNI driver is not functional.	In the OMNI driver version 30.437, the fonts tab in the printer properties has not been implemented. The tabs within **Fonts** will not work.

Table 15 (Page 3 of 3). Problem Determination Table	
Problem description	**Action**
When do I have to install the Epson driver, DeskJet driver, PaintJet driver, or OMNI driver?	Support for the Epson, DeskJet and PaintJet drivers are all included in the OMNI driver. It is preferred that the OMNI driver should be installed. However, if you want to print on a OS/2 2.1 server that is currently using the 2.1 drivers, you should select either the Epson, DeskJet or PaintJet driver in order to be backward compatible.

3.5.3 Printer FixPaks for OS/2 Warp

Some problems are solved with the newest printer drivers. These drivers can be part of FixPaks, which you can download from BBS or from the Internet (see Appendix B, “OS/2 Device Driver Sources” on page 325).

The following list of new printer driver FixPaks describes which problems will be solved by applying them.

IBMNULL Ver.30.453 (File XR0P018.DSK) fixes the following problems:

- Invalid printout to HP LaserJet (driver level 30.437) from 3270 host print
- Trap 000D in IBMNULL printer driver

LASERJET Ver.30.453 (File XR0P012.DSK) fixes the following problems:

- Form sizes for custom forms created for LASERJET.DRV are incorrect if more than one custom form is created.
- LASERJET.DRV prints an incorrect horizontal line when using envelopes.
- Printing with AMIPRO gives a blank output area in the middle of the page using the OS/2 Warp LaserJet driver.
- Printing on landscape and legal options in IBM WORKS using HP LaserJet Series II prints a vertical line next to each character.
- Printing to a HPLJ 4 (VER 30.443) from CM/2 1.11 prints a blank space on each and every line at two places on the document.
- After setting the forms with different options for the LaserJet driver, the printout comes out on plain paper instead of envelope.
- Printing to file and then performing drag and drop causes extra sheets of paper before and after a document on HP LaserJet IIP.
- Wrong output when using LASERJET.DRV VER. 30.444
- Migrating to OS/2 Warp from OS/2 2.11 the LaserJet printer properties have changed.

- Blank columns when printing from HP LaserJet 4P using driver LASERJET.DRV Ver.30.452.

IBM4019 Ver.2.387 (File XR0P015.DSK) fixes the following problem:

- Printing to the IBM4019 driver in 600 dpi with IWP/2 will cause a trap in the driver.

IBMPCL3 Ver.2.218 (File XR0P017.DSK) fixes the following problem:

- When printing text and graphics from IBM Works on IBM 4076 ExecJet II, you get the message " ERRONEOUS DATA DETECTED IN METAFILE".

IBMPCL5 driver Ver.2.218 (File XR0P014.DSK) fixes the following problems:

- When printing text and graphics from IBM WORKS on IBM 4076 ExecJet II you get the message " ERRONEOUS DATA DETECTED IN METAFILE".
- IBMPCL5 driver leaks memory in versions after 2.11 release.

PSCRIPT driver Ver.30.452 (File XR0P011.DSK) fixes the following problems:

- GPISETTEXTALIGNMENT does not work with PSCRIPT.DRV.
- Printing problem with OS/2 Warp and Novell.

OMNI driver Ver.30.453 (File XR0P013.DSK) fixes the following problems:

- The name OMNI.OKIDATA XXX is misleading. This driver uses the Epson language and not an Okidata language.
- When using the OMNI.DRV, after printing from an application, prints blank pages from DOS or OS2 window.
- Epson stylus OMNI driver won't print from a DOS application after printing from an OS/2 session.

3.5.4 How to Install a Printer FixPak for OS/2 Warp

To install a printer Fixpak for OS/2 Warp perform the following steps:

- Unpack printer driver with LOADDSKF to a directory on your system or to a diskette.
- Open the setting page of the printer object you want to apply the FixPak to.
- Select **Printer driver**.
- Deselect the driver you want to change and select another printer driver as default (for example IBMNULL).

- Close the printer object.
- Reboot the system without letting any print jobs print.
- Open the setting page of the printer object you want to apply the FixPak for.
- Select **Printer driver**.
- Select **Install** from one of the printer drivers. The **Install New Printer Driver** dialog will appear see Figure 30 on page 93.
- Select **Other OS/2 Printer Driver** and enter the drive and/or directory that you have put the driver files into for the install.
- Press the **Install** button and a message box will appear asking whether you would like to replace the driver with the new level.
- Select **Yes**.
- Close the **Install New Printer Driver** dialog and select the new driver for the print object.
- Close print object.

You will now be ready to print using the driver. If you need additional help installing the printer driver, please refer to the on line help facility.

Note: If you are in a network environment, we suggest that you match printer driver levels between both the server and the requestors.

Chapter 4. OS/2 Warp Storage Device Drivers

This section describes the storage device drivers (SCSI, floppy disks, DASD, CD-ROM, RAID device drivers) in OS/2 Warp with regard to the driver installation, which drivers are available in OS/2 Warp, configuration of device drivers and problem determination.

The term OS/2 Warp will be used as generic term for the following OS/2 Versions: OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect. If a description refers to one specific OS/2 version, it will be mentioned specifically.

The following different types of device drivers related to storage in OS/2 Warp:

- Device managers
- Adapter device drivers
- Filter device drivers

An overview of the interconnection between the storage adapter device drivers, device managers and filter device drivers in OS/2 Warp is shown in Figure 40 on page 124.

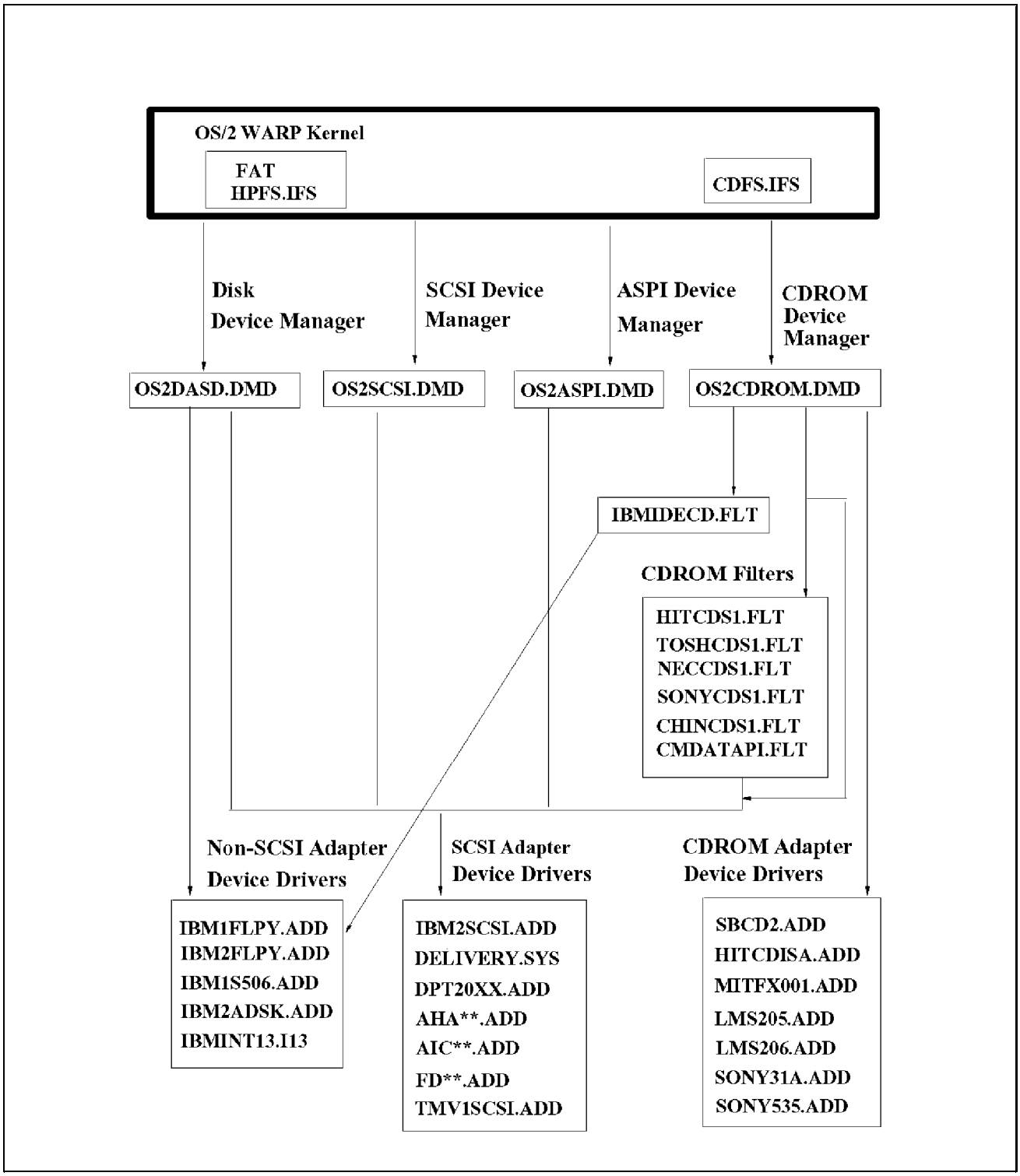


Figure 40. Storage Device Driver Overview

4.1 Device Managers (.DMD)

A device manager is a hardware-independent module that services the standard OS/2 request packet interface. It provides a uniform interface between its client and adapter device drivers. Device manager clients normally are an OS/2-installable file system or the OS/2 kernel but can be other device drivers. They are called clients because in their interactions, the device manager is treated as a server.

The Device Managers provided with OS/2 Warp are shown in Table 16

Table 16. Device Manager Drivers

Device Manager Driver	**Device Manager Client**
OS2DASD.DMD	OS/2 Warp File System
OS2SCSI.DMD	SCSI.SYS option drivers
OS2ASPI.DMD	ASPI option drivers
OS2CDROM.DMD	CD-ROM file system

OS/2 Warp requires a device to be allocated by a device manager, such as OS2ASPI.DMD or OS2DASD.DMD before it can be accessed. Device managers can handle this in one of the following two ways:

- Wait for a device driver to issue an allocation request using OS2SCSI.DMD
- Permanently allocate the device during system boot using OS2DASD.DMD and OS2CDROM.DMD

4.2 Adapter Device Drivers (.ADD)

An adapter device driver is a hardware-dependent module and is the lowest layer in the device driver hierarchy. Adapter device drivers provide a uniform software interface to the hardware devices that they manage. Adapter device drivers for industry standard interfaces shipped with OS/2 Warp are shown in Table 17.

Table 17 (Page 1 of 2). Adapter Device Drivers Shipped With OS/2 Warp

Device Driver	**Supported Devices**
IBM1S506.ADD	ISA ST-506 and AT Compatible IDE drives
IBM1FLPY.ADD	ISA diskette drives

Table 17 (Page 2 of 2). Adapter Device Drivers Shipped With OS/2 Warp	
Device Driver	**Supported Devices**
IBM2FLPY.ADD	Micro Channel (ABIOS) diskette drives
IBM2ADSK.ADD	ABIOS (non-SCSI) fixed disk drives
IBM2SCSI.ADD	Micro Channel SCSI controller device driver
IBMINT13.I13	Generic disk device driver using INT 13H BIOS
DPT20XX&period&.ADD	DPT ISA/EISA SCSI controllers

Hardware-specific SCSI adapter device drivers shipped with OS/2 Warp are shown in Table 19 on page 132. Hardware-specific CD-ROM adapter device drivers shipped with OS/2 Warp are shown in Table 22 on page 169.

4.3 Filter Device Drivers (.FLT)

Filter device drivers differ from adapter device drivers in that they normally do not manage hardware directly. Instead they monitor the stream of commands between a device manager (.DMD) and regular adapter device drivers (.ADD). Filter device drivers provid e the following services:

- Generic value-added services, such as data stripping or encryption
- Device-specific services, such as adjusting and altering the command stream between a device manager and an adapter device driver to support a particular type of device

The interfaces between device managers and filter device drivers are identical to the interfaces between device managers and ordinary adapter device drivers.

The filter device drivers shipped with OS/2 Warp are shown in Table 18:

Table 18 (Page 1 of 2). Filter Device Drivers Shipped with OS/2 Warp	
Filter	**Supported Devices**
HITCDS1.FLT	SCSI-1 Hitachi CD-ROM drives
TOSHCDS1.FLT	SCSI-1 Toshiba CD-ROM drives
NECCDS1.FLT	SCSI-1 NEC CD-ROM drives
SONYCDS1.FLT	SCSI-1 Sony and Texel CD-ROM drives
IBMIDECD.FLT	ATAPI (IDE controller) CD-ROM drives
CHINCDS1.FLT	SCSI-1 Chinon CD-ROM drives

Table 18 (Page 2 of 2). Filter Device Drivers Shipped with OS/2 Warp	
Filter	**Supported Devices**
CMDATAPI.FLT	CMD640 chipset [1]

Note

CMDATAPI.FLT and its corresponding adapter device driver CMD640x.ADD were not included in OS/2 Warp Version 3 and OS/2 Warp with WIN-OS/2. They were shipped with OS/2 Warp Connect. PJ19409 includes an updated version of these files along with the following:

- CMD640X.SYM
- CMDATAPI.SYM
- IBM1S506.ADD
- IBM1S506.SYM
- IBMIDECD.FLT
- IBMIDECD.SYM

PJ19409 can be obtained from the IBM PCC BBS.

4.4 SCSI Device Drivers

This chapter describes the SCSI drivers in OS/2 Warp in regard to the driver installation, which drivers are available in OS/2 Warp, configuration of device drivers and problem determination.

SCSI or Small Computer Systems Interface is described in detail in *IBM PS/2 and PS/ValuePoint Subsystems*, GG24-4002. It enables flexibility with regards to hardware configuration because of its standard interface. Up to seven SCSI devices can be directly attached to one SCSI controller. Each of these devices can further support up to an additional eight devices.

The list of available SCSI devices in the marketplace includes:

- Fixed disk drives
- CD-ROM drives
- Tape drives
- Optical disk drives
- Printers
- Plotters

- Scanners

SCSI drivers that are shipped with OS/2 Warp include:

- OS2SCSI.DMD
- IBM2SCSI.ADD
- OS2ASPI.DMD
- VASPI.SYS
- DELIVERY.SYS

Also, there are specific SCSI adapter device drivers included with OS/2 Warp which are shown in Table 19 on page 132 and detailed in OS/2 Warp online help.

These drivers are installed in the \OS2\BOOT subdirectory and loaded by default in the CONFIG.SYS as BASEDEV= statements if SCSI support is installed as shown below. `BASEDEV=OS2SCSI.DMD BASEDEV=IBM2SCSI.ADD`

VASPI.SYS is installed in the \OS2\MDOS subdirectory.

OS2SCSI.DMD is a device manager which provides a hardware independent interface to device drivers written to IBM's SCSI standard. It is a replacement driver for SCSI.SYS. Device managers provide communication between adapter device drivers (.ADD) and either the OS/2 Warp kernel or other devices. There are no parameters associated with this device driver.

IBM2SCSI.ADD supports IBM PS/2 SCSI adapters for IBM Micro Channel SCSI controllers. There are a number of parameters associated with this driver which are described in detail in the OS/2 Warp command reference and briefly in 4.5.1, “Configuration of SCSI Device Drivers” on page 135. Figure 41 on page 129 contains a syntax diagram of the available parameters for IBM2SCSI.ADD.

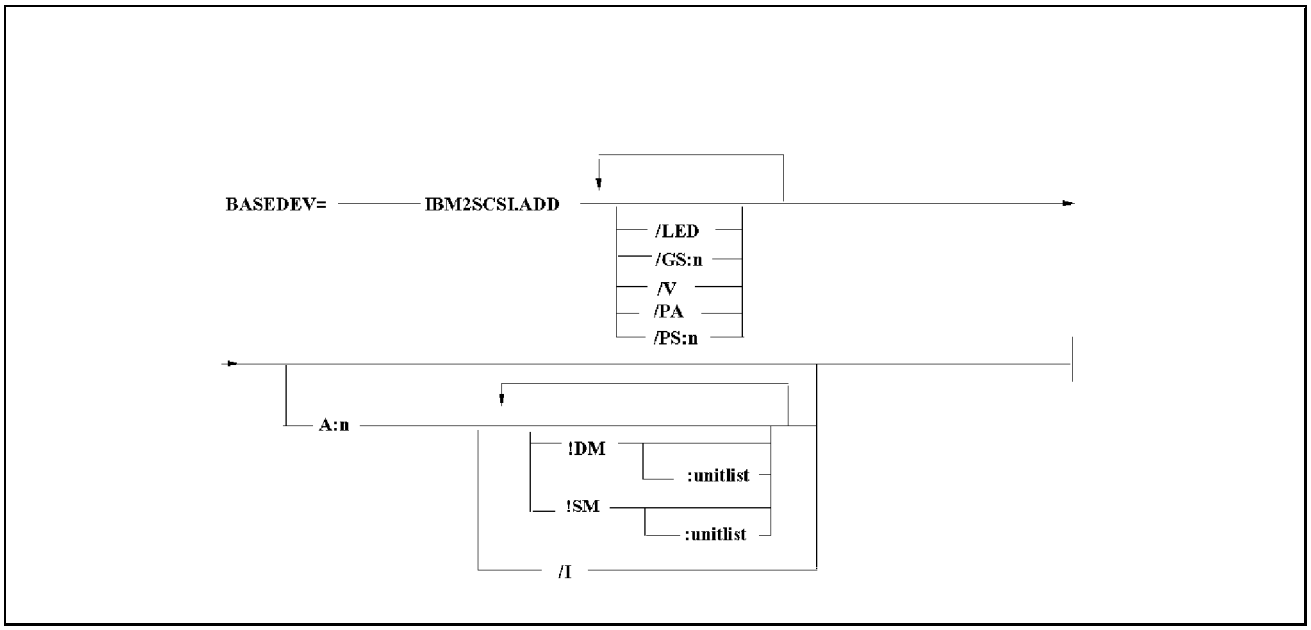


Figure 41. IBM2SCSI.ADD Syntax Diagram

OS2ASPI.DMD is the device manager transport layer for device drivers written to Adaptec's ASPI (Advanced SCSI Programming Interface). It provides a hardware-independent interface to device drivers written to Adaptec's ASPI specification. OS/2 Warp requires a device to be allocated by a device manager before it can be accessed. Device managers handle this allocation request by either waiting for the device driver to make the request or permanently allocating the device during system boot.

The ASPI specification however has no concept of device allocation which leaves it up to the implementation to decide what to do. OS2ASPI will not allocate a device until the first execute I/O command is issued. This allows it to scan for devices and not interfere with them until an application decides to issue a command. Once the allocation takes place however, OS2ASPI will not release the device because it can never be sure when the application is finished with it. In this case you may wish to specify the /SHARE parameter which is covered under 4.5, “ASPI” on page 134.

VASPI.SYS is the virtual ASPI device driver that enables ASPI support for ASPI applications running in a DOS session. Adaptec's ASPI allows easier access to SCSI devices. Under DOS, users typically load an ASPI manager that routes all requests directly to the hardware. ASPI DOS drivers such as ASPIDISK and ASPICD send requests to the ASPI manager who then sends the command on to the appropriate device. Under OS/2 Warp, applications that wish to send ASPI requests do so by routing them to a device manager,

OS2ASPI.DMD, which converts them into requests recognizable to any SCSI adapter device driver (.ADD).

DELIVERY.SYS is a driver which is only needed if you have an IBM SCSI-2 FAST/WIDE adapter installed in your system. It is loaded as a BASEDEV= statement in your CONFIG.SYS during OS/2 Warp installation if you have one of these adapters installed:

```
BASEDEV=DELIVERY.SYS
```

DELIVERY.SYS provides support for the Move Mode function on the SCSI-2 FAST/WIDE adapter. Move Mode is a type of system to adapter command protocol based on the PS/2 Subsystem Control Block (SCB) which allows more than one command to be sent to the adapter for each device. A protocol known as Tagged Command Queueing is used to accept the multiple commands. Tagged Command Queueing is an optional SCSI-2 device protocol that is mainly used by hard disk drives to allow more than one command at a time to be sent to the device by tagging each command line with a command number. This can improve the the subsystem performance by allowing the hard disk to re-order commands to reduce seek time and by eliminating the delay between when one command completes and when the disk can start processing the next command.

There are no parameters that can be specified on DELIVERY.SYS.

4.4.1 SCSI Device Driver Installation

The installation process of OS/2 Warp will scan your system for the presence of a SCSI adapter. If it is on the list of supported devices for which a device driver has been shipped with OS/2 Warp, it will automatically add the correct statements to your CONFIG.SYS and install the necessary files in the \OS2\BOOT subdirectory. If you are adding a different SCSI adapter or need to change the device selected during installation, you do this by performing the following steps:

1. Open the **OS/2 System** folder.
2. Select **Selective Install**.
3. Highlight **SCSI Adapter Support** as shown in Figure 42 on page 131.
4. Select your adapter from the list shown in Figure 43 on page 132. You may select more than one SCSI adapter.
5. You are returned to the Selective Install panel where the SCSI device you selected has been added under the SCSI Adapter Support section.
6. Select **OK** to continue the installation.
7. Follow the instructions on the display to complete the installation.

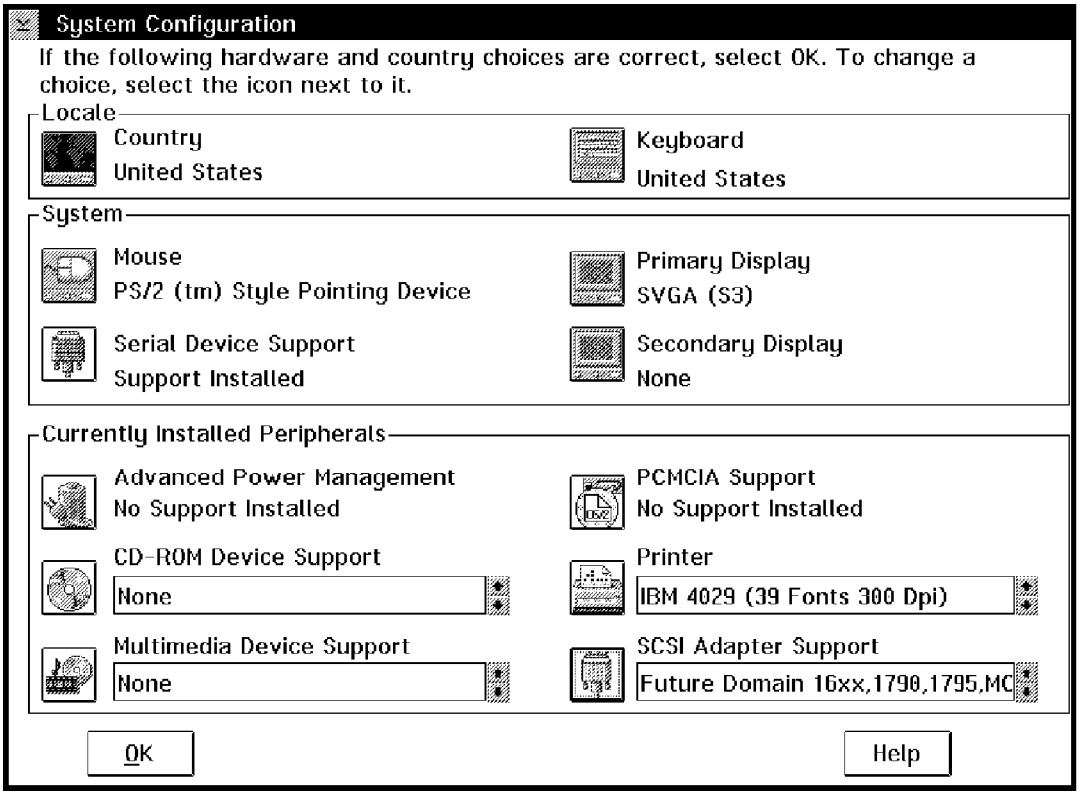


Figure 42. Selective Install of SCSI Support

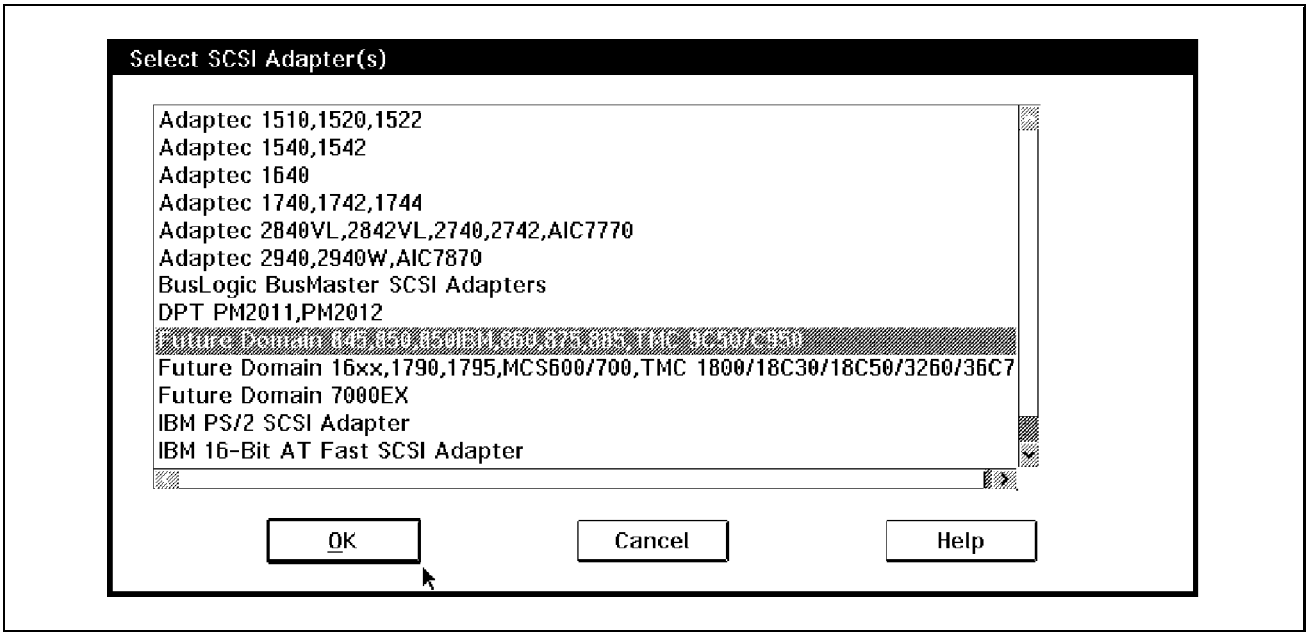


Figure 43. Select SCSI Adapter

Once the installation of SCSI support is completed, and you have rebooted your system, you will see additional BASEDEV statements in your CONFIG.SYS file which load the SCSI support for the device you selected.

For example, you loaded support for a Adaptec 1740 SCSI adapter, you would see the following statements added in your CONFIG.SYS:

```
BASEDEV=OS2SCSI.DMD
BASEDEV=AHA152X.ADD /A:0
```

4.4.2 Supported SCSI Device Drivers

See Table 19 for a complete listing of the supported SCSI adapters shipped with OS/2 Warp. If you have an adapter which is not listed in Table 19, obtain the latest version of PCMTABLE off the Internet or a BBS. The table lists devices which have been tested and found compatible with OS/2 Warp. In most cases, the drivers can be obtained from the device manufacturer. Further information on PCMTABLE is contained in B.2.2, “IBM PCM Table” on page 330.

Table 19 (Page 1 of 2). Supported SCSI Adapters

Manufacturer	Driver Name	Adapter
Adaptec	AHA152X.ADD	AHA-1510/1520/1522 ISA SCSI AIC-6350/6360

Table 19 (Page 2 of 2). Supported SCSI Adapters

Manufacturer	Driver Name	Adapter
Adaptec	AHA154X.ADD	AHA-1540/1542 ISA SCSI
Adaptec	AHA164X.ADD	AHA-1640 Micro Channel SCSI host adapter
Adaptec	AHA174X.ADD	AHA-1740/1742/1744 EISA SCSI host adapter
Adaptec	AIC7770.ADD	AHA-2840VL/2842VL ISA SCSI AHA-2740/2742 EISA SCSI AIC-7770
Adaptec	AIC7870.ADD	AHA-2940 PCI SCSI AHA-2940W AIC-7870
BusLogic	BTSCSI.ADD	BusMaster SCSI Host Adapter • BT-445S ISA VL SCSI • BT-542B, BT-542S ISA SCSI • BT-640A, BT646S Micro Channel SCSI • BT-742A, BT-747S EISA SCSI • BT-946 PCI SCSI
DPT	DPTM20XX.ADD	PM2011/2012
Future Domain	FD8XX.ADD	845, 850 860, 875, 885
Future Domain	FD16-700.ADD	16xx, 1790, 1795 1800/18C30/18C50 3260/36C70 MCS600/700
Future Domain	FD7000EX.ADD	TMC-7000EX
IBM	FD850IBM.ADD	TMC 850IBM
IBM	FD16IBM.ADD	IBM 16-bit ISA SCSI Adapter
IBM	IBM2SCSI.ADD	IBM 16 or 32-bit Micro Channel Adapter
IBM	DELIVERY.SYS	32-bit Fast and Wide SCSI Micro Channel Adapters
MediaVision	TMV1SCSI.ADD	ProAudio Spectrum with Trantor SCSI

All of the SCSI device drivers listed in Table 19 on page 132 are described in detail in OS/2 Warp's online help. If you have installed a SCSI adapter and are experiencing problems, verify with the online help that all the correct switches have been specified.

Note

An additional device driver that ships only with OS/2 Warp Connect and OS/2 Warp Connect with WIN-OS/2 is DETNE2.SYS. This driver detects the NE2000 Ethernet adapter, identifies and reserves its resources. An optional /P parameter specifying the port address can be added to the driver statement. For example:

```
BASEDEV=DETNE2.SYS /P:x   (where x=the port address)
```

4.5 ASPI

Advanced SCSI Programming Interface (ASPI) is a software specification developed by Adaptec that addresses the problem of SCSI software compatibility. ASPI defines a standard software interface to the SCSI bus. This interface is independent of the host bus adapter manufacturer's hardware implementation. It provides a protocol that allows multiple SCSI device drivers and programs to submit I/O requests to one adapter card, independent of the card manufacturer's implementation.

OS2ASPI.DMD provides this support in OS/2 Warp. This driver does not replace the SCSI device driver, but it enables the application to use the ASPI interface. If you have an OS/2 Warp printer or scanner software that supports ASPI, then you will be able to use it under OS/2 Warp using this driver (as a prerequisite your adapter must support ASPI). If your program does not use the ASPI technology, use the standard SCSI driver.

Most OS/2, and many DOS/Windows applications interface with a SCSI device using the drivers provided by the operating system that are designed specifically for the SCSI device. When an application supports ASPI, the OS2ASPI.DMD driver can be loaded to accommodate the application.

```
--BASEDEV--=--OS2ASPI.DMD-- --------=  ----------------------------
                          -/SHARE-
                          -/ALL---
```

Parameters:

/SHARE

This switch instructs OS2ASPI.DMD to release each target after each command. This allows multiple managers to access a target at different times.

/ALL

This switch instructs OS2ASPI.DMD to allow commands to be issued to any device on the SCSI bus, even those allocated by other managers (such as OS2SCSI.DMD). An example of this would be a diagnostic routine that reports information about the system's configuration. The application would need access to all devices regardless of which manager has been allocated to the device.

Two other components are necessary to support ASPI application in OS/2 Warp. They are:

VASPI.SYS This is the virtual device driver which enables applications running in the VDM to easily access SCSI devices such as printers and scanners.

WINASPI.DLL This is a Windows DLL which exports the Windows ASPI interface to Windows applications. It allows WIN-OS/2 applications to make requests using the ASPI for Windows convention. This file is copied to your \WINOS2\SYSTEM subdirectory only when a SCSI adapter is detected by OS/2, or if you selectively install SCSI Adapter support.

Further details on ASPI are available in *OS/2 Warp Generation, Volume 1: OS/2 Warp Version 3,OS/2 Warp with WIN-OS/2, OS/2 Warp Connect and Bonuspak*, SG24-4552.

4.5.1 Configuration of SCSI Device Drivers

With the exception of OS2SCSI.DMD, which has no parameters associated with it, all other SCSI drivers in OS/2 Warp have configurable parameters which are described in detail in the online help. A short snapshot of all the available parameters is included below. Please note that not all of the parameters listed are applicable to each device driver. Check OS/2 Warp online help for a more complete explanation of each parameter.

/ET Embedded Target This tells the adapter to search the SCSI devices for logical units. If any attached SCSI devices support multiple addressable units, then this parameter should be set. Certain CD-ROM drives that handle multiple CD-ROMs require this parameter.

/V **Verbose** This tells the adapter to display adapter information during system initialization.

/!DM **DASD Manager Support** This parameter disables DASD Manager support.

/!SN **Synchronous Negotiation** This disables Synchronous negotiation for Adaptec AHA-152X adapters only.

/!SM **SCSI Manager Support** This disables SCSI Manager Support which prevents OS2DASD.DMD from reporting that SCSI devices listed are available for allocation to the drives written to IBM SCSI standards.

/UR **Underrun** This controls the reporting of adapter detected data overruns or underruns (receiving more or less data than expected). This parameter is provided for use with some tape software packages.

/H **Host Adapter ID (Adaptec AHA-152 adapters)** Host adapter SCSI ID.

/Y **SCSI BUS Parity (Adaptec AHA-152 adapters)** This disables SCSI bus parity checking.

/DMA **Direct Memory Access (Adaptec only)** Specifies that a DMA channel should be used for data transfer.

/CHAN **DMA Channel** Specifies the DMA channel used by the driver if DMA Mode is enabled.

/BON **Bus on time (microseconds)** This parameter controls the maximum amount of time an SCSI adapter may control the system bus.

/BOFF **Bus off time (microseconds)** This parameter controls the minimum amount of time an SCSI adapter will wait between requests for control of the system bus.

/I **Ignore Adapter** The adapter number indicated by the /A:n parameter will be ignored by this .ADD driver.

/A **Adapter number** The number of the adapter to which the parameters on the device driver statement apply.

/!D **Disable SCSI Disconnect (Adaptec AHA-152X and AHA-154X)** Some older SCSI devices do not operate properly when SCSI disconnection is enabled.

/!TQ **Disable Tag Queuing Support (Adaptec AHA174x only)** Tag queuing is an SCSI-II feature that allows commands to an SCSI-II device to be overlapped, resulting in enhanced performance.

/TAG Tagged Commands (AIC7770.ADD and AIC7870.ADD only) Sets the maximum number of active, tagged SCSI commands on each SCSI target.

/TQ Enable Tag Queuing (BTSCSI.ADD only) Enables tag queuing for all or selected SCSI devies. Both the host adapter and the SCSI device must support tagged queuing to take advantage of this feature.

/LED (only IBM2SCSI.ADD) Simulate disk activity light on IBM Model 95.

/GS (only IBM2SCSI.ADD) Chained request count. Controls the number of I/O requests sent to the IBM SCSI adapter prior to waiting for a response from the adapter.

/PA (only IBM2SCSI.ADD) Patches microcode on some non-cached version of IBM 16-bit PS/2 SCSI adapters. This parameter may help if hang conditions are encountered with this adapter.

/PS (IBM2SCSI.ADD only) Specifies the amount of memory used for communication between the IBM SCSI-2 Fast/Wide adapter and the host CPU in KB. This only applies to the Fast/Wide adapter.

4.5.2 TMV1SCSI.ADD

There is no online help available for TMV1SCSI.ADD. It is the adapter device driver used to support a ProAudio Spectrum adapter with a Trantor SCSI. The available parameters for this device driver are as follows:

/I: This parameter is used to assign an IRQ level. The default is that the adapter runs in polling mode and therefore no IRQ is assigned.

/O: This parameter states to treat optical disk drives as disk devices.

/T: This is used to specify that all CD-ROM drives should be treated as Toshiba drives which was the old SCSI-1 standard.

/U: This parameter is used to specify not to scan embedded LUNs on devices.

/X: This parameter specifies to treat all removable media as fixed media.

/Q: The Quiet parameter is used to suppress output display messages. This is the default setting.

/V: This is the verbose option which is the opposite of Quiet. It turns on the displaying of output messages on the screen.

/R: This parameter is used to specify that the SCSI bus be reset on initialization. The default is that no reset is specified.

4.5.3 SCSI Problem Determination

If you encounter problems using or installing SCSI devices, refer to Table 20 for a listing of the some of the most common problems and resolutions. As new versions of OS/2 Warp and new FixPaks are made available, this table will not contain the most current information. Always check either the IBM PCC BBS or with your SCSI manufacturer to verify if you have the most current release of drivers for your system.

Table 20 (Page 1 of 3). SCSI Problems and OS/2 Warp

Problem	Resolution
OS/2 Warp install fails at first reboot with multiple SCSI Adapters installed.	Reverse the order of the BASEDEV= statements for the SCSI device drivers in the CONFIG.SYS. OS/2 Warp installation does not consider which SCSI adapter is being used for installation when it chooses the order of the BASEDEV= statements in the CONFIG.SYS. If more than one SCSI adapter is present, a BASEDEV= statement for each adapter will normally be added to the CONFIG.SYS. The system tends to continue the installation using the first SCSI device driver that loads.
Failure to recognize SCSI drives connected via a BusLogic adapter.	Obtain an updated version of the BTSCSI.ADD driver.
Forex SCSI card support.	This card is not supported by OS/2 Warp, but a driver can be obtained from Forex (408-955-0938). The file name is F600SCSI.ADD.
Future Domain Drivers broken.	If you have the following versions of Future Domain drivers, you must replace them with a later or earlier version. • FD16-700.ADD 01/10/95 31258 bytes • FD7000EX.ADD 12/12/94 30030 bytes • FD8XX.ADD 12/12/94 20848 bytes
OS/2 Warp install on an IBM PC Server with PCI Fast SCSI-2.	1. Make a copy of Diskette 1. 2. Copy IBMPCSI.ADD from the IBM PCI Fast SCSI-2 Support Diskette (shipped with your machine) to Diskette 1. Delete AHA*.* files if there is not enough room on Diskette 1. 3. Edit the CONFIG.SYS on Diskette 1 and add BASEDEV=IBMPSCSI.ADD after IBMINT13.13 statement. 4. Remove the BASEDEV=AHA* lines

Table 20 (Page 2 of 3). SCSI Problems and OS/2 Warp

Problem	Resolution
Trap000d when installing Warp with Qlogic SCSI adapters.	Contact Qlogic for updated drivers. The driver name is QL100S3.ADD.
ThinkPad 750C with IDE hard drive and Dock II station with SCSI hard drive.	Move the SCSI driver statement before the IDE driver statement in the CONFIG.SYS.
MediaVision PAS16 SCSI adapter.	Dual booting between DOS and OS/2 Warp may result in lost access to the SCSI device. Add /R to the BASEDEV statement: BASEDEV=TMV1SCSI.ADD /R
Unable to install OS/2 Warp on Compaq SystemPro or DeskPro series with a built-in SCSI chipset on the system board.	If the chipset is AMDPCNET-SCSI, contact Compaq for their driver for the chipset. The file name is SP0928.ZIP.
Install fails on a non-IBM system with an IN-2000 SCSI adapter. Error message on EASY install is "drive is too small for OS/2". Error message on ADVANCED install is "FDISK Unsuccessful".	Obtain an OS/2 Warp driver from Always Technology.
Unable to load OS/2 Warp with a Trantor SCSI adapter.	Contact Adaptec for up-to-date drivers. At the time of writing this book, the latest driver package was called TRAN_OS.
Attempting to access a CD-ROM attached to an Adaptec 2740/2742 SCSI controller causes trap or system hang.	Disable tagged queuing for the AIC7770.ADD driver. Edit the BASEDEV statement to read: `BASEDEV=AIC7770.ADD/A:0 /TAG:1`.
Unable to access CD-ROM drive attached to Adaptec 2940 SCSI controller.	The AIC7879.ADD driver shipped with OS/2 Warp Version 3 was faulty. Obtain an updated version of the driver.
IBM Server 320 hangs during periods of intense disk activity. The SCSI Activity light stops but the system does respond to I/O interrupts, such as mouse commands.	All of the following must apply: 1. The system is a PC Server 320, either PCI/Micro Channel or PCI/EISA. 2. The operating system is either OS/2 Warp or OS/2 2.11 SMP (Symmetrical Multi-Processing). 3. The failures occur only during periods of heavy fixed disk activity. 4. All hardware diagnostics run error free. Obtain the following OS/2 APAR fixes from 1-800-992-4777: • PJ19712 • PJ19722 • PJ20015

Table 20 (Page 3 of 3). SCSI Problems and OS/2 Warp	
Problem	**Resolution**
The IBM PC 300 and 700 Series systems may experience Trap 000e errors while running OS/2 Warp from an SCSI hard drive attached to an IBM FAST SCSI-2 PCI Adapter card. The following statement is loaded in the CONFIG.SYS: `BASEDEV=IBMPSCSI.ADD`.	The IBM FAST SCSI-2 PCI Adapter (made for IBM by Future Domain) has no compatible drivers for the IBM PC 300 or 700 Series systems. This adapter and drivers were developed for the IBM PCI/Micro Channel Servers. A workaround is to use `BASEDEV=IBMINT13.I13` in the CONFIG.SYS instead of `BASEDEV=IBMPSCSI.ADD` but not all functions of the adapter will be utilized.

4.5.4 SCSI Adapter Autodetection

A set of SCSI autodetection programs are loaded into the \OS2\DRIVERS subdirectory on the installation partition when OS/2 Warp is installed. If you want to verify if OS/2 Warp has identified your SCSI adapter properly, follow these steps:

1. Restart your computer with OS/2 Warp Installation diskette in Drive A:
2. Insert Diskette 1 when prompted and press Enter.
3. At the Welcome screen, press F3, which will display a command prompt.
4. At the command prompt, type `PROMPT ($R) [$P]` and press Enter. Before you see the directory location, you will see a number in parentheses. This is the return code from the previous command. You should see a 0 return code at this point.
5. Type **x:** where x: is the installation drive and press Enter.
6. Type **CD \OS2\DRIVERS** and press Enter.
7. Type **DIR *.EXE**. This gives you a list of the SCSI autodetection programs that are shipped. This is an example of the list:

```
IBM16AFS EXE     3177  10-07-94   5:54p
IBM2SCPR EXE     3035  12-01-94   5:39p
FD8XX    EXE    3263   1-10-95   3:18p
FD7000EX EXE     2801   1-10-95   3:17p
FD16-700 EXE     3513   1-10-95   3:17p
DPTPRES  EXE     3463  10-05-94  10:37p
BTKPRES  EXE     2925  10-03-94   1:56p
7870PRES EXE     3517  10-03-94   1:48p
7770PRES EXE     3141  10-03-94   1:46p
174XPRES EXE     2933  10-03-94   1:44p
154XPRES EXE     3245  10-03-94   1:43p
152XPRES EXE     3125  10-03-94   1:45p
TMV1PRES EXE     2595  10-03-94   1:33p
```

```
DELIVPRC EXE     2733  10-03-94   1:41p
164XPRES EXE     2773  10-03-94   1:43p
```

8. Execute each of these programs until you see a 0 (zero) return code in the parentheses. This means that the adapter is recognized by OS/2 Warp. If the adapter is not installed or OS/2 Warp does not recognize it, then you will see a non-zero number in the parentheses. After you receive a 0 return code, make a note of the .EXE file that you ran and continue to the next step. If you did not get a 0, OS/2 Warp did not autodetect the SCSI adapter. Check the supported adapter list. If your adapter is listed as supported, ensure that you have the most recent driver for your adapter installed and that you have specified the necessary parameters.
9. At the command line type `CD \OS2\INSTALL` and press Enter.
10. Type `TYPE SCSI.TBL` and press Enter. You will see output similar to Figure 44.

```
* This list is to be used to display the SCSI adapters to the user.
* The format will be :
*     <manufacturer model>;<presence check executable>;<NULL>
* The semicolon will be the delimiter between the fields.
*
* Need to add:
* IBM PS/1 or Valueline (Actual name for Future Domain adapter for IBM)
* IBM Int 13 driver.
*
Adaptec 1510,1520,1522;152XPRES.EXE;AHA152X.ADD;Prod-ID;None;
Adaptec 1540,1542;154XPRES.EXE;AHA154X.ADD;Prod-ID;None;
Adaptec 1640;164XPRES.EXE;AHA164X.ADD;Prod-ID;None;
Adaptec 1740,1742,1744;174XPRES.EXE;AHA174X.ADD;Prod-ID;None;
Adaptec 2840VL,2842VL,2740,2742,AIC7770;7770PRES.EXE;AIC7770.ADD;Prod-ID
None;
Adaptec 2940,2940W,AIC7870;7870PRES.EXE;AIC7870.ADD;Prod-ID;None;
BusLogic BusMaster SCSI Adapters;BTKPRES.EXE;BTSCSI.ADD;Prod-ID;None;
DPT PM2011,PM2012;DPTPRES.EXE;DPT20XX.ADD;Prod-ID;None;
Future Domain 845,850,850IBM,860,875,885,TMC
9C50/C950;FD8XX.EXE;FD8XX.ADD;Prod-ID;None;
Future Domain 16xx,1790,1795,MCS600/700,TMC
1800/18C30/18C50/3260/36C70; FD16-700.EXE;FD16-700.ADD;Prod-ID;None;
Future Domain 7000EX;FD7000EX.EXE;FD7000EX.ADD;Prod-ID;None;
IBM PS/2 SCSI Adapter;IBM2SCPR.EXE;IBM2SCSI.ADD;Prod-ID;None;
IBM 16-Bit AT Fast SCSI Adapter;IBM16AFS.EXE;FD16-700.ADD;Prod-ID;None;
ProAudio Spectrum 16 with Trantor SCSI;TMV1PRES.EXE;TMV1SCSI.ADD;Prod-ID;None;
```

Figure 44. SCSI.TBL Text File

Each field in this file is separated by semicolons. The fields are as follows:

- The first field is the description or name of the adapter.

- The second field is the name of its associated autodetection program.
- The third field is the name of the device driver for that SCSI adapter.
- The fourth and fifth fields can be ignored.

Find the name of the autodetection program you noted earlier. It is the second field. Get the name of the device driver. Make a list of all the other device drivers in the third field of each line. REMark out each of these drivers in the CONFIG.SYS file on your hard drive.

11. Start the editor by typing `TEDIT CONFIG.SYS` at the command line.
12. Find each BASEDEV=xxxxx.xxx statement in your CONFIG.SYS file the list of SCSI adapters that were not autodetected and insert `REM` before each statement.
13. Make sure that you do not REM out the BASEDEV statement for your SCSI adapter that was autodetected.
14. Save the file by pressing F4.
15. Remove the diskette from drive A: and reboot your system.

4.6 Diskette Drive Device Drivers

This section describes the diskette device drivers in OS/2 Warp with regard to the driver installation, which drivers are available in OS/2 Warp, configuration of device drivers and problem determination. An overview of the architecture of diskette drive device drivers is shown in Figure 45.

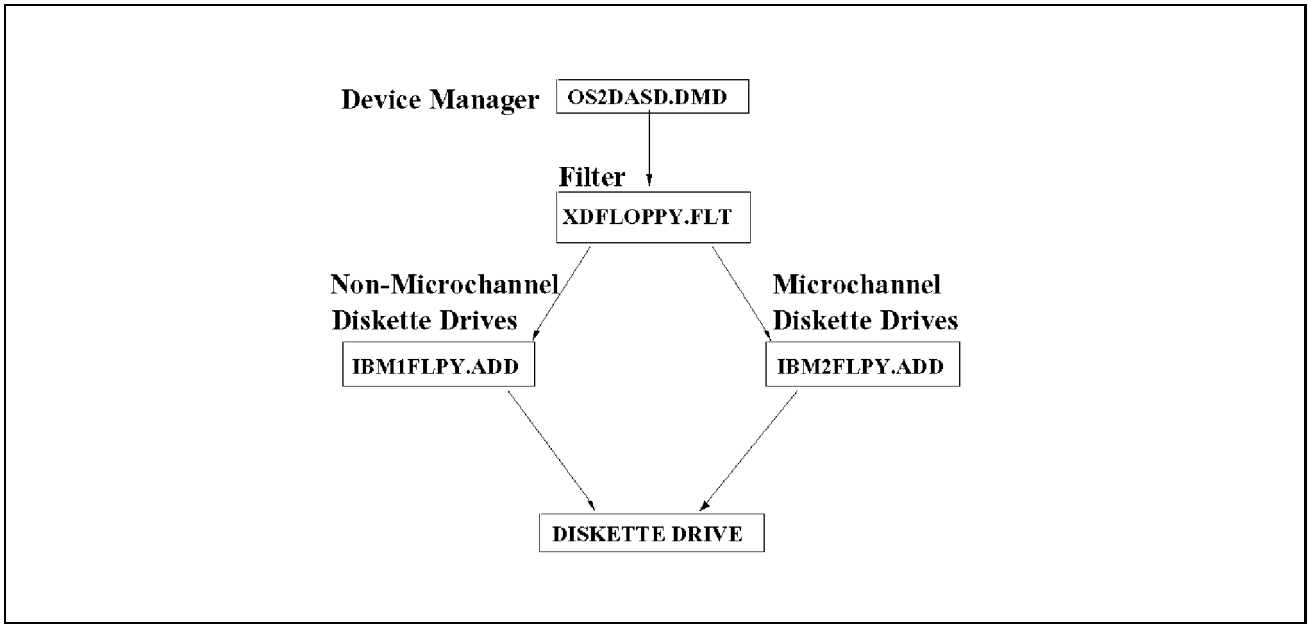


Figure 45. Diskette Drive Device Driver Overview

4.6.1 Diskette Drive Device Driver Installation

There are three device drivers associated with the diskette drive under OS/2 Warp:

- IBM1FLPY.ADD
- IBM2FLPY.ADD
- XDFLOPPY.FLT

During the installation of OS/2 Warp, all three of these devices drivers are added to the \OS2\BOOT subdirectory. During and after the actual installation however, only one of IBM1FLPY.ADD or IBM2FLPY.ADD is used (depending on what type of hardware you have). You can therefore remove from or REMark out of your CONFIG.SYS file whichever driver is not being used and delete it from your system.

The following will help you determine which driver can be erased:

SYSTEM	LOADED	ERASE
all ISA,EISA,PCI systems (non-Microchannel)	IBM1FLPY.ADD	IBM2FLPY.ADD
all PCM Microchannel systems (non-IBM Microchannel)	IBM1FLPY.ADD	IBM2FLPY.ADD
all IBM MicroChannel PS/2	IBM2FLPY.ADD	IBM1FLPY.ADD

The question is sometime raised regarding why we have both IBM1FLPY.ADD and IBM2FLPY.ADD instead of just using a single driver. The answer is that during XDF (eXtended Density Format) development, IBM needed to patch Micro Channel OEM (Other Equipment Manufacturer) ABIOS code but of course did not have the ABIOS source for OEM systems. So a change was made from using IBM2FLPY.ADD on OEM Micro Channel systems to using IBM1FLPY.ADD or in other words no longer using the ABIOS interface. This caused a change in the initialization to detect 3 types of systems, non-ABIOS, OEM ABIOS and IBM ABIOS. The floppy drivers were changed to load the appropriate floppy driver on the appropriate system. IBM development felt it was to cumbersome for Install to query SysInit (part of the installation procedure) and to install the appropriate driver, so instead the intelligence was incorporated into the driver.

4.6.2 Configuration of Diskette Disk Drivers

IBM1FLPY.ADD provides support for diskette drives on ISA, EISA, PCI and non-IBM Micro Channel machines. You normally need never to configure any parameters for this device driver since it is done automatically for you. IBM1FLPY ADD is loaded in the CONFIG.SYS as a BASEDEV=IBM1FLPY. ADD statement. The syntax of the statement is shown in Figure 46:

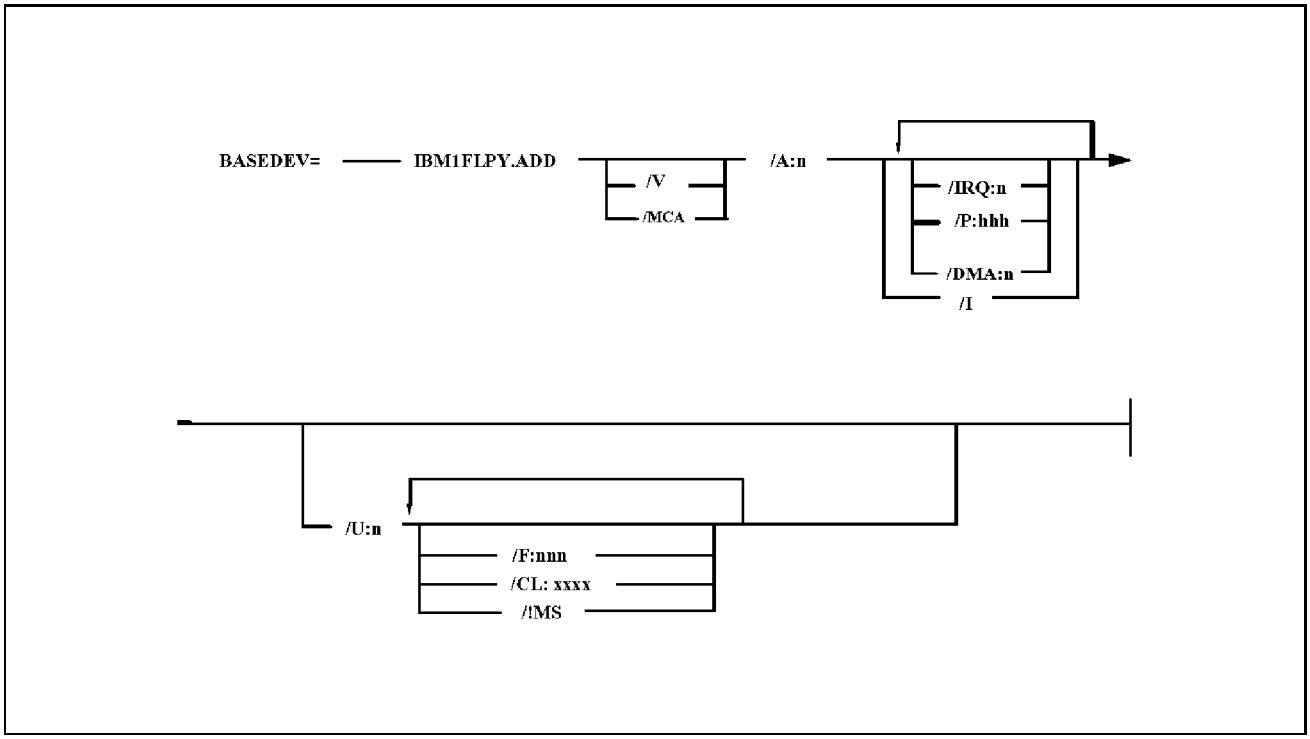


Figure 46. IBM1FLPY.ADD Device Driver Parameters

The configurable parameters for IBM1FLPY.ADD are:

/A: Specifies the adapter number. Setting /A:0 indicates parameters that follow apply to the primary diskette controller. Setting /A:1 indicates parameters that follow apply to a secondary or add-on diskette controller.

/V Specifies the IBM1FLPY driver and should provide a listing of diskette controllers and drives it has detected. This listing will appear while OS/2 Warp is booting.

/IRQ Specifies the IRQ in decimal form. This parameter overrides the default IRQ of 6. If a secondary controller is installed that uses a different IRQ level, this parameter must be set to match the jumper settings of

the secondary controller board. The default IRQ level is 6.

/MCA Specifies the IBM1FLPY driver that should load on Micro Channel machines with ABIOS (Advanced BIOS) support. Normally, the IBM2FLPY.ADD drivers is used to support Micro Channel configurations using ABIOS services provided by the machine supplier. If the /MCA parameter is specified, then the user must ensure the IBM2FLPY driver does not load by removing the BASEDEV= IBM2FLPY.ADD statement from the CONFIG.SYS file.

NOTE.

IBM1FLPY.ADD with /MCA will work on the IBM Micro Channel PS/2 systems. In fact, for installation of DMF diskettes, we ask users to use IBM1FLPY.ADD /MCA for IBM Micro Channel PS/2 systems.

/DMA Specifies the DMA channel number. This parameter overrides the default DMA channel number, which is 2. If a secondary controller is installed that uses a different DMA level, this parameter must be set to match the jumper settings of the secondary controller board.

/P Specifies the base port address in hex. The default port address is 3F0 for a primary diskette controller and 370 for a secondary diskette controller. If a secondary controller is installed that uses different base port address, this parameter must be set to match the jumper settings of the secondary controller board.

/I Indicates that the IBM1FLPY driver should not attempt to initialize the diskette controller indicated by the preceding /A parameter.

/U Indicates the unit or diskette drive to which the parameters apply. Unit 0 means the first drive attached to this controller

/F Indicates the maximum capacity for the diskette drive (360 KB....2.88 KB)

/CL Change line type (NONE, AT, PS2). Indicates the type of media change signal provided by the drive. Normally, the IBM1FLPY driver will determine this parameter automatically.

/!MS specifies whether automatic media type detection is enabled or disabled. Media type detection is used by OS/2 Warp FORMAT to automatically detect the capacity of a diskette being formatted. Automatic media type detection is enabled by default if the diskette controller or drive supports this feature. If you encounter difficulties formatting diskettes, or diskettes are not formatted at their expected capacity, then specifying /!MS prevents the IBM1FLPY driver from telling OS/2 Warp FORMAT the capacity of the media in the drive.

After OS/2 Warp was shipped, the compression used on some Microsoft software products changed. The new type of compression (DMF) could not be recognized by OS/2 Warp on some older PS/2 models (65, 70, 80). To order to install products with this type of compression, you must do the following:

1. In CONFIG.SYS change the followin:
   `rem basedev=ibm2flpy.ADD`
   and use
   `basedev=ibm1flpy.ADD /mca`
2. If the above step does not resolve the problem, then change your statement to read:
   BASEDEV=IBM1FLPY.ADD /MCA /A:0 /U:0 /F:1.44MB /CL:A

4.7 IBM2FLPY.ADD

This device driver supports diskette drives on IBM Micro Channel machines. There are no parameters that can be specified for it. It loads as follows in the CONFIG.SYS:

```
BASEDEV=IBM2FLPY.ADD
```

4.8 XDFLOPPY.FLT

This device driver provides support for eXtended Density Format (XDF) diskettes. It has no parameters and is required in order to use the XDFCOPY command and for OS/2 Warp installation.

All versions of OS/2 Warp were compressed onto installation media in a different format than previous versions of OS/2. This reduced the number of diskettes needed for installation and increased the speed of installation for both diskette and CD-ROM versions of OS/2 Warp.

This creates a problem for users who needed to create backup diskettes or new diskettes from the CD-ROM images on a non-Warp system. You must do the following to create OS/2 Warp diskettes on a non-Warp system:

- ISA OS/2 2.X systems:

  ```
  Rename IBM1FLPY.ADD to IBM1FLPY.OLD in the \OS2 directory
  Copy XDFLOPPY.FLT and IBM1FLPY.ADD to the OS/2 directory.
  Add the following line to your CONFIG.SYS:

          BASEDEV=XDFLOPPY.FLT
  ```

- IBM Micro Channel OS/2 2.X systems:

  ```
  Rename IBM2FLPY.ADD to IBM2FLPY.OLD in the \OS2 directory
  Copy XDFLOPPY.FLT and IBM2FLPY.ADD.  Add the following lir
  to your CONFIG.SYS:

          BASEDEV=XDFLOPPY.FLT
  ```

- IBM Micro Channel Systems with separately loadable ABIOS or PCM Micro Channel Systems (Reply and NCR brands)

  ```
  Rename IBM1FLPY.ADD to IBM1FLPY.OLD in the \OS2 directory
  Copy XDFLOPPY.FLT and IBM1FLPY.ADD.  Add the following lir
  to your CONFIG.SYS:

          BASEDEV=XDFLOPPY.FLT

  Change the following line in your CONFIG.SYS:

   BASEDEV=IBM2FLPY.ADD to BASEDEV=IBM1FLPY.ADD /MCA
  ```

To create the diskette images, issue XDFCOPY from either a native DOS, OS/2 or VDM (Virtual DOS Machine) session.

Diskettes 0 and 1 are not in the XDF format which means that you can add, delete or copy files to these diskettes. All remaining diskettes are in XDF format.

You can do a directory on these diskettes but you cannot copy individual files or bundle files without XDFCOPY , XDFLOPPY.FLT, IBM1FLPY.ADD and if you have a Micro Channel system, IBM2FLPY.ADD.

These diskettes have software write protection. You cannot erase, bundle or add files to these diskettes due to their software write protection feature. See the README file provided with OS/2 Warp for more information on how to create diskettes from images on the CD-ROM.

4.9 DASD Device Drivers

This chapter describes the DASD device drivers in OS/2 Warp in regard to the driver installation, which drivers are available in OS/2 Warp, configuration of device drivers and problem determination. An overview of DASD device driver support is shown in Figure 47 on page 149.

There are a number of DASD drivers shipped with OS/2 Warp. They include the following:

- IBMS506.ADD
- OS2DASD.DMD
- IBMINT13.I13
- IBM2ADSK.ADD
- CMD640X.ADD [1]

Note

This .ADD file along with its filter file CMDATAPI.FLT were not shipped with OS/2 Warp Version 3 and OS/2 Warp with WIN-OS/2. They were included with OS/2 Warp Connect. Updated version of these files are available from CompuServ, IBM Internal Tools and the IBM PCC BBS as file PJ19049.

Each of these drivers is described in 4.9.2, “Supported DASD Device Drivers” on page 150.

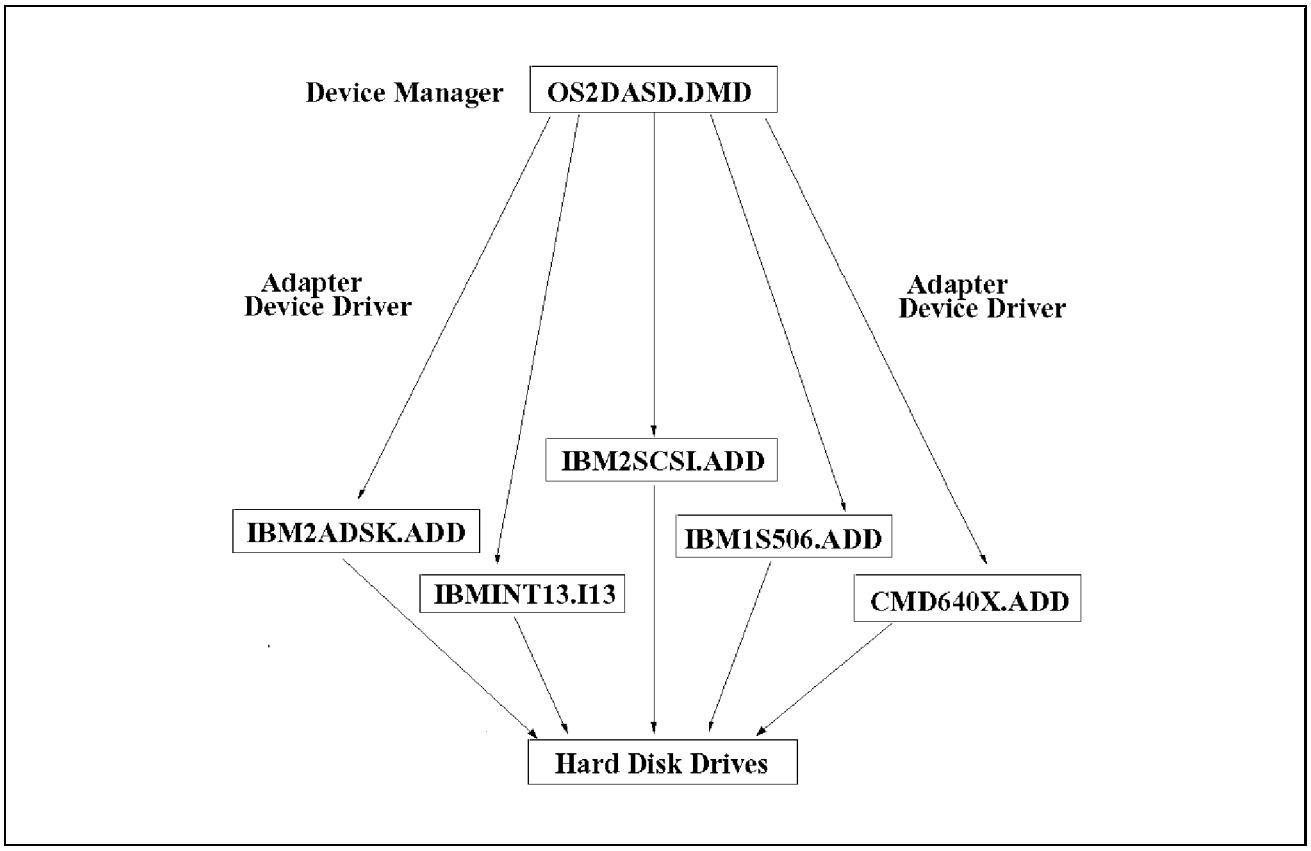


Figure 47. DASD Device Driver Overview

4.9.1 DASD Device Drivers Installation

DASD drivers are loaded in the CONFIG.SYS during the installation process. The CONFIG.SYS file on Diskette 1 of OS/2 Warp contains the following BASEDEV statements that relate directly to DASD:

- `BASEDEV=IBM1S506.ADD`
- `BASEDEV=IBM2FLPY.ADD`
- `BASEDEV=IBM1FLPY.ADD`
- `BASEDEV=IBM2ADSK.ADD`
- `BASEDEV=IBM2SCSI.ADD`
- `BASEDEV=IBMINT13.I13`

BASEDEV=OS2SCSI.DMD is not in the CONFIG.SYS file on Diskette #1 because it is a programming interface for non-DISK devices (fax, scanner, tape). It is IBM's version of ASPI. It is not needed for disk access during OS/2 Warp installation so it is not on the install diskettes. All of the files are located in the \OS2\BOOT subdirectory. If you are encountering problems installing OS/2 Warp, REMark out of the CONFIG.SYS any drivers which are

not needed. For example, if you have a Micro Channel system, REMark out all IBM1*.* statements. This will reduce any contention that may be occurring as two drivers may be attempting to load for a single device.

4.9.2 Supported DASD Device Drivers

IBM1S506.ADD is described in greater detail in 4.9.3, “Configuration of DASD Device Drivers” on page 151. Basically it is a driver that supports standard ESDI and IDE hard disk controllers.

IBMINT13.I13 supports generic DASD controllers via BIOS code. If OS/2 Warp cannot locate an appropriate .ADD driver, it uses this special driver which utilizes the BIOS present on most SCSI and non-SCSI DASD adapters. IBMINT13.I13 provides support only to DASD-type devices. It will activate only when other .ADD drives present have not claimed all of the DASD devices detected. There are no parameters associated with this device driver.

OS2DASD.DMD is the Device Manager transport layer for DASD devices. It is *always* required and is automatically installed in the CONFIG.SYS.

IBM2ADSK.ADD supports all IBM and OEM non-SCSI hard drive controllers using ABIOS (Advanced BIOS). There are no parameters that can be specified for this device driver.

Note

Some models of the IBM PC 700 Series are Micro Channel machines. A new driver called IBM2IDE.ADD has been written for these machines. IBM2IDE.ADD is needed in order for OS/2 Warp to recognize IDE controllers and their attached devices in the PC 700 Series. This driver is essentially the same as IBM1S506.ADD but it loads in Microchannel Architecture machines which IBM1S506.ADD does not do. It uses the same parameters used by IBM1S506.ADD. This driver, as of the time of writing this book, is not shipped with any version of OS/2 Warp including OS/2 Warp Connect. It is available from the IBM BBS 407-443-8000 as MCA_IDE.ZIP. It is also available from the IBM PCC Internet site (ftp://ftp.pcco.ibm.com/pub/dos_util). The file name is IDECDROM.DSK.

4.9.3 Configuration of DASD Device Drivers

This section covers the description of how to configure DASD device drivers after their installation. In many cases, problems with OS/2 Warp not recognizing or having problems handling controllers and attached devices can be resolved by correctly configuring your BASEDEV statements. Of the DASD device drivers supplied with OS/2 Warp Only IBM1S506.ADD and CMD640x.ADD have parameters that can be specified. Information on CMD640x.ADD, at the time this book was written, was not included in OS/2 Warp's online help.

4.10 IBM1S506.ADD

This device driver provides support for MFM, RLL, ESDI, and IDE hard disk controllers on non-Micro Channel industry standard devices. In most cases, the IBM1S506.ADD driver will automatically determine its own parameters when OS/2 Warp is installed. Figure 48 is provided in case you need to override the default parameter selections.

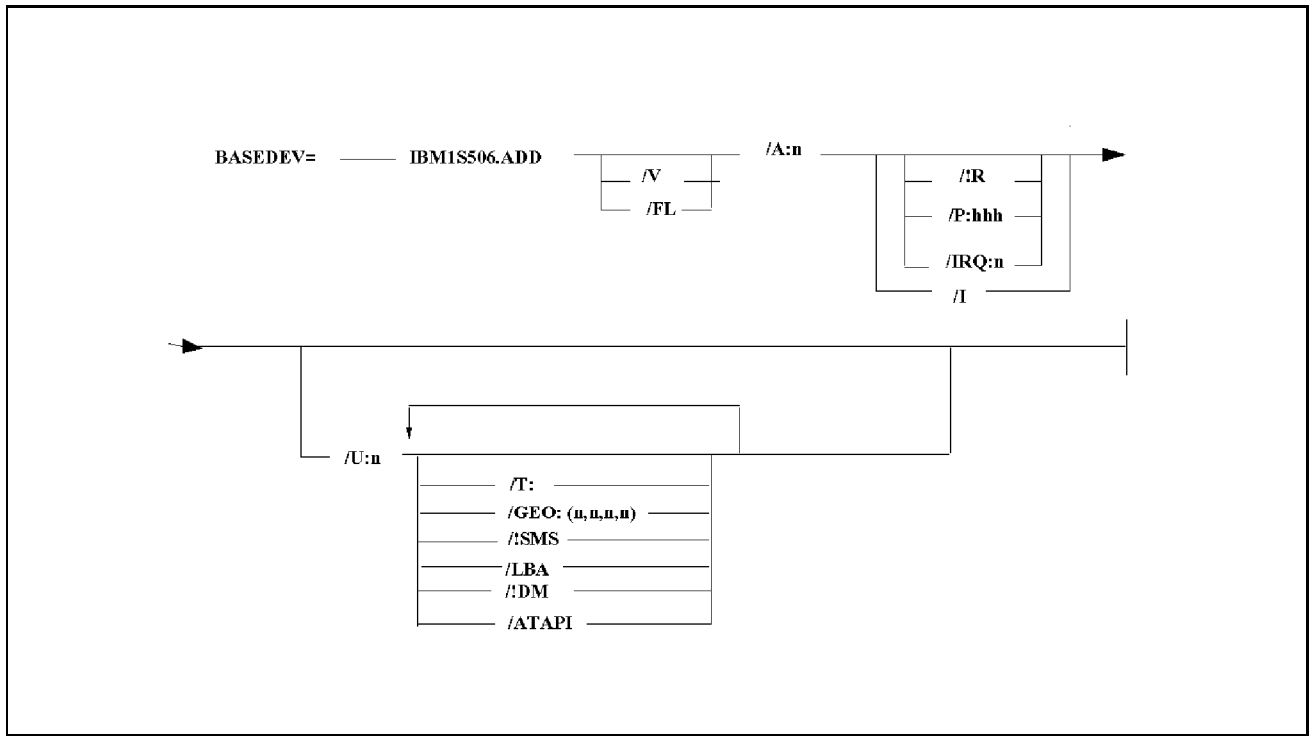


Figure 48. IBM1S506.ADD Device Driver Parameters

The parameters that can be specified on IBM1S506.ADD are as follows:

/A: This refers to the adapter number. /A:0 indicates that the parameters that follow apply to the primary disk controller. /A:1 indicates that the parameters that follow apply to the secondary disk controller.

/V This parameter turns on the VERBOSE mode. This means that drive controller status and drive geometry information will be displayed during OS/2 Warp initialization.

/FL This parameter forces the loading of IBM1S506.ADD even if the driver sees the CMD chipset. You should use this parameter if you have both a CMD chipset and an IDE adapter in your system and you want to use the CMD device driver (CMD640X.ADD available in OS/2 Warp Connect) for the CMD chipset. This will allow you to specify IRQ and port addresses for your IDE adapter.

/!R This parameter disables adapter resets. In most cases, resets assist in recovering from transient hardware problems such as lost interrupts, timeouts, and unsupported commands. However, for some ESDI adapters, options set by vendor unique commands such as sector sparing might be lost after a reset. Setting this parameter is recommended for ESDI adapters with disks formatted using sector sparing.

/P:hhh This specifies the base port address in hex. This overrides the default base port address for this adapter. Ports are still assigned and in this case would be 120 to 127 and 326. The default port address for Adapter 0 is 1F0 and for Adapter 1 is 170.

/IRQ: This specifies the IRQ level in decimal. The default IRQ level for Adapter 0 is 14 and for Adapter 1 is 15.

/I This specifies Ignore the adapter. The driver automatically attempts to locate and initialize both the primary and secondary adapters. In some cases, other DASD controllers might appear between the primary and secondary IDE controller. In these cases, the system should be configured as follows:

```
BASEDEV=IBM1S506.ADD /V /A:1 /I
BASEDEV=MOREDASD.ADD
BASEDEV=IBM1S506.ADD /V /A:0 /I
```

/U:n This specifies the Unit ID. Unit 0 indicates parameters that follow apply to Drive 0. Unit 1 indicates parameters that follow apply to Drive 1.

/T:n This indicates Error Retry Time in seconds. The total allowable error recovery time for a request is specified here. Error recovery times less than 5 seconds will be ignored. This parameter defaults to 30 seconds. A shorter interval might be desirable for fault tolerant applications.

/GEO:(n,n,n,n) This parameter is for drive geometry override. It is specified in decimal. It indicates the Cylinder/Head/Sector geometry for the drive. This parameter is the Write Precompensation Cylinder which can be omitted for drives that do not require precompensation. As an alternate format, standard BIOS drive types can be used. Types 0-47 are supported. User defined types 48 and 49 should be entered directly in the previous format. When specified, this parameter overrides other geometry sources. If this parameter is absent, other geometry sources discussed above will be used.

/!SMS This parameter is to Disable Set Multiple Support (Block Mode). The IBM1S506 driver will automatically enable Set Multiple Support if a drive indicates that it supports this feature. The /V parameter indicates whether Block Mode support has been enabled for a particular drive. This feature improves performance of some IDE drives by allowing the drive to transfer more than 512 bytes of data per interrupt to the host CPU. Some older IDE drives and caching IDE controllers may not support this feature properly. In this case, specifying the /!SMS switch will disable this support.

/LBA This parameter enables Logical Block Support for IDE drives that support this option. The /V parameter indicates whether this feature has been enables on a particular device.

/!DM This parameter is used to prevent the OS2DASD.DMD device driver from managing the hard disk drive indicated by the /U parameter.

/ATAPI This parameter specifies that the attached device used the ATAPI specification.

4.11 CMD640X.ADD

CMD640X.ADD was not included in OS/2 Warp and OS/2 Warp Version 3. It was first shipped with OS/2 Warp Connect. This driver is needed if your machine has a CMD640 controller chipset. Items to be aware of with regards to this chipset include:

- The chipset does not support two channels concurrently while the IBM1S506.ADD assumes that it does. Therefore, you must must use the CMD640x.ADD driver which was written specifically for this chipset.
- If in your system BIOS usually does not enable the secondary controller while hardware leaves it disabled by default, you must use CMD640X.ADD.
- With prefetch enabled, some data may be lost. If you can disable prefetch through BIOS setup, then you can use IBM1S506.ADD if items 1 and 2 are not causing you a problem.
- If the diskette drive port changeline connection on your adapter goes through the CMD chipset, then you must turn off prefetch in order to do both hard drive and floppy I/O concurrently. Otherwise you will lose data on your hard disk.

If you have a copy of OS/2 Warp that does not include the CMD640 device driver, you can download CMD640.ZIP from the IBM PCC BBS. If you have RZ1000 or CMD640 IDE PCI interface chips, then you need to download PJ19049.ZIP. This APAR contains updated versions of the following files:

- IBM1S506.ADD
- IBMIDECD.FLT
- CMD640X.ADD
- CMDATAPI.FLT

The APAR was written to disable the read-ahead mode for the RZ1000 and CMD640X PCI IDE CHIPS in the IBM1S506.ADD and CMD640X.ADD device drivers. In some cases, IDE disk could incur possible data read conflicts which these updated drivers fix by disabling the read-ahead mode. See the README file included with PJ19409.ZIP for complete installation instructions. PJ19409 is included in all OS/2 Warp FixPaks after FixPak 9.

To install the CMD640 device driver follow these instructions:

1. Copy CMD640X.ADD and CMDATAPI.FLT to your \OS2\BOOT subdirectory.
2. Edit x:\CONFIG.SYS.
    a. From a command prompt, type `E CONFIG.SYS`

b. Type `REM BASEDEV=IBM1S506.ADD`
c. Insert the following line: `BASEDEV=CMD640X.ADD /V`

3. Reboot the system and verify that it is functioning correctly. The following steps are optional ones for those users who are interested in getting maximum performance.

4. In order for the driver to load performance optimizations for your IDE drives, you must specify your Local Bus Clock Speed. If you are not sure of your Local Bus Clock Speed, *do not* proceed until you are sure.

   PCI-Bus: If you are using a 25MHz or a DX2-50 processor, your Local Bus speed is probably 25. Otherwise, it is probably 33.

   VL-Bus: If you are using a DX processor, your Local Bus Clock Speed is equal to your CPU clock speed. If you are using a DX2, your Local Bus clock speed is half of your CPU clock speed. For example:

   ```
   1)486=50DX CPU    Local Bus Clock Speed= 50MHz.
   2)486-66DX2 CPU   Local Bus Clock Speed= 66MHz divided by 2 = 33MH
   ```

5. Edit x:\CONFIG.SYS.

   a. Type `E x:\CONFIG.SYS`
   b. Change `BASEDEV=CMD640X.ADD /V` to `BASEDEV=CMD640X.ADD /V /LBSPEED:dd` (where dd equals the Local Bus Speed in MHz).

6. If you have an ATAPI CD-ROM, REM out the line `BASEDEV=IBMIDECD.FLT` and change it to `BASEDEV=CMDATAPI.FLT`.

7. Shutdown and reboot your system, and the driver will load the optimizations.

The configurable parameters for this device driver are as follows:

/V **Verbose** The Verbose parameter displays the adapter device driver level, disk controller status and drive geometry information during the OS/2 system initialization.

/LBSPEED:dd **Local Bus Clock Speed** This is specifies the clock speed of the Local Bus in MHz. Specifying this parameter enables the driver to load performance optimizations for each attached drive (ATA Timing Modes). <dd> must be between the range of 20 and 50. The /V option will display the local bus clock speed, as well as the ATA PIO (Programmed Input/Output) Timing mode supported by each drive.

If your BIOS has built-in support for Fast PIO Modes on the PCI-0640x, specifying /LBSPEED will override your BIOS' settings. Do not specify /LBSPEED if you do not wish the driver to perform

PCI-0640X drive/chip initialization. See the /!SMS parameter below for information on how to control initialization on a per-IDE port basis.

/CH2:dd Secondary IDE Channel This parameter enables support of the secondary IDE channel. If <dd> is 0, the PCi-0640x Secondary IDE Channel is used. If <dd> is 1, the driver will support an external 16-bit ISA IDE adapter. If /CH2 is not specified, the secondary IDE channel is ignored.

/A:d Adapter Number This parameter specifies the IDE port number to which options following this parameter apply. Specify 0 for the Primary IDE, and 1 for the Secondary IDE.

/I Ignore Adapter This parameter indicates that the CMD IDE driver should not attempt to initialize the adapter indicated. This adapter device driver automatically attempts to locate and initialize both the primary and secondary adapters. In some cases, other DASD controllers may appear between the primary and secondary IDE controllers. In these cases, the system should be configured as follows:

```
BASEDEV=CMD640X.ADD /V /A:1 /I
BASEDEV=MOREDASD.ADD
BASEDEV=CMD640X.ADD /V /A:0 /I
```

/<!>R Reset Adapter If this parameter is negated (!R), adapter resets are disabled. In most cases, resets are beneficial to assist in recovering from transient hardware problems such as lost interrupts, timeouts, or commands a particular adapter may not support.

/IRQ: Interrupt Level This parameter overrides the default IRQ number for the adapter indicated. The default IRQ address for Adapter 0 is 14 and for Adapter 1 is 15.

/PORT:hhhh Port Number This parameter specifies the hexadecimal I/O port base address to be used when accessing the specified adapter. Defaults are 1F0 for A:0, and 170 for /A:1.

/16BIT 16-Bit Access By default, 32-bit accesses are used for Local Bus IDE ports. If 16-bit accesses are preferred, this parameter should be specified.

/U: Unit Number This parameter specifies the fixed disk drive number to which options following this parameter apply. Fixed disk drive numbers start at 0.

/GEO Drive Geometry This parameter overrides the Cylinder/Head/Sector geometry for the unit selected. The fourth parameter is the Write Precompensation Cylinder which may be omitted for drives which do not require precompensation. As an alternate format, standard BIOS drive types may be used. Types 0-46 are supported. User defined types 47-49 should be entered directly by using the previous format. If a second set of geometry is present, then the first set specifies the physical geometry of the drive, and the second set indicates the translated geometry which is reported to the OS/2 Warp system.

/T: Drive Timeout This parameter indicates the total allowable error recover time for a request. Error recovery times of 5 seconds will be ignored. This parameter defaults to 30 seconds. A shorter interval may be desirable for fault tolerant applications.

/<!>SMS Enable Multiple Block I/O Support This parameter enables Set Multiple Support, which improves performance of most IDE drives. If the drive does not support this feature, this switch will be ignored. The /V option will indicate whether this feature has been enabled on a particular drive. By default, Set Multiple Support is enabled. To disable it on a particular drive, use <!SMS>.

/<!LBA> Enable LBA Support This parameter enables Logical Block Support for IDE drives which support this option. The /V option will indicate whether this feature has been enabled on a particular drive. By default, LBA Support is disabled.

/!SATM Disable Setting of ATA Timing Modes This parameter prevents the driver from loading performance optimizations for drives attached to the currently specified adapter. If your BIOS directly supports the CMD PCI IDE and you do not want to override its settings, you must specifiy /!SATM.

NOTE: Not specifying /LBSPEED is equivalent to `/A:0 /!SATM /A:1 /!SATM`

/PIOMODE:d Override Vendor-Specified ATA PIO (Programmed Input/Output) Mode By default, the drive automatically sets the highest ATA PIO timing mode supported by each drive. This parameter allows the user to override the vendor-specified ATA PIO timing mode with any timing mode between 0 and 5. This particularly useful for support of drives which have firmware bugs, causing them to return incorrect PIO timing modes in the IDENTITY DRIVE command. For example, many current drives which claim to be Mode 2 are really Mode 0 or Mode 1.

Warning

Setting a PIO Mode higher than supported by a drive may cause boot failure or data corruption. However, setting a lower PIO Mode than specified by a drive is harmless.

4.11.1 DASD Problem Determination

A very important known limitation concerning DASD devices is the following:

If you have a system with a harddisk that is larger than 1024 cylinders, then you will not be able to install a boot partition on that drive. The reason for this limitation is the fact that with the lack of a so called translating BIOS, the BIOS cannot address partitions larger than 1024 cylinders. The following describes history of this limitation and its workaround.

In order to begin loading itself from your system's hard drive, OS/2 Warp, like any other operating system, must use BIOS services. These BIOS services remain basically unchanged from the routines first used in the early 1980's with personal computers. At that time, an addressability limit of 1024 cylinders was incorporated into BIOS. This limit still exists today for systems that do not have a *translating BIOS*. The end result of this is the inability of the boot operation to exist on a partition which is larger than 1024 cylinders. In other words, the size of the boot partition is limited by the BIOS to the first 1024 cylinders of the hard drive even though many of the hard drives available today are much larger than 1024 cylinders. In the case of IBM hard drives, 1024 cylinders translates to approximately 1 GB.

Most IDE systems are limited to approximately 504 MB in size because they do not have a *translating* BIOS. If the system has a translating BIOS however, the same restrictions do not apply. A translating BIOS is one that correctly addresses multi-megabyte IDE drives. All IBM systems shipped with greater than 528 MB hard drives are shipped with translating BIOS. With translating BIOS you can have a single partition the size of the drive, be it 528 MB, 720 MB or 1 GB. Without translating BIOS, you cannot access anything above 528 MB as your boot drive.

Available BIOS translation utilities include OnTrack which ships with Western Digital and PC Company greater than 528 MB hard drives and Micro House's EZ-Drive. The current version of EZ-Drive which supports OS/2 Warp is V4.02 You may also be able to perform *sector translation* via the CMOS on your machine to configure your hard drive to 1024 cylinders but you may lose some of your disk space. Sector translation involves remapping the physical

cylinder, head and sector layout of the hard drive. On EIDE (Enhanced IDE) drives, this is known as Logical Block Addressing or LBA.

If your system has non-translating BIOS and therefore falls under the 1024 cylinder limitation for boot and FAT drives, you will be still be able to address drives above the 1024 cylinder limit. This is because once OS/2 Warp is running, it no longer requires BIOS services. The partitions above 1024 cylinders however, must be HPFS partitions and you must not be using the generic DASD driver (IBMINT13.I13). This is because the generic DASD driver uses BIOS routines and therefore all BIOS limitations still apply.

4.12 CD-ROM Device Drivers

CD-ROM drives have greatly increased in popularity over the last few years. Accordingly, OS/2 Warp includes support for a greater number of these devices than previous versions of OS/2. This chapter describes the installation of CD-ROM drivers, which drivers are shipped with OS/2 Warp, configuration of the drivers and problem determination.

An overview of the CD-ROM device driver architecture is shown in Figure 49 on page 160.

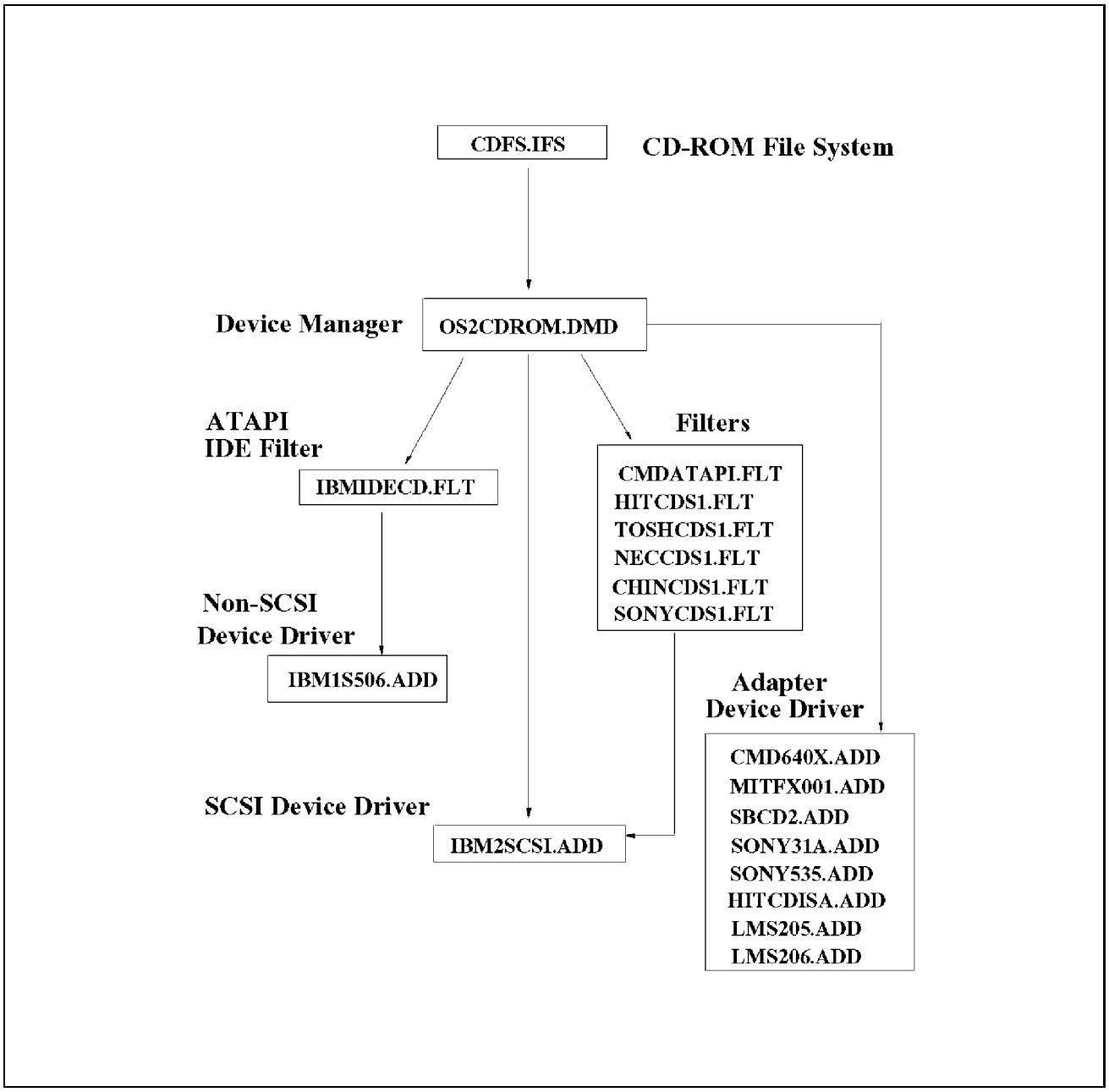


Figure 49. CD-ROM Device Driver Overview

4.12.1 CD-ROM Device Drivers Installation

If you are installing OS/2 Warp from CD-ROM, you still need to boot from diskettes to start the installation process. The installation process queries your system hardware and if your CD-ROM is recognized by OS/2 Warp the correct device driver is selected and the installation will continue from the CD-ROM.

To add support for a CD-ROM after installation of OS/2 Warp, complete the following steps:

1. Open the **OS/2 System** folder.
2. Open **System Setup**.
3. Open **Selective Install**.
4. Select **CD-ROM Device Support** as shown in Figure 50 on page 162.
5. You are presented with a list of supported CD-ROM devices as shown in Figure 51 on page 163. If your CD-ROM device is not listed, you must obtain the device driver from the manufacturer or from a BBS. After you have obtained the device driver, you may select **OTHER** from the list of drivers.
6. You are then returned to the Selective Install screen where the CD-ROM you selected has been added. This is shown in Figure 52 on page 164.
7. Select **OK** and continue with the installation.

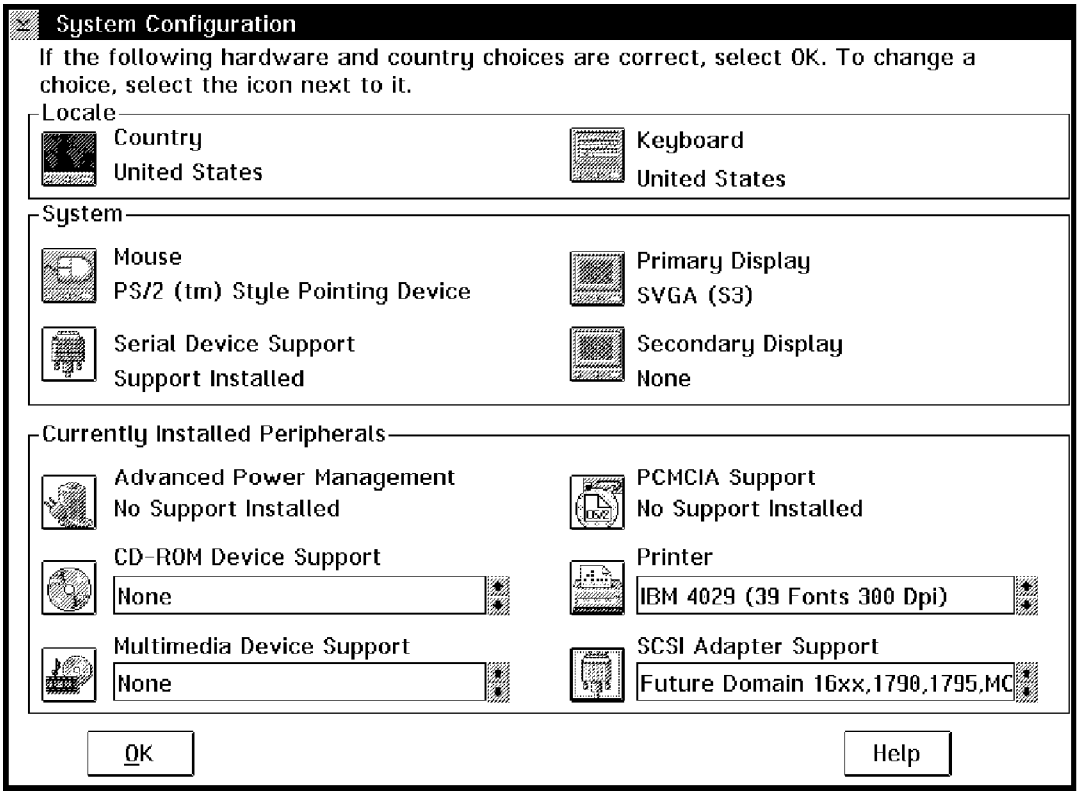


Figure 50. CD-ROM Selective Install

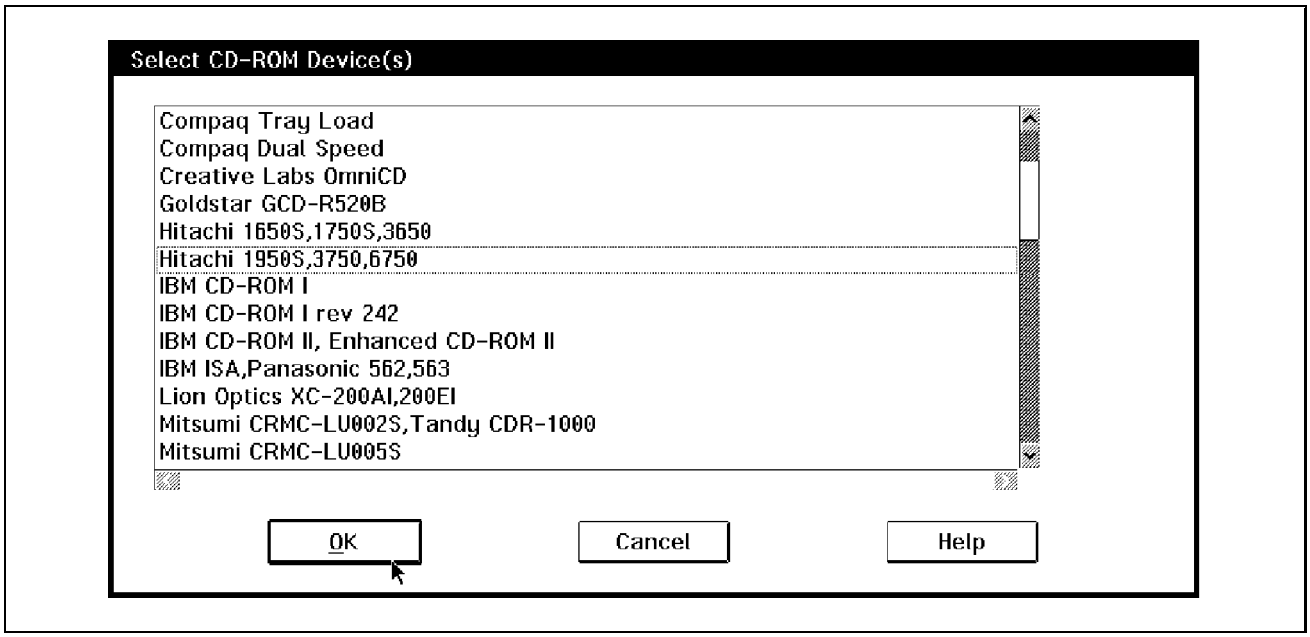


Figure 51. Select CD-ROM Device Listing

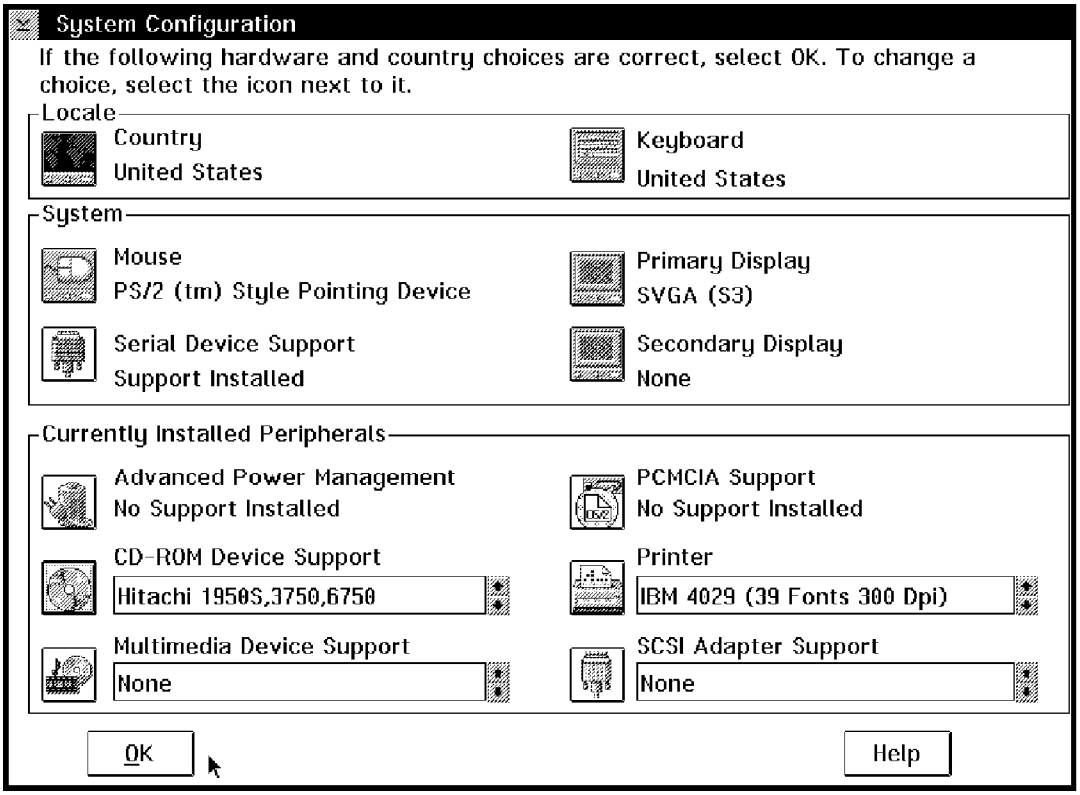


Figure 52. CD-ROM Updated Selective Install Panel

4.13 ADDing Support for Other CD-ROMs

If your CD-ROM is one for which a device driver is not included in the OS/2 Warp package, then you will need to get a driver for your CD-ROM. Either contact the CD-ROM manufacturer for a device driver or locate one from an OS/2 BBS. If you are installing OS/2 Warp from this CD-ROM, after you obtain a current device driver you must:

1. Make a copy of Diskette 1 from the OS/2 Warp Installation diskettes. At a command prompt, type `diskcopy a:` and press Enter.
2. Copy the .ADD file to the root directory on the copy of Diskette 1. If there is not enough room, delete the following files from the copy of Diskette 1:
   - For an ISA/EISA (non-Micro Channel) computer: IBM2*.*
   - For a Micro Channel computer: IBM1*.*

   You will now have room to add device drivers to Diskette 1. You will also need to copy the .ADD device driver to your hard disk.

3. Edit the CONFIG.SYS file located on the copy of Diskette 1.
   - At the end of the file, add a BASEDEV= statement for your device. For example, if you are adding a file called T128SCSI.ADD, your BASEDEV= statement will be:

     ```
     set cdrominst=1  (this line is already present in the CONFIG.S
     ifs=cdfs.ifs /q  (this line is already present in the CONFIG.S
     BASEDEV=T128SCSI.ADD
     ```

   - Remember to REMark out any lines in the CONFIG.SYS that refer to files that you deleted in step 2.
4. Insert the OS/2 Warp Installation Diskette into Drive A and restart the system. When prompted for Diskette 1, insert the copy that you just modified.
5. Follow the instructions to install OS/2 Warp.
6. When the installation is complete, you must make changes to your CONFIG.SYS file on your hard drive in order to make the CD-ROM available for use. You must copy the .ADD file that you put on the copy of Diskette 1 to the \OS2 directory of the OS/2 Warp drive. The OS/2 Warp Installation program does not copy unsupported .ADD files automatically.
7. Open an **OS/2 Window**.
8. Type `cd\os2`..
9. Insert Diskette 1 into Drive A.

   ```
   Type the following:
   COPY A:\OS2CDROM.DMD  (then press Enter).
   COPY A:\CDFS.IFS      (then press Enter).
   ```

10. Remove Diskette 1 from drive A and insert the diskette that contains the CD-ROM device driver (the .ADD file).
11. Type the following: `copy A:\T128SCSI.ADD` (where T128SCSI.ADD is the name of the device driver).
12. Using an editor (such as E.EXE or EPM.EXE), add the lines shown in uppercase letters to your CONFIG.SYS file. The lines in lowercase letters are lines that are already present in the CONFIG.SYS file. The order of the device statements is important.

    ```
    basedev=ibm1s506.ADD
    basedev=os2dasd.dmd
    DEVICE=x:\OS2\OS2CDROM.DMD /Q
    IFS=x:\OS2\CDFS.IFS /Q
    set bookshelf=x:\os2\book..
    codepage=437,850
    ```

```
devinfo=kbd,us,x:\keyboard.dcp
BASEDEV=T128SCSI.ADD
devinfo=scr,vga,x:\os2\viotbl.dcp
```

13. Save the CONFIG.SYS file and exit.
14. Shut down your system and reboot.

If you are still encountering problems, refer to 4.14.3, “Configuration of CD-ROM Device Drivers” on page 174 and 4.14.13, “CD-ROM Problem Determination” on page 182. Otherwise, contact the manufacturer of your CD-ROM for assistance.

If OS/2 Warp has been already been installed via diskette before you decide to add support for a CD-ROM drive that a device driver is not shipped with OS/2 Warp you must obtain a device driver for the CD-ROM driver. Once you have the device driver and have ascertained that the driver will work with OS/2 Warp (check this either via the PCMTABLE which is available from the IBM PCC BBS or with the CD-ROM drive manufacturer), follow the steps outlined in 4.12.1, “CD-ROM Device Drivers Installation” on page 161 to install the driver.

4.14 ATAPI Support

ATAPI or AT Attachment Packet Interface refers to the specification that allows SCSI commands to be "packetized" and transmitted on the IDE channel. The ATAPI specification version that is supported under OS/2 Warp is V1.2.

In OS/2 Warp, the IDE driver IBM1S506.ADD was made aware of ATAPI. It claims all ATAPI devices and marks them as generic devices. The IBMIDECD.FLT filter loads afterwards and scans all drivers for generic ATAPI devices. If it locates one, it will determine if that device is a CD-ROM, and if so, it will claim the device and convert the SCSI-2 request from OS2CDROM.DMD to the ATAPI command packet format and protocol.

The IBMIDECD.FLT filter communicates directly with the hardware. Since it does this, and because we cannot share interrupts on an ISA system, the filter is able to suspend and resume the IBM1S506 driver. When the suspend is initiated, the filter passes its IRQ handler routine address so that the IBM1S506 interrupt routine can notify the filter routine while the IBM1S506 is suspended.

Detection for ATAPI devices, as mentioned previously, is in the IBM1S506.ADD driver. The detection is automatic through the Enhanced IDE controller. You cannot use IBMINT13.I13 for an IDE CD-ROM.

An IDE CD-ROM cannot be configured as a master (primary) drive either in the BIOS or in its jumper settings, while a hard drive is configured as a slave (secondary) drive.

The following CD-ROM drives are supported by IBMIDECD.FLT:

- Sony CDU55E
- Philips LMSCM207
- Mitsumi FX001DE

The syntax of the statement in the CONFIG.SYS file is as follows:

```
--BASEDEV--=--IBMIDECD.FLT-- ------ -------------------------------
                             -/V-
```

The only parameter that can be specified is /V. This parameter specifies the VERBOSE mode which means that display driver information such as the revision level, is displayed as the machine boots.

Both of the following device drivers must also be in the CONFIG.SYS if IBMIDECD.FLT is used.

- IBM1S506.ADD
- OS2CDROM.DMD

These drivers are added automatically to the CONFIG.SYS when Selective Install is run to add CD-ROM support.

IDE drives that are compatible with OS/2 Warp at the time this book was written are shown in Table 21.

Table 21 (Page 1 of 2). IDE Compatible Drives

Manufacturer	**Model**	**Notes**
Mitsumi	FX001DE FX400	1
NEC	CDR-250 CDR-260 NEC 2vi	2

Table 21 (Page 2 of 2). IDE Compatible Drives		
Manufacturer	**Model**	**Notes**
Sony	55E 55D	1 1
Panasonic	571	
Wearnes	CDD-120	

Notes:

1. The Mitsumi and Sony CD-ROMs are not ATAPI V1.2 compliant. This may cause some problems which should be resolved by updated drivers. Contact the manufacturer for updated drivers.

2. NEC 260 CD-ROM that ship with Gateway systems adhere to the ATAPI V1.7 specification instead of v1.2. For these CD-ROMs, the BASEDEV=IBM1S506.ADD line in the CONFIG.SYS must be edited to read as follows: `BASEDEV=IBM1S506.ADD /A:x /U:y /ATAPI`

   - The /A: switch refers to the adapter number that the CD-ROM is attached to.
   - The /U: option references the unit or device number on a particular adapter. The /ATAPI parameter enables ATA Packet Interface protocol for the NEC 260.

4.14.1 ATAPI.ZIP

ATAPI.ZIP is a package available from the IBM PCC BBS as well as other BBS locations which contains updated drivers for IDE CD-ROMs. These updated drivers contain modifications which allow certain IDE CD-ROMs which are not 100% compatible to work with OS/2 Warp.

It contains four files that are newer than the ones shipped with OS/2 Warp. The files are:

- IBM1S506.ADD
- IBMIDECD.FLT
- OS2CDROM.DMD
- OS2DASD.DMD

If you have an IDE CD-ROM that is not on the list of supported devices, download the ATAPI.ZIP package and follow the instructions in the README file that comes with this package for information regarding how to install the updated drivers.

You should also check with your manufacturer to see if they have issued a later version of ATAPI drivers than the ones contained in ATAPI.ZIP. Creative Labs is one manufacturer that has. Their updated driver is called CL_ATAPI.EXE and is available from Creative Labs BBS.

4.14.2 Supported CD-ROM Device Drivers

Table 22 lists the CD-ROM drives in that ship with device drivers in OS/2 Warp. For a complete listing of CD-ROM drives that will work with OS/2 Warp, refer to PCMTABLE which is available from numerous BBSs, including the IBM PCC BBS. Further information on PCMTABLE is contained in B.2.2, “IBM PCM Table” on page 330.

Table 22 (Page 1 of 4). Supported CD-ROM Drives in OS/2 Warp

Manufacturer	Model	Interface	Driver
Aztech	CDA-268-031-SE [5] CDA-468-011	IDE IDE	IBMIDECD.FLT IBMIDECD.FLT
BSR	6800MX [1]	Mitsumi	MITFX001.ADD
CD Technology	T3301 [6] T3401	SCSI-2 SCSI-2	
Chinon	431 [2] 435 [2] 535 [2] 5251 [5]	SCSI-1 SCSI-1 SCSI-2 IDE	CHINCDS1.FLT CHINCDS1.FLT CHINCDS1.FLT IBMIDECD.FLT
Compaq	Tray Load [5] Dual Speed [5] Quad Speed	IDE IDE IDE	IBMIDECD.FLT IBMIDECD.FLT IBMIDECD.FLT
Creative Labs	OmniCD [1]	Panasonic	SBCD2.ADD
Goldstar	GCD-R520B [5]	IDE	IBMIDECD.FLT
Hitachi	CDR-1650S CDR-1700S [3] CDR-1900S [3] CDR-1950S [6] CDR-1750S CDR-3600 [3] CDR-3650 CDR-3700 [3] CDR-6700 [3] CDR-3750 [6] CDR-6750 [6]	SCSI-1 Hitachi Hitachi SCSI-2 SCSI-1 Hitachi SCSI-1 Hitachi Hitachi SCSI-2 SCSI-2	HITCDS1.FLT HITCDISA.ADD HITCDISA.ADD HITCDS1.FLT HITCDISA.ADD HITCDS1.FLT HITCDISA.ADD HITCDISA.ADD

Table 22 (Page 2 of 4). Supported CD-ROM Drives in OS/2 Warp

Manufacturer	Model	Interface	Driver
IBM	CD-ROM I	SCSI-1	TOSHCDS1.FLT
	CD-ROM II [6]	SCSI-2	
	Enhanced II [6]	SCSI-2	
	ISA CD-ROM [1]	Panasonic	SBCD2.ADD
	IDE 2X	IDE	IBMIDECD.FLT
Lion Optics	XC-200AI [5]	IDE	IBMIDECD.FLT
	XC-200EI [5]	IDE	IBMIDECD.FLT
Mitsumi	CRMC-LU002 [1]	Mitsumi	MITFX001.ADD
	CRMC-LU005	Mitsumi	MITFX001.ADD
	CRMC-FX001	Mitsumi	MITFX001.ADD
	CRMC-FX001D	Mitsumi	MITFX001.ADD
	CRMC-FX001DE	Mitsumi	IBMIDECD.FLT
	CRMC-FX300 [5]	IDE	IBMIDECD.FLT
	CRMC-FX400 [5]	IDE	IBMIDECD.FLT
NEC	CDR-25	SCSI-1	NECCDS1.FLT
	CDR-36	SCSI-1	NECCDS1.FLT
	CDR-37	SCSI-1	NECCDS1.FLT
	CDR-38 [6]	SCSI-2	
	CDR-72	SCSI-1	NECCDS1.FLT
	CDR-73	SCSI-1	NECCDS1.FLT
	CDR-74	SCSI-1	NECCDS1.FLT
	CDR-74-1 [6]	SCSI-2	
	CDR-82	SCSI-1	NECCDS1.FLT
	CDR-83	SCSI-1	NECCDS1.FLT
	CDR-84	SCSI-1	NECCDS1.FLT
	CDR-84-1 [6]	SCSI-2	IBMIDECD.FLT
	3XE [6]	SCSI-2	IBMIDECD.FLT
	3XI [6]	SCSI-2	IBMIDECD.FLT
	3XP [6]	SCSI-2	IBMIDECD.FLT
	4XE [6]	SCSI-2	IBMIDECD.FLT
	4XI [6]	SCSI-2	IBMIDECD.FLT
	CDR-260	IDE	IBMIDECD.FLT
	CDR-250	IDE	IBMIDECD.FLT
	CDR-260GW	IDE	IBMIDECD.FLT
	CDR-260R [5]	IDE	IBMIDECD.FLT
	CDR-271 [5]	IDE	IBMIDECD.FLT
	CDR-272 [5]	IDE	
	CDR-2VI	IDE	IBMIDECD.FLT
Optics Storage	8001IDE	IDE	IBMIDECD.FLT
	8221IDE [5]	IDE	IBMIDECD.FLT
	8322 [5]	IDE	IBMIDECD.FLT
	8422 [5]	IDE	

Table 22 (Page 3 of 4). Supported CD-ROM Drives in OS/2 Warp

Manufacturer	Model	Interface	Driver
Panasonic	CR-501 [6]	SCSI-2	
	LK-MC501S [6]	SCSI-2	
	CR-521 [1]	Panasonic	SBCD2.ADD
	CR-522 [1]	Panasonic	SBCD2.ADD
	CR-523 [1]	Panasonic	SBCD2.ADD
	CR-562 [1]	Panasonic	SBCD2.ADD
	CR-563 [1]	Panasonic	SBCD2.ADD
	CF-41 [6]	IDE	
	CR-571 [6]	IDE	
	CR-572	IDE	IBMIDECD.FLT
Philips LMS	CM-205 [1]	Philips	LMS205.ADD
	CM-225 [1]	Philips	LMS205.ADD
	CM-205MS [1]	Philips	LMS206.ADD
	CM-206 [1]	Philips	LMS206.ADD
	CM-207	Philips	IBMIDECD.FLT
	CM-225MS [1]	Philips	LMS206.ADD
	CM-226 [1]	Philips	LMS206.ADD
	CM-215 [6]	SCSI-2	
Pioneer	DRM-600 [6]	SCSI-1	
	DRM-604X [6]	SCSI-2	
Plextor	DM-3028 [6]	SCSI-2	
	DM-5028 [6]	SCSI-2	
	4PLEX [6]	SCSI-2	

Table 22 (Page 4 of 4). Supported CD-ROM Drives in OS/2 Warp

Manufacturer	Model	Interface	Driver
Sony	CDU-31A	Sony	SONY31A.ADD
	CDU-33A	Sony	SONY31A.ADD
	CDU-55D	Sony	IBMIDECD.FLT
	CDU-55E	Sony	IBMIDECD.FLT
	CDU-531 [1]	Sony	SONY535.ADD
	CDU-535 [1]	Sony	SONY535.ADD
	CDU-541 [6]	SCSI-2	
	CDU-561 [6]	SCSI-2	
	CDU-6111	SCSI-1	SONYCDS1.FLT
	CDU-6150 [1]	Sony	SONY535.ADD
	CDU-6201 [1]	Sony	SONY535.ADD
	CDU-6205 [1]	Sony	SONY535.ADD
	CDU-6211 [6]	SCSI-2	
	CDU-6251 [1]	Sony	SONY535.ADD
	CDU-7201 [1]	Sony	SONY535.ADD
	CDU-7205 [1]	Sony	SONY535.ADD
	CDU-7211 [6]	SCSI-2	
	CDU-7305	Sony	SONY31A.ADD
	CDU-7405	Sony	SONY31A.ADD
	CDU-7811 [6]	SCSI-2	
	CDU-76E	IDE	IBMIDECD.FLT
Tandy	CDR-1000 [1]	Mitsumi	MITFX001.ADD
Teac	CD-40E	IDE	IBMIDECD.FLT
Texel	DM-3021	SCSI-1	SONYCDS1.FLT
	DM-3024 [4,6]	SCSI-2	
	DM-3028 [6]	SCSI-2	
	DM-5021	SCSI-1	SONYCDS1.FLT
	DM-5024 [6]	SCSI-2	
	DM-5028 [6]	SCSI-2	
Toshiba	XM-3201	SCSI-1	TOSHCDS1.FLT
	XM-3301 [6]	SCSI-2	
	XM-3401 [6]	SCSI-2	
	XM-4101 [6]	SCSI-2	
	XM-3501	SCSI-1	
	XM-5302B [5]	IDE	IBMIDECD.FLT
Wearnes	CDD-120 [5]	Wearnes	IBMIDECD.FLT

Notes

1. OS/2 Warp Device Drivers can be downloaded from the OS2SUPPORT forum on CompuServe, Prodigy, and other IBM BBSs.

   CDDRVR.ZIP contains the following drivers:

   - LMS205.ADD
   - LMS206.ADD
   - MITFX001.ADD
   - SBCD2.ADD
   - SONY535.ADD

   If you have a Reveal Multimedia package, using SBCD2.ADD, you must:

   - Use 630 for port address.
   - Download the current OS/2 WarpFixPak.
   - If you cannot install OS/2 Warp, you also need to download WFWIN5.ZIP from one of the above BBSs and follow the instructions in its README file.

   If you are having problems, contact the CD-ROM vendor.

2. Chinon CD-ROM drives must be attached to an SCSI adapter which is supported in OS/2 with an OS/2 SCSI Adapter Device Driver file. The Chinon SCSI adapter that is typically bundled with the drive is currently incompatible with OS/2 Warp. Contact Chinon for additional information.
3. The Hitachi non-SCSI CD-ROM device drivers are available from Hitachi.
4. TEXEL 3024 CD-ROM needs a firmware upgrade to version 1.16. Please contact your vendor for the firmware upgrade.
5. Driver available in OS/2 Warp with WIN-OS/2.
6. Some SCSI-2 CD-ROM drives do not require any special .ADD or .FLT from OS/2 Warp. This is because they are supported directly by OS/2's SCSI-2 and CD-ROM support.

The most current list of supported CD-ROM drives is always contained in the PCMTABLE which is available off the IBM PCC BBS.

4.14.3 Configuration of CD-ROM Device Drivers

Four device statements are needed in your CONFIG.SYS file for CD-ROM support. They are as follows: `BASEDEV=IBM1S506.ADD (for IDE based CD-ROM support)` or

```
BASEDEV=IBM2SCSI.ADD (for SCSI based CD-ROM support)
IFS=x:\OS2\BOOT\CDFS.IFS /Q
DEVICE=x:\OS2\BOOT\OS2CDROM.DMD /Q
DEVICE=x:\OS2\MDOS\VCDROM.SYS
```

Along with the above four statements, you also need to have the specific driver for your CD-ROM loaded as a BASEDEV= statement. For example, if you have a Panasonic 562 CD-ROM, your statement would be: BASEDEV=SBCD2.ADD /P:220

Each of these device drivers (with the exception of the virtual DOS driver VCDROM.SYS) have parameters which can be specified in the CONFIG.SYS.

4.14.4 IBM1S506.ADD

This driver statement is discussed earlier in this chapter in section 4.10, “IBM1S506.ADD” on page 151.

4.14.5 CDFS.IFS

This driver statement specifies the file system program for loading the CD-ROM File System or CDFS. It is loaded in the CONFIG.SYS file as follows:

```
--IFS--=-------  -------- -CDFS.IFS-----------  -------------
         -drive-   -path-           -arguments-
```

This command cannot be entered at an OS/2 command prompt. It must be executed within the CONFIG.SYS. It is added automatically when you install a CD-ROM drive either at time of installation of OS/2 Warp or if you perform a Selective Install of a CD-ROM device.

The CD-ROM file system provides file-system functionality for the CD-ROM devices that are supported by OS/2 Warp. CDFS.IFS provides read-only access to data stored on CD-ROM media. Programs can use OS/2-supported APIs to access this media. Any functions involving write access will be denied because they are unsupported.

In the syntax diagram above, `drive` and `path` refer to the location of the CDFS.IFS program. It is normally located in the \OS2\BOOT subdirectory.

The parameters that can be specified on the statement are as follows:

/P: Indicates the debug output port. The values can be 1 (for COM1) or 2 (for COM2).

/K Indicates the supplemental volume descriptor with KANJI.

/C:n Where n indicates how many 64 KB segments to use for the sector cache. The default is /C:2.

/M:n Where n indicates the maximum number of file sectors to read at a time. The default is /M:8.

/Q Suppress initialization messages.

4.14.6 OS2CDROM.DMD

OS2CDROM.DMD is a device manager which provides support for CD-ROM drives. The syntax of the statement in the CONFIG.SYS file is as follows:

```
 --DEVICE--=----------  -------- -OS2CDROM.DMD-------------------------
           -drive-   -path-              -/V-
                                        -/Q-
```

In the syntax diagram above, `drive` and `path` refer to the location of the OS2CDROM.DMD program. It is normally located in the \OS2\BOOT subdirectory.

There are only two parameters that can be specified on this statement.

/V This specifies that the VERBOSE mode is to be used. This means that the product identification and firmware level of the CD-ROM drive is displayed during OS/2 Warp initialization.

/Q This specifies a QUIET fail. This parameter inhibits the display of an error message if OS2CDROM.DMD fails to load during OS/2 Warp initialization. /Q is useful for users who occasionally start the OS/2 Warp operating system with the CD-ROM drive turned off. It is the default set when a CD-ROM drive is installed.

4.14.7 VCDROM.SYS

VCDROM.SYS provides virtual support for CD-ROM drives.

4.14.8 LMS205.ADD and LMS206.ADD

The LMS205.ADD driver support the following CD-ROM drive:

- Philips LMS CM205 and CM225.

The LMS206.ADD driver supports the following CD-ROM driver:

- Philips LMS CM 205MS and CM225MS (multi-session Photo CD version of CM205).
- Philips LMS CM206 and 226.

The difference between the LMS CM205, CM225, and the CM205MS cannot be detected. If your Philips LMS 205 drive supports multi-session Photo CD, then use the Selective Install option to install the CD-ROM and choose the Philips LMS CM205, CM225MS which uses the LMS206.ADD device driver. The LMS205.ADD will not work with this multi-session Photo CD drive.

Both drivers use the same parameters and syntax. They are specified as followed in the CONFIG.SYS file:

```
--BASEDEV--=--LMS205.ADD (or LMS206.ADD)---------  ------------
                                        -/p:hhh-
                                        -/M:y---
                                        -/U:x---
                                        -/V-----
```

The description of each parameter is as follows:

/p:hhh This specifies the base I/O port address of the interface card. This value *must* be the same number as the port address selected by the jumper on the host interface card.

/M:y This indicates the number of 2500 byte CD frame buffers that should be allocated by the LMS206.ADD driver. Valid values for y are 8,.....,26. The default is 16. Any value below the minimum of 8 will be assigned the minimum of 8.

/U:x This identifies a specific unit, x. The value of x must be set to 0,1,2 or 3. The default is 0. LMS205 and LMS206 locates all CM250 and CM260 host adapters and assigns unit numbers based on the order in which

each was found. This parameter tells LMS205 and LMS206 which BASEDEV=LMS206.ADD or BASEDEV=LMS205.ADD line it is currently processing.

/V This specifies the verbose mode. This parameter displays the device driver revision level and CD-ROM product identification information at startup.

4.14.9 SONY31A.ADD

This adapter device driver support the following CD-ROM drives:

- Sony CDU-31A
- Sony CDU-33A
- Sony CDU-7305

The syntax for this command in the CONFIG.SYS file is:

```
--BASEDEV--=--SONY31A.ADD-------- --------- ------------------
                          -/a:n-    -/AT:dd-
                                   -/P:hhh-
                                   -/I:nn--
                                   -/V-----
```

The parameters that can be specified for this device driver are as follows:

/A:n This specifies the adapter number as a single digit value that is zero based. For example, the first adapter is specified as A:0.

/AT:dd This sets the adapter type connected to the CD-ROM drive. The following values are supported: 00 Sony CDB-334 (default) 08 Media Vision ProAudio Spectrum 16.

/P:hhh This specifies the base port address of the interface card. This port address must match the address specified on the host interface card. If the parameter is not specified, the default port address for the host adapter is used. The Sony CDB-334 host adapter supports base I/O port addresses of 320, 330, 340, 360 (hex). The default is 340. For the Media Vision ProAudio Spectrum-16 adapter card, the default is 1F88.

/I:nn This specifies the interrupt request or IRQ. This value must match the IRQ value specified on the host interface card. To enable interrupt transfer mode, which improves performance, this parameter must be specified. If it is not specified, the device driver uses software polling transfer. Some Sony host adapter cards did not include the plastic jumper switch that selects the IRQ channel on the IRQ jumper block. You might need to obtain this switch and install it to enable the IRQ channel.

/V Specifies the verbose mode. This parameter displays the device driver revision level and the CD-ROM product identification information at startup.

For example:

If you have a Sony CDU-31A CD-ROM drive attached to a Sony CDB-334 host adapter and the host adapter is set to any port address other than the default (340), you must modify your BASEDEV statement. If the base port address is 360, your CONFIG.SYS statement must read:

```
BASEDEV=SONY31A.ADD /A: /P:360
```

If you have a Sony CDU-31A CD-ROM drive attached to a Media Vision ProAudio Spectrum-16 host adapter, your statement is:

```
:BASEDEV=SONY31A.ADD /A:0 /AT:08
```

If you have a Sony CDU-31A CD-ROM drive attached to a Creative Labs Sound Blaster Pro, Sound Blaster 16 or Sound Blaster 16MultiCD, the port address specified on the BASEDEV statement should be 10h above the port address specified on the host adapter card. For example, if your Sound Blaster card is set for a base port address of 220h, your CONFIG.SYS statement should read:

```
BASEDEV=SONY31A.ADD /A:0 /P:230
```

4.14.10 SONY535.ADD

This adapter device driver supports the following CD-ROM drives:

- Sony 531 series CDU-531, 6201, 6205
- Sony 535 series CDU-535, 6205, 7205

The syntax of this command in the CONFIG.SYS file is as follows:

```
--BASEDEV--=--SONY535.ADD-- ------=-  -------------------------
                          -/p:hhh-
                          -/I:nn--
                          -/U:d,d-
                          -/V-----
```

The following options can be added to the driver statement in the CONFIG.SYS file.:

/p:hhh This specifies the base I/O port address of the interface card. This value must be the same number as the port address selected by the jumper on the host interface card.

/I:nn This specifies the interrupt request or IRQ channel marker. This value must match the IRQ value specified on the host interface card It is recommended to change the transfer mode from its default, which is software polling transfer to software interrupt transfer. This helps lower the CPU utilization of CD-ROM applications and enable better performance for other tasks while the CD-ROM drive is being accessed. Some Sony host adapter cards did not include the plastic jumper switch that selects the IRQ channel on the IRQ jumper block. You might need to obtain this switch and install it to enable the IRQ channel.

/U:d,d This specifies the drive unit number that the Sony CD-ROM drive is set to. The value of "d" must be set to 0,1,2, or 3. If more than one Sony CD-ROM drive is attached to the adapter, this parameter must be specified. If only one CD-ROM drive is attached to the adapter, and this parameter is not specified, then the default unit ID used by the driver is 0.

/V This specifies the verbose mode. This parameter displays the device driver revision level and CD-ROM product identification information at startup.

For example, if you have a Sony CD-ROM drive attached to a Sony CDB-240 series host adapter at a base I/O port address of 360h and the drive is operating in interrupt mode at IRQ channel 5, your BASEDEV statement should read:

```
BASEDEV=SONY535.ADD /p:360 /I:5
```

If you have two Sony CD-ROM drives daisy chained from the Sony host adapter with the first drive set to drive unit 0 and the second set to drive unit 1, your CONFIG.SYS statement should be:

```
BASEDEV=SONY535.ADD /p:340 /U:0,1
```

4.14.11 SBCD2.ADD

An updated version of SBCD2.ADD is available in CDDRVR.ZIP which is available from the IBM PCC BBS, CompuServe, Prodigy and other BBS locations. SBCD2.ADD supports the following CD-ROM drives:

- Creative Labs OmniCD
- IBM ISA CD-ROM
- Panasonic 521, 522, 523, 562, 563

The syntax of the command in the CONFIG.SYS is as follows:

```
--BASEDEV--=--SBCD2.ADD-------- ------------------------------
                      -/P:hhh-
                      -/T:x---
```

There are two options that can be added to this device driver statement in the CONFIG.SYS. They are:

/P:hhh This parameter specifies the base I/O port address of the interface card. The SBCD2.ADD driver will check for a Panasonic-compatible host adapter installed at port addresses 220, 240, 260 or 300 as shown in Table 23:

Table 23. SBCD2.ADD Port Addresses

Host Adapter	**Port Addresses**
Creative Labs Sound Blaster	220, 240
Creative Labs CD-ROM Adapter	250, 260 (Use /T:2)
IBM ISA CD-ROM	300, 310, 320, 330
Panasonic	300, 310, 320, 330

If your adapter is configured for a different port address, then the /P parameter must indicate the port address that your host adapter is set to.

/T:x This parameter sets the adapter type connected to the CD-ROM drive. Only a value of 2 is supported. This sets the adapter type to Creative Labs CD-ROM interface card (not Sound Blaster).

For example, if you have a Creative Labs OMNICD CD-ROM drive attached to a standard Creative Labs CD-ROM host adapter (not a Sound Blaster), your BASEDEV statement would look as follows:

```
BASEDEV=SBCD2.ADD /P&COLON.250 /T&COLON.2
```

This example also assumes that your adapter is set to a base port address of 250.

4.14.12 MITFX001.ADD

MITFX001.ADD supports the following CD-ROM devices:

- Mitsumi CRMC-FX001
- Mitsumi CRMC-FX001D
- Mitsumi CRMC-LU002S
- Mitsumi CRMC-LU005S

This driver is added to the CONFIG.SYS automatically when you install one of the above drives via Selective Install or during the initial installation of OS/2 Warp.

The syntax of the line in the CONFIG.SYS is as follows:

```
--BASEDEV--=--MITFX001.ADD-------- ---------------------------
                          -/p:hhh-
                          -/I:nn--
                          -/V-----
```

Parameters supported on this device driver statement are:

/P:hhh This specifies the base I/O port address of the interface card. The MITFX001.ADD driver will automatically check for a Mitsumi Host adapter installed at port address 300 or 340. The /P parameter must indicate the port address your adapter is set to if your adapter is configured for a different port address.

/I:nn This parameter specifies the interrupt request (IRQ). It must match the IRQ value specified on the host interface card. Performance is increased if interrupt transfer mode is enabled. To do this, you must specify the /I: parameter. If it is not specified, the device driver uses software polling transfer.

/V This parameter specifies the verbose mode which results in the display of the device driver revision level and CD-ROM product identification information at startup.

For example, assume your Mitsumi CD-ROM is attached to a Creative Labs Sound Blaster 16 MultiCD, and that the I/O port is set to address 320. Also assume that you wish to enable the use of IRQ, your CONFIG.SYS statement would be:

```
BASEDEV=MITFX001.ADD /P:320 /I:10
```

4.14.13 CD-ROM Problem Determination

Generally speaking, the problem you are most likely to experience with CD-ROM devices is that the device is not recognized. In most cases, this is resolved by configuring one of the device driver statements listed in the previous sections of this chapter.

Table 24 is a sampling of some known problems and resolution with CD-ROM drives and OS/2 Warp.

Table 24 (Page 1 of 5). Resolutions for Known CD-ROM Problems in OS/2 Warp

Problem Description	**Resolution**
OS/2 Warp will not load from a Philips LMS CM205 or CM225 CD-ROM The LMS205.ADD driver is not located on diskette 1.	1. Make a **DISKCOPY** of OS/2 Warp diskette 1. 2. Delete the file LMS206.ADD from the copied diskette. 3. Copy the file LMS205.ADD from the OS/2 Warp Installation diskette to the copy of diskette 1. 4. In the CONFIG.SYS of diskette 1, REMark out the BASEDEV=LMS206.ADD statement. :li.ADD the line BASEDEV=LMS205.ADD. 5. Restart the installation.
OS/2 Warp will not boot if /m parameter is used on Philips CD-ROM BASEDEV statement.	If your CONFIG.SYS has BASEDEV=LMS205.ADD /m:26 in it, you must edit this line to remove the /m parameter.
Unable to access or recognize CD-ROM drive that shipped with Creative Labs 3D0 Blaster.	Change your BASEDEV statement to read as follows: BASEDEV=SBCD2.ADD /P:260 /T:2

Table 24 (Page 2 of 5). Resolutions for Known CD-ROM Problems in OS/2 Warp

Problem Description	Resolution
IDE CD-ROM is not recognized after installation of OS/2 Warp from the CD-ROM.	1. Open the **System Setup** folder. 2. Open **Selective Install**. 3. Select **CD-ROM**. 4. From the CD-ROM selection list select **OTHER IDE CD-ROM SUPPORT** (During the initial install of OS/2 Warp, the user would have selected the actual CD-ROM he has installed from the list). 5. Complete the install, shut down and reboot. 6. Edit the CONFIG.SYS and check for the following statement: BASEDEV=IBMIDECD.FLT. 7. The CD-ROM should now be recognized.
IDE CD-ROM is not recognized during install of OS/2 Warp from a CD-ROM.	If an IDE CD-ROM and a IDE hard drive share a disk controller, then you should ensure that the hard drive is configured as the master and the CD-ROM drive is configured as the slave. *but* if the CD-ROM drive and the hard drive are on separate disk controllers, then the user should ensure that both drives are configured as masters. There must be one master per controller in order for the drive on that bus to be recognized. A combination of adapters such as one PCI bus and one ISA bus would mean that both IBM1DECD.FLT and IBM1S506.ADD must be loaded in the CONFIG.SYS file. The IBM1S506.ADD driver statement will need /A:0 or /A:1 depending on if it is the primary or secondary controller.

Table 24 (Page 3 of 5). Resolutions for Known CD-ROM Problems in OS/2 Warp

Problem Description	Resolution
NEC 260 IDE CD-ROM is not being recognized by OS/2 Warp	If OS/2 Warp is already installed, do the following: 1. Open **Selective Install** 2. Select **NEC 260** from the list of CD-ROM drives. 3. Follow the instructions to install and insert the OS/2 Warp diskette when prompted. 4. Edit the CONFIG.SYS in the root directory of the hard drive where OS/2 Warp is installed. (Use any text editor such as E.EXE or EPM.EXE). 5. Change the line `BASEDEV=IBM1S506.ADD`. to read `BASEDEV=IBM1S506.ADD /A:x /U:y /ATAPI`. Refer to 4.10, "IBM1S506.ADD" on page 151 for instructions on the parameters for IBM1S506.ADD. 6. Verify that BASEDEV=IBMIDECD.FLT is also in the CONFIG.SYS. If not, add it to the CONFIG.SYS. If you are trying to install OS/2 Warp from the NEC 260 CD-ROM drive, configure the BASEDEV=IBM1S506.ADD line as per the above. Ensure that the /A and the /U parameters are specified.

NEC 4XI CD-ROM is not working on a machine with a NCR53C810 controller.	Download a file from the DELL BBS called NCR-SCSI.ZIP. Unzip and copy the file OS2CAM.ADD to the \OS2\BOOT subdirectory. Edit your CONFIG.SYS file so that it has the following statements:
	`BASEDEV=OS2DASD.DMD`
	`BASEDEV=OS2SCSI.DMD`
	`DEVICE=C:\OS2\BOOT\OS2CDROM.DMD /V`
	`BASEDEV=OS2CAM.DADD`
	`IFS=C:\OS2\BOOT\CDFS.IFS /Q`
	Use SCSI ID 3,4 or 5 or the CD-ROM **NOTE:** This driver is not supported by IBM. If you have further problems, please contact the vendor.

Panasonic CD-ROM cannot be accessed even with SBCD2.ADD loaded in the CONFIG.SYS file.	You may have an outdated version of SBCD2.ADD. An updated file is included in CDDRVR.ZIP which is available off the IBM BBS.

Table 24 (Page 4 of 5). Resolutions for Known CD-ROM Problems in OS/2 Warp

Problem Description	Resolution
Panasonic multi-disk SCSI CD-ROM model DRM-602X with 6 CD-ROMs.	You must specify /ET on your SCSI driver statement in your CONFIG.SYS. This parameter is usable on the Adaptec, CPT and Future Domain controllers. This tells the driver to scan for embedded targets. For example, if you have an Adaptec controller, your CONFIG.SYS statement would be: `BASEDEV=AHA152X.ADD /ET`.
Multiple Panasonic CD-ROM drives attached to the same IDE card.	At this time, multiple Panasonic IDE CD-ROM drives are not supported. Creative Labs however, has a driver on their BBS (405-742-6660) called CD_OS2.EXE.
Install of OS/2 Warp via a NEC CDR74 CD-ROM with an Adaptec MiniSCSI EPP Parallel Port interface hangs while loading UHPFS.DLL.	Contact NEC or Adaptec for a newer driver. The file name is T358SCSI.ADD.
Unable to install OS/2 Warp from an internal CD-ROM drive connected directly to a sound card (not to a separate controller card). Error message is: OS2CDROM.DMD not found.	This is a hardware problem. On the back of the CD-ROM drive is a jumper which controls the bus device number. OS/2 Warp install requires it to be 0. Most sound board manufacturers leave it at the factory default of 1. Switch the jumper from 1 to 0.
OS/2 Warp install from CD-ROM does not copy non-IBM drivers to hard disk.	A user is installing from a CD-ROM and a device driver does not exist on Diskette 1 but the user has a copy of the correct device driver from the vendor. The install process will not copy this file onto the hard drive after installation is complete. Development has added a variable called `copyfromfloppy` that the installation program will read from CONFIG.SYS on diskette 1. If the CONFIG.SYS has the statement `set copyfromfloppy=1`, then the installation program will copy files from diskette 1 if the diskette is in the drive and the installation is from a drive other than A:.
Install of OS/2 Warp from a Toshiba CD-ROM connected to an Adaptec 1542C controller. Error message: No CD-ROM device support found.	Under the Adaptec setting option (CTRL+A), disable the FAST SCSI and Synchronize option.

Table 24 (Page 5 of 5). Resolutions for Known CD-ROM Problems in OS/2 Warp

Problem Description	Resolution
OS/2 Warp install cannot find SCSI CD-ROM connected to an IBM SCSI-2 RAID controller card. The install program halts after displaying a red screen with a message indicating there is no accessible CD-ROM.	1. Copy IBMRAID.ADD into diskette 1 and add BASEDEV=IBMRAID.ADD into the CONFIG.SYS file of diskette 1. 2. Boot with Diskette 0 and insert Diskette 1 when prompted. 3. When the red screen appears, press Enter for the OS/2 prompt. 4. Type x: where x: is the CD-ROM drive. 5. Change to the \OS2IMAGE\DISK_1 directory. 6. If you need to make a partition, type FDISK and restart from step 2. Otherwise, type SYSINST2 x:\OS2IMAGE and press Enter. 7. OS/2 Warp installation should continue.
Sony 541 CD-ROM connected to a Future Domain 1600 series SCSI card is not recognized by OS/2 Warp.	The Sony 541 is an SCSI II CD-ROM. It works with the FD16-700.ADD device driver. Do not set the SCSI ID for the Sony to 0 or 1.
Cannot recognized CD-ROM drive on ThinkPad 755CD after installation of OS/2 Warp from diskettes.	Edit the CONFIG.SYS file so that the BASEDEV=IBM1S506.ADD reads BASEDEV=IBM1S506.ADD /A:0 /u:1 /ATAPI
Unable to access IDE CD-ROM on ThinkPad 755CD after adding PCMCIA support.	Verify that there are no IRQ conflicts between the PCMCIA device and the CD-ROM drive.
OS/2 Warp does not recognize the Sony 31A CD-ROM attached to a Cardinal DSP16 (SoundBlaster compatible).	Use the latest SONY31A.ADD file and ensure the correct port address and IRQ levels for the CD-ROM are specified. For example: `BASEDEV=SONY31A.ADD /A:0 /AT:5 /P:300 /I:12 /V`

4.15 RAID Device Drivers

This chapter describes the RAID device drivers with regard to their installation in OS/2 Warp as well as giving a brief description of RAID.

RAID is a term which means Redundant Array of Independent Disks. It is an architecture designed to improve data availability by using arrays of disks in conjunction with data striping methodologies. Data striping refers to splitting data between hard drives. For example, a single file will appear to be contiguous but is actually physically split between two different hard drives.

An array is a collection of disks which appears as a single device to the system. RAID is not equivalent to a disk array; it is an architecture which improves data availability in a disk array.

There are a number of different RAID architectures. Each has its own strengths and weaknesses. When RAID was originally developed, there were five levels: RAID 1 to RAID 5. This has now been expanded to include RAID 0 and RAID 6. Only RAID Levels 0,1 and 5 are used in the PC environment. For more information, please refer to *4552a4552b*.

A brief description of each of the RAID levels follows.

4.16 RAID Level Description

RAID 0 RAID 0 is also known as sequential data striping. It is not a true RAID implementation because there is no logical data redundancy or parity. It stripes data sequentially across multiple disks to allow parallel read or write operations. This can result in very high data transfer rates. RAID 0 does not include logical data redundancy. In the event of a single disk failure, the data residing on the disk cannot be regenerated. The advantage of RAID 0 is that it can provide higher throughput than non-arrayed disks.

RAID 1 RAID 1 uses data mirroring to achieve data redundancy. Two copies of the data are created and maintained on separate disks, each containing a mirror image of the other. RAID 1 is the most costly of the RAID levels because the data is duplicated. It does however provide the best data availability (from a disk failure standpoint) because it uses the fewest number of disks in its array configuration. The fewer the number of disks, the lower the probability of multiple disk failure. Performance is improved with RAID 1 because if the primary disk is busy when read requests are issued, the requests can be redirected to the mirrored copy.

RAID 2 RAID 2 is not considered viable for commercial applications. It is similar to RAID 3 in that it distributes data across several disks with striping at the bit or byte/multibyte level. The data is written or retrieved in one parallel movement of all the access arms. RAID 2 uses an encoding technique called Hamming error correction which requires multiple disks for error detection and error correction. This makes RAID 2 more complex and more expensive for commercial usage.

RAID 3. As mentioned above, RAID 3 stripes or distributes information sequentially across several disks. Contrary to RAID 2 however, it uses a single dedicated disk to store parity information. If an array of five disks is used as an example, we would see that four of the five disks are used to store data. The fifth disk stores parity information. If one of the four disks fails, the remaining three plus the parity disk can be used to regenerate the lost data. If the parity disk fails, access to data is not affected. Only one I/O can be active across the arrayed disks at one time because the disk access arms move in parallel. This makes RAID 3 impractical for transaction processing or other high throughput applications needing random access to data. It does however give excellent transfer rates for large blocks of sequential data.

RAID 4 RAID 4 also stripes data across several disks but does it in the form of blocks or records. RAID 4 is not considered viable for commercial applications because it only has one parity disk which is involved in every write operation.

RAID 5 RAID 5 does not have a dedicated parity disk. It mixes data and parity across all disks. The access arms are able to move independently of one another unlike RAID 3. This enables multiple concurrent access to the array devices which satisfies multiple concurrent I/O requests. This provides higher transaction throughput. RAID 5 is best suited for small block size, random access data. An important difference between RAID 5 and RAID 3 is that in RAID 3 every transfer involves all of the data disks. In RAID 5, most transfers involve only one data disk. This allows operations in parallel and gives higher throughput.

RAID 6 RAID 6 adds a second, independent parity block to RAID 5. With two independent parity schemes, data availability is extremely good and is uninterrupted even when two disk failures occur at the same time. However, more disk space is required for parity and the write performance of RAID 6 is extremely low. RAID 6 is considered impractical for most applications.

4.16.1 RAID Device Drivers Installation

OS/2 Warp is not shipped with RAID device drivers. If you are installing OS/2 Warp on a RAID system, you will need to get a copy of the RAID device driver from the option diskette shipped with your hardware system and install it as described in this section.

Some RAID controllers can be accessed using the IBMINT13.I13 base device driver but if possible, install the RAID driver that is shipped with your hardware.

IBMRAID.ADD is the device driver that supports the IBM SCSI-2 Fast/Wide Streaming-RAID Adapter/A. This adapter is installed in the IBM PC 500 among other machines. To add this driver during the installation of OS/2 Warp, follow these steps:

1. Copy the IBMRAID.ADD driver file to OS/2 Warp Disk 1.
2. If space is needed on diskette 1, delete device drivers that are not being used such as AHA152X.ADD, AHA154x.ADD. Ensure that you also delete the corresponding BASEDEV statements from the CONFIG.SYS.
3. Edit the CONFIG.SYS on Disk 1 and add a BASEDEV statement for this driver. Your statement should look like the following: `BASEDEV=IBMRAID.ADD`
4. Once OS/2 Warp has installed, insert the RAID Option Disk in drive A.
5. Enter `DDINSTAL` from any OS/2 command prompt.
6. Select **IBM RAID Controller ADD installation** from the menu and install.
7. DDINSTALL will insert `BASEDEV=IBMRAID.ADD` at the end of the CONFIG.SYS file and will copy the following files from the RAID option diskette to the \OS2 subdirectory:
   - IBMRAID.ADD (device driver)
   - RAIDADM.EXE (RAID Administration and monitor)

   RAIDADM.HLP will be copied to the \OS2\HELP subdirectory. It is a help file for RAIDADM.EXE.

After restarting the system, RAID administration can be done via the RAIDADM program. The program is initiated by typing `RAIDADM` at a command prompt.

Note

Ensure that you are at the latest level of RAID BIOS and the latest version of the IBMRAID.ADD file. If you are not, you may be unable to install OS/2 Warp.

4.16.2 Problem Determination

If you are having problems installing the CD-ROM version of OS/2 Warp, ensure that you are at the latest level of RAID BIOS as mentioned previously. The latest level at the time of writing this book was RAID BIOS V1.63.

The latest levels may be obtained from the PCC BBS in the PC Server's file area. This file area contains all of the RAID-related file updates.

If you have both a RAID controller and a separate SCSI controller, you must load BASEDEV=IBMRAID first if you want the RAID hard drive to be seen as the primary hard drive.

Chapter 5. OS/2 Warp PCMCIA Device Drivers

This chapter describes the PCMCIA drivers in OS/2 Warp with regard to PCMCIA driver installation, which drivers are available in OS/2 Warp, configuration of device drivers and problem determination.

The term OS/2 Warp will be used as generic term for the following OS/2 Versions: OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect. If a description refers to one specific OS/2 version, it will be mentioned specifically.

5.1 Introduction to PCMCIA Device Drivers

OS/2 Warp provides support for the Personal Computer Memory Card International Association (PCMCIA) bus architecture and provides true "Plug and Play" ability within the operating system. Where OS/2 2.1 conformed to the PCMCIA 2.0 standard, OS/2 Warp upgrades this support to the PCMCIA 2.1 level. OS/2 Warp also provides the Resource Manager so a separate program (ICRMU02.SYS) is not necessary to integrate system resources for potential conflicts. The device drivers COM.SYS and OS2DASD.DMD have been made PCMCIA-aware making it easier for developers to write PCMCIA support.

OS/2 Warp provides enhanced PCMCIA support including Card Services, Socket Services, and Resource Clients. These terms are defined later in this chapter. See 5.2.3, “PCMCIA Basic Functions” on page 194 for a detailed discussion. In previous implementations of PCMCIA support, Card Services was provided by the card manufacturer, Socket Services was supplied by the PC manufacturer, and Resource Clients were shipped with the individual PCMCIA card makers. OS/2 Warp provides all of the components with the operating system. Of course device driver support for newly developed PCMCIA hardware will be shipped with the card.

The provided Resource Clients for modems, ATA (Advanced Technology Attach) drives, and Static and Flash RAM Cards are generic drivers. This makes it possible to support most of these cards without the need of specific or additional drivers. See 5.2.7, “PCMCIA Modem Support” on page 198, 5.2.7.1, “ATA Device Driver” on page 200, and 5.2.8, “Integrated Circuit Memory Cards” on page 200 for a detailed discussion on the topics, respectively.

In addition, there is now a graphical user interface (GUI) called Plug and Play. This Workplace Shell (WPS) object allows you to visualize the PCMCIA cards inserted in sockets and display their actual status. It can launch another WPS object when a special event happens at the socket. See Figure 63 on page 212 for details.

Similar features have already been shipped with the IBM ThinkPads. For OS/2 Warp, this code has been optimized in several ways, such as reduced memory usage.

Card Services, Resource Client, and Socket Services drivers are now Base Device drivers. In OS/2 2.1x, they were loaded via DEVICE= (SYS drivers) statements in CONFIG.SYS.

5.2 PCMCIA Standards

PCMCIA standards describe the physical requirements, electrical specifications, and software architecture for PCMCIA PC cards. Three types of cards are described by the PCMCIA standards:

- Type I Card

  PCMCIA type I cards are 3.3 mm thick and may be used for various types of memory enhancements, including RAM, flash memory, one time programmable (OTP) memory, and electronically erasable programmable read only memory (EEPROM).

- Type II Card

  PCMCIA type II cards are 5.0 mm thick and are mainly used for I/O features such as modems, LAN adapters, and host connectivity adapters.

- Type III Card

  PCMCIA type III cards are 10.5 mm thick and are mostly storage devices, such as miniature hard disk drives.

- Extended Cards

  Extended cards support peripheral devices which "extend" outside the computer, such as antennas for wireless applications.

All three card types are 85.6 mm long and 54 mm wide and use the same 68-pin edge connector for attachment to the computer. Thinner cards can be used in the thicker slots, but thicker cards cannot be used in thinner slots.

You can use PC cards with suitably equipped laptops, notebooks, palmtops, tablets, and other portable computer systems, as well as some desktop

computers. PCMCIA PC cards are a convenient alternative to pocket adapters and docking stations.

5.2.1 PCMCIA Standard, Release Levels

The PCMCIA Standard Release levels refer to the version of the PC Card Standard that is used for your specific PCMCIA system or cards. The first Release of the Standard was 1.0 and the second release is 2.x. Release 2.x has had minor updates since its original release.

- PCMCIA Release 1.0

  Release 1.0 was introduced in June of 1990. It supported the 68-pin interface for both Type I and Type II cards. It defined the Physical and electrical specifications, as well as the Card Information Structure (CIS) that is vital to Plug and Play for PC Cards.

- PCMCIA Release 2.0, 2.01, and 2.1

  Release 2.0 was announced in 1991 and enhanced through 1994. It introduced an I/O interface for both types of PC cards defined in release 1.0 of the PCMCIA Standard. Release 2.0 also added support for dual-voltage memory cards as well as clarifications to release 1.0. Release 2.01 added support for Type III cards, the Advance Technology Attach (ATA) specification, and Auto-Indexing MASS Storage (AIMS) specification. It also added the initial version of the Card Services specification. Release 2.1 enhanced both Card and Socket Services and the Card Information Structure (CIS).

- PC Card Standard - February 1995

  In the February 1995 release of the PCMCIA Card Standards support was added for 3.3 volt operation, DMA, and 32-bit Cardbus Busmastering.

5.2.2 PCMCIA Terminology

Term	Definition
card Information Structure	Characteristices and capabilities of the card read by the system for auto-configuration purposes.
Cardbus	Support for 32-bit Busmastering and operation at 33 MHz. Defined in the electrical specification.
DMA	Direct Memory Access support allows the PC Card to utilize DMA accesses in the host PC system.
eXecute In Place	XIP allows you to run operating systems and application software directly on the PCMCIA card, including system boot.

Low Voltage Operation Allows operation on 3.3- and 5-volt systems. Provides physical protection so that 3.3-volt cards do not get damaged in 5-volt systems.

Multiple Function PC Cards Supports multiple function PC Cards - for example, IBM Home and Away, Ethernet and modem card.

Plug and Play The ability to dynamically insert and remove PC cards while the system is up and running.

Power Management Advanced Power Management (APM) support within card Services.

5.2.3 PCMCIA Basic Functions

This architecture was mainly implemented in laptop computers. However, PCMCIA adapter cards are now available for desktop computers and support from two to eight PCMCIA cards per adapter. The different devices available to be inserted into PCMCIA slots are modems, LAN adapters, 3270 and 5250 host emulation cards, ATA hard disks, and Flash RAM and Static RAM memory cards.

PCMCIA adapters are about the same dimensions of a credit card except somewhat thicker, depending on the type of card. There are Type 1, Type 2, and Type 3 PCMCIA cards. Type 3 cards are thicker and take up the space of two Type 1 or Type 2 cards.

There are five major support components for PCMCIA cards and device drivers for each of these parts. They are:

- PCMCIA Card Services
- PCMCIA Socket Services
- PCMCIA Modem Support
- PCMCIA Advance Technology Attach (ATA) Support
- PCMCIA Flash Memory Support.

5.2.4 Card Services

The device drivers that support the card interface into the computer are called Card Services.

The PCMCIA cards plug into a special connector, referred to as a slot, which attaches the card to the computer's bus via a component called the Host Bus Adapter (see Figure 53 on page 195). Device drivers called Socket Services

support the data movement to and from the card across the Host Bus Adapter to the computer bus.

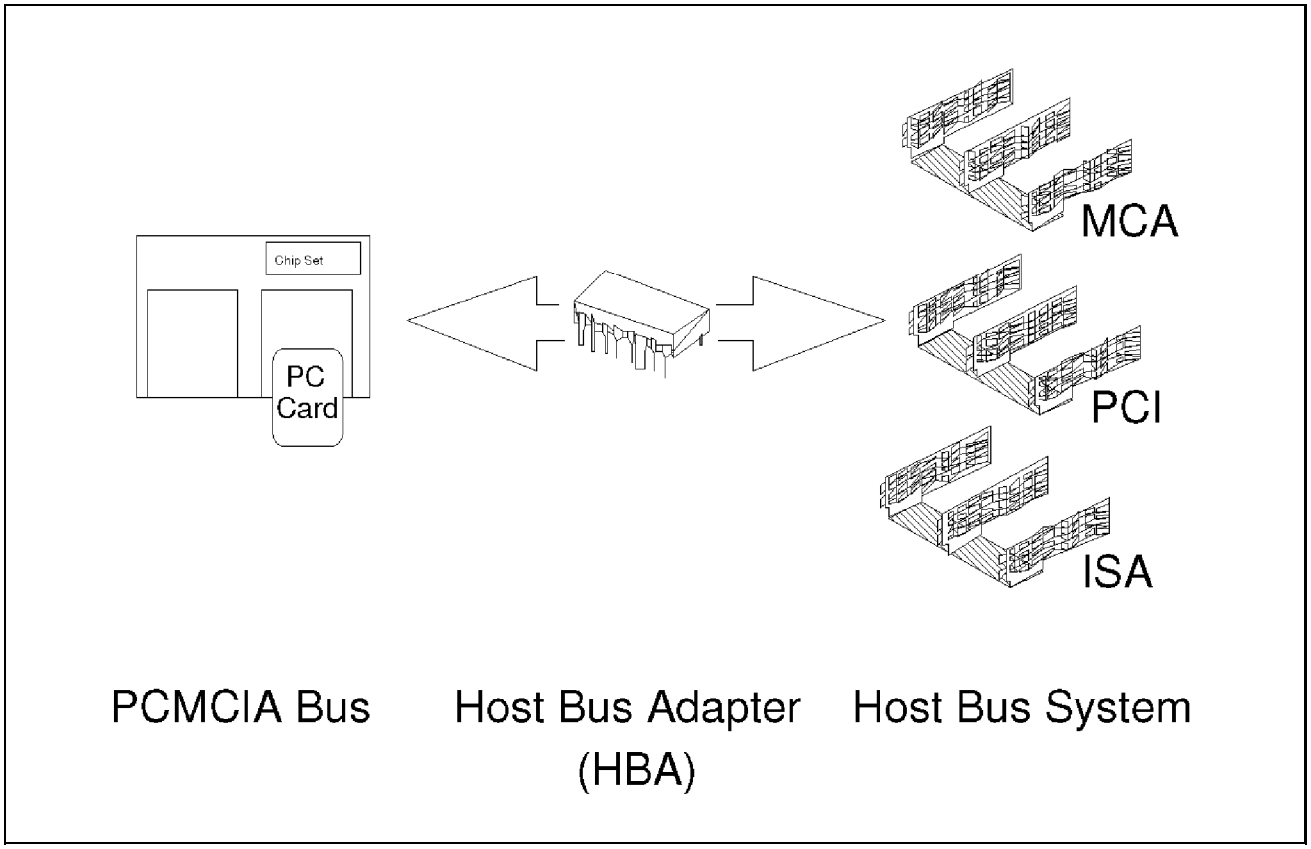


Figure 53. Host Bus Adapter

These first two components of PCMCIA support must be installed before any other card-specific device drivers are loaded. For this reason Card Services and Socket Services are now installed from the BASEDEV= statement in CONFIG.SYS.

5.2.5 Card Services Installation

Card Services and Socket Services device drivers must appear in this order within the CONFIG.SYS file. During PCMCIA installation, see 5.3, “PCMCIA Device Driver Installation” on page 205 later in this section, OS/2 Warp enters statements for you in the CONFIG.SYS in the correct sequence. Both these device drivers are base device drivers with the same file name extension of .SYS, so they will be executed in the order they appear.

- BASEDEV=PCMCIA.SYS

- BASEDEV=IBM2xxxx.SYS

  Where "xxxx" represents a card-specific device driver for a particular brand of computer supporting PCMCIA devices. The following Socket Services device drivers are supported in OS/2 Warp:

  - IBM2AMB1.SYS - Ambra
  - IBM2AST1.SYS - AST
  - IBM2CMQ1.SYS - Compaq
  - IBM2CAD1.SYS - CompuAdd
  - IBM2MAT1.SYS - Panasonic
  - IBM2NEC1.SYS - NEC
  - IBM2NCR1.SYS - NCR
  - IBM2TOS1.SYS - Toshiba
  - IBM2ZEN1.SYS - Zenith
  - IBM2ZOS1.SYS - ZEOS
  - IBM2SS01.SYS - IBM ThinkPad 750 (ISA bus)
  - IBM2SS02.SYS - IBM ThinkPad 720 (Micro Channel bus)

5.2.6 Socket Services

Socket Services provides an Industry-Standard Interface layer across hardware platforms for specific chip-set support. The Socket Services device driver has many parameters that allow control and customization of how PCMCIA support is provided.

The Socket Services device driver options are as follows:

Option:	Option description:
/E or /e	Enable copyright
/Sn=x	x sets the number of sockets on adapter n. The adapter number can be 0 or 1.
/Cn=x	x sets the interrupt level for Status Change on adapter n. The adapter number can be 0 or 1.
/N:IRQ0	No-check IRQ-0 Value at SetAdapter/SetSockets function.
/IRQH	Set IRQ trigger level high. (AT-bus systems are set to be IRQ-High as the default.)
/IRQL	Set IRQ trigger level low.
/APOFF	Set Auto-power mode to OFF. Auto-power mode provides the PC-card power automatically On/Off by hardware. The default is "OFF".

/PH Change the return code from BAD SOCKET to BUSY when the client accesses the specified socket (which is for Boot-Socket or Not-Accessible Socket).

/IOn=xxxx xxxx specifies the socket number list of adapter n. The adapter number can be 0 or 1.

- /IO0=12 Socket 1 and 2 are changed on adapter 0.
- /IO2=21 Same as /IO0=12.
- /IO1=124 Socket 1, 2 and 4 are changed on adapter 1.
- Change the IOCS16 control-line connection from the PC card itself to the PC card controller chip. This option is needed for some cards that do not generate an IOCS16 signal.

/MEMn=xxxx xxxx specifies the socket number list of adapter n. The adapter number can be 0 or 1.

- /MEM0=12 Socket 1 and 2 are changed on adapter 0.
- /MEM0=21 Same as /MEM0=12.
- /MEM1=124 Socket 1, 2, and 4 are changed on adapter 1.
- Change the MEMCS16-line generated from A23-A12 to A23-A17.

/RIn=xxxx xxxx specifies the socket number list of adapter n. The adapter number can be 0 or 1.

- /RI0=12 Socket 1 and 2 are changed on adapter 0.
- /RI0=21 Same as /RI0=12.
- /RI1=124 Socket 1, 2, and 4 are changed on adapter 1.
- Change the RI-signal (Ring Indicator) from the I/O card to be mapped STSCHG Line in the system. (For ExCA V1.50 requirement).

/IGn=xxxx xxxx specifies the socket number list of adapter n. The adapter number can be 0 or 1.

- /IG0=12 Socket 1 and 2 are changed on adapter 0.
- /IG0=21 Same as /RI0=12.
- /IG1=124 Socket 1, 2, and 4 are changed on adapter 1.
- Ignore the specified socket. With this option, Socket Services does not access the physical socket. This option is for some point-enabler software, but point-enabler software is not guaranteed to work perfectly under the socket services.

/NCn=xxxx xxxx specifies the socket number list of adapter n. The adapter number can be 0 or 1.

- /NC0=12 Socket 1 and 2 are changed on adapter 0.
- /NC0=21 Same as /RI0=12.
- /NC1=124 Socket 1, 2, and 4 are changed on adapter 1.
- Treat the specified socket on the adapter as though it is not connected in the system.

/DEBUG Display PC controller card information.

/G For PS/2 E model Systems.

/H For PS/2 model 55 Systems.

/TP710T For IBM ThinkPad 710T Systems.

/TP730T For IBM ThinkPad 730T Systems.

NOTE:

These options are available for the IBM2SS01.SYS and IBM2SS02.SYS Socket Services device drivers, and are used to set the environment for the specified system.

5.2.7 PCMCIA Modem Support

OS/2 Warp provides a Super-Client modem device driver that supports many different PCMCIA modems. There is no need to install a modem-specific device driver as well. The following statement in CONFIG.SYS activates this driver:

```
DEVICE=X:\OS2\AUTODRV2.SYS  X:\OS2\AUTODRV2.INI
```

where x: = the OS/2 Warp install drive

The AUTODRV2.INI file is the modem initialization file used by the IBM Auto Configurator to set up the system modem automatically. AUTODRV2.INI is an ASCII text file which can be viewed with your favorite text editor. The default AUTODRV2.INI file installed on laptop computer is shown in Figure 54 on page 199.

```
; PCMCIA PC Card INI File for IBM Auto Configurator
; ------------------------------------------------------------------------
; Note 1 - Required Resources.
;          Port1  Port2  IRQ  Memory1  MemSize1  Memory2  MemSize2  Others
; Modem       *      -     *      -        -         -        -      none
; SDLC        -      -     -      -        -         -        -      none
;
; *: A value for a key word marked by "*" should be described here
; -: A value for a key word marked by "-" should not be described here
;
; A "SDLC" card has not been supported by the Auto Configurator yet.
; ------------------------------------------------------------------------
; Note 2 - Card ID.
; When you use the following, please add a card ID in the "CardID" statement.
;
; [Modem]
; CardID=MD24XC        OMRON Fax/Data Modem card
;       116E2         OKI Modem card 2400
;       118C2         OKI Modem card Fax/Data
;       FC2400        Dr.Neuhaus Mikroelektronik GmbH FURY CARD 2400
;       2460MC        ELSA GmbH MicroLink 2460MC
; ------------------------------------------------------------------------
; Note 3 - Card Option.
; [(All Card Name)]
; Option=Ignore        Not configure the card
; "All Card Name" means Modem, SDLC.
; ------------------------------------------------------------------------
; Note 4 - Co-existence with an enabler supplied with a PC card.
; If an enabler is supplied with a PC card and you want to utilize its
; function, you must specify the DEVICE statement of that enabler after
; the DEVICE statement of AUTODRV2.SYS in CONFIG.SYS.
;
; (Example)
;
;    DEVICE=C:\...\PCMCIA.SYS                    (the Card Services      )
;    DEVICE=C:\...\COM.SYS                      (the COM driver         )
;    DEVICE=C:\...\AUTODRV2.SYS C:\...\AUTODRV2.INI (the Auto Configurator   )
;    DEVICE=C:\...\xxxxxxxx.SYS                  (another enabler        )
;    DEVICE=C:\...\IBM2SS01.SYS                  (the Socket Services    )
;    DEVICE=C:\...\ICRMU01.SYS                   (the Resource Map Utility)
;
[Auto Configurator Option]
Beep=ON

[Modem]
CardID=MODEM,MD24XC,116E2,118C2,FC2400,2460MC

; Port1    :
; IRQ      : Interrupt Level

;* Port1=3F8,2F8,3E8,2E8,3220,3228,4220,4228,5220,5228
;* IRQ=4,3

Port1=3F8,IRQ=4
Port1=2F8,IRQ=3
Port1=3E8,IRQ=3
Port1=2E8,IRQ=3

[SDLC]
CardID=SDLC
Option=Ignore
```

Figure 54. Sample AUTODRV2.INI File From IBM ThinkPad 750CS Computer

5.2.7.1 ATA Device Driver

The PCM2ATA.ADD base device driver supports PCMCIA Advanced Technology Attach (ATA) hard disk devices. See Figure 57 on page 207 in chapter 5.3, “PCMCIA Device Driver Installation” on page 205 for details.

Command Line Option Switches:

Switch:	Switch description:
/S:n	The number of sockets in PC. The default is 2.
/I:n	The socket number to be ignored (1 origin). The ignored socket is not assigned a drive letter. All card events for the ignored socket are ignored in the CallBackHandler of PCM2ATA.ADD. This switch is useful for the socket that is always used for communication PCMCIA cards and the socket that is always occupied by Type-3 PCMCIA cards.
/B	There is a PCMCIA ATA device as used IDE hard disk. This switch must be used when OS/2 is started from the PCMCIA device itself.
/NOBEEP	No beep is sounded when the PCMCIA ATA device is inserted into a slot and is recognized.
STBTIME:nn	Specifies the value (in minutes) that ATA cards will go to Standby Mode. The maximun value is 21 minutes, and the default is 0. If a value greater than 21 is specified, this option is ignored and is set to the default.
/EXIRQ:n	Do not use the IRQ level number. The IRQ level number specified by this switch is excluded when the PCM2ATA.ADD device driver requests the IRQ level number for CardService and OS/2.

5.2.8 Integrated Circuit Memory Cards

Integrated Circuit (IC) memory cards are PCMCIA Type II cards that contain memory chips for storage of information. There are two different types of IC memory cards called *Flash RAM* cards and *Static RAM* cards. The difference between the two cards is how your data is written and stored on the card. The term Flash RAM is often used when referring to both Flash RAM cards and Static RAM cards.

The major difference between the two types of IC memory cards is that Static RAM cards need a battery source, usually inside the card, to maintain the

information written to the cards memory chips. Flash RAM cards are similar to Erasable Programmable Read Only Memory (EPROM) chips, in that the data is actually burned into the memory chip.

Flash RAM is similar in concept to a Write Once, Read Many (WORM) device. Data which will never be modified is most suitable for storage on these Flash and Static RAM cards. However, with a special utility program, ICMEMFMT.EXE, Flash cards can be erased through formatting. Once formatted the card can be written to again.

The following restrictions apply when using Flash memory:

- After a file is copied, the date and time might not be the original "create" date and time of the file.
- No subdirectories are allowed.
- After a label is created, it cannot be changed.
- A file cannot be erased after it has been written, unless the card is reformatted with ICMEMFMT.EXE.
- After a file has been created, its read-only attribute is set to ON.
- Any file associated with "extended attributes" will not be able to be copied to or created in Flash memory directly. This is because the extended attribute file would be updated in the Flash Memory every time the file is modified, and this is not permitted.
- Multiple threads writing to the same Flash Memory is not supported. Multiple reads from Flash Memory is supported.
- The following commands are known to fail when used on a FAT file system:

  Backup, Recover, Diskcomp, Diskcopy, and Format.

Flash cards come in a variety of sizes. There are Flash RAM Only cards, Static RAM Only cards, and "combo" cards which accommodate both Flash and Static RAM. Available cards and capacities are:

- Static RAM cards:

  256 KB / 512 KB / 1 MB / 2 MB.

- Flash RAM cards:

  1 MB / 2 MB / 4 MB.

- Combo Flash and Static RAM cards:

  1 and 2 MB Flash RAM / 1 and 2 MB Static RAM

1 MB Flash RAM / 1 and 2 MB Static RAM
1 MB Flash RAM / 1 MB Static RAM
2 MB Flash RAM / 2 MB Static RAM.

The device driver that provides support for Flash memory drives is ICMEMCDD.SYS. This driver supports two parameters:

DEVICE=x:\OS2\BOOT\ICMEMCDD.SYS number_of_slots,memory_regions

- number_of_slots = the number of PCMCIA slots in the computer.
- memory_regions = "S" for single or "D" for dual.

NOTE:

If both parameters are expressed, separate them with a comma, otherwise the parameters will be ignored and the defaults of 1 slot and single memory region will be used.

The number_of_slots parameter specifies how many PCMCIA slots are in the computer. Most laptop computers support two Type II cards or one Type III card. IBM provides new PCMCIA Desktop Adapters for ISA bus and Micro Channel bus computers. These new adapters come in two and four slot offerings. The range for the number_of_slots parameter is from 1 to 8 slots and the default value is 1 slot. Set this parameter to the total number of PCMCIA slots in your computer system.

The memory_regions parameter specifies whether a Single or Dual region PCMCIA memory card is to be inserted in one or more slots. ICMEMCDD.SYS supports Dual-region PCMCIA Flash cards as well as the more common single-region memory cards. The IBM COMBO card is an example of a dual-region memory card, supporting Flash RAM in the first region and Static RAM in the second region. Each region of each Dual-Region memory card is assigned a drive letter.

When ICMEMCDD.SYS is installed it assigns drive letters to PCMCIA slots depending on what type of Flash card is installed; single-region memory card or dual-region memory card. If single-region memory cards are to be installed each slot is assigned one drive letter. If dual memory region cards are to be installed each slot is assigned two drive letters.

Assuming the current hard disk is one single "C:" partition, and that drive "D:" is the next available drive letter, drive letters would be assigned as follows for each different CONFIG.SYS statement:

1. Scenario #1: DEVICE=C:\OS2\BOOT\ICMEMCDD.SYS 2,S

   Scenario #1 indicates there are 2 PCMCIA slots in the system and ICMEMCDD.SYS is to support single-region memory cards. You could insert one single-region memory card in either of the two slots or in both available slots. Therefore the next two available drive letters are assigned to each of the two PCMCIA slots in the computer.

   - slot 1 => D:
   - slot 2 => E:

2. Scenario #2: DEVICE=C:\OS2\BOOT\ICMEMCDD.SYS 2,D

   Scenario #2 indicates there are 2 PCMCIA slots in the system and that dual-region memory cards are to be supported. A single dual-region memory card is assigned two drive letters, one for the Flash RAM region and another for the Static RAM region. It is possible to insert two dual-region memory cards in this system, therefore two drive letters are assigned to the first PCMCIA slot and two drive letters are assigned to the second slot as shown in the following list.

   - slot 1 => D:
   - slot 1 => E:
   - slot 2 => F:
   - slot 2 => G:

The default parameters are "1" for number_of_slots and "S" for memory_regions. The maximum number of drive letters supported is 16, assuming 8 PCMCIA slots each supporting dual memory regions.

If a COMBO card with dual memory regions is inserted into a slot with only one drive letter assigned, only the first memory region of that card will be used and the second memory region is disabled. If a single memory region Flash or Static RAM card is inserted into a slot that has two drive letters assigned to it, the first drive letter is used to access the single memory region and the second drive letter is invalid. If the second drive letter is used, the system will return a the message "Drive is not ready" to show it cannot be accessed.

IBM has added to the IC memory card accessories with the introduction of the *PCMCIA Solid State File Cards*. These low power consumption, high reliability solid state storage devices are fast gaining popularity because of their integrity and capacity. IBM PCMCIA Solid State Files include device drivers that automatically recognize and enable them as the next logical

drive in your system. Up to a maximum of four sockets are supported at this time.

Five offerings have been announced by IBM. There is a 5 MB, 10 MB, and 20 MB Type I version, and a 30 MB and 40 MB Type II version of card available. Installation instructions are shipped with each card.

Some highlights of the cards are:

- Flash memory, non-volatile technology that requires no battery backup
- On-card microcontroller that emulates disk storage for compatibility with your operating system
- Rugged, laser-welded stainless steel packaging for reliability
- Fifty percent faster performance than other Flash Cards on the market
- Power efficient storage for mobile users
- Software driver included that automatically establishes a logical drive
- Resistant to shock damage in the rough-and-tumble mobile environment

5.2.9 IBM PCMCIA SCSI Card

The IBM PCMCIA SCSI card comes with device driver CSSCSI.SYS, which is the card services enabler. After card services and socket services are loaded CSSCSI.SYS activates the card upon insertion. The actual SCSI adapter device driver, FD16-700.SYS, will now be able to detect an SCSI adapter and load successfully during the boot process.

CSSCSI.SYS is installed using a BASEDEV= statement in the CONFIG.SYS file and has two parameters:

Option:	**Option description:**
IO=x	where x can be either port address 140 or 170
IRQ=y	where y can be interrupts 3, 5, 10, 11, 12, 14, or 15

The device driver CSSCSI.SYS supports two PCMCIA SCSI cards in one machine and allows you to specify two parameters for each card. The driver accepts an IO port address and Interrupt Request channel for each card. If you specify parameters for two cards separate them with a comma. Please refer to the example below:

```
BASEDEV=CSSCSI.SYS  IO=140  IRQ=5,  IRQ=11
```

In the above example the first SCSI card would be assigned IO address port 0x140 and Interrupt Request Channel 5, and the second SCSI card would be assigned the default IO address port 0x170 with Interrupt Request Channel 11. If no parameters are specified in addition to the device driver, the default assignments are IO=140 IRQ=5, and IO=170 IRQ=11, respectively.

5.3 PCMCIA Device Driver Installation

OS/2 Warp supports two methods of installing PCMCIA support. You can select PCMCIA support during the initial installation of OS/2, or you can choose to run Selective Install from the System Setup folder (see Figure 55).

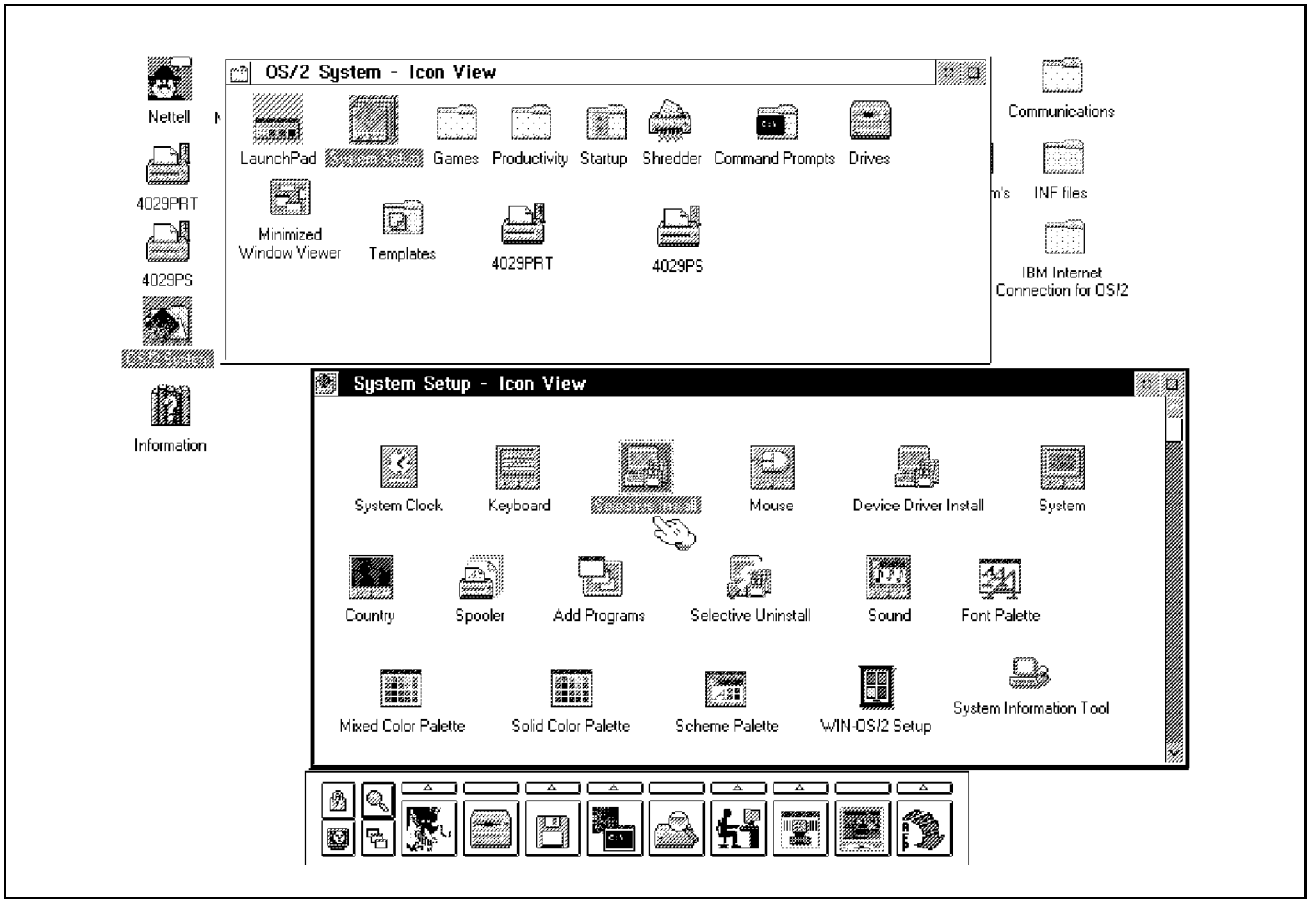


Figure 55. Selective Install in System Setup folder

The first phase of OS/2 Warp installation installs the maintenance desktop. This includes support for a minimal Workplace Shell environment with Presentation Manager support. At this point of the install you receive an instruction on the screen to reboot your machine by pressing the Enter key.

This reboot starts the second phase of the OS/2 installation process with a multi-threaded, Presentation Manager user inferface.

The first screen you see is the System Configuration screen (see Figure 56). This is the same whether this is your initial installation or you double-clicked on *Selective Install* in the OS/2 System Setup folder.

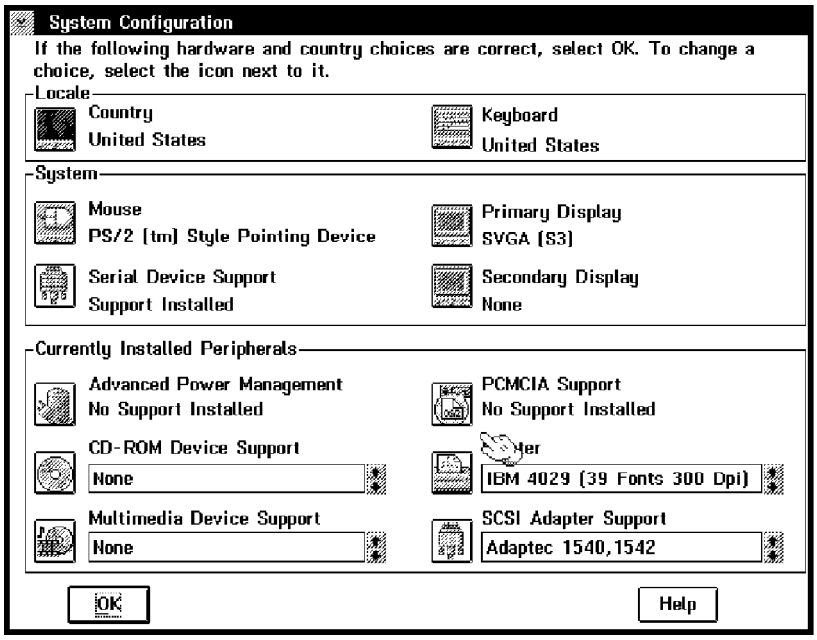


Figure 56. System Configuration screen

The *System Configuration* panel has three sections, the Locale, System, and Currently Installed Peripherals areas. PCMCIA Support is in the latter. The PCMCIA Support pushbutton will indicate either what system is configured or indicate *No Support Installed*. Click on the pushbutton to select which PCMCIA support to install.

The next panel displayed is *PCMCIA Support*. Under the title "Select PCMCIA System" is a list box naming all systems tested with OS/2 Warp to date. Your system should be highlighted in the list, but you can scroll through the list and examine all the systems supported. On the right side of the panel you can select one or more check boxes for PCMCIA Modem/FAX, PCMCIA ATA hard Disk, and PCMCIA Flash. See Figure 57 on page 207.

Support is installed as follows:

PCMCIA Support Option	Option description
PCMCIA Modem/FAX	Installs AUTODRV2.SYS for FAX/modem supprt.
PCMCIA Hard Disk	Installs Advanced Technology Attach (ATA) driver PCM2ATA.SYS.
PCMCIA Flash	Installs ICMEMCDD.SYS for Flash RAM card support and ICMEMMTD.SYS for Static RAM card support.

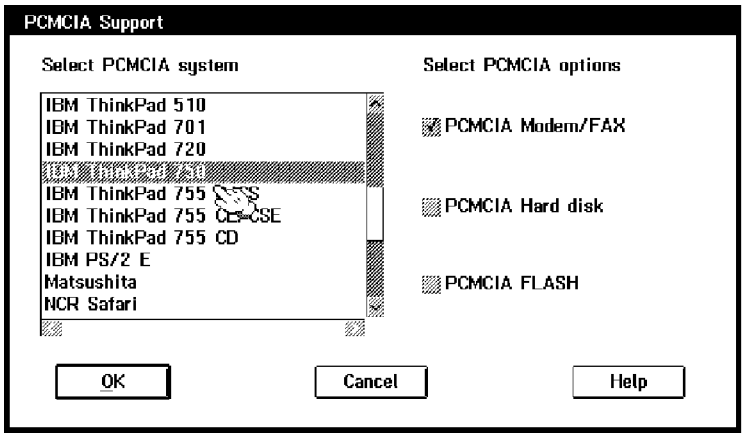


Figure 57. PCMCIA Support screen (System List)

If your system is not already highlighted scroll through the list until you see it and select it by clicking once on it with mouse-button 1. If you require support for a fax/modem, ATA hard disk, or Flash memory card select the appropriate check boxes and click on **OK** to continue the installation.

Your CONFIG.SYS file will be updated and you will be required to reboot your system to load the newly installed device drivers. Follow the instructions on your screen and perform a shutdown and reboot as described.

5.4 Plug and Play

After having installed PCMCIA support in OS/2 Warp you can examine the state of your PCMCIA slots and cards by using the *Plug and Play for PCMCIA* object. This object is new to OS/2 Warp and is found in the System Setup folder. See Figure 58 on page 208.

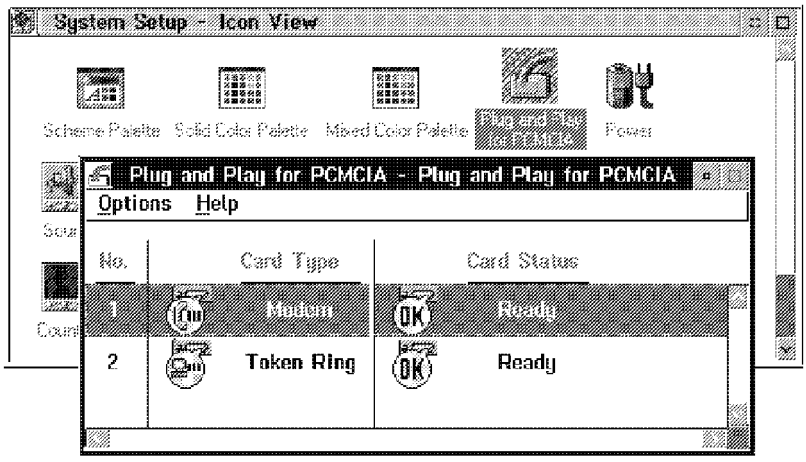


Figure 58. Plug and Play for PCMCIA

Note:

The Plug and Play for PCMCIA folder only gets installed on machines that support PCMCIA slots, and then only when PCMCIA support is installed.

Double-click mouse-button one on the object to open the **Plug and Play** program. In the window you will see a numbered entry representing each PCMCIA slot available in your computer. Slot numbering begins with the number 1. Some other PCMCIA programs start at slot zero (0). For each slot you will see two headings; Card Type and Card Status.

Heading	**Description**
Card type	Short description of the PCMCIA card in that slot
Card Status	Current state of the PCMCIA slot: Ready, Not Ready, or Empty

From the information you see for each slot you can determine if the card initialized without problems, or whether there is a problem that may need action. If a PCMCIA card is in the slot and Plug and Play shows the slot as empty you probably have a hardware problem and should run diagnostics on the computer. If Plug and Play indicates the card in the slot is ready but you still cannot use it, perhaps you have a device driver problem. With the Plug and Play for PCMCIA object you can actually see if a problem exists.

To get more information on a particular PCMCIA card you can point to the card in the Plug and Play window and double-click mouse button one. Figure 59 on page 209 displays the I/O Card - Details View. In this window

you see a Card Information area and an Assigned Resource area. Card Information will give you specific details on the PCMCIA card in that slot and Assigned Resource provides system information about the card.

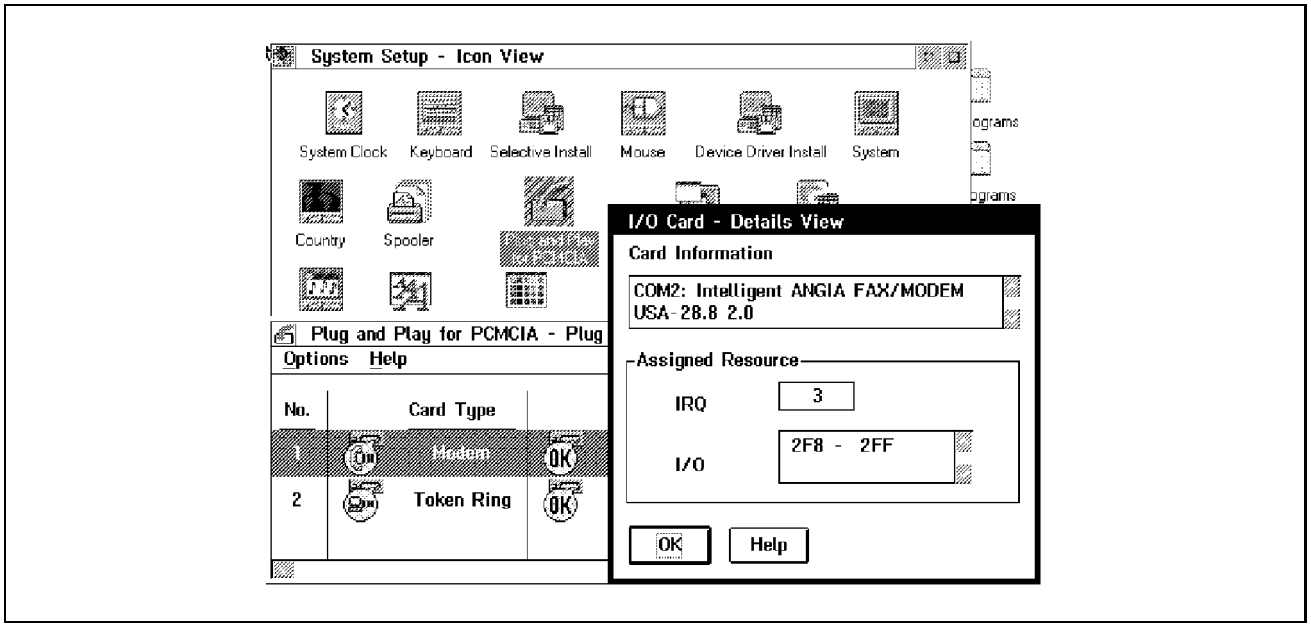


Figure 59. I/O Card - Details View

In an IBM ThinkPad 750Cs we installed an Angia Communications SAFEJACK 28.8 PCMCIA modem. This is a 28,800 bps data, 14,400 bps Send/Receive Fax, V.34 compliant modem. When you double-click on the slot you get the information in Figure 59.

Depending on what hardware is installed, the information displayed will vary somewhat. This information will be very helpful should the need arise to perform problem determination on this machine. If you suspect an IRQ conflict and need to determine which IRQ is being used by a modem, the I/O Card - Details View displays it for you. After viewing the information click on **OK** to close the window.

The Plug and Play for PCMCIA window has an action bar with two possible selections: Options and Help. The Help pull-down menu shows two important actions that display useful information. First, About Card Services... displays the IBM OS/2 PCMCIA Card Services Device Driver Version number and copyright information including Release and Revision information. See Figure 60 on page 210 for the Card Services panel.

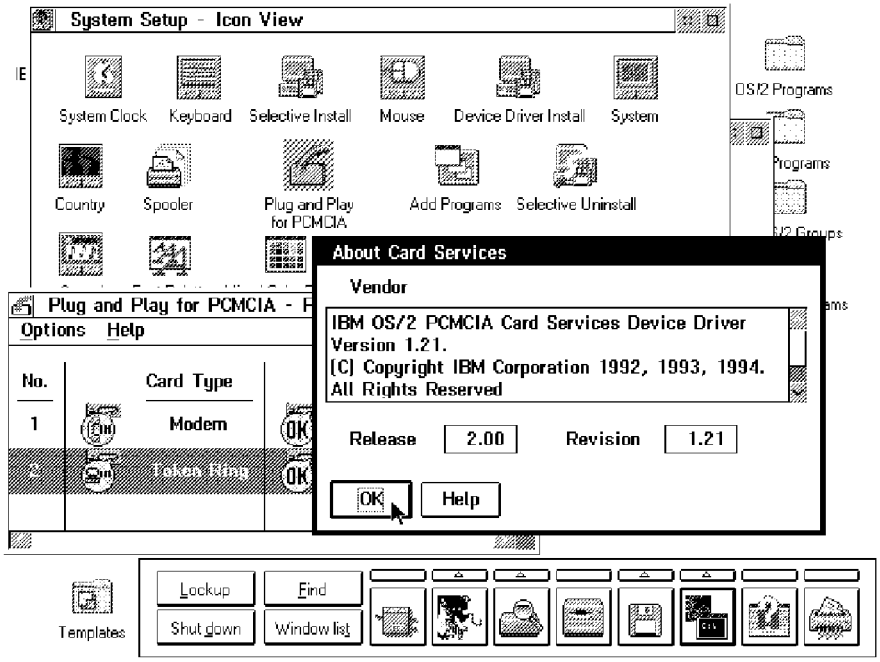


Figure 60. About Card Services

The *Product Information...* displays the IBM Plug and Play for PCMCIA version number. When performing problem determination this information is vitally important. See Figure 61 on page 211 for details.

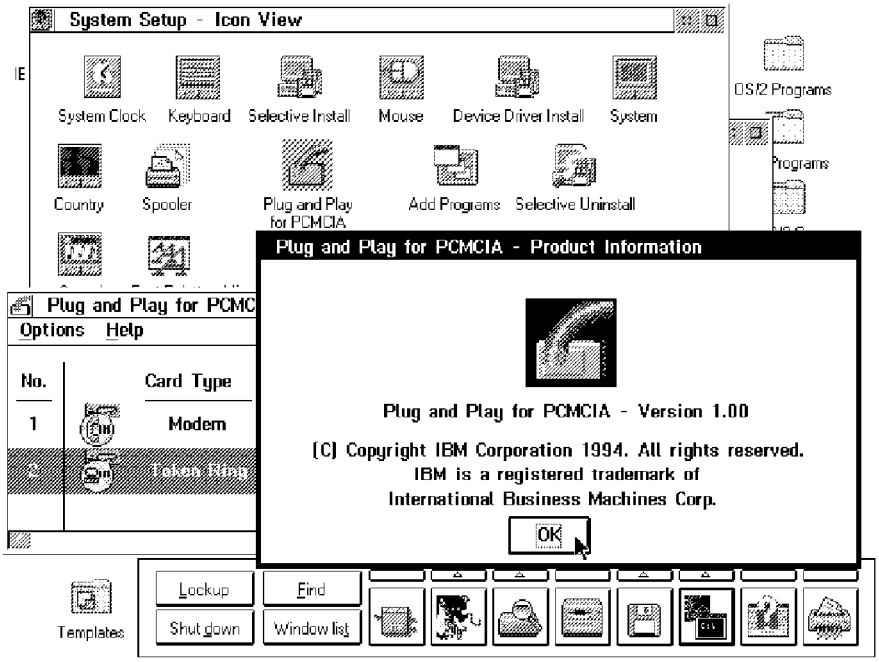


Figure 61. Product Information

The first action on the Action Bar of the Plug and Play for PCMCIA is Options. When you click on **Options** on the Action bar the pulldown menu displays *Customize...* and *Register Objects...*.

Note:

The three dots after Customize and Register Objects indicates that you will be presented with another OS/2 dialogue box after clicking on these options.

Clicking on Customize presents you with the **Customize** dialogue box, as shown in Figure 62 on page 212. This is where you can customize certain features and behaviors of Plug and Play. You can choose to display a window or sound a beep based on the state of a particular PCMCIA card. You can also choose whether or not to display the Plug and Play for PCMCIA window.

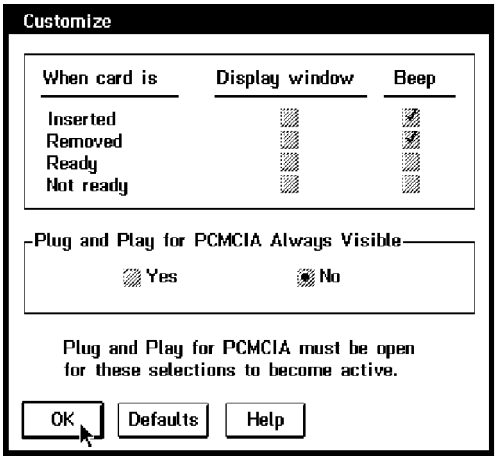


Figure 62. Customize Dialog

The second action on the Option pulldown menu is Register Object, as shown in Figure 59 on page 209. Register Objects allows you to automatically launch a program based on the state of a PCMCIA card.

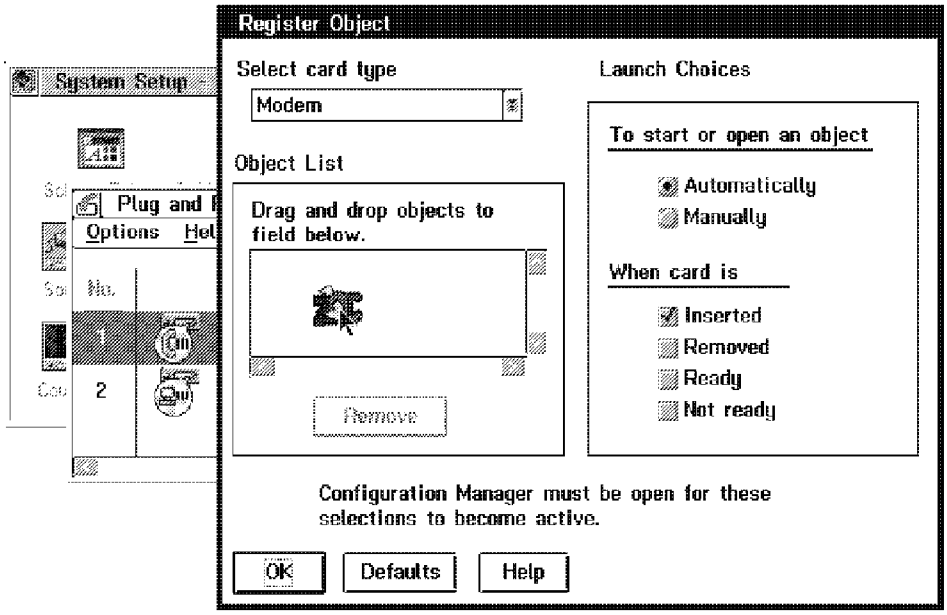


Figure 63. Register Object Dialog

This OS/2 dialogue box has three sections:

- Select Card Type

You select what PCMCIA card you want to launch a program automatically.

- Object List

  Drag and Drop the application you want to launch automatically into this window.

- Launch Choices

  You can cause your application to start *Automatically* or *Manually* based on the state of the selected PCMCIA card. The possible states are Inserted, Removed, Ready, or Not Ready.

In Figure 63 on page 212 the selected Card Type is modem, the Object List displays the icon for Zap-O-Comm (ZOC) OS/2 Communications program, and selected Launch Choices options are Automatically and Inserted. These selections will cause the ZOC program to start automatically when a modem card is inserted into a PCMCIA slot.

You can add more than one program to the Object List box of the Register Object dialogue. When more than one program is added to the list you will be presented with a selection list containing the names of all programs. Then you will click on the program you wish to launch.

Note:

When you first add a program to the Object List in the Register Object dialogue the name of the program appears in the list. After clicking on **OK** the dialogue closes. When you reenter the Register Object dialogue the Object List does not display current selections as it should. To see that your choice is indeed there, open the Plug and Play for PCMCIA object and this will cause the launch conditions to be checked and your program will be executed.

5.5 PCMCIA Drivers not Included in OS/2 Warp

There are many PCMCIA device drivers supported in OS/2 Warp. However, there are some common PCMCIA device drivers, that are not included in the OS/2 Warp packages. The following is a list of these PCMCIA device drivers. To retrieve those device drivers, refer to Appendix B, “OS/2 Device Driver Sources” on page 325.

Table 25. PCMCIA Adapter Support not included in OS/2 Warp

Device	Card Type	Device Driver	Comment
Ext CD-ROM	II	NA	none
16-bit Audio	II	NA	none
Data/Fax Modems	II	AUTODRV2.SYS	28.8(v.34) & 14.4(v.42)
Home & Away	II	AUTODRV2.SYS	Modem & Ethernet LAN
Token-Ring LAN	II	NA	Auto 16/4 Token-Ring
Ethernet LAN	II	NA	Ethernet Card II
RS232 Serial Port	II	NA	Provides additional COM port
Ext Hard disks	II	NA	364 & 527 MB
Solid State File Cards	I, II	NA	5, 10, 20MB(I), 30, 40MB(II)
IBM SCSI card	II	CSSCSI.SYS & FD16-700.ADD	Future Domain
IBM Wireless Modem	II	ACRCS2.SYS	Wireless modem for ARDIS
PCMCIA Desktop Adapters	All types	NA	Supports PCMCIA adapters

5.6 Configuration of PCMCIA Device Drivers

This section covers the description of how to configure PCMCIA device drivers after their installation. We will discuss all PCMCIA drivers that require configuration after installation.

- BASEDEV=CSSCSI.SYS IO=x IRQ=y

  CSSCSI.SYS is a card services enabler. Once the PCMCIA SCSI card is enabled, or activated, a SCSI device driver can be loaded to make this device useable. This card uses the FD16-700.ADD. When the BASEDEV=FD16-700.ADD executes, it now sees a SCSI adapter in the system and continues to load. This base device driver should be placed in CONFIG.SYS after the Card Services and Socket Services device drivers.

This device driver has two parameters.

- IO=x where "x" = 140 or 170 (IO port address)
- IRQ=y where "y" = 3, 5, 10, 11, 12, 14 or 15 (Interrupt channel)

Two SCSI adapters are supported in one machine. If you include this base driver in CONFIG.SYS without specifying the optional parameters, the default values are IO port 140, Interrupt 5 for the first card and IO port 170, Interrupt 11 for the second card. If you specify parameters for two cards, separate them with a comma. For example:

BASEDEV=CSSCSI.SYS IO=140 IRQ=5, IRQ=11

Card 1 (in slot 0) will use IO port 140 and Interrupt Request Channel 5 and card 2 (in slot 1) will use the default IO port for the second card, IO=170, and Interrupt Request Channel 11.

- BASEDEV=PTCSSCSI.SYS IO=x IRQ=y

  This PCMCIA SCSI card device driver can work without card services.

  This device driver has two parameters.

  - IO=x where "x" = 140 or 170 (IO port address)
  - IRQ=y where "y" = 3, 5, 10, 11, 12, 14 or 15. (Interrupt channel).

5.7 Known PCMCIA Problems

This section describes some known OS/2 Warp problems affecting PCMCIA support. The following hints and tips are descriptions of APARS and other problems experienced by experts. The problem description and its suggested fix will solve your problems in most cases. Nevertheless they may not have the expected result if you have specific hardware or software. The descriptions are taken from various sources, therefore the description of the exact hardware and software are not include.

Table 26 (Page 1 of 2). Known PCMCIA Problems

Problem	Problem Fix
Affected module: COM.SYS, (APAR: PJ15906). Unable to access PCMCIA modem on an IBM ThinkPad 720. You require OS/2 Warp FixPak Installation diskettes, WARPBDSK #1 and WARPBDSK #2 to install this FixPak. (These diskettes can be downloaded from the IBM BBS or, call your local support group to obtain directly from IBM.)	To install this FixPak perform the following steps: 1. Insert WARPBDSK #1 in drive A. 2. Open an OS/2 window or Full Screen. 3. [C:\]Enter `a: service` and press the Enter key. 4. Follow displayed instructions. Note: When prompted, do the following for \ARCHIVE specification: 5. Enter the path where a copy of replaced module(s) will be stored in the ARCHIVE directory (for example D:ARCHIVE). 6. Click on **OK.** Note:A "Reboot" could be required at this point. If so, follow instructions displayed. If a "Reboot" is not required, then do: 7. Select NO for re-display of "Product List" when displayed. 8. Close the CSF window. 9. Shut down and reboot your system. Note 1: To view the corrective Service Facility documentation do: 1. Insert WARPBDSK #1 in drive A. 2. [C:\]Enter PCMCIA Drivers not included in OS/2 Warp E `A:README.CSF`. Note 2: To print the corrective Service Facility documentation do the following: 1. Insert WARPBDSK #1 in drive A. 2. [C:\]Enter `PRINT A:README.CSF`.
PCMCIA Support does not work on Toshiba 1900 Series Notebooks. SYMPTOMS: PCMCIA Socket Services does not work on Toshiba 1900 Series Notebooks.	Summary of Resolution: Obtain the file BATT.SYS from the Toshiba BBS, and install the file and add the statement "DEVICE=BATT.SYS" after the other PCMCIA statements in the CONFIG.SYS file.
Symptoms: PCMCIA support does not work in Warp on Gateway Color Notebooks. Gateway Color Notebook Socket Services in Warp Selective Install.	Resolution: Select the AST PowerExec Socket Services device driver "IBM2AST1.SYS" for the Gateway Color Notebook during Selective Install of PCMCIA support. This device driver may work for other Notebooks with the same PCMCIA Socket Services chipset.

Table 26 (Page 2 of 2). Known PCMCIA Problems

Problem	Problem Fix
APAR PJ16864. COMPAQ LTE Elite & AST ASCENTIA 900N PCMCIA Support not working. SYS1201 during boot for VCOM.SYS & AUTODRV2.SYS been reported. Unable to use PCMCIA on a Compaq LTE Elite 4/50cx due to VLSI chipset. Customer gets SYS1201 on VCOM.SYS & AUTODRV2.SYS during boot. Also reported on the AST Ascentia 900N which uses a similar PCMCIA socket controller.	**Local fix**: There are VLSI drivers available on the IBM PCC BBS for the Compaq and the AST Notebook computers. COMPAQ: CVLSI3.ZIP; AST: OS2P30.ZIP. **Problem summary**: There was no support for the VLSI PCMCIA socket controller in OS/2s PCMCIA support. **Problem conclusion**colon. A new BASEDEV device driver, SSVLSI.SYS, has been incorporated into the code. **Temporary fix**: 1. If the user has not already done so, have the user (selective) install for PCMCIA Support using the Panasonic selection. 2. Insert the diskette containing the SSVLSI.SY_ file. The README.1ST file (which is located on the first FixPak diskette) can be used to determine which FixPak diskette contains the SSVLSI.SY_ file. 3. Open an OS/2 command prompt (session) and change the directory to "\OS2". 4. Enter the following command: Type `UNPACK A:\FIX\OS2.1\SSVLSI.SY_`. Note that the trailing underscore ("_") is very important. A message will be displayed indicating that one file was unpacked/copied. 5. Edit the CONFIG.SYS and locate the line, "BASEDEV=IBM2MAT1.SYS". This assumes that the Panasonic selection was used for the Selective Install. If a different selection was chosen, the customer needs to locate the OS/2 PCMCIA Socket device driver. A list of the device driver names is in the \OS2\INSTALL\PCMCIA.TBL file. 6. Remark (REM) the line containing BASEDEV=IBM2MAT1.SYS and add the line below immediately following: BASEDEV=SSVLSI.SYS. 7. Save the changes to the CONFIG.SYS file, shut down OS/2 and reboot. The SSVLSI.SYS device driver will now be loaded.

Chapter 6. OS/2 Warp Multimedia Device Drivers

The term OS/2 Warp is used as generic term for the following OS/2 Versions: OS/2 Warp Version 3, OS/2 Warp with WIN-OS/2 and OS/2 Warp Connect. If a description refers to one specific OS/2 version, it will be mentioned specifically.

This chapter describes multi media device drivers for OS/2 Warp. In this section multi media refers to audio or sound support and not CD-ROMs. Full details on OS/2 Warp CD-ROM device drivers are in 4.12, “CD-ROM Device Drivers” on page 159 in Chapter 4, “OS/2 Warp Storage Device Drivers” on page 123. In a specific example later in this chapter we refer to the Panasonic 563 CD-ROM drive because it attaches to the sound card described there.

We will show you a list of multimedia adapters that OS/2 Warp supports and compliments this with drivers from other sources for adapters not yet included. The OS/2 multimedia installation will be reviewed from the viewpoints of a brand new installation and adding device support to a workstation with OS/2 Warp already installed. You will also see an example of installing device driver support for an audio adapter without built-in support under OS/2 Warp.

It is very important that your audio devices are configured correctly under OS/2 Warp. Configuration parameters are a varied as there are different audio devices supported by OS/2 Warp. Some adapters do not allow you to configure any parameters via the device driver. Others have 8-bit and 16-bit DMA, multiple IO ports, for example, an IO port for the audio adapter itself, the CD-ROM connection and the MIDI device, as well as a number of adapters in the system, interrupt levels, and more. It can be quite complicated. We will show you configuration parameters for the adapters where support in included in OS/2 Warp and for some popular OEM audio adapters.

6.1 Overview of Multimedia Support

Multimedia is the combining of media elements on a personal computer to enhance the communication of information. A variety of audio and video hardware is supported in OS/2 Warp. The functions range from digital audio recording and playing, video capturing, playing and recording software

motion video (AVI and MPEG), watching movies from CD-ROMs, MIDI player support to watching movies on videodisk.

This chapter will concentrate on the support for audio adapter cards since they are a popular and often combined with a CD-ROM drive.

6.2 Supported Audio Adapter Cards

OS/2 Warp has built-in support for IBM audio adapters and many OEM audio adapter cards available on the market today. The current version of OS/2, OS/2 Warp Connect with WIN-OS/2, includes device driver support for 24 popular audio cards.

Many more device drivers are available from such sources as the IBM BBS, the IBM PC Company BBS, other local BBSs, the Internet, Compuserve and other online services.

OS/2 Warp Connect with WIN-OS/2 includes built-in support for the following audio adapter cards:

- AudioDrive (ESS 688)
- Business Audio (AD1848)
- Compaq Business Audio
- IBM M-Audio Adapter
- IBM ThinkPad Audio - Crystal Semi
- Jazz 16-Media Vision
- M&M Basic - OmniComp
- Pro Audio Spectrum 16
- Reel Magic - (Audio) Sigma Designs
- Reel Magic - (Video) Sigma Designs
- Sound Blaster (Non-Pro, ISA and MCV)
- Sound Blaster 16
- Sound Blaster AWE32
- Sound Blaster Pro (MCV or OPL3)
- Sound Blaster Pro (OPL2)
- Sound Galaxy NOVA 16 EXTRA

- Super VideoWindows - New Media Graphics
- Toshiba T4700C
- Toshiba T6600C
- Video Blaster - CLI
- Video Clipper - CEI
- Video Magic - Samsung
- WaveWatcher - AITech
- WIN/TV - Hauppauge

There may be sound cards not mentioned here that have available OS/2 device drivers. Please consult Appendix B, “OS/2 Device Driver Sources” on page 325 for a detailed list of sources of OS/2 device drivers for your favorite personal computer hardware peripherals. New OS/2 device drivers are being written on an increasing basis and usually appear on a BBS or other electronic media before officially announced by IBM or included in a refresh of the operating system.

6.3 Multimedia Device Driver Installation

OS/2 multimedia support is comprised of two parts; Multimedia Device Support and Multimedia Application Support. This section will introduce both topics but only go into detail on device support. Installing OS/2 Multimedia Presentation Manager/2 involves first installing device driver support for the particular sound card you have installed in your system, then installing the multimedia software provided with OS/2.

OS/2 Warp supports many different sound cards, some from IBM and a variety from Other Equipment Manufacturers (OEM). The current list of supported sound cards is in 6.4, “Supported Multimedia Device Drivers” on page 227. Support for sound cards can be installed during your initial installation of OS/2 Warp or from a Selective Install, executed from the System Setup folder of the OS/2 System object on the your OS/2 Desktop. See Figure 64 on page 222.

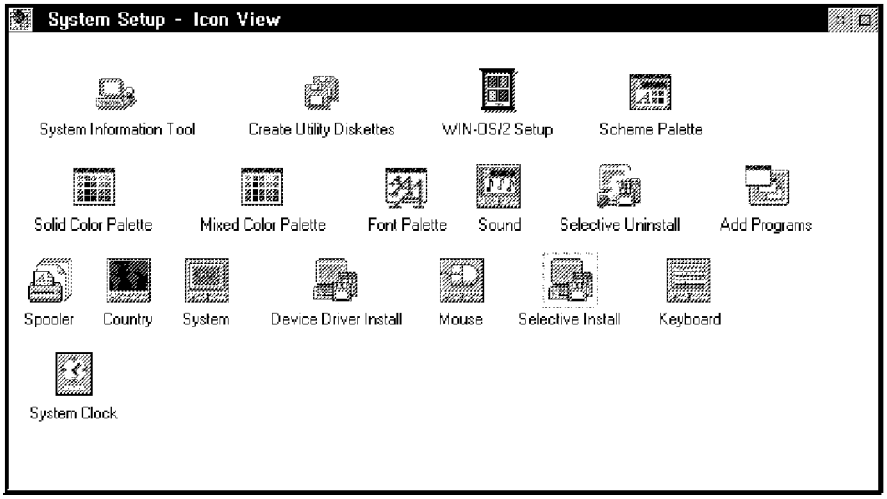


Figure 64. Selective Install Object

After double-clicking on the Selective Install object in the System Setup folder the System Configuration panel appears. See Figure 65 on page 223. Of the three main sections here, Locale, System and Currently Installed Peripherals, we are interested in Multimedia Device Support in the latter. Take note however that right above the Multimedia Device Support input field is the CD-ROM Device Support input field. We will refer to this later when giving an example of installing a sound card device driver not included in this release of OS/2 Warp.

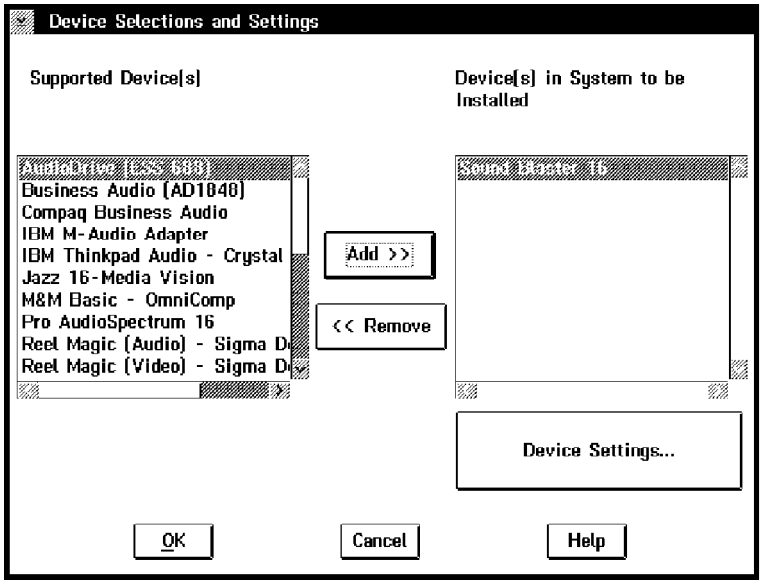


Figure 65. System Configuration Panel

When you double-click on the pushbutton beside Multimedia Device Support you open the Device Selections and Settings panel, shown in Figure 66.

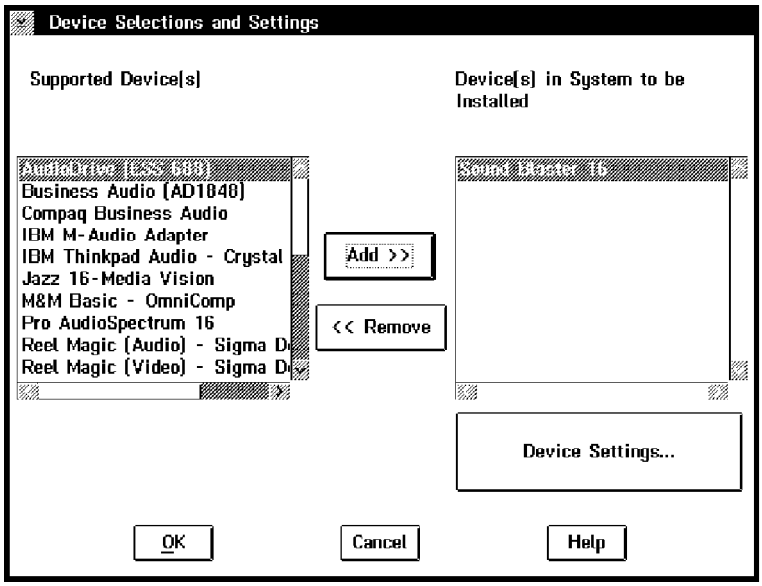


Figure 66. Device Selections and Settings

This panel contains the following important areas:

- Supported Devices

  This is a list of audio adapters which OS/2 Warp provides the support for. When you select an audio card from this list OS/2 will install the appropriate device drivers on your hard disk and update the CONFIG.SYS file with the DEVICE= command necessary to load required software support. Currently OS/2 Warp Connect with WIN-OS/2 includes twenty-four sound cards which are listed in 6.4, “Supported Multimedia Device Drivers” on page 227.

- Device(s) in System to be Installed

  When you locate your particular audio adapter in the Supported Devices list you must select it and add it to the Device(s) in System to be Installed list. To do this, you must first select your adapter from the list and then click once on the **Add** button. Your selection will disappear from the left list and reappear in the right list. If your system supports more than one audio adapter you could select an additional adapter at this time.

- Device Settings...

  Some audio sound card device drivers allow you to specify certain parameters during installation. To determine if your adapter allows configuration, time click on the **Device Settings...** pushbutton below the Device(s) in System to be Installed list.

  Note: A device driver must be selected and appear in this list, otherwise Device Settings... is not selectable.

  In Figure 67 on page 225 we show the Device Settings... window for the Sound Blaster 16 audio adapter. The Sound Blaster 16 allows you to change DMA (8-bit), DMA (16-bit), Interrupt level, Port address, and MPU-401 Port Address.

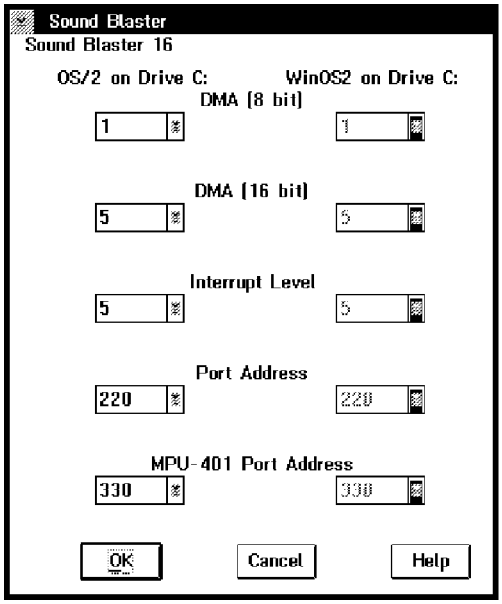


Figure 67. Device Settings - (Sound Blaster 16)

Some audio adapters do not allow the user to modify any parameters for the device driver during the installation process. An example of this is the IBM ThinkPad Audio - Crystal Semi device driver. If you select this audio support from the Supported Device(s) list and then click on the Device Settings... pushbutton, you will be presented with the OS/2 dialogue box shown in Figure 68. For a complete list of Device Settings... for all 24 adapters supported in OS/2 Warp, see Figure 71 on page 233. Just click on **OK** to return to the installation process.

Figure 68. Device Settings - (IBM ThinkPad, Crystal Semi)

Once you have made all the necessary changes just click on **OK** until you arrive at the OS/2 Setup and Installation panel as shown in Figure 69 on page 226.

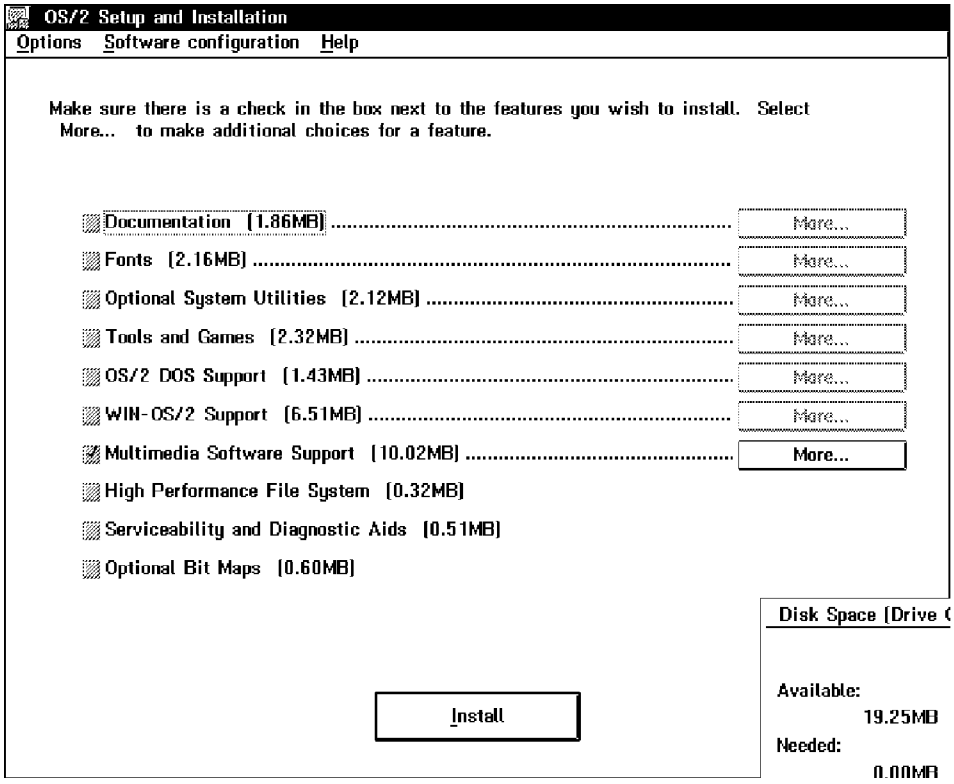


Figure 69. OS/2 Setup and Installation

You have now selected proper support for the audio hardware installed in your system. The next step is to select the multi media software support you desire. This is done from the OS/2 Setup and Installation panel. On the initial installation all items in this list are selected by default, but on subsequent Selective Installs no items are selected. We are interested in Multimedia Software Support so ensure this item is selected by clicking on the checkbox to the left of it.

When Multimedia Software Support is selected the More... pushbutton to the right of the panel becomes highlighted, or selectable. Click once on the **More...** button beside Multimedia Software Support to open the Multimedia Software Support dialogue box depicted in Figure 70 on page 227.

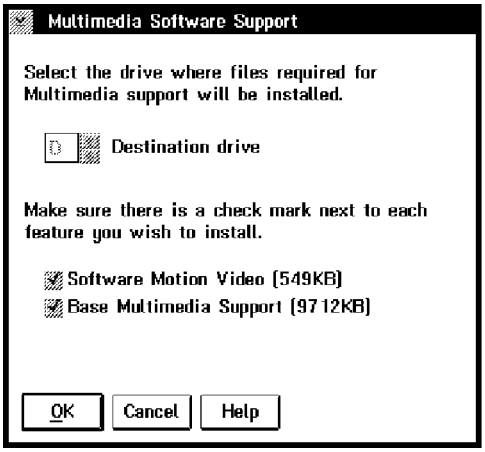


Figure 70. Multimedia Software Support

This dialogue allows you to select the hard disk that multimedia support will be installed on. This is very handy if your C: drive is constrained. In early versions of OS/2 2.xx multimedia had to be installed on the same drive as the base OS/2 operating system. OS/2 Warp allows you to install it where it best suits your requirements.

You also get to choose Software Motion Video and Base Multimedia Support. Beside each item is the total amount of hard disk space required by each component. This allows you to make accurate decisions about where to best place software on your system. When you are finished making your selections click on **OK** to return to the OS/2 Setup and Installation panel where you will click on **Install** to continue your OS/2 Warp installation.

You will be prompted by instructions on the screen as to how to proceed with your install. Follow the instructions carefully and insert OS/2 installation diskettes as requested. When installation is complete you will be required to reboot your computer to load the new operating system or activate the changes you made to your existing system.

6.4 Supported Multimedia Device Drivers

This section describes which multimedia device drivers are supported in OS/2 Warp.

1. AudioDrive (ESS-688)

   Audiodrive is not a sound card but a chipset. Manufacturers that use this chipset are Twinhead, Chicony, Mitac, Clevo, and Compaq. It is Sound

Blaster compatible, supports 16-bit, CD quality audio and has hardware compression support.

The previous AudioDrive chipset is the ESS-488. This version of the AudioDrive chipset does not support Advanced Power Management and and does not have the capability to play stereo files.

The following are the CONFIG.SYS entries for the AudioDrive:
DEVICE=C:\ES688DD.SYS /B220 /D1 /I5 /N:ESS688$

- /B - Base adapter address. Options are 220, 230, 240 and 250.
- /D - DMA adapter address. Valid addresses are 0, 1, and 3.
- /I - Adapter Interrupt (IRQ). Valid Interrupts are 5, 7, and 10.
- /N: - Name of the device. Do not change.

2. Business Audio (AD1848)

   The Business Audio chipset is compatible with the Analog Devices AD1848 and Crystal Semiconductor CS4231 chipsets and support 16-bit audio playback and record. Both these chipsets will run on the generic Business Audio device driver (AD1848.SYS). However, the Crystal Semiconductor chipset also can record and play back digital audio simultaneously and perform hardware audio compression and decompression. To take advantage of these features in the CS4231 chipset you must use the CS4231.SYS device driver.

   The following computers support the Business Audio chipset:

   - ThinkPad 750/755 (CS4248). Compatible with CS4231.
   - Compaq Deskpro XE and Compaq Deskpro XL (AD1848).
   - Microsoft Sound System (AD1848).
   - Toshiba T4700CS and T660CS (AD1848).

   The following are the CONFIG.SYS entries for AD1848.SYS:
   DEVICE=C:\path\AD1848.SYS /B220 /D1 /I5 /N:ESS688$

   - /T - Type of card. MS_SOUND, COMPAQ, TOSHIBA_T4700CS/T6600CS.

     Note: For the Orchid Soundwave 32 or Cardinal DSP adapters, install Business Audio support and change the /T parameter to T:SW32.
   - /B - Base adapter address. Options are 530, 534, 604, 608 and E80.
   - /D - DMA adapter address. Valid addresses are 0, 1, and 3.
   - /I - Adapter Interrupt (IRQ). Valid Interrupts are 7, 9, 10 and 11.

- /N: - Name of the device. Do not change.

3. Compaq Business Audio

   See Business Audio (AD1848), above in the section.

4. IBM M-Audio Adapter

   DEVICE=C:\MMOS2\ACPADD2.SYS A P

   - A - NA
   - P - Automatically route "line-in" to "line-out".

5. IBM ThinkPad Audio - Crystal Semiconductor

   The Crystal Semiconductor chip is compatible with the Business Audio (AD1848) driver. Unlike the Business Audio chipset the Crystal Semi can record and playback digital audio simultaneously and supports hardware audio compression and decompression.

   Entry in CONFIG.SYS file:

   DEVICE=C:\MMOS2\CS4231.SYS P:xxx I:xx D:x N:BSAUD1$

   - P: - IO Port Address. Valid addresses are 530, E80, F40 and 604.
   - I: - Interrupt Request Level. Valid IRQs are 3, 5, 7 and 11.
   - D: - PlayDMA and RecordDMA Channels. Valid vlaues are 1 and 3.
   - N: - Name of audio device.

6. Jazz 16-Media Vision

   The Jazz 16 is Media Vision's OEM adapter. It is Sound Blaster 16 compatible and supports the sound mixing functions of the Pro Audio Spectrum 16 adapter.

   These CONFIG.SYS device driver parameters are available:

   DEVICE=C:\MMOS2\JAZZDD.SYS /I: /D: /E: /T: /Q: /P: /N:NA

   - /I - Interrupt Request Level. Valid IRQs are 3, 5, 7, 10, and 15.
   - /D - 8-bit DMA Channel. Valid channels are 1 (default), and 3.
   - /E - 16-bit DMA Channel. (Default use 8-bit channel).
   - /T - MPU 401 MIDI IO Port address. Default is 320.
   - /Q - IRQ for the MPU 401 MIDI interface.
   - /P - Hex IO Port Address for card. (Default = 220).
   - /N - Name of the device. /N:JAZZ01.

7. M&M Basic - OmniComp

8. Pro Audio Spectrum (PAS) 16

   The Pro Audio Spectrum 16 is one of a family of cards offered by Media Vision. The PAS16 has a built-in SCSI port which can support CD-ROMs, double-speed and triple-speed, and tape backup units. OS/2 Warp supplies a multi-instance PAS16 driver that plays MIDI and wave files simultaneously, run multiple audio applications, and use Media Vision's OS/2 based mixer.

   The PAS16 is fully Sound Blaster compatible and actually contains a Sound Blaster chip on the card. Another feature of the PAS16 card is complete, software configurability. There are no jumpers on the card.

   Entry in CONFIG.SYS file:

   DEVICE=C:\MMOS2\MVPRODD.SYS /I11 /D5 /N:PAS161$

   - /I - Audio Adapter Interrupt Level.
   - /D - Audio Card DMA Channel.
   - N: - Name of audio device.

   These are additional parameters that you can use to configure the PAS16:

   - /S:a,bbb,c,d - Sound Blaster Emulation.
     - a - 1 to enable, 0 to disable.
     - b - Base IO Port Address; recommend 240 or 220.
     - c - Interrupt level; recommend IRQ 5.
     - d - DMA Channel; must be 1.
   - /B:xxx - HEX base board I/O location; /B:338 is the default.
   - /W:x - x=1 enables warm boot reset. x=0 is the default. Warm boot enabled means you can activate device driver modifications without powering off your machine.
   - /M:x,yyy,z MPU (enable, base address, IRQ) MP 401 emulation.
   - /F:x - FM Synth disable switch; /F:1 enabled default.
   - /J:x - J:1 joystick enabled; J:0 is default.
   - /T:x - T:1 use PAS oscillator for OPL3, T:0 is default. Used on machines that have the OPTI chipset.

9. Reel Magic - (Audio) Sigma Designs
10. Reel Magic - (Video) Sigma Designs

11. Sound Blaster Family of Cards

    Creative Labs set the standard for DOS sound support with their Sound Blaster card. They have gone on to expand their sound card line to include the following adapters:

    - Sound Blaster (Non-Pro, ISA and MCV)

      This is the original 8-bit version of the card which can only play mono files. For stereo support you need a Sound Blaster Pro.

    - Sound Blaster Pro (OPL2)

      This version of the 8-bit Sound Blaster has the capability to play stereo files. It has a proprietary CD-ROM interface for connection to specific CD-ROMs supplied in the same multimedia kit as the card. It was only available for ISA bus computers at this release.

    - Sound Blaster Pro (MCV or OPL3)

      This version of the 8-bit Sound Blaster has the capability to play stereo files. It has a proprietary CD-ROM interface for connection to specific CD-ROMs supplied in the same multimedia kit as the card. This upgraded Sound Blaster Pro was available for ISA bus and Micro Channel bus computers.

    - Sound Blaster 16

      The SB16 and SB16 ASP (Advanced Signal Processor) can play 16-bit stereo files, and if equipped with the ASP chip can also play Mulaw, Alaw, and ADPCM files. Both SB16 cards support a proprietary CD-ROM connection and SCSI support.

      The following are the CONFIG.SYS entries for the SB16 card:
      DEVICE=C:\MMOS2\SB16D2.SYS 2 1 5 5 220 4 330 /N:SBAUD1$

      - 220 - Base adapter address. Options are 220, 230, 240 and 250.
      - /N: - Name of the device. Do not change.

12. Sound Blaster AWE32

    The Sound Blaster AWE32 contains a DSP (Digital Sound Processor) chip utilized to process wave table synthesized MIDI files. It can also address more memory than the SB16 ASP card. With greater memory addressability the AWE32 supports richer sound, varied audio effects, and more realistic wave table synthesis. This card is programmable which give developers greater power to produce unlimited variations of sound effects.

13. Sound Galaxy NOVA 16 EXTRA

The Sound Galaxy NOVA 16 by Aztech supports either Mitsumi or Panasonic CD-ROM drives, 16-bit, CD-quality audio, MIDI synthesis, MPU 401 compatibility, and an upgrade to SCSI support.

CONFIG.SYS options for the Aztech audio driver are:

- /B - Base adapter address. Options are 530, 604, E80 and F40.
- /D - DMA adapter address. Valid addresses are 0, 1, and 3.
- /I - Adapter Interrupt (IRQ). Valid Interrupts are 2, 7, 10 and 11.
- /N: - Name of the device driver. Do not change.

14. Super VideoWindows - New Media Graphics
15. Toshiba T4700C and T6600CS

    See "Business Audio (AD1848)", above in this section.
16. Video Blaster - CLI
17. Video Clipper - CEI
18. Video Magic - Samsung
19. Video Magic
20. WaveWatcher - AITech
21. WaveWatcher
22. WIN/TV - Hauppauge
23. WIN/TV

6.5 Configuration of Multimedia Adapters

Multimedia audio adapters must be configured properly in order to function correctly when installed in your computer system. The following are two types of configuration that must be considered:

- Hardware configuration
- Software configuration

Hardware configuration is usually performed before installing the sound card in your system. The adapter card has jumper pins on it that can be changed to indicate different settings for particular features. Settings normally controlled by jumpers are:

- Port Address
- DMA Channel (8 and 16-bit)

- Interrupt Level
- MIDI Port Address
- CD-ROM Port Address

It is very important that these settings are configured correctly and do not conflict with existing settings of previously installed cards. Different implementations of audio cards utilize different combinations of settings. The three most common settings are Port Address, Interrupt Level, and DMA Channel. When these parameters are not configured by the user they are hard coded into the adapter and cannot be changed. In this case you will need to ensure that no other adapter installed in the system uses a conflicting setting.

Some recently introduced adapters do not utilize jumpers on the adapter for setting parameters. These cards have a software program that allows you to specify and set the configuration settings. The software program can be built into the ROM of the adapter card or come as a separate program you initiate from a command prompt. Consult the user's guide of your particular adapter for details.

This section shows the parameters that can be set for the twenty-four audio adapters with built-in support for OS/2 Warp.

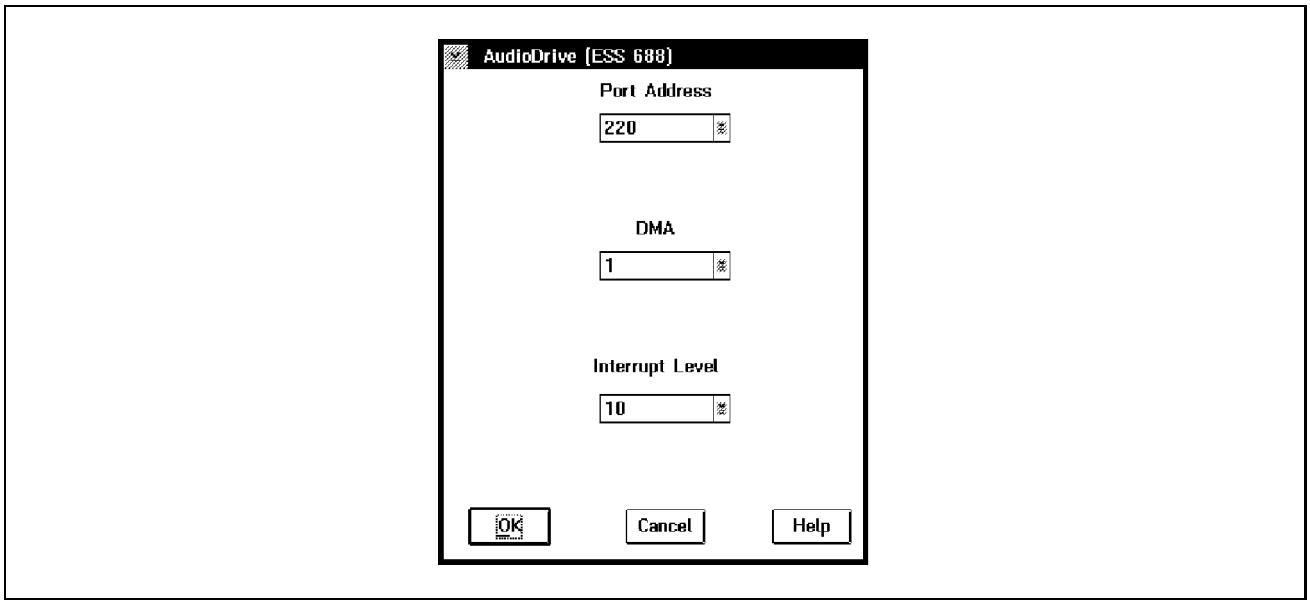


Figure 71. Audio Drive (ESS 688)

DEVICE=C:\MMOS2\ES688DD.SYS /B220 /D1 /I5 /N:ESS688$

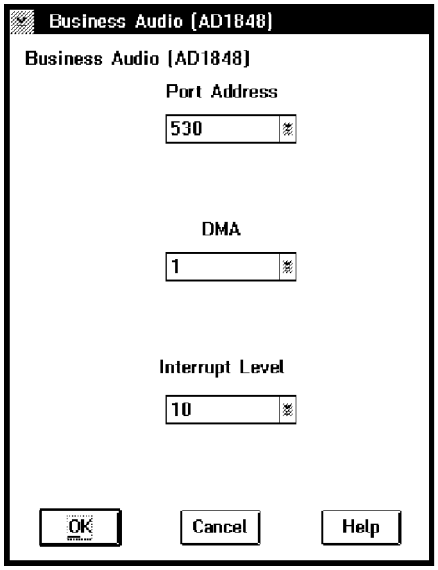


Figure 72. Business Audio (AD1848)

DEVICE=C:\MMOS2\AD1848.SYS /B220 /D1 /I5 /N:ESS688$

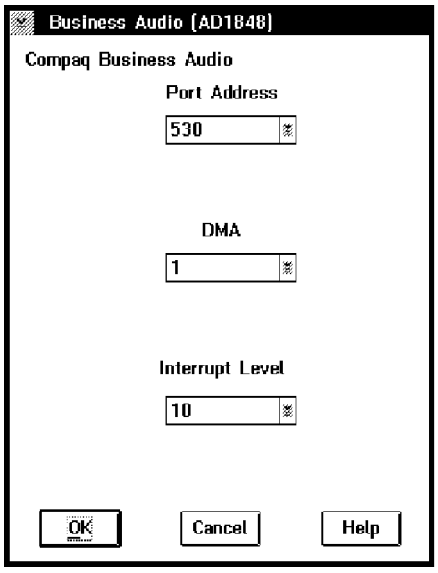


Figure 73. Compaq Business Audio

DEVICE=C:\MMOS2\AD1848.SYS /B220 /D1 /I5 /N:ESS688$

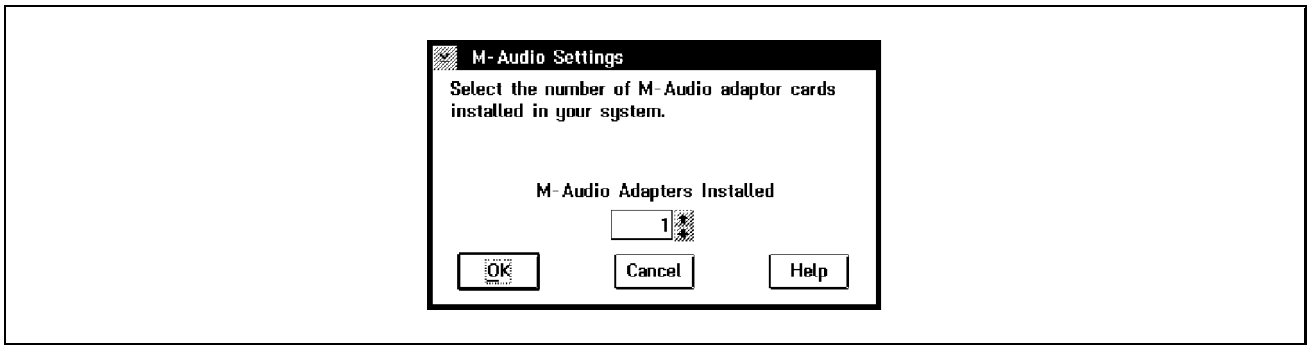


Figure 74. IBM M-Audio Adapter

DEVICE=C:\MMOS2\ACPADD2.SYS A P

Figure 75. IBM ThinkPad Audio - Crystal Semi

DEVICE=C:\MMOS2\CS4231.SYS P:xxx I:xx D:x N:BSAUD1$

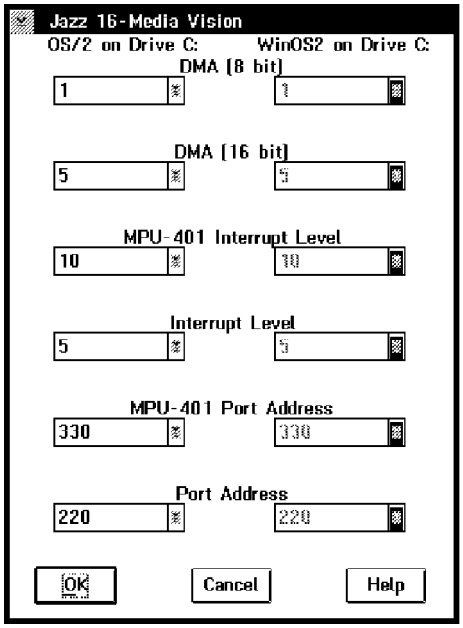


Figure 76. Jazz 16-Media Vision

DEVICE=C:\MMOS2\JAZZDD.SYS /I: /D: /E: /T: /Q: /P: /N:

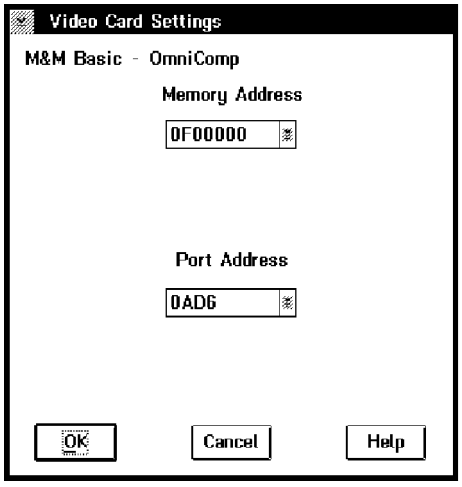


Figure 77. M&M Basic - OmniComp Adapter

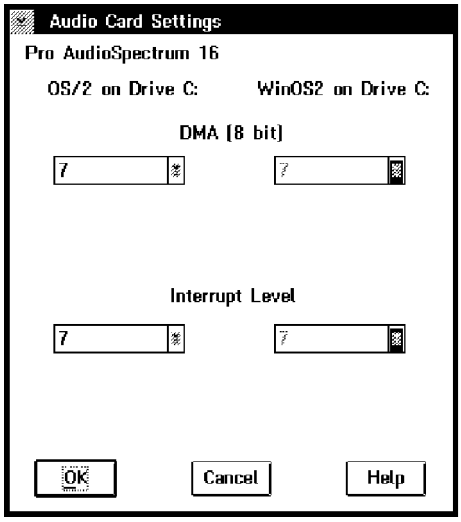


Figure 78. Pro Audio Spectrum

DEVICE=C:\MMOS2\MVPRODD.SYS /I11 /D5 /N:PAS161$

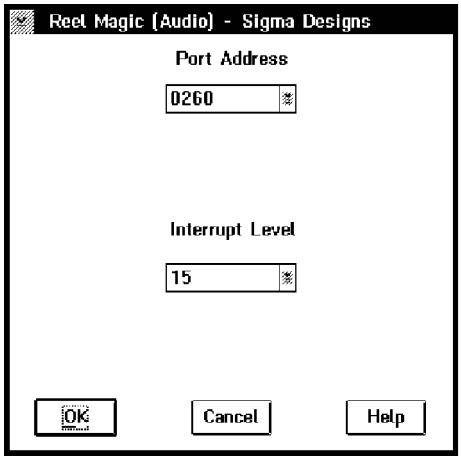


Figure 79. Reel Magic - (Audio) Sigma Designs

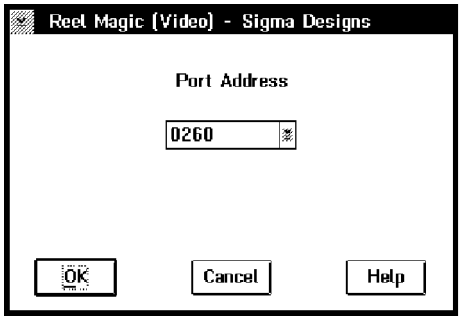


Figure 80. Reel Magic - (Video) Sigma Designs

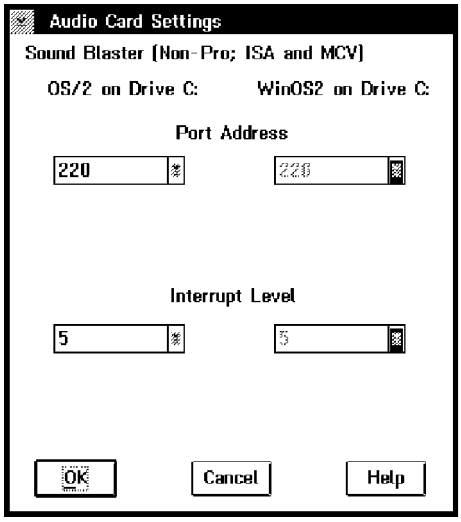


Figure 81. Sound Blaster (Non-Pro ISA and MCV)

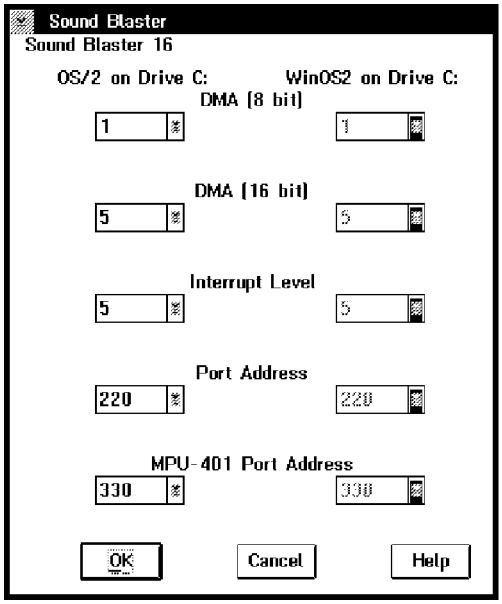


Figure 82. Sound Blaster 16

DEVICE=C:\MMOS2\SB16D2.SYS 2 1 5 5 220 4 330 /N:SBAUD1$

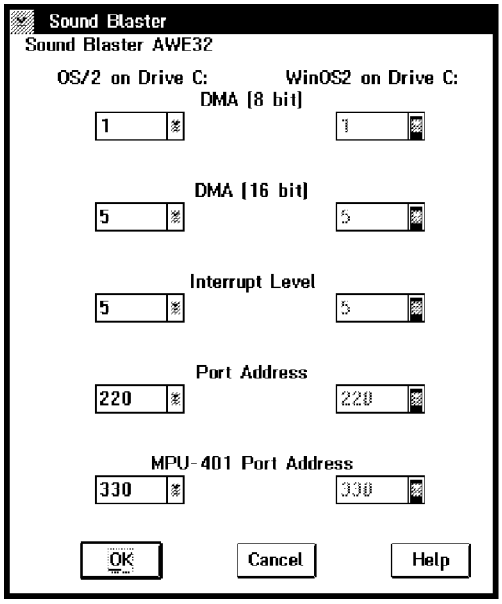


Figure 83. Sound Blaster AWE32

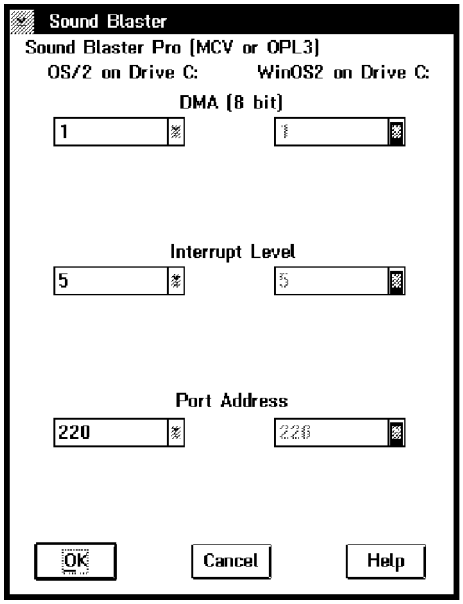


Figure 84. Sound Blaster Pro (MCV and OPL3)

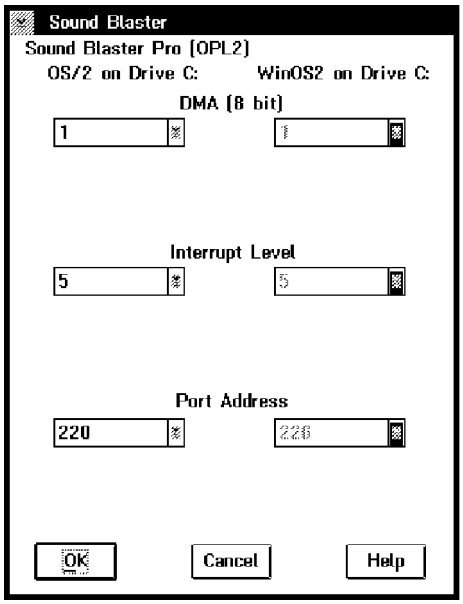


Figure 85. Sound Blaster Pro (OPL2)

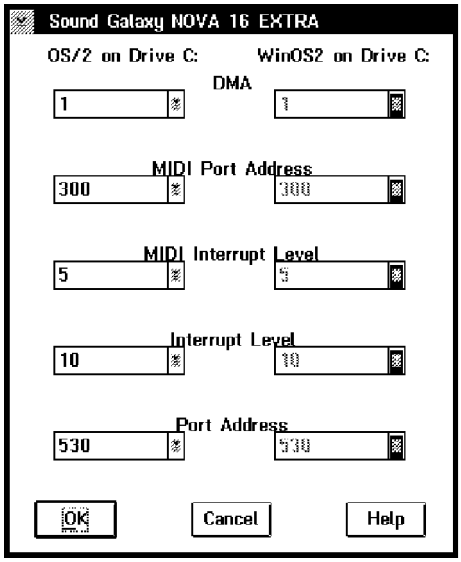


Figure 86. Sound Galaxy NOVA 16 EXTRA

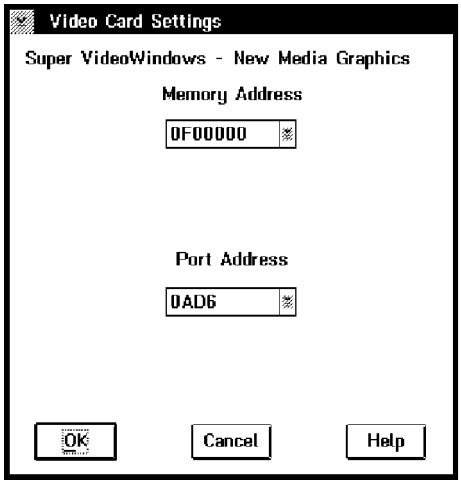


Figure 87. Super VideoWindows - New Media Graphics

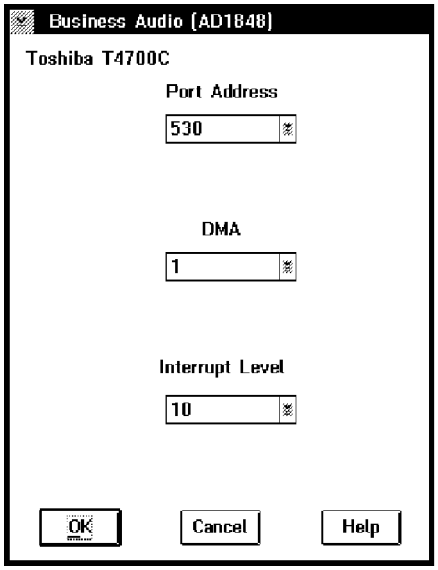


Figure 88. Toshiba T4700C

DEVICE=C:\MMOS2\AD1848.SYS /B220 /D1 /I5 /N:ESS688$

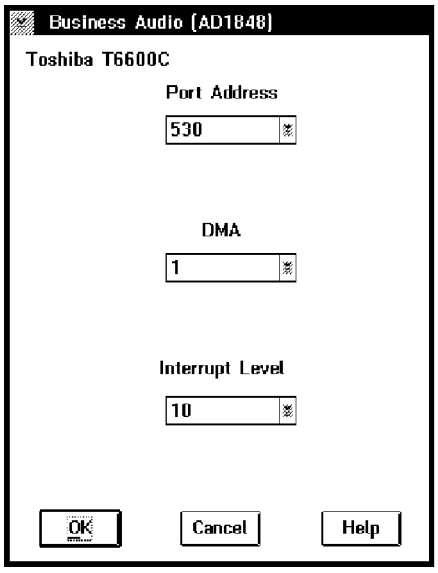


Figure 89. Toshiba T6600C

DEVICE=C:\MMOS2\AD1848.SYS /B220 /D1 /I5 /N:ESS688$

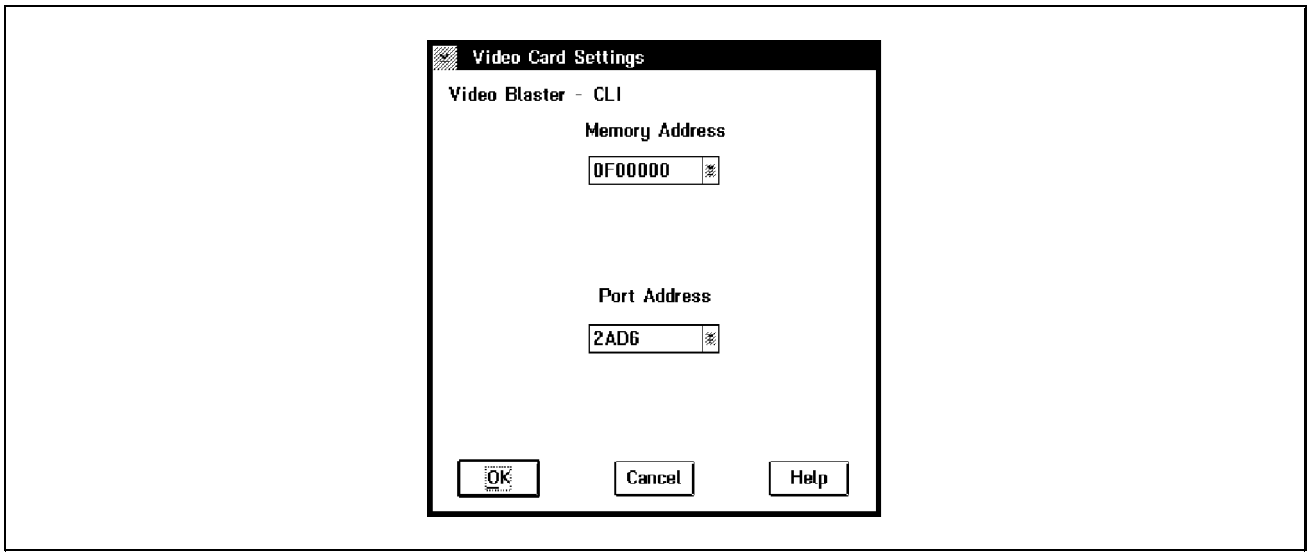


Figure 90. Video Blaster - CLI

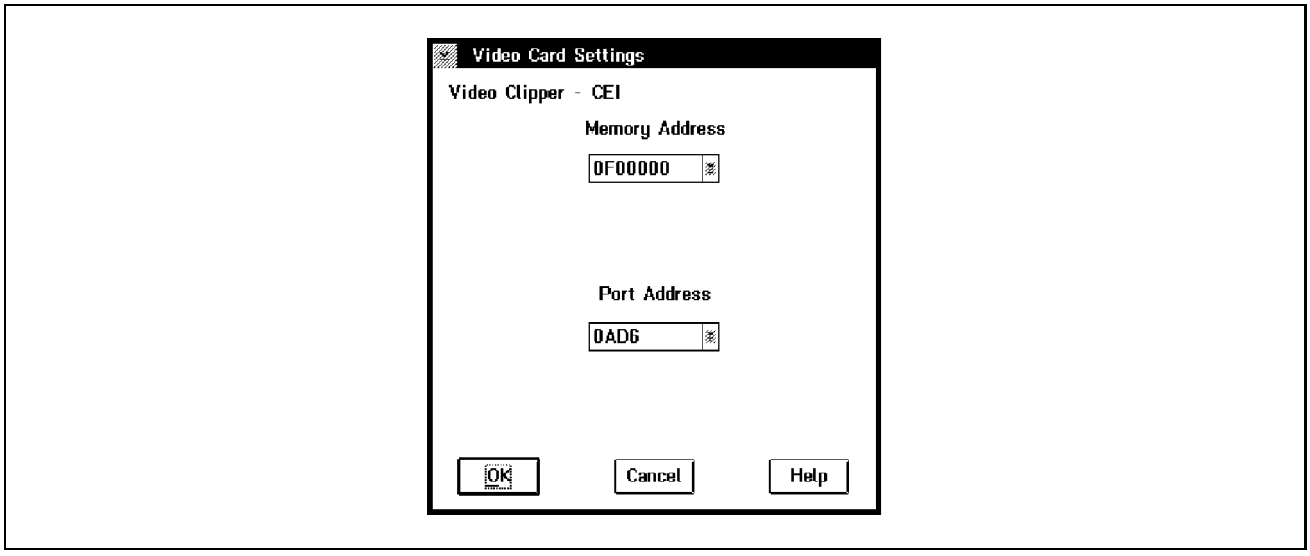


Figure 91. Video Clipper - CEI

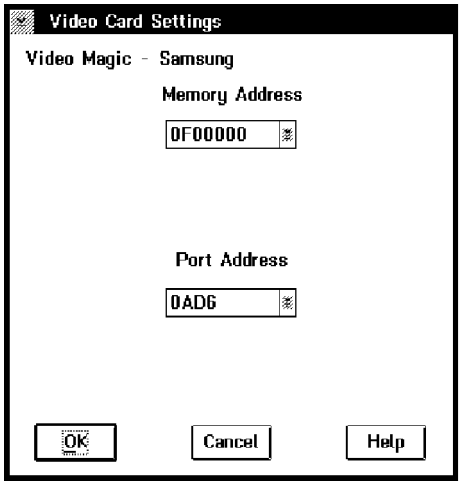


Figure 92. Video Magic - Samsung

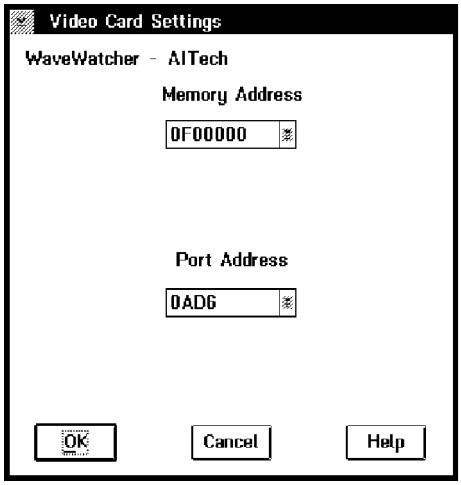


Figure 93. WaveWatcher - AITech

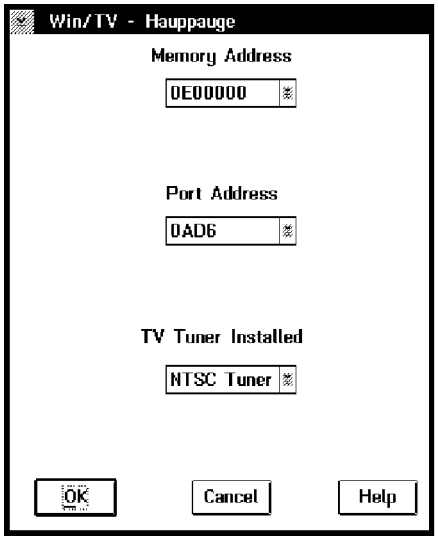


Figure 94. WIN/TV - Hauppauge

6.6 Device Drivers from Other Sources

The following device drivers for OS/2 are available from other sources such as the OEM manufacturer, BBSs and the Internet. Where available, these sources are named.

Name	Description
Advanced Gravis	Gravis Ultrasound, Ultrasound Max
Media trix	Audio Trix Pro
IBM Mwave chip	Windsurfer and Audiovation

6.6.1 Gravis Ultrasound, Ultrasound Max

The Ultrasound supports 16-bit audio and SCSI CD-ROM interface. There are multi-instance digital audio-only drivers available from `ftp:os2.cdrom.com.` and the OS2USER forum on Compuserve. This card also has improved MIDI sound via wavetable synthesis.

6.6.2 MediaTrix AudioTrix

A unique feature of the AudioTrix adapter is that it is built with two chips; the main Crystal Semiconductor CS4231 chip and a Yamaha OPL4 chip. The CS4231 chip supports the popular CS4231.SYS device driver which provides CD-quality audio and audio data compression. The Yamaha OPL4 provides additional support for wave table synthesis which provides more realistic sound reproduction for your MIDI programs.

The AudioTrix adapter is one of the first cards to use the OPL4 chip. Most other sound cards implemented older versions of the OPL chip, either OPL2 or OPl3.

6.6.3 IBM Audiovation Adapter (Mwave Chip)

Device driver and MMPM/2 support for the IBM Audiovation adapter comes with the adapter when you purchase it. This adapter is a good example of OS/2 device driver support not included in the current release of OS/2 Warp, and how to install it.

We will show you how to install the support for this adapter for OS/2 and WIN-OS/2. These instructions will only apply if you have the IBM Audiovation Adapter or the Options by IBM Kit which includes the Panasonic 563 CD-ROM drive. These instructions are written assuming you have the sound card & CD-ROM kit.

The following hardware and software are included in the kit:

Hardware:

- Audiovation Adapter (Actual sound card)
- Microphone
- Headphone Set
- Speaker Cable (RCA - 1/8")
- Audio Patch/Wrap Cable (1/8" - 1/8").

Diskettes:

- Audiovation Utilities/Options Diskette (Native DOS based)
- Audiovation Installation OS/2 Mwave Manager (Support disk #1)
- Audiovation Installation OS/2 MMPM (Support disk #2)
- Audiovation Installation Microsoft Windows Diskette 1, 2, and 3

- ISA CD-ROM Drive Option/Device Driver Diskette (OS/2 2.1 only)

The following instructions are for installing and configuring the IBM Audiovation Adapter and the Panasonic 563 CD-ROM adapter on a machine with OS/2 Warp installed. Mutimedia support must be installed on the machine before you begin this installation process. If it is not installed please do so now by starting Selective Install from the System Setup folder.

Note:

In order for OS/2 Warp to correctly install the Compact Disc Player object in the Multimedia folder you must install support for a sound card and a CD-ROM drive simultaneously. However, the IBM Audiovation adapter is not in the Multimedia Device Support list. To get around this you select the **IBM M-Audio Adapter** from the Supported Device(s) list (see Figure 66 on page 223) and select **Device Settings** to specify that "0" adapters are in the system.

The Panasonic 563 CD-ROM is supported in OS/2 Warp. By selecting the IBM M-Audio Adapter at the same time as the CD-ROM, the multimedia install program will properly install the Compact Disc Player object in the Multimedia folder. Though it will copy the support files for the IBM M-Audio adapter to the hard disk, it will not update CONFIG.SYS with device statements for that sound card. You must reboot your system to activate your changes.

The following steps are to install support for the IBM Audiovation adapter:

1. Install Audiovation Device Driver Support
    a. Insert Audiovation Installation OS/2 Mwave Manager diskette into drive A:, open an OS/2 command prompt, and type, A:SETUP.
    b. The Mwave Software Installation logo appears and will change to the Audiovation OS/2 Install window. Follow the instructions on the screens and make the necessary configuration selections.
    c. Select **ISA** or **MCA** bus and click on **OK**.
    d. Select **IO Port Address**. 0x4E30 is the default.
    e. Select **DMA** Channel. DMA 5 is the default.
    f. Select IRQ level. 15 is the default.

Note:

Though IRQ 15 is the default, Version 1.14 of the Mwave Install Program preselects IRQ 9 in this panel. You must select IRQ 15 if you are using the default setting.

g. You will now receive the dialogue stating that the OS/2 Mwave Manager Operating System is Installed. Click on **OK** to end the installation program and return to the OS/2 command prompt.

h. You do not need to reboot the system before performing the next step.

2. Update MMPM/2 to Recognize the Audiovation Adapter

a. Insert the Audiovation Installation OS/2 MMPM diskette into drive A:, from an OS/2 command prompt type `A:` to make drive `A:` the current drive.

Note:

In the above step you *must* make `A:` the current drive. The MMPM/2 Installation program looks in the current drive for a file on `A:` drive named CONFIG.CHG, which is used to update CONFIG.SYS. If it does not find this file in the current directory the installation will fail.

b. From the `A:` command prompt type `MINSTALL`. MINSTALL is in the MMOS2 subdirectory on the drive you specified for multimedia installation. Even though A: is the current directory, \MMOS2 is in the path statement, so MINSTALL will be located and executed.)

c. On the IBM Multimedia Presentation manager/2 panel, in the SOURCE section of the panel, click on the pull-down list button of the Drive input area. Click on **A:**

d. The IBM Audiovation Adapter OS/2 ONLY will appear as the only entry under Features. It should already be selected, if not, select it.

e. Click on the **Install** button.

f. In the MMPM/2 - Change CONFIG.SYS dialogue, click on **YES** to automatically update the CONFIG.SYS file.

g. In the "Multimedia Installation" dialogue, specify the total number of audiovation adapters in this machine and click on OK.

h. Follow instructions on the screen to end the installation process. You must now reboot the system to activate your changes.

3. Install WIN-OS/2 Support for the Audiovation Adapter

   a. Click on **WIN-OS/2 Fullscreen Session** in the Command Prompts folder to start the WIN-OS/2 Fullscreen interface.

   b. Click on **File** in the Program Manager action bar.

   c. Click on **Run** in the File pull-down menu.

   d. Type A:SETUP in the input line and hit the ENTER key.

   e. Follow the instructions presented on the screen to complete the installation, inserting the diskettes 1, 2, and 3 when requested.

   f. When the installation is complete, close down the Full Screen Program Manager and restart it to activate the changes.

These are the lines added to your CONFIG.SYS file after completing the installation process.

```
REM ********************************************************
REM Note: The Mwave MWAVEVDD.SYS device driver must be loaded *
REM      before the VEMM.SYS OS/2 driver in the CONFIG.SYS.  *
REM ********************************************************
DEVICE=D:\MWAVEOS2\BIN\MWAVEVDD.SYS
DEVICE=C:\OS2\MDOS\VEMM.SYS

later on...

SET MWPATH=D:\MWAVEOS2\MWVAEOS;D:\MWAVEOS2;D:\MWAVEOS2\DSP;C:\MMOS2\AUDIODD;D:\MMOS
SET MWCARD=Audiovation
SET MWROOT=d:\MWAVEOS2
SET MWOSNAME=mwavosw.dsp
SET MWBIOS=bioswos2.dsp
DEVICE=d:\MWAVEOS2\BIN\mwaveDD.SYS
DEVICE=d:\MWAVEOS2\BIN\mwBIOSDD.SYS ID=FG IO=4E30 SLOT=1 COM=0 DMA=5 IRQ=15 BUS=
RUN=d:\MWAVEOS2\BIN\mwaveDM.exe

later on...

DEVICE=D:\MWAVEOS2\BIN\meioedqo.sys
```

6.7 CID Support for MMPM/2

Multimedia Presentation Manager/2 is configuration, installation, distribution (CID) enabled. This means you can install MMPM/2 code onto workstations from a strategically located CID Server across your own networks.

A file named README.CID located on the OS/2 Warp Installation diskette (disk #0) contains detailed information on the following topics:

- Code Server Setup

- Loading Diskette Images on the Code Server from CD-ROM
- Loading Diskette Images on the Code Server from Diskette
- Layout of the Installation Diskettes
- Using an OS/2 2.x Code Server
- Obtaining the SEIMAGE Program from the OS/2 Diskettes
- Extracting CID Utilities and Other Programs from the OS/2 Images
- Creating CID Boot Diskettes
- CID Enabled Multimedia
- Using a Response File to Install OS/2
- And more...

The README.CID file on the OS/2 Installation diskette (disk #0) is a plain text file and can be viewed with the System Editor or your personal favorite ASCII editor. For more information on CID please refer to ITSO Redbook OS/2 Installation Techniques: The CID Guide. This publication will in turn refer sources of information regarding the topic of CID.

6.8 Adding WIN-OS/2 Audio Support

To enable audio support for most applications in DOS and Windows sessions, the following settings for DOS properties must be in effect:

- INT_DURING_IO = On
- VIDEO_RETRACE_EMULATION = Off
- AUDIO_ADAPTER_SHARING = Required

Be sure to check the settings for these DOS properties.

In most cases when you install OS/2 support for your audio adapter, drivers for Windows audio support are also copied to your hard disk. To make this support available, you have to tell the Windows program where the audio drivers are located.

Double-click on the name of your audio adapter in the list below. Open a Windows session and follow the procedure to complete the installation of audio support for Windows.

- Crystal Semiconductor (CS4231)
- IBM M-Audio (ACPADD2)

- Sound Blaster Non-Pro ISA or MCV
- Sound Blaster Pro OPL2 (SBPD2)
- Sound Blaster Pro MCV or OPL3 (SBP2D2)
- Sound Blaster 16
- Sound Blaster AWE 32
- Pro Audio Spectrum 16
- Media Vision Jazz 16
- Sound Galaxy
- ESS-688

6.8.1 Crystal Semi

To add Windows support for the Crystal Semiconductor audio devices on the ThinkPad 750 or 755, you need to:

1. Edit the SYSTEM.INI file, which is located in the directory you load Windows from, usually the \WINDOWS directory.
2. Copy the Crystal Semiconductor CS4231 drivers from the \OS2 directory to the appropriate Windows directories.

First, edit the SYSTEM.INI file:

1. Add the following lines under the heading drivers‘.
   - Wave=CS31BA11.DRV
   - Aux=CS31BA11.DRV
   - Mixer=CS31BA11.DRV
2. Add the following line under the heading 386enh‘.

   Device=vsndsys.386
3. Add the contents of the TP750INI.ADD file to the end of the SYSTEM.INI file. You can use your editor to perform this operation, or you can use the COPY command.

   To use the COPY command, enter the following at the command prompt:

   - `COPY d:\WINDOWS\SYSTEM.INI+o:\OS2\DRIVERS\CS4231\TP750INI .AD`

     where o: is the drive that OS/2 is installed on and d: is the drive that Windows is installed on.

Second, copy the Crystal Semiconductor CS4231 drivers from the \OS2 directory to the Windows directories:

1. Copy the file CS31BA11.INI from \OS2\DRIVERS\CS4231 to your \WINDOWS directory.
2. Copy the file CS31BA11.DRV from \OS2\DRIVERS\CS4231 to your \WINDOWS\SYSTEM directory.
3. Copy the file VSNDSYS.386 from \OS2\DRIVERS\CS4231 to your \WINDOWS\SYSTEM directory.

6.8.2 IBM M-Audio

To add Windows audio support for the IBM M-Audio adapter:

1. Open a Windows session
2. Open Control Panel in the Main Group.
3. Open Drivers.
4. Select **Add**.
5. Select **Unlisted** or **Updated Driver**.
6. Select **OK**.
7. In the Install Driver window type the path name of the driver, `\OS2\DRIVERS\ACPADD2`. The drive letter is the startup drive.
8. Select **OK**.
9. Select **IBM M-Audio Sound Driver**.
10. Select appropriate input and output sources.
11. Select **OK**.
12. Restart the Windows session when requested.

6.8.3 SoundBlaster Cards

To add Windows audio support for the Sound Blaster Non-Pro ISA or MCV adapter, you need to edit the Windows SYSTEM.INI file and add two drivers to the list of installed drivers.

First, edit the SYSTEM.INI file, which is located in the same directory you load Windows from, usually the \WINDOWS directory. Add the following lines to the end of the file:

```
[sndblst.drv]
Port=NNN
Int=N
DmaChannel=N
MidiPort=NNN
```

where N and NNN are replaced by the proper numeric values acquired from the adapter manufacturer's documentation.

Second, add the drivers to the list of Windows installed drivers:

To add the first driver to the list:

1. Open **Control Panel** in the Main Group.
2. Open **Drivers**.
3. Select **Add**.
4. Select **Unlisted** or **Updated Driver**.
5. Select **OK**.
6. In the Install Driver window type the path name of the driver. This is the `\OS2\DRIVERS\SBD2` directory on the startup drive.
7. Select **OK**.
8. Select **Creative Sound Blaster 2.0 MIDI Synthesizer**.
9. Select **OK**.
10. If the Driver Exists window appears, select **New**.
11. Select **OK** for the port address shown in the Sound Blaster Setup window.
12. Cancel the request to restart the Windows session so you can add the second driver.

To add the second driver to the list:

1. Select **Add**.
2. Select **Unlisted** or **Updated Driver**.
3. Select **OK**.
4. In the Install Driver window, select **OK**.
5. Select **Creative Sound Blaster 2.0 Wave and MIDI**.
6. If the Driver Exists window appears, select **New**.
7. Restart the Windows session when requested.

You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:

1. Open **Midi Mapper** in the Control Panel window.

2. Select **MIDI Mapper Name SB All FM**.
3. Select **Close**.

6.8.4 Sound Blaster Pro OPL2

To add Windows support for the Sound Blaster Pro OPL2 adapter, you need to add three drivers to the list of installed drivers.

Before you add the drivers, you must edit the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \WINDOWS directory. Add the following lines to the end of the file:

```
[sndblst.drv]
Port=NNN
Int=N
DmaChannel=N
HDmaChannel=N
MidiPort=NNN
```

where N and NNN are replaced by the proper numeric values acquired from the adapter manufacturer's documentation.

Save the file and then add the drivers.

- To add the first driver:
  1. Open **Control Panel** in the Main Group.
  2. Open **Drivers**.
  3. Select **Add**.
  4. Select **Unlisted** or **Updated Driver**.
  5. Select **OK**.
  6. In the Install Driver window type the path name of the driver. This is the `\OS2\DRIVERS\SBPD2` directory on the startup drive.
  7. Select **OK**.
  8. Select **Creative Sound Blaster Pro Auxiliary Audio**.
  9. Select **OK**.
  10. If the Driver Exists window appears, select **New**.
  11. Select **OK** in the Sound Blaster Setup window.
  12. Cancel the request to restart the Windows session so you can add the second driver.

- To add the second driver:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Creative Sound Blaster FM Driver**.
  6. If the Driver Exists window appears, select **New**.
  7. Cancel the request to restart the Windows session so you can add the third driver.
- To add the third driver:
  1. Select **Add**.
  2. Select **Unlisted or Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Creative Sound Blaster Pro Wave and MIDI**.
  6. If the Driver Exists window appears, select **New**.
  7. Restart the Windows session when requested.
- You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:
  1. Open **Control Panel** in the Main Group.
  2. Open **MIDI Mapper**.
  3. Select **MIDI Mapper Name SBP All FM**.
  4. Select **Close**.

6.8.5 Sound Blaster Pro (MCV and OPL3)

To add Windows audio support for the Sound Blaster Pro MCV or OPL3 adapter, you need to add three drivers to the list of installed drivers.

Before you add the drivers, you must edit the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \WINDOWS directory. Add the following lines to the end of the file:

```
[sndblst.drv]
Port=NNN
Int=N
DmaChannel=N
HDmaChannel=N
MidiPort=NNN
```

where N and NNN are replaced by the proper numeric values acquired from the adapter manufacturer's documentation.

After you save the file you can add the drivers.

- To add the first driver:
  1. Open **Control Panel** in the Main Group.
  2. Open **Drivers**.
  3. Select **Add**.
  4. Select **Unlisted** or **Updated Driver**.
  5. Select **OK**.
  6. In the Install Driver window type the path name of the driver. This is the `\OS2\DRIVERS\SBP2D2` directory in the startup drive.
  7. Select **OK**.
  8. Select **Creative Sound Blaster Pro Auxiliary Audio**.
  9. If the Driver Exists window appears, select **New**.
  10. Cancel the request to restart the Windows session so you can add the second driver.
- To add the second driver:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Creative Sound Blaster Pro Wave and MIDI**.
  6. If the Driver Exists window appears, select **New**.
  7. Cancel the request to restart the Windows session so you can add the third driver.
- To add the third driver:

1. Select **Add**.
2. Select **Unlisted** or **Updated Driver**.
3. Select **OK**.
4. In the Install Driver window, select **OK**.
5. Select **Creative Sound Blaster FM Driver**.
6. If the Driver Exists window appears, select **New**.
7. Restart the Windows session when requested.

You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:

1. Open the **Control Panel** in the Main Group.
2. Open **MIDI Mapper**.
3. Select **MIDI Mapper Name SBP All FM**.
4. Select **Close**.

6.8.6 Sound Blaster 16

To add Windows audio support for the Sound Blaster 16, you need to edit the Windows SYSTEM.INI file and add three drivers to the list of installed drivers.

First, edit the SYSTEM.INI file, which is located in the same directory you load Windows from, usually the \WINDOWS directory. Add the following lines to the end of the file:

```
[sndblst.drv]
Port=NNN
Int=N
DmaChannel=N
HDmaChannel=N
MidiPort=NNN
```

where N and NNN are replaced by the proper numeric values acquired from the adapter manufacturer's documentation.

Second, add the drivers to the list of Windows installed drivers:

- To add the first driver:
  1. Open **Control Panel** in the Main Group.
  2. Open **Drivers**.
  3. Select **Add**.

4. Select **Unlisted** or **Updated Driver**.
5. Select **OK**.
6. In the Install Driver window type the path name of the driver. This is the `\OS2\DRIVERS\SB16D2` directory on the the startup drive.
7. Select **OK**.
8. Select **Creative Sound Blaster 16 Auxiliary Audio**.
9. If the Driver Exists window appears, select **New**.
10. Cancel the request to restart the Windows session so you can add the second driver.

- To add the second driver:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Creative Sound Blaster FM Driver**.
  6. If the Driver Exists window appears, select **New**.
  7. Cancel the request to restart the Windows session so you can add the third driver.
- To add the third driver:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Creative Sound Blaster 16 Wave and MIDI**.
  6. If the Driver Exists window appears, select **New**.
  7. Restart the Windows session when requested.

You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:

1. Open **Control Panel** in the Main Group.
2. Open **MIDI Mapper**.
3. Select **MIDI Mapper Name SBP ALL FM**.

4. Select **Close**.

6.8.7 Sound Blaster AWE32

To install Windows audio support for the Sound Blaster AWE 32 adapter, you need to edit the SYSTEM.INI and SBWIN.INI files, and then add the drivers to the list of installed drivers.

First, edit the INI files:

1. Edit the SYSTEM.INI file, which is located in the same directory you load Windows from, usually the \WINDOWS directory. Add the following lines to the end of the file:

   ```
   [sndblst.drv]
   Port=NNN
   Int=N
   DmaChannel=N
   HDmaChannel=N
   MidiPort=NNN
   ```

   where N and NNN are replaced by the proper numeric values acquired from the adapter manufacturer's documentation.

2. Copy the file SBWIN.INI from \OS2\DRIVERS\SBAWED2 to your \WINDOW S directory.

3. Edit the SBWIN.INI file to reflect the drive letter where OS/2 is installed.

Then, add the drivers to the list of installed drivers:

- To add the first driver:

  1. Open **Control Panel in the Main Group**.
  2. Open **Drivers**.
  3. Select **Add**.
  4. Select **Unlisted** or **Updated Driver**.
  5. Select **OK**.
  6. In the Install Driver window type the path name of the driver. This is the \OS2\DRIVERS\SBAWED2 directory on the the startup drive.
  7. Select **OK**.
  8. Select **Creative Sound Blaster 16 MIDI Synthesizer**.
  9. If the Driver Exists window appears, select **New**.

10. 10. Cancel the request to restart the Windows session so you can add the second driver.

- To add the second driver:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Creative Sound Blaster 16 Wave and MIDI**.
  6. If the Driver Exists window appears, select **New**.
  7. Cancel the request to restart the Windows session so you can add the third driver.
- To add the third driver:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Creative Sound Blaster 16 Auxiliary Audio**.
  6. If the Driver Exists window appears, select **New**.
  7. Cancel the request to restart the Windows session so you can add the third driver.
- To add the fourth driver:
  1. Select **Add**.
  2. Select **Unlisted or Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Sound Blaster AWE32 MIDI Driver**.
  6. If the Driver Exists window appears, select **New**.
  7. Restart the Windows session when requested.

After you add the drivers, follow the instructions in the Sound Blaster setup window to select the proper port.

Note: You must be sure that any Windows session that uses the Sound Blaster AWE32 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Standard or you will not be able to start the session.

6.9 Pro Audio Spectrum 16 - Media Vision

To add Windows audio support for the Pro Audio Spectrum 16:

1. Open **Control Panel in the Main Group**.
2. Open **Drivers**.
3. Select **Add**.
4. Select **Unlisted** or **Updated Driver**.
5. Select **OK**.
6. In the Install Driver window type the path name of the driver. This is the \OS2\DRIVERS\MVPRODD directory on the the startup drive.
7. Select **OK**.
8. Select **Pro Audio Spectrum/CDPC Wav/MIDI/AUX driver**.
9. If the Driver Exists window appears, select **New**.
10. Choose the settings that best suit your situaton and select **OK** for each choice.
11. Restart the Windows session when requested.
12. To enable audio recording, the following line must be added to the DOS_DEVICE setting for that session:

```
d:\OS2\DRIVERS\MVPRODD\MVSOUND.SYS D:PD Q:PI /S:SE,SP,SD,SI
```

where:

- d: is the drive letter you installed OS/2 on
- PD is the PAS-16 DMA channel
- PI is the PAS-16 IRQ level
- SE is the Sound Blaster Enable/Disable setting (1=Enable, 0=Disable)
- SP is the Sound Blaster port address
- SD is the Sound Blaster DMA channel
- SI is the Sound Blaster IRQ level

6.9.1 Media Vision Jazz 16

If you have a Media Vision Jazz 16 adapter, you need to add five driver s to the list of installed drivers.

Before you add the drivers, you must change the setting for the DOS property, DOS_DEVICE. Add the following line to the DOS_DEVICE setting:

```
d:\OS2\DRIVERS\JAZZDD\JAZZ.SYS Pnnn In Dn En Tnnn Qn
```

where n following the parameters has the following meanings for audio adapter settings:

- Pnnn is the I/O base address.
- In is the IRQ level.
- Dn is the 8-bit DMA channel.
- En is the 16-bit DMA channel.
- Tnnn is the MPU-401 base address.
- Qn is the MPU-401 IRQ level.

Note: d: is the drive where OS/2 is started from. After you complete the changes to DOS settings, you are ready to add the drivers to the Windows Installed Drivers list.

- To add the first driver:
  1. Open **Control Panel in the Main Group**.
  2. Open **Drivers**.
  3. Select **Add**.
  4. Select **Unlisted** or **Updated Driver**.
  5. Select **OK**.
  6. In the Install Driver window type the path name of the driver. This is the \OS2\DRIVERS\JAZZDD directory on the startup drive.
  7. Select **OK**.
  8. Select **Jazz Wave Audio**.
  9. Ignore the error message.
  10. Follow the installation instruction, selecting **New**.
  11. Select **OK**.

12. Cancel the request to restart the Windows session so you can add the next driver.

- To add the second driver to the list:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Jazz Mixer**.
  6. Follow the installation instruction, selecting **New**.
  7. Cancel the request to restart the Windows session so you can add the next driver.
- To add the third driver to the list:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Jazz-401 MIDI Interface**.
  6. Follow the installation instruction, selecting **New**.
  7. Cancel the request to restart the Windows session so you can add the next driver.
- To add the fourth driver to the list:
  1. Select **Add**.
  2. Select **Unlisted** or **Updated Driver**.
  3. Select **OK**.
  4. In the Install Driver window, select **OK**.
  5. Select **Jazz OPL2 FM Synth**.
  6. Follow the installation instruction, selecting **New**.
  7. Cancel the request to restart the Windows session so you can add the next driver.
- To add the fifth driver to the list:
  1. Select **Add**.

2. Select **Unlisted** or **Updated Driver**.
3. Select **OK**.
4. In the Install Driver window, select **OK**.
5. Select **Jazz OPL3 FM Synth**.
6. Follow the installation instruction, selecting **New**.
7. Restart the Windows section when requested.

6.9.2 Sound Galaxy Adapter

To add Windows audio support for the Sound Galaxy adapter:

1. Open **Control Panel** in the Main Group.
2. Open **Drivers**.
3. Select **Add**.
4. Select **Unlisted** or **Updated Driver**.
5. Select **OK**.
6. In the Install Driver window type the path name of the driver. This is the \OS2\DRIVERS\AZT16DD directory on the startup drive.
7. Select **OK**.
8. Select **16-bit Audio Driver**.
9. Ignore the error message.
10. Follow the installation instruction, selecting **New**.
11. Select **OK**.
12. Restart the Windows session when requested.

To set the MIDI Mapper for Sound Galaxy:

1. Open **Control Panel**.
2. Open **MIDI Mapper**.
3. Select **MIDI Mapper name IBM FM SYN**.
4. Select **Close**.

6.9.3 ESS-688

To install Windows audio support for the ESS-688 audio adapter, you need to do the following:

1. Edit the SYSTEM.INI file
2. Edit the CONTROL.INI file
3. Copy all the files from OS2\DRIVERS\ES688DD to \WINDOWS\SYSTEM.
4. Make the following changes to the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \WINDOWS directory.
   - In the [boot] section, add the msmixmgr.dll string to the end of drivers= entry so that it looks like this: `drivers=mmsystem.dll msmixmgr.dll`
   - In the [drivers] section, add the following entries:
     - WAVE=es688win.drv
     - MIDI=es688win.drv
     - AUX=es688win.drv
     - MIXER=es688win.drv
     - MIDI1=audmpio.drv
   - In the [mciseq.drv] section, add the following entry:

     disablewarning=true
   - In the [386Enh] section, add the following entry:

     device=es688win.386
   - Create a new section for the audio driver with the following entries:

```
[auddrive.drv]
AudioDrive=ES688
Synth=OPL3
portchoices=220,230,240,250
irqchoices=2,5,7,10
dmachoices=0,1,3
port=220
int=7
dmachannel=1
AutoConfig=yes
VerifyInt=yes
VerifyDMA=no
```

Note: The values for port=, int=, and dmachannel= must match the adapter settings.

5. Remove the following entries (if they exist) from CONTROL.INI file.

```
[drivers.desc]
es688win.drv=
audmpio.drv=
```

6. Copy all the files from the \OS2\DRIVERS\ES688DD directory to the \WINDOWS\SYSTEM directory.

Note: You must be sure that any Windows session that uses the ESS-688 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Standard or you will not be able to start the session.

Chapter 7. Miscellaneous OS/2 Warp Device Drivers

This chapter covers some other device drivers such as the mouse driver, keyboard driver and joystick driver. It will give you a good overview of how to install and configure them as well as which device requires which driver.

7.1 Mouse Driver

One of the most important input methods OS/2 Warp supports is the mouse input. This section includes mouse driver installation procedures and a list of supported mouse devices. At the end of this chapter you can find a list of some known problems related with mouse drivers and devices.

7.1.1 Mouse Driver Installation

The mouse driver installation happens during the OS/2 system installation. The MOUSE.SYS driver tries to detect what kind of pointing device you have attached to your system. It checks the pointing devices in the following order:

- Pointing Device Interface (PDI) or PS/2 style port
- COM1 port
- COM2 port
- ISA bus In-port
- Bus card

MOUSE.SYS supports both relative and absolute pointing devices. A relative pointing device is one that causes the pointer to move across the screen relative to the motion of the device. An absolute pointing device sends information corresponding to a screen location where the pointer should appear (for example, a touch screen).

If the installation facility locates a supported mouse device, OS/2 Warp automatically installs all the necessary drivers. It will then create a mouse object in the OS/2 System folder where you can change the settings of the mouse (see 7.1.4, “Mouse Driver Configuration” on page 272).

The files which OS/2 Warp uses for the mouse access are listed in Table 27 on page 268.

Table 27. Mouse Drivers	
Name	**Description**
VMOUSE.SYS	Virtual mouse driver for DOS applications
POINTDD.SYS	Provides general mouse pointer draw support
PMDD.SYS	Provides mouse pointer draw support for OS/2 sessions.
MOUSE.DRV	Mouse driver for Windows applications
MOUSE.SYS	Provides support for pointing devices
MOUSECALLS.DLL	Dynamic link library for mouse calls

An example of the files installed if you have an IBM PS/2 mouse is shown below:

```
DEVICE=C:\OS2\BOOT\POINTDD.SYS
DEVICE=C:\OS2\BOOT\MOUSE.SYS
DEVICE=C:\OS2\MDOS\VMOUSE.SYS
```

If your pointing device was delivered with its own device driver or is not supported by the MOUSE.SYS driver, you can use the TYPE=xxxxx$ statement to install the device. For example, some older Logitech devices are not detectable by MOUSE.SYS. However, OS/2 Warp still supports these devices using the PCLOGIC.SYS driver. An example of such a statement in a CONFIG.SYS file is shown below:

```
DEVICE=C:\OS2\PCLOGIC.SYS SERIAL=COM1
DEVICE=C:\OS2\MOUSE.SYS TYPE=PCLOGIC$
```

The TYPE=PCLOGIC$ statement refers to a device-dependent driver called PCLOGIC.SYS. This driver has a separate parameter called SERIAL=COM1 that connects the mouse to COM1.

To change your mouse device manually, use the **Selective Install** function.

Note

It is not recommended to change the pre-configured pointing device unless you experience problems.

To perform this step, follow the steps listed below:

- Open the **OS/2 System** folder.
- Open the **OS/2 System Setup** folder.

- Open the **Selective Install** icon. The **System Configuration** window appears.
- Click on the **Mouse** button. The window showed in Figure 95 will be displayed.

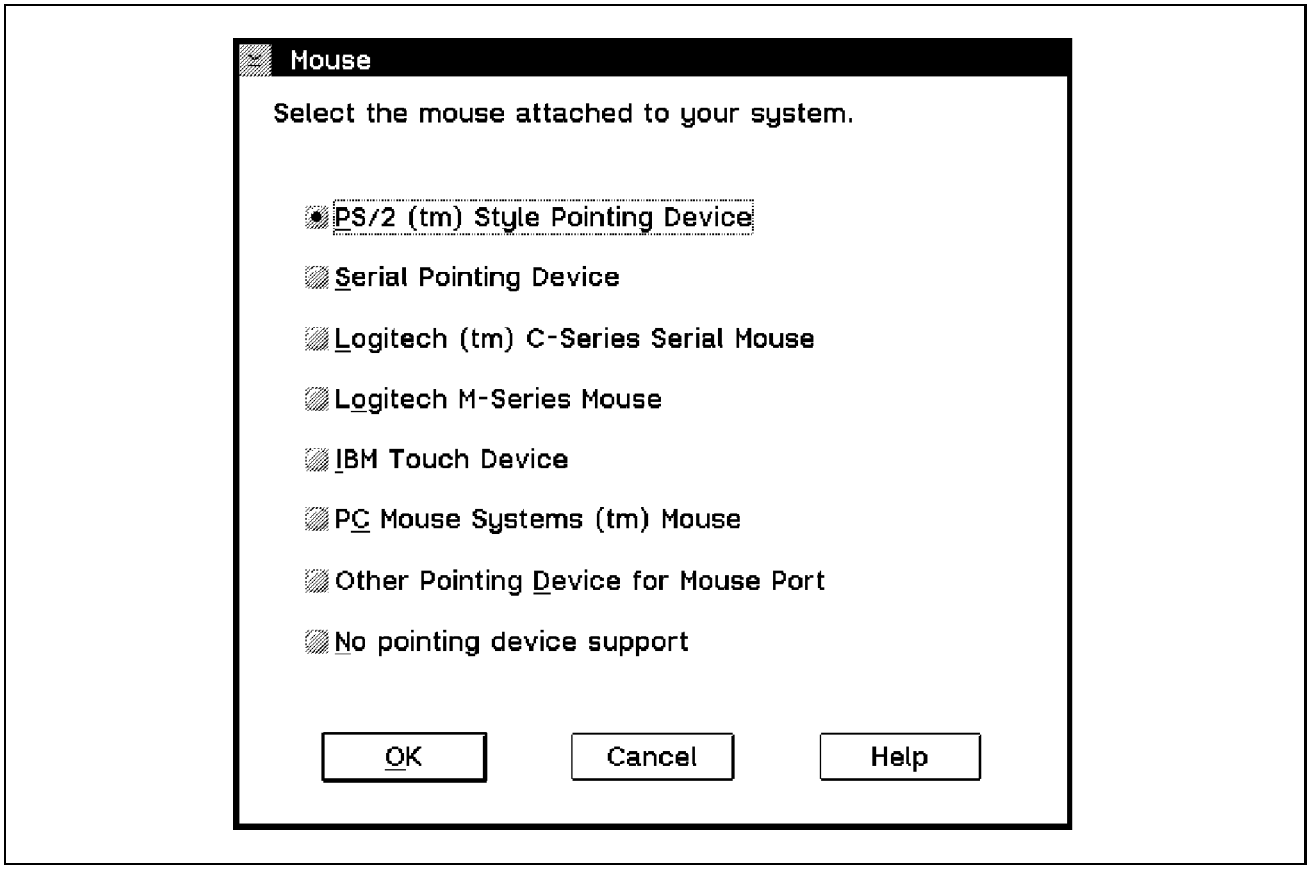


Figure 95. The Mouse Selection Menu

- Select the desired mouse.
- Click on **Ok**.

After you have chosen the new mouse device, perform a shutdown.

Attention

When a user selects a wrong mouse (for example Logitech serial) and changes the selection afterwards via Selective Install (for example to PS/2 Pointing Device), the statement DEVICE=C:\OS2\PCLOGIC.SYS is left in the CONFIG.SYS. Remove this statement manually, otherwise your mouse won't work.

7.1.2 MOUSE.SYS

The MOUSE.SYS driver in OS/2 Warp provides general support for pointing devices. It detects what kind of pointing device is connected to the system. All Microsoft compatible mice are supported by the MOUSE.SYS driver. The valid parameters for the MOUSE.SYS driver are:

- QSIZE=q
  Specifies the length of the queue for events to be used for all OS/2 Warp applications. The valid range is between 1 and 100. The default setting is 10.

- TYPE=name
  Specifies the device driver of a mouse that is not supported by the MOUSE.SYS driver. OS/2 Warp provides two drivers:

  - PCLOGIC$ calls PCLOGIC.SYS. Provides support for PC Mouse devices and some Logitech mice.
  - VISION$ calls VISION.SYS. Provides support for the Visi-On mouse.

  These are the drivers delivered with OS/2 Warp. If you have your own driver delivered with a pointing device, you can add the appropriate statements yourself. For example, if you have a Logitech Trackman, the statements in CONFIG.SYS would look like this:

  ```
  DEVICE=C:\OS2\PCLOGIC.SYS SERIAL=COM1
  DEVICE=C:\OS2\MOUSE.SYS TYPE=PCLOGIC$
  ```

  Pay attention that you put the '$' sign after the name in the TYPE statement of the MOUSE.SYS driver. Always load the device-dependent driver (in this example PCLOGIC$.SYS) before the MOUSE.SYS driver.

- STYPE=name
  This is an undocumented function of the MOUSE.SYS driver. Use this parameter only if you have an alternative pointing device (for example a touch screen or a tablet). The syntax is similar to the TYPE parameter described before. The name parameter specifies the name of the alternative pointing device driver with a '$' sign at the end.

- RELAXED
  Can be used for any three button mouse if the mouse pointer is jumping randomly over the screen. Do not use this parameter unless you experience this problem.

Attention

Be aware that the COM.SYS driver has to be loaded after the MOUSE.SYS driver if the mouse is connected to one of the COM ports!

7.1.3 Supported Mouse Devices

The following pointing devices have been tested and verified to work. Included are the CONFIG.SYS statements for each entry.

Table 28. Supported Pointing Devices

Device Name	**CONFIG.SYS Statements**
IBM PS/2 Mouse	DEVICE=C:\OS2\MOUSE.SYS
MS PS/2 Mouse	DEVICE=C:\OS2\MOUSE.SYS
MS Serial Mouse	DEVICE=C:\OS2\MOUSE.SYS
Kensington Expert PS/2 Mouse	DEVICE=C:\OS2\MOUSE.SYS
Logitech PS/2 Mouse	DEVICE=C:\OS2\MOUSE.SYS
MS Bus Mouse	DEVICE=C:\OS2\MOUSE.SYS
MS Inport Mouse	DEVICE=C:\OS2\MOUSE.SYS
Logitech Serial Mouse (Series M)	DEVICE=C:\OS2\MOUSE.SYS
Logitech Serial Mouse (Series C)	DEVICE=C:\OS2\PCLOGIC.SYS SERIAL=COM1 DEVICE=C:\OS2\MOUSE.SYS TYPE=PCLOGIC$
Logitech Trackman serial mouse	DEVICE=C:\OS2\PCLOGIC.SYS SERIAL=COM2 DEVICE=C:\OS2\MOUSE.SYS TYPE=PCLOGIC$
PC Mouse Systems serial mouse	DEVICE=C:\OS2\PCLOGIC.SYS SERIAL=COM2 DEVICE=C:\OS2\MOUSE.SYS TYPE=PCLOGIC$
PC Mouse Systems bus mouse	DEVICE=C:\OS2\MSBUS01.SYS DEVICE=C:\OS2\MOUSE.SYS TYPE=MSBUS$
Visi-On serial mouse	DEVICE=C:\OS2\PCLOGIC.SYS SERIAL=COM2 DEVICE=C:\OS2\MOUSE.SYS TYPE=PCLOGIC$

Note: The mouse driver is smart enough to figure out if the mouse is in a mouse port or one of the COM ports. Be sure that the MOUSE.SYS statement appears before DEVICE=C:\OS2\COM.SYS in your CONFIG.SYS file if the mouse is in a COM port.

There are hundreds of mouse devices available today. Most of them are Microsoft compatible and you are able to use the MOUSE.SYS driver.

7.1.4 Mouse Driver Configuration

After installing the mouse driver, OS/2 Warp creates a mouse object in the OS/2 System folder. Double click this icon and the mouse settings appear as seen in Figure 96.

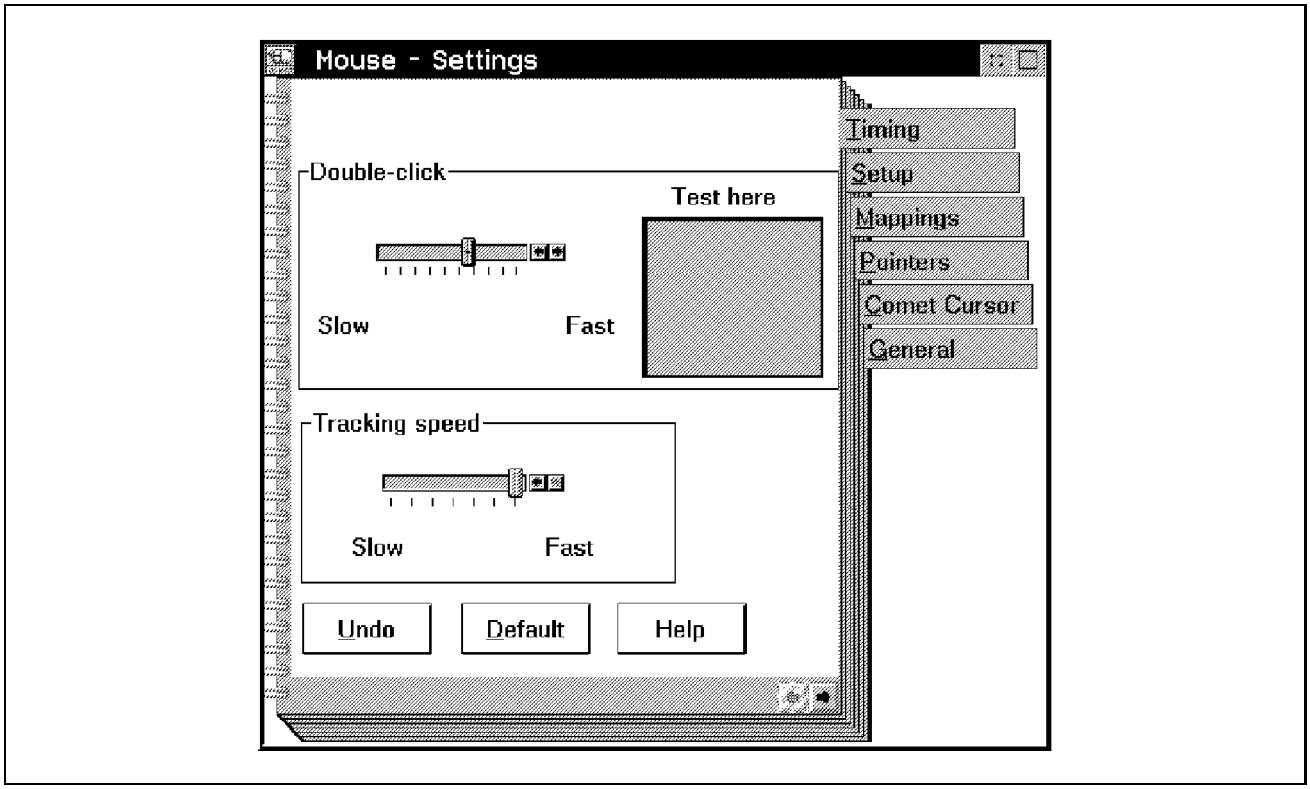


Figure 96. The Mouse Object Settings Page

It contains six different pages:

- **Timing**
  Here you can adjust the double-click interval and the tracking speed. The double-click interval is the period of time OS/2 Warp recognizes two mouse clicks as a double-click action. The tracking speed adjusts the sensitivity to the movement of the mouse.

- **Setup**
  Choose here between right-handed and left-handed mouse use. The difference between these two modes is, that on the right-handed mouse, the mouse button one is on the left, whereas on the left-handed mouse it is on the right.

- **Mappings**

This page enables you to change the action OS/2 Warp takes, when you press a single mouse button or a combination of mouse buttons.

Attention

Do not try to assign two actions to one mouse button.

- **Pointers**
  Select this page if you want to change the look of your mouse cursor set. A complete cursor set includes nine pointers for all the different actions you can do. You can choose from four different sets by simply selecting the Load Set pushbutton. To edit one of the shown pointers, double-click on the pointer and the icon editor appears. OS/2 Warp saves the mouse pointers in the \OS2\POINTERS directory. If you wish to create your own cursor set, create a new subdirectory: For example \OS2\POINTERS\NEWPOINT.

- **Comet Cursor**
  The last feature is the comet cursor page. Selecting this option draws a trail behind your mouse cursor while your move it. This has the advantage of better visibility of the mouse cursor on the screen (especially laptop LCD displays). To activate the comet cursor, select the Comet Cursor On box and restart OS/2.

7.1.5 Problem Determination

Most of the problems with mouse drivers are caused by old mouse devices that don't support the Microsoft standard or by software that doesn't use standard mouse interfaces. Table 29 on page 274 lists a few of the most common problems:

Table 29 (Page 1 of 2). Problem Determination Table for Mouse Drivers

Problem description	Solution
`SYS1201 VMOUSE.SYS not installed` error message during boot up.	Usually means that MOUSE.SYS was installed but couldn't find the mouse and therefore could not install VMOUSE.SYS. Check the following: • Is your mouse firmly connected to the computer? • Is your mouse supported? Check if there any DIP switches that put it into Microsoft emulation mode. • If there was already mouse support during the OS/2 installation process, then you probably changed the mouse driver or the mouse port. Run the **Selective Install** program as seen earlier in this section. Choose another mouse device or mouse port. • There might be an interrupt conflict. On an AT bus system, a serial mouse will only install on COM1 (Address 3F8, IRQ4) and COM2 (2F8, IRQ3).
Logitech Mouse doesn't function under OS/2 when installed with the Logitech drivers.	Most Logitech mice emulate Microsoft mice and use the OS/2 pointing device. The CONFIG.SYS statement should contain the following statements: DEVICE=C:\OS2\MOUSE.SYS If there is a remaining PCLOGIC.SYS driver left in CONFIG.SYS you must remove it manually.
Logitech mouse - mouse button doesn't work properly.	There exists a replacement fix (l_ms_os2.zip) if you experience problems with mouse buttons of Logitech devices. It contains a replacement MOUSE.SYS driver. Follow the instructions on the README file. You can download this fix at the Dell FTP site (ftp://ftp.dell.com/dellbbs/os2).
Mouse pointer is offset (by several inches) from the effective internal location for windows applications running in a seamless (windowed) session. This is seen on Dell computer with Windows pre-installed.	This is the result of a Dell-specific version of the Windows mouse driver MOUSE.DRV. Obtain a copy of a standard version of this driver or download an updated driver from Dell. The address is ftp://ftp.dell.com/dellbbs/os2.

Table 29 (Page 2 of 2). Problem Determination Table for Mouse Drivers

Problem description	**Solution**
Cannot use alternate pointing devices.	There is an undocumented function in the mouse device driver. Use this function only if you have some alternative pointing devices such as a tablet or touch screen. Add the following to the end of the DEVICE=C:\OS2\MOUSE.SYS statement: STYPE=xxxxxxx$ where xxxxxxx$ is the name of the alternative device. Reboot the system.
The mouse cursor suddenly zips over to the side of the screen and hangs there, no longer responding to any mouse movements	This is caused by a hardware glitch and cannot be prevented from happening, but by using a special version of the mouse driver (WILDMOUS), you are not forced to perform a cold start. Obtain this mouse driver from the OS/2 support or from BBS.
Mouse pointer jumps around the screen using a three button mouse device.	Use the RELAXED parameter in the MOUSE.SYS statement in CONFIG.SYS. For example: `DEVICE=C:\OS2\BOOT\MOUSE.SYS RELAXED`
Using WordPerfect creates two mouse pointers in a windowed session: one for the OS/2 desktop and one for the session.	WordPerfect uses an own implementation of a mouse driver. To solve this problem, open the **DOS Settings** and change MOUSE_EXCLUSIVE_ACCESS to Yes.
In a full screen WIN-OS/2 session, the mouse pointer is white and stays in the middle of the screen. In a windowed WIN-OS/2 session, the mouse pointer is black on the OS/2 desktop and turns into an hour glass if you move it over the windowed session.	Check the IRQ settings, there is probably an IRQ conflict between serial ports. If your mouse is attached on COM1, then disable COM3 or assign it to another IRQ. You can use the COM command as shown below: `C:\OS2\COM.SYS(3.03e8,2)`. This assigns COM3 to address 03e8 at IRQ2. For further information, refer to the online help.

A good hint is also to use the MODE COMx command in order to determine whether the serial port is occupied by the mouse or not for example: `MODE COM1`.

If it reports that the port is not available then MOUSE.SYS is loaded. This means that the drivers are correct and you don't have to change the CONFIG.SYS statements.

If it reports a list with baud rate and all the other COM port parameters, then MOUSE.SYS did not recognize the mouse and therefore did not load.

7.2 Keyboard Driver

The keyboard is a primary input like the mouse. This section describes what you can change in the keyboard driver, which files have to be installed in which directory as well as a problem determination section.

7.2.1 Keyboard Driver Installation

During the installation of OS/2 Warp you selected the keyboard layout you want to use as well as the country. If you want to change these settings follow the steps described below:

- Open the **OS/2 System** folder.
- Open the **OS/2 System Setup** folder.
- Open the **Selective Install** icon. The System Configuration window appears.
- Select **Keyboard** from the Panel. A list of keyboard country layouts appears as seen in Figure 97 on page 277.

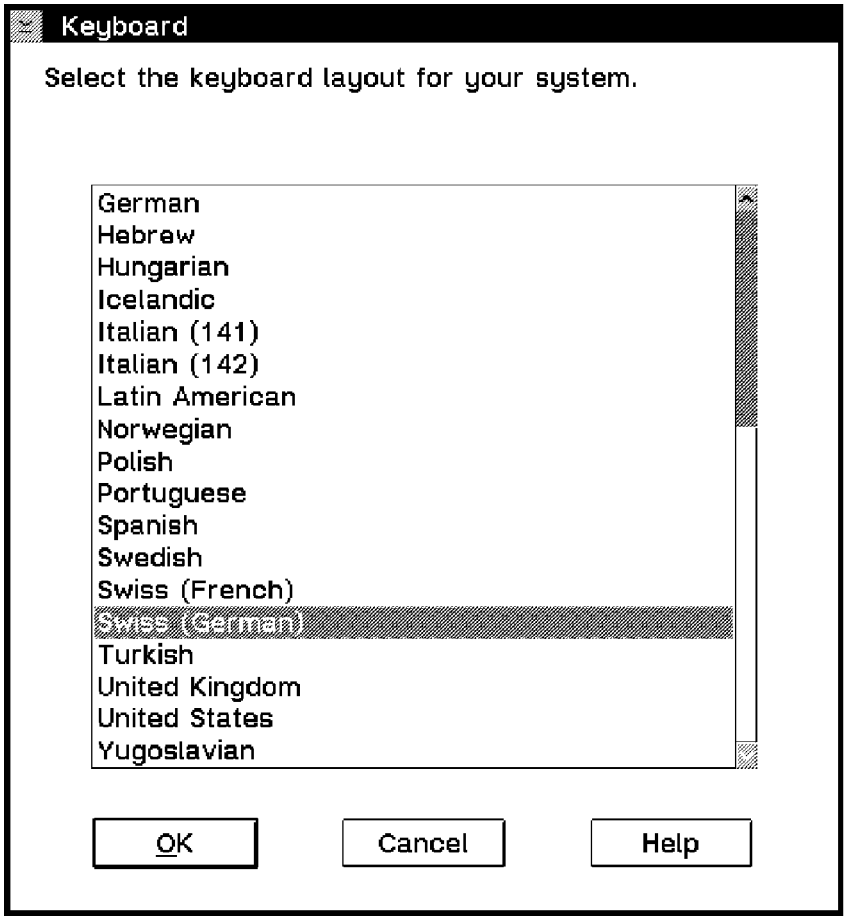


Figure 97. The Keyboard Layout Selection Page

- Choose the desired country.
- Click on **OK**.

The files OS/2 uses to access the keyboard are shown in Table 30.

Table 30 (Page 1 of 2). Keyboard Files

Name	Description
IBMKBD.SYS	This is the hardware-specific portion of the keyboard device driver. It provides support for the keyboards listed in 7.2.2, “Supported Keyboards” on page 278. It also gets the scan codes and passes them to the KBDBASE.SYS driver.
KBDBASE.SYS	The base OS/2 keyboard driver. It processes the scan codes sent from the IBMKBD.SYS driver and instructs IBMKBD.SYS if there are any updates.

Table 30 (Page 2 of 2). Keyboard Files	
Name	**Description**
VKBD.SYS	The DOS virtual keyboard driver is used by DOS application.
KEYBOARD.DRV	This is the Windows Keyboard driver. It is used by Windows applications.
ANSI.SYS	Provides extended screen/keyboard support for DOS sessions.
KBDCALLS.DLL	DLL for keyboard calls.
BKSCALLS.DLL	Basic keyboard dynamic link library.

7.2.2 Supported Keyboards

The IBMKBD.SYS driver supports the following of keyboards:

- IBM Enhanced 101/102 Key keyboard
- IBM 3279 Enhanced 130 Key keyboard
- Honeywell 101 WN
- Lexmark Enhanced 101 Key keyboard
- Mitsumi 101/102 keyboard Model-R ,-S, -U, KPQ-E99ZC

Note: Any keyboard compatible with the IBM Enhanced 101 Key keyboard will be supported.

7.2.3 Keyboard Driver Configuration

After installing the keyboard driver, OS/2 Warp creates a keyboard icon in the System Setup folder. To change the settings of this keyboard object, follow the steps below:

- Open the **OS/2 System** folder.
- Open the **System Setup** folder.
- Double-click at the keyboard icon. The **Setting** page appears as seen in Figure 98 on page 279.

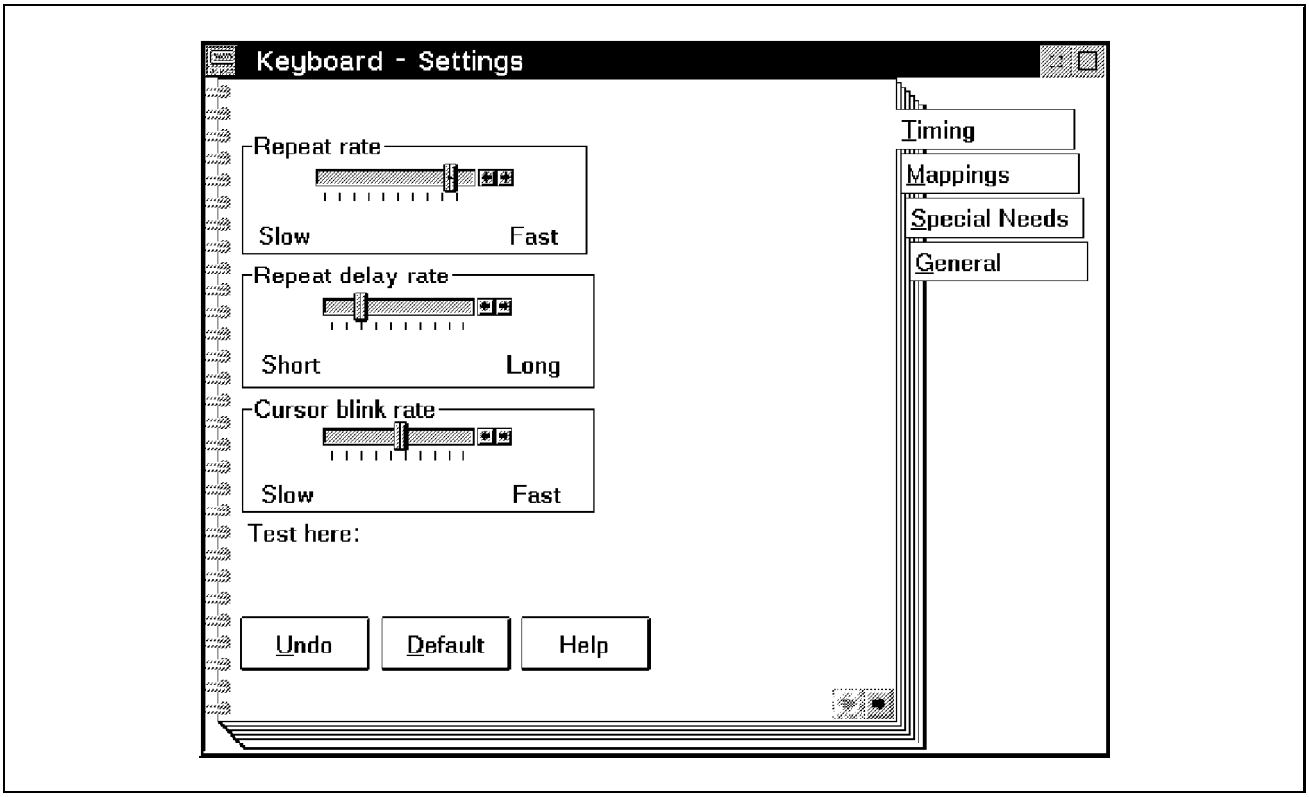


Figure 98. The Keyboard Settings Page

It contains four different pages:

- **Timing**
  Adjust the following here:
  - Repeat rate - how fast characters repeat when you hold down a key.
  - Repeat delay rate - how long to delay before repeating.
  - Cursor blink rate - how fast the text cursor blinks.

  You can see the result of the changes in the testbox.

- **Mappings**
  You can change the keys used to display the pop-up menu of a window or to edit an icon's title.

  Attention

  Pay attention that your new selection doesn't conflict with an OS/2 key combination.

- **Special Needs**

This page is for people who are perhaps not very nimble with their hands or who are unable to hold down two keys at once. The online help gives you extensive help if you want to use these features.

- **General**
  The general page provide the usual information like the icon name or the icon picture.

7.2.3.1 The KEYB Command

You can also change the current keyboard settings from a command line using the KEYB command.

The KEYB command selects a keyboard layout to replace the current keyboard layout for all OS/2 and DOS sessions. KEYB is useful for quickly accessing the keyboard characters of another keyboard layout.

Note

The KEYB command must be run only from an OS/2 full screen session command prompt. Using an OS/2 window could create unexpected results.
If you don't have a DEVINFO=KBD,xx statement in your CONFIG.SYS, the KEYB command returns an error code when trying to change the keyboard layout (see 7.2.3.2, “The DEVINFO=KBD Statement” on page 281).

The syntax for the KEYB command is:

```
KEYB <command> <subcountry>

<command>    : specifies the keyboard layout
<subcountry> : specifies a specific keyboard layout for countries
               that have more than one layout.
```

An example of the use of the KEYB command is shown below:

To switch to the Poland layout type:

```
KEYB PL
```

To switch to the French keyboard with the French enhanced keyboard 120 type:

```
KEYB FR120
```

To display the configuration type:
KEYB

This will then display the status as seen in the example below:

```
Current keyboard layout: US   Subcountry code: 103
Current keyboard translation table is based on code page: 437
```

A list of the available layouts is shown in Table 31

7.2.3.2 The DEVINFO=KBD Statement

The DEVINFO=KBD statement in the CONFIG.SYS file prepares a keyboard for system code page switching. It specifies a keyboard layout and a file named KEYBOARD.DCP that contains a keyboard table for translating keystrokes into characters. The syntax of this statement is shown below:

```
DEVINFO=KBD,<layout>,<drive path filename>

<layout>                  :Specifies the keyboard layout.
<drive path filename>       :Specifies the complete name of the
                          file that contains the keyboard translation
                          table (*.DCP).
```

An example of the use of the DEVINFO=KBD statement is shown below:

```
DEVINFO=KBD,US,C:\OS2\BOOT\KEYBOARD.DCP
```

This statement prepares a U.S keyboard layout but it does not switch the keyboard yet. To switch the keyboard to another layout, use the KEYB command (see 7.2.3.1, “The KEYB Command” on page 280). A list of all available layouts is shown in Table 31.

Table 31 (Page 1 of 2). Keyboard Layouts

Parameter	Country Layout	Parameter	Country Layout
AR	Arabic	NL	Netherlands
BE	Belgium	NO	Norway
BR	Brazil	PL	Poland
CF	Canada (french)	PO	Portugal
CS	Czechoslovakia	SP	Spain
DK	Denmark	SV	Sweden
SU	Finland	SF	Switzerland (French)

Table 31 (Page 2 of 2). Keyboard Layouts

Parameter	Country Layout	Parameter	Country Layout
FR	France	SG	Switzerland (German)
GR	Germany	TR	Turkey
HE	Hebrewm	TW	China
HU	Hungary	UK	United Kingdom
IS	Isalnd	US	United States
IT	Italy	YU	Yugoslavia
LA	Latin America		

Additionally you can choose the subcountry code for those countries that have more than one keyboard layout. An example of such a configuration is shown below:

```
DEVINFO=KBD,FR120,C:\OS2\BOOT\KEYBOARD.DCP
```

This prepares the enhanced French keyboard for code page switching.

A list of countries with more than one subcountry code is shown in Table 32.

Table 32. Subcountry Parameter

Codes	Country
243,245	Czechoslovakia
189,120	France
141,142	Italy
166,168	United Kingdom

Note: If you don't specify the subcountry code for these countries, OS/2 Warp uses the first subcountry code listed.

To get further information about the keyboard commands and statements in CONFIG.SYS please refer to the online help.

7.2.4 Keyboard Problem Determination

Few problems are reported in connection with keyboards. If you do experience problems, the table shown in Table 33 lists a few problems and its resolutions.

Table 33. Problem Determination Table for Keyboard Drivers

Problem description	**Solution**
Keyboard doesn't respond.	First check for the obvious: • Is your keyboard firmly connected to the keyboard port? • Has the cable been damaged? Is it firmly plugged in the keyboard itself? • Check the keyboard files on your hard disk (especially IBMKBD.SYS and KBDBASE.SYS). • Press ALT+F1 during startup. Does OS/2 Warp displays the recovery screen? - If not, you might have a hardware problem, exchange the keyboard. - If yes, the error might be in the configuration. Try to install the keyboard again by selecting the option M (selective install) from the recovery screen.
Letter B does not appear in a DOS window or full screen on AT&T desktop systems with a Flash level 1.00.07 BFOB.	There is a problem with the Flash BIOS level 1.00.07. AT&T recommends to downgrade the Flash Level to 1.00.06 to resolve the problem. Contact AT&T for information about downlevel Flash BIOS.
An external keyboard is not being recognized on a IBM laptop.	You need to have a special Y cable to connect the external keyboard to the laptop. The keyboard is not recognized without this special cable. The Y cable is inserted in the mouse port of the system. The mouse device and the keyboard are inserted in the two ends of the cable. If a replicator is connected to the back of your laptop, you don't need this cable. You can plug the external keyboard directly into the replicator's keyboard port.
On the AMS 5200 series laptops the comma and period character keys do not display when pressed. A symbol character is displayed instead.	This is not an OS/2 code problem. There might be an incompatible controller chip on the system board. It may also be related to the wrong video mode setup on the system. Contact the vendor for this problem.

7.3 Serial Port Drivers

Serial port drivers allow OS/2 application programs or system programs (for example the OS/2 spooler) to use serial devices. OS/2 sends print job data to the serial port using a device driver to control serial ports.

7.3.1 Installation of Serial Port Drivers

The installation of the serial port support is normally performed during system installation. The name of the driver used is COM.SYS. It supports up to four serial ports called COM1, COM2, COM3 and COM4.

The files used by OS/2 Warp to access the serial ports are shown in Table 34.

Table 34. Files Used to Access the Serial Port

File name	Description
COM.SYS	This is the primary serial communication driver. It should be located in CONFIG.SYS after any other serial communication drivers, such as MOUSE.SYS.
VCOM.SYS	This driver is used for DOS applications. It should be denoted in CONFIG.SYS after COM.SYS.
COMM.DRV	This driver is used for WIN-OS/2 sessions. It is not denoted in the CONFIG.SYS file.

OS/2 puts the following statements in your CONFIG.SYS file:

```
DEVICE=C:\OS2\BOOT\COM.SYS
DEVICE=C:\OS2\MDOS\VCOM.SYS
```

```
C: is the drive where OS/2 is installed
```

For ISA/EISA machines only COM1 and COM2 are available by default. If you want to use COM3 and COM4 as well, you have to specify additional parameters. For Micro Channel machines, you don't have to specify this parameter unless you experience problems with a nonstandard COM port adress or IRQ. The parameters of COM.SYS and their explanation is shown below:

```
COM.SYS (<n>,<addr>,<IRQ>,<S>) [(<n>,<addr>,<IRQ>,<S>)] ...

<n>     COM port number (1, 2, 3, or 4)
<addr>   COM port address in hex number (3e8, 2e8, 3320 or others)
<IRQ>    IRQ level in decimal number (from 1 to 15)
<S>     Unexpected interrupt handling value (optional).
       You can set it to:
         - D  de-install COM.SYS if more than 1000 interrupt occur.
         - I  ignore unexpected interrupts
```

An example of a definition for COM3 is shown below:

```
DEVICE=C:\OS2\COM.SYS (3,3E8,10,D)
```

This defines COM3 at I/O port address 03E8h / IRQ 5. The driver unloads if more than 1000 interrupts occur.

It is not possible in ISA/EISA computers to share the IRQ level and therefore all IRQ levels defined for COM ports must be unique.
On Micro Channel machines, the IRQ level can be shared and therefore no parameter is required to define COM3 and COM4 ports. Instead you might have to specify the **I** parameter in order to avoid unexpected interrupts.

7.3.2 Configuration of Serial Port Drivers

For configuring the serial ports, you can use both the command line or the PM setting page. Those two options will be described in this section.

7.3.2.1 Configuring a Serial Port Using the Setting Page of a Port Object

OS/2 Warp uses port objects to access the ports. You can find them for example in the Output page within the settings of any printer object.
To change the configuration of a serial port object, follow the steps below:

- Open the **Settings** page of any printer object.
- Select the **Output** tab.
- Double-click on any serial port displayed. The Serial Port Settings page appears as seen in Figure 99 on page 286.

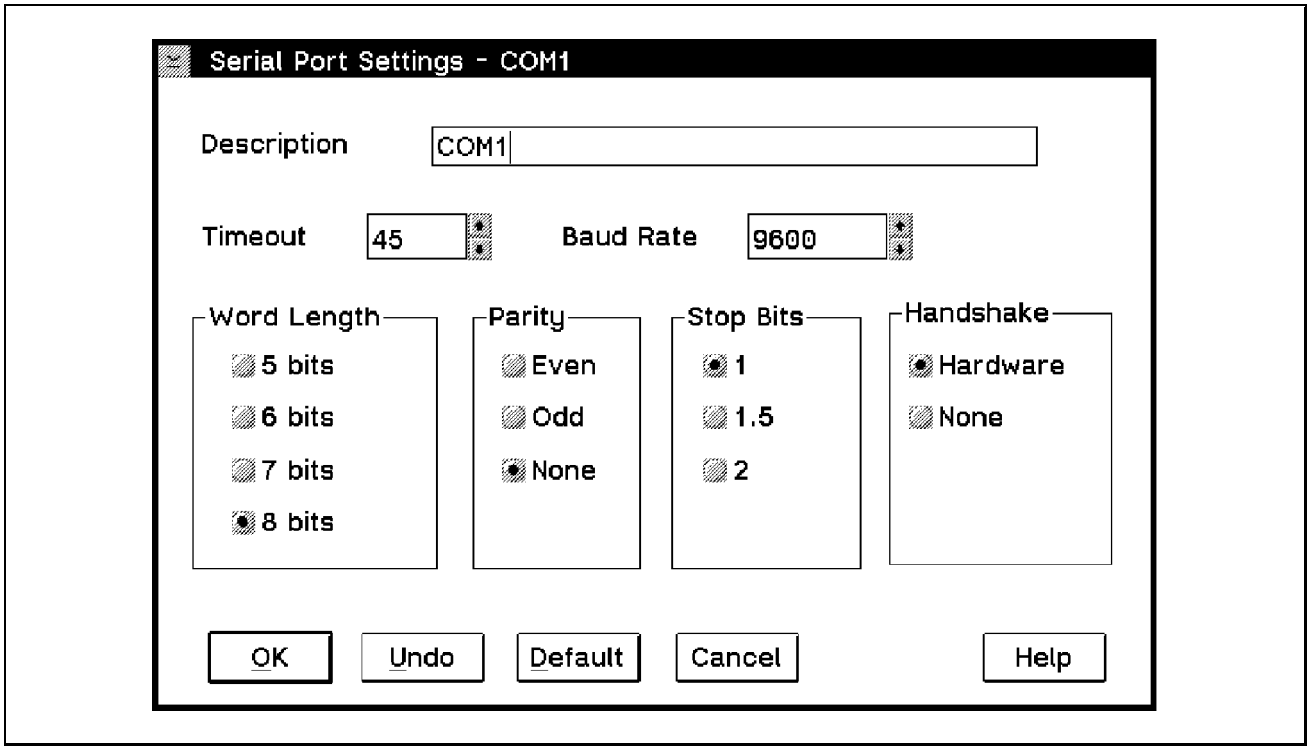


Figure 99. The Serial Port Setting Page

- You can change these options:
  - **Baud Rate**
    Here you can adjust the baud rate from 110 baud to 57600 baud. The default setting is 9600 baud.
  - **Word length**
    Choose here the word length between 5 and 8 bits. 8 bits is the default.
  - **Parity**
    Select here what kind of parity you have. You can choose between None, Even, or Odd. Odd is the default option.
  - **Stop Bits**
    1, 1.5, or 2 are the possible selections you can make here. The preselected choice is 1.
  - **Handshake**
    Select between Hardware and None. The default option is none.
  - **Timeout**
    Adjust here the time the Operating System reports a delay as an error. This value depends on how long it takes for the connected device to process the data. The default setting is 45 seconds.

Change these settings only if the manufacturer of the connected device advices this or if you experience problems with the default settings.

7.3.2.2 Configuring COM ports for DOS and WIN-OS/2 sessions

You can use the *Other DOS settings* page for changing the settings of a serial port for DOS sessions and WIN-OS/2 sessions. You can find this page by following these steps:

- Open the settings page of the DOS/WIN-OS/2 application you want to configure.
- Select **Session**.
- Select **DOS settings** or **WIN-OS/2 settings**.
- Click on **Other DOS settings** and select **Ok**. The setting page appears as seen in Figure 100.

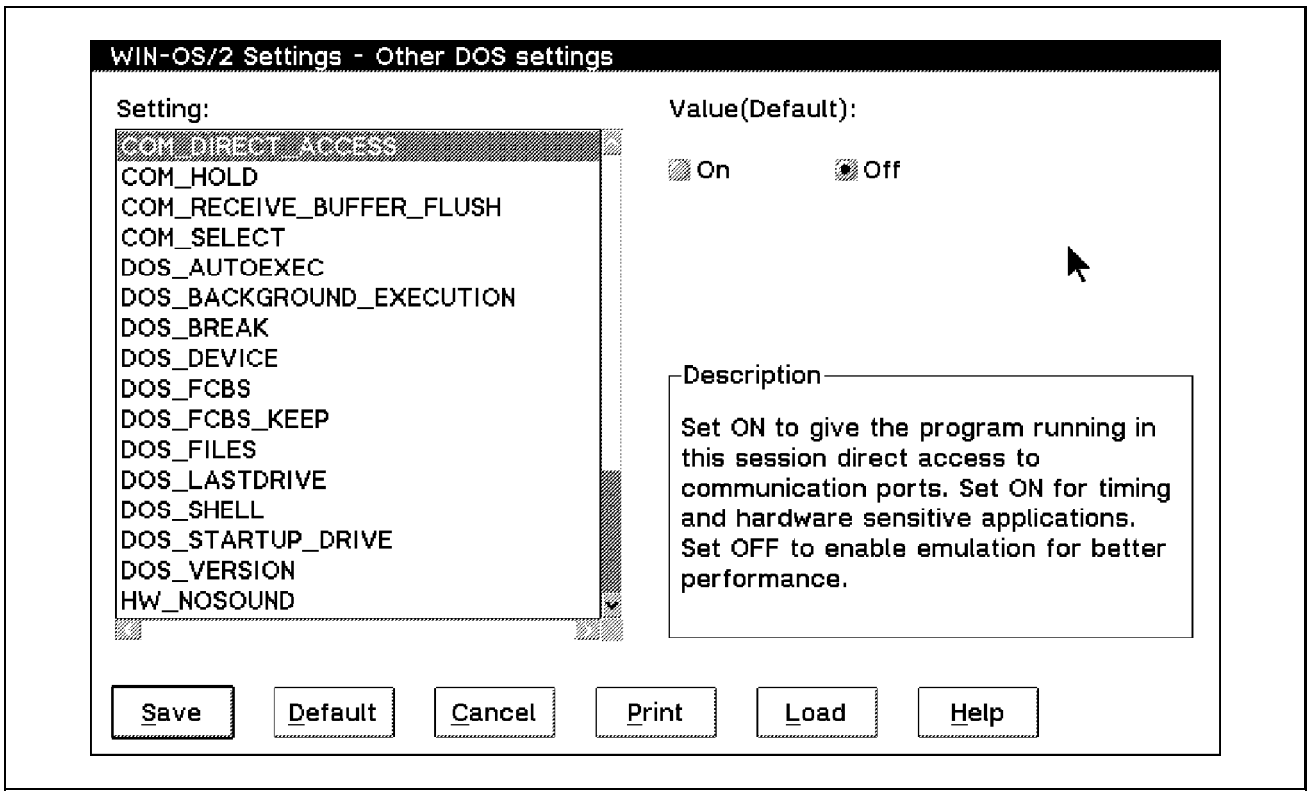


Figure 100. The Other DOS Setting Page

Four parameters are available to configure the COM port:

- **COM_DIRECT_ACCESS** br;This allows the VCOM.SYS driver to access serial ports directly, without the intervention of the COM.SYS driver. Use this for programs which use the serial port for high-speed communication (for example, LapLink III). Be careful when enabling this parameter

because VCOM.SYS doesn't provide buffering while COM.SYS does. This can cause some applications to lose data because of the lack of buffering.

- **COM_HOLD**
  Holds a serial port open, once a DOS application has opened it, until the session is closed. Selecting **Off** will close the serial port as soon as the program using it ends even if the DOS session from which you access the port is still active. This can cause problems when a communication program uses two programs: One for dialing the Bulletin Board and one for the connection to the Bulletin Board computer. Symptoms may be loosing the connection to the Bulletin Board. In this case select **On**.

- **COM_RECEIVE_BUFFER_FLUSH**
  This parameter helps OS/2 Warp to support timing sensitive DOS applications. It applies only if COM_DIRECT_ACCESS is set to off. Possible values are:

  - SWITCH TO FOREGROUND
    This setting causes any data received and held in the buffer to be deleted when the DOS session is switched from the background to the foreground. Some CAD applications with digitizer tables may need this feature when incoming data fills the buffer much faster than the program can process.
  - RECEIVE DATA INTERRUPT
    This setting discards any data in the buffer when a DOS application enables a receive data interrupt. Some DOS programs expect the buffer to be empty while this interrupt is disabled.
  - ALL
    Enables both the `switch to foreground` option and the `receive data interrupt` option.
  - NONE
    Disables both options and is the default.

- **COM_SELECT**
  This option allows DOS applications to access only one port. This makes sense if your DOS programs monopolize all ports regardless whether it uses them or not. *All* is the default setting which gives a DOS session full access over all ports. If you want to restrict the access of one of the COM ports, select either COM1, COM2, COM3 or COM4.

7.3.2.3 Using the MODE Command

The MODE command sets the mode for serial ports. It is valid in both OS/2 and DOS sessions. Before using the MODE command, be sure that the serial port device driver COM.SYS is installed.
The syntax of the MODE command is seen below:

```
MODE COMx,<baud-rate>,<parity>,<databits>,<stopbits>,<p>

x          Port number between 1 and 4
<baud-rate>  Baud rate between 110 and 57600 baud
<parity>    N=None, O=Odd, E=Even
<databits>   Databits between 5 and 8
<stopbits>   Stopbits, values are 1, 1.5, 2.
<p>        Specifies a timeout of 30 seconds for DOS sessions
```

The P parameter can only be used in DOS sessions. All the parameters are positional. This means, if you want to omit a parameter but include a parameter that follows it, you have to enter a comma for the parameter that doesn't change.
Example:

```
MODE COM1,,,,,P
```

For further information about using the MODE command, please refer to the online help.

7.3.3 IRQ Settings

If you have a ISA machine, each device or port needs a unique interrupt and I/O port address assignment (see also 3.4.7, “IRQ-Settings” on page 115). Unlike the parallel ports, serial ports can be configured to a different interrupt or I/O address by using additional parameters for the COM.SYS statement in CONFIG.SYS.

7.3.3.1 Standard Settings

Standard I/O port addresses and IRQ assignments are shown in Table 35.

Table 35 (Page 1 of 2). Standard I/O Port Addresses and IRQ Assignments

Bus type	COM port	I/O port	IRQ number
General	COM1	3F8h	IRQ4
General	COM2	2F8h	IRQ3
ISA bus	COM3	3E8h, 3E0h, 338h	IRQ4
ISA bus	COM4	2E8h, 2E0h, 238h	IRQ3

Table 35 (Page 2 of 2). Standard I/O Port Addresses and IRQ Assignments			
Bus type	**COM port**	**I/O port**	**IRQ number**
MCA bus	COM3	3220h	IRQ3
MCA bus	COM4	3228h	IRQ3
MCA bus	COM5	4220h	IRQ3
MCA bus	COM6	4228h	IRQ3
MCA bus	COM7	5220h	IRQ3
MCA bus	COM8	5228h	IRQ3

Standard definitions for COM3 and COM4 has never been defined. Instead, a convention places the port addresses for COM3 and COM4 at 03E8h and 02E8h respectively. This is a generally accepted convention but not a standard. Users who would like to use these ports have to check the IRQ and I/O port address settings for conflicts. After you have established unique IRQ and port address settings, you can configure COM3 and COM4 with the COM.SYS statement in CONFIG.SYS (see 7.3.1, “Installation of Serial Port Drivers” on page 284).

7.3.3.2 Setting IRQ levels on ISA systems

When setting IRQs, you should generally choose the lines shown as open in Table 36. These are the lines most likely to be available without conflicts with other adapters.

Table 36 (Page 1 of 2). Standard Definitions of IRQs	
IRQ	**Standard usage**
0	System timer
1	Keyboard
2	Secondary programmable interrupt controller
3	COM2 (serial communication port 2)
4	COM1 (serial communication port 1)
5	LPT2 (parallel port 2)
6	Floppy disk drive
7	LPT1 (parallel port 1)
8	Real time clock
9	Open
10	Open

Table 36 (Page 2 of 2). Standard Definitions of IRQs	
IRQ	**Standard usage**
11	Open
12	PS/2 mouse (if present)
13	Math coprocessor
14	Hard drive
15	Open

If the system only has one parallel port, IRQ 5 would also be available for other use (for example COM3 or COM4 support).

7.3.4 Problem Determination

The following table gives some resolutions to common problems:

Table 37. Problem Determination Table for Serial Port Driver	
Problem	**Resolution**
`SYS1620` and `SYS0049` error messages on EISA systems.	If you run OS/2 Warp with the delivered COM.SYS driver on an EISA machine, the COM port does not work. There is a fix available on the IBM PCC BBS called XR_WPK1.DSK. You can also download it from the IBM PCC ftp site (see Table 40 on page 327).
You get error messages when trying to run a communication application. OS/2 Warp is installed over Windows 3.11. Systems include messages like modem not present or other communication related messages.	Perform the following steps: • Backup the old COM.DRV file. • Add the Windows 3.1 COM.DRV driver to the \windows\system directory. Contact Microsoft or your hardware manufacturer if you don't have this driver.
`SYS1201 COM.SYS not loading` message appears.	You are trying to share interrupts on ISA/EISA machines. This has never been allowed due to hardware restrictions of the ISA/EISA PIC (Programmable Interrupt Controller). The Interrupt levels of the COM ports must be unique.

7.3.5 Other Serial Port Drivers

A popular serial port driver is Ray Gwinn's serial port driver SIO.SYS. It has some advanced features and supports up to eight serial ports.

Note: This driver is not part of OS/2 Warp.

You can download the package SIO153.ZIP from the Hobbes FTP server (ftp://hobbes.nmsu.edu/os2). It contains the driver and several documentations.

7.4 Joystick Driver

Joystick support originally wasn't supported by OS/2 Warp because many applications (especially games) have direct access to the game port. This caused some problems in DOS applications which used the joystick (for example incorrect calibrating or flickering).
Installing a Joystick driver has the advantage that you can configure either an analog or a digital joystick even if only an analog joystick is in use. This feature is possible because the driver reads the analog value from the game port and can converts it to a digital value that is given back to the application. You can download this driver with the name game_02b.zip from the PCC BBS or at many locations on the Internet (see B.1.2, “World Wide Web and FTP Sites” on page 327).

7.4.1 Joystick Driver Installation

There are differences in the installation procedures of this joystick driver, depending if you have the Multimedia support for OS/2 Warp (MMPM/2) installed or not.

7.4.1.1 Installation with MMPM/2 Installed

To install joystick support under OS/2 Warp with MMPM/2 installed, follow the steps below:

1. Make sure that the joystick is physically connected to the game port or the sound card.
2. Insert the OS/2 Joystick Device Driver diskette in drive A.
3. Type **MINSTALL** at a command prompt.
4. Select the source drive.
5. Select**Install**.
6. Shut down and then restart your computer for the joystick driver to take effect.

The OS/2 joystick device driver installation adds the following statements to the CONFIG.SYS file:

```
DEVICE=X:\MMOS2\GAMEDD.SYS
DEVICE=X:\MMOS2\GAMEVDD.SYS
```

X is the drive where MMPM/2 is installed.

7.4.1.2 Installation without MMPM/2 Installed

If MMPM/2 is not installed on your machine follow this procedure:

1. Make sure that the joystick is physically connected to the game port or the sound card.
2. Copy GAMEDD.SYS and GAMEVDD.SYS from the diskette containing the driver to the \OS2 directory.
3. Add the following statements to the CONFIG.SYS file:

   ```
   DEVICE=X:\MMOS2\GAMEDD.SYS
   DEVICE=X:\MMOS2\GAMEVDD.SYS
   ```

   X is the drive where OS/2 is installed
4. Shut down and then restart your computer for the joystick driver to take effect.

7.4.2 Joystick Driver Configuration

Two new additional settings are added to the **Settings Page** of both DOS sessions and WIN-OS/2 sessions. They are as follows:

- **GAME_DIRECT_ACCESS**
  - ON - This setting disables the driver and gives the DOS program direct access to the game port. Only choose this if you're having problems with control of a DOS program and you suspect the driver may be at fault.
  - OFF - The default setting. It prevents the DOS program from talking directly to the game port.

- **GAME_DIGITAL_RESPONSE**
  - **ON** - This is the default setting. The driver reports information back to the DOS program and makes your joystick handling much like a GamePad, even if your joystick is analog.
  - **OFF** - Analog joysticks will still look like analog joysticks.

7.4.3 Supported Joystick

The following joysticks have been tested with this driver:

- Advance Gravis Analog Joystick
- Advance Gravis GamePad
- Advance Gravis Analog Pro
- CH Products Flightstick
- Dexxa Joystick (Infrared)
- Kraft Thunderstick
- Logitech WingMan Extreme
- Logitech WingMan
- Thrustmaster XL Action Controller

However, most other joysticks should work as well, thanks to the generic interface of the game port.

Chapter 8. Device Driver Maintenance and Recovery

This chapter describes the basic overview of the procedures that can be followed for finding malfunctioning device drivers. It discusses how to display device drivers during startup, recovering from the installation of a corrupt or incorrect device driver, and general troubleshooting procedures.

8.1 Displaying Drivers during Startup

If you encounter a problem after installing a new device driver, you can use one of the new hot-key options available at startup under OS/2 Warp to aid you in resolving the problem.

When you boot your system under OS/2 Warp, a small white box is displayed in the upper left corner of the screen before the OS/2 Warp logo appears. Press Alt+F2 when the white box is displayed. All of the device drivers are displayed under the Warp logo at the bottom of the screen as they load.

This will allow you to see at which driver the boot process fails if your system is not booting properly. The system stops and will display at the bottom of the screen the driver that was attempting to load during the hang. This can then be used as a starting point to fix the problem. Usually if it hangs at this point, it is due to a hardware setting or incompatibility problem but it could also be a corrupted driver.

ALT+F2 can also be used during the initial installation of OS/2 Warp. The white box is displayed when loading from diskette 0. The driver display will begin after diskette #1 processing starts.

Note

If you have selected *Display Recovery Choices at each Restart*, from the *Archive* option of the *Desktop Settings*, Alt+F2 will not display the device drivers during bootup. The Recovery Choices screen is discussed in 8.2, “Recovery Choices” on page 296.

8.2 Recovery Choices

OS/2 Warp provides a feature to recover a system that is trying to load with an incorrect or malfunctioning device driver and cannot complete the boot process. By pressing Alt+F1 when the small white box is displayed during system startup, you are presented with a Recovery Choices screen as seen in Figure 101.

```
                RECOVERY CHOICES


Select the system configuration file to be used, or enter the
option corresponding to the archive desired.


ESC    - Continue the boot process using \CONFIG.SYS without
         changes
C      - Go to command line, (no files replaced, use original
         CONFIG.SYS
V      - Reset primary video display to VGA
M      - Restart the system from the Maintenance Desktop
         (Selective Install)

Choosing an archive from the list below replaces your current
CONFIG.SYS, Desktop directory, and INI files with older versions.
These older versions might be different from your current files.
Your current files are saved in \OS2\ARCHIVES\CURRENT.

1)Archive created 9-25-95  1:20:45 PM
X)Original archive from INSTALL created 09-05-95 9:10:24 AM
```

Figure 101. Recovery Choices Screen

8.2.1 Command Line Option

Choosing option C from the Recovery Choices screen starts the system from the command processor using the original CONFIG.SYS file. The command processor is started in a full screen session. Use the new Tiny Editor (TEDIT.EXE) to edit the CONFIG.SYS. Since Presentation Manager has not been started, you cannot use either the System Editor (E.EXE) or the Enhanced Editor (EPW.EXE) at this point.

Once you have started TEDIT.EXE, press ESC to move the cursor into the body of the text and begin editing. You can edit the CONFIG.SYS and REMark out the offending device driver.

After you have made your changes to CONFIG.SYS, SAVE the changes and press CTRL+ALT+DELETE or type EXIT at the command prompt to restart the system.

8.2.2 Reset Primary Video Back to VGA

With the large variety of new and updated video drivers available from both IBM and outside vendors, it is likely that you will have to update your video drivers at least once. Before installing a new driver, you must reset the video mode of your machine back to VGA to ensure the proper installation of the new video driver.

The **Recovery Choices** screen now offers you a simple way to do this. Type **V** on this screen and the system will reinstall the VGA display drivers and boot up in VGA mode.

You can download updated video drivers from BBSs (Bulletin Boards) or ftp (Internet) sites. Many updated video drivers are available from the IBM PCC BBS or from the display manufacturer's BBS or ftp site. Refer to B.3, “Bulletin Boards” on page 330 and B.1.2, “World Wide Web and FTP Sites” on page 327 for a listing of some available sites. Once you have located an updated video driver for your machine's chipset, you must follow the instructions in the README file that is included in the driver package. Otherwise, to reinstall a video driver that is shipped with the Warp package, do the following:

1. Open the **OS/2 System** folder.
2. Select **System Setup**.
3. Select **Selective Install**.
4. Select the **Primary Display Icon**.
5. Select the display adapter from the list.
6. Follow the Instructions on the screen to complete the installation.
7. When prompted on the screen, shut down and reboot the machine. The new video device driver will not take effect until the machine is rebooted.

8.2.3 Maintenance Desktop

If your Workplace Shell does not load properly, first try issuing CHKDSK or MAKEINI commands (see the online OS/2 Warp Command Reference for help for these commands). If you still cannot recover your desktop and need to reinstall OS/2 Warp, by selecting M on the Recovery Choices screen, you will boot to the Maintenance Desktop.

This brings you to the same point that you would be at if you had installed the first seven diskettes or to the first reboot when installing from CD-ROM. You can now perform a *selective install* to reinstall your system.

If you have a preloaded OS/2 Warp system, and the Maintenance Desktop does not load when M is selected, your system may have incorrect information regarding the installation source. When M is selected from the Recovery Choices screen, OS/2 Warp reads OS2\BOOT\CONFIG.M instead of \CONFIG.SYS. Two statements within CONFIG.M specify the source for installation files.

SET SOURCEPATH specifies the drive letter and the directory for the installation diskettes, CD-ROM, or CID. The second statement, SET FDISKETTESOURCE, specifies the media type. Type 1 is for diskettes, Type 0 is for any other type of media. Check your installation diskettes made from your preloaded system's Diskette Factory so that the statements read as follows:

```
SET SOURCEPATH=A:
SET FDISKETTESOURCE=0
```

If you have a OS/2 Warp CD-ROM, the lines should read as follows:

```
SET SOURCEPATH=x:\OS2IMAGE
SET FDISKETTESOURCE=0
```

8.2.4 Restore Archived CONFIG.SYS

The Recovery Choices screen allows you to specify if you want to boot from a particular saved or the original CONFIG.SYS file which is created at the time the system is installed. The archiving feature will save three configurations plus the original configuration. The original configuration is never deleted and can be loaded by selecting X at the Recovery Choices screen. Your other archived configurations can be loaded by selecting the corresponding number: 1, 2, or 3. Each time a new archive is saved, the oldest archived configuration is deleted. It is important to turn off the *Create archive at every system restart* option if you have a specific configuration that you may want to switch back to at a later time. Otherwise, if you enable this

option, the archived configurations only reflect your last three boots and the original CONFIG.SYS created at installation time.

In order to save your Desktop configuration and add it to the archive list which appears on the Recovery Choices screen, you must complete the following steps:

1. Open the **Desktop Setting** notebook by single clicking Mouse Button 2 on any empty area of the Desktop.
2. Select **Settings** from the popup menu.
3. Select the **Archive** tab.
4. Select **Create archive at each system restart**.

The Archive Tab of the Desktop Settings screen is shown in Figure 102

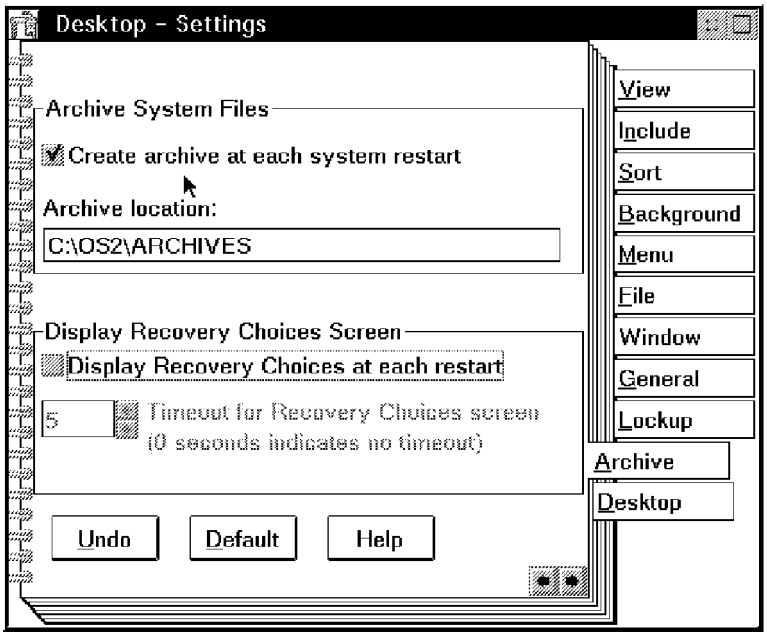


Figure 102. Archiving System Files

Selecting one of the Archive Choices on the Recovery Choices screen immediately replaces the current CONFIG.SYS, Desktop directory and INI files with an archived version of these files.

You can also choose to add a specific archived configuration choice to the Recovery Choices screen by manually adding the choice. The Recovery Choices screen is built from three ASCII files which are displayed sequentially. You must use the ATTRIB command to turn off the read-only flag on each file before it can be edited.

ALTF1TOP.SCR This file contains the introductory text up until the display of the archive choices. This file can be modified if you wish to add your own comments that will be displayed on the Recovery Choices screen.

ALTF1MID.SCR This file contains a list of archives that you can select from. This file is modified automatically by the system when a configuration is archived. Do not modify this file.

ALTF1BOT.SCR Use this file to add your own personal menu items which will appear at the bottom of the Recovery Choices screen. This file is never modified by the system.

This last file is of particular value in the mobile environment where users may be LAN-attached in the office and stand-alone at home. If you are LAN-attached, having the option of loading a CONFIG.SYS which does not include LAN statements, for the times that you need to work away fro the office will allow you to avoid errors that will appear if you bootup without being connected to a LAN.

Note

The multiple CONFIG.SYS option is a new feature in OS/2 Warp Previous versions of OS/2 2.x programs are not aware of this feature.

To add another option to the Recovery Choices menu, see 8.2.5, “Adding an Additional CONFIG.SYS to Recovery Options.”

8.2.5 Adding an Additional CONFIG.SYS to Recovery Options

The example given is for adding a CONFIG.SYS that when loaded will boot a machine without loading LAN drivers.

1. Choose a title that you will add to the Recovery Choices screen and the hot key that you will associate with the choice. The hot key letter cannot be X,x,C,c,M,m or V,v as those letters are already in use. In this example, we chose the letter N and the title "Boot No LAN Drivers."
2. Change the directory to: `\OS2\BOOT`.
3. The Recovery Choices screen's text files are read-only. To turn off the read-only flag, type the following:

   ```
   ATTRIB -R ALTF1BOT.SCR
   ```

4. Edit ALTF1BOT.SCR with a text editor (E.EXE or EPM.EXE) and add the following line:

   ```
   N) Boot No LAN Drivers
   ```

5. Save the changes to ALTF1BOT.SCR and close the file.
6. From the command prompt, type the following to turn the read-only attribute back on:

   ```
   ATTRIB +R ALTF1BOT.SCR
   ```

7. Find a backup copy of the CONFIG.SYS file that was created before you installed the LAN drivers. Most programs automatically create backups of the CONFIG.SYS before they change it. For example, MPTS creates a backup file called CONFIG.MPT in the root directory. If you cannot find a backup copy of CONFIG.SYS, make a copy of the CONFIG.SYS file and edit your copy.
8. Copy this file to the \OS2\BOOT directory and change the extension to the hot key letter that you have chosen. For our example, you would type

   ```
   COPY \CONFIG.MPT \OS2\BOOT\CONFIG.N
   ```

9. If you need to make changes to this CONFIG file, edit it directly.
10. To select this file on boot, either press ALT+F1 while the white box is displayed in the upper left corner of the screen when the system is booting to get the Recovery Choices screen, or do the following:
    a. Open **Desktop Settings**.
    b. Select the **Archive** tab.
    c. Toggle on **Display Recovery Choices at each restart**. Set the time that you want the Recovery Choices screen to be displayed on startup. See Figure 103 on page 302. Toggling on the Display Recovery Choices button will display the Recovery Screen at each reboot.

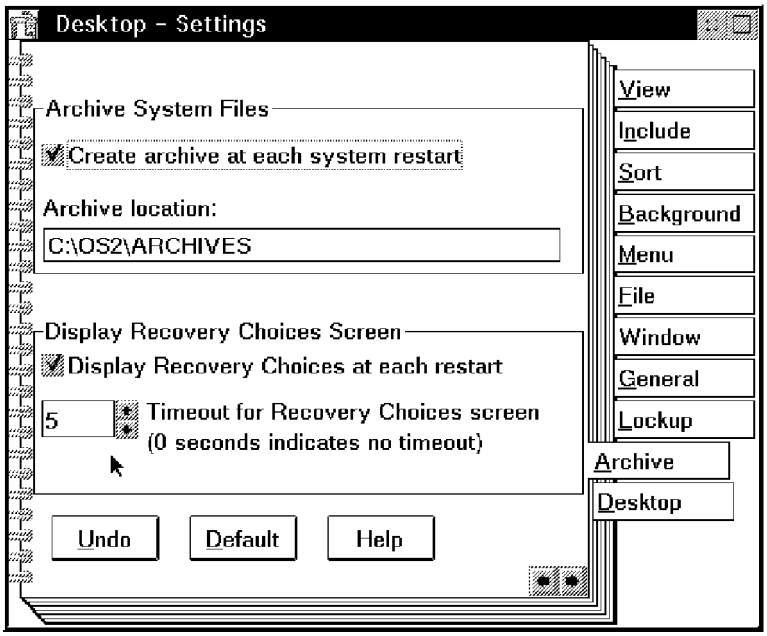


Figure 103. Display Recovery Choices at Each Restart

Instead of creating a separate CONFIG.SYS file as described in the 8.2.5, “Adding an Additional CONFIG.SYS to Recovery Options” on page 300, you may choose to add the following line to your CONFIG.SYS file: PAUSEONERROR=NO. This may be a valid option for you if you very rarely remove your machine from the network. This statement tells the operating system not to stop the loading process to display the message that it was unable to load a driver. This means you will not have to press Enter after each instance when the system is unable to load a LAN driver because it it no longer attached to a network. The statement is most useful in cases such as above when you know that OS/2 Warp will be unable to load certain drivers because the hardware is not attached.

8.3 Problem Determination

Sometimes after the installation of a new device driver you may encounter a problem. Examples of problems may include the following:

- The driver loading properly in the CONFIG.SYS but the device (such as a CD-ROM or a printer) not being recognized by the system. This can be caused by:

- Either by missing switches on the device driver statement in the CONFIG.SYS file or by specifying incorrect information (such as IRQ or DMA addresses) in the switches.
- Loading the incorrect driver for the attached device. For example, if you are using a 4019 printer and cannot print, make sure the print driver that you are loading matches the emulation that the printer is using, (such as Postscript, PPDS or HP).

• Black screen or blank display on rebooting after installing a new device driver.

- Read the instructions that came with the driver. Check if there are any steps in the README file that you might have missed.
- If you installed a new video device driver, ensure that you first reset the machine to VGA mode before installing the new driver.

• The machine hangs on reboot either at the OS/2 Warp Desktop or without being able to reach the OS/2 Warp Desktop.

- If this is happening immediately after the installation of a new device driver, it is likely the new driver is the one causing the hang. To verify this, reboot your machine and press ALT+F2 when the small white box displays in the top left corner of the screen. Doing this will cause all device drivers to display as they are loading along the bottom left corner of the screen. The driver that is displayed when your machine hangs is the driver that it was attempting to load at the time of the hang. You can use this information to further troubleshoot the problem.

For further problem determination, refer to Figure 104 on page 304.

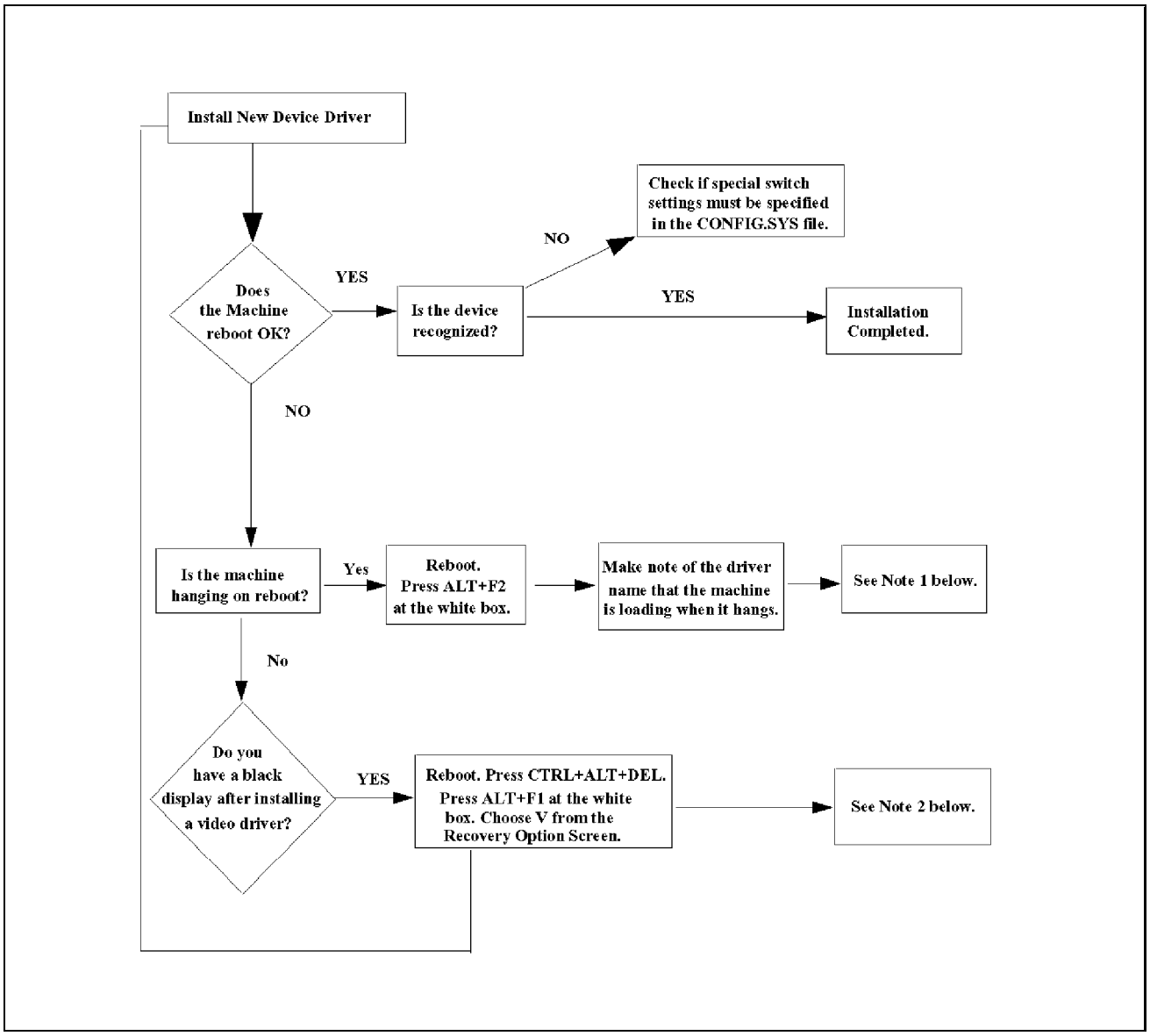


Figure 104. Device Driver Installation Problem Determination

Note:

1. Are you specifying the right switches for the driver? Check online help for the configurable switches available.
2. Is it a supported device under OS/2 Warp? Check PCMTABLE or with the manufacturer.Refer to B.2.2, “IBM PCM Table” on page 330 for information
3. Are you using the latest version of the device driver? Confirm this with the manufacturer, technical support or with a BBS.

4. Did you read the README file provided with the device driver? Did you follow the instructions *exactly*?
5. Have you checked your CONFIG.SYS file? Are you trying to load more than one driver for the same device?

Note:

1. Physically verify what chipset is in your machine. That is, open the machine and check the system board or video adapter. You may need to check with the PC manufacturer.
2. Is the chipset supported by OS/2 Warp? Check the PCMTABLE.
3. Do you have the latest driver for the chipset in your machine? Remember that driver versions can change rapidly. Verify you have the latest with your chip manufacturer or from a BBS.
4. Read the display device driver README instructions again carefully. Follow the directions exactly. Do NOT skip any steps.

8.4 OS/2 Warp Tools for Problem Determination

Other problems with device drivers and other parts of the OS/2 Warp operating system may not be easily determined by following the above steps. In these cases, there are tools supplied with OS/2 Warp which can assist in problem determination.

- SYSLOG
- Traces
- System Dump
- Process Dump
- Dump Formatter
- PSTAT

All of the above tools are covered in detail both in the online help and in *OS/2 Warp Generation, Volume 1: SG24-4552*.

8.4.1 Determining the System Level

If you report a problem to IBM technical support, the first question you will be asked will be what version of OS/2 Warp are you using. You can determine this by running SYSLEVEL.EXE at the command prompt.

OS/2 Warp will return a screen with information similar to the example in Figure 105:

```
SYSLEVEL.EXE


C:\OS2\SYSLEVEL.EPW
IBM OS/2 First Failure Support Technology/2
Version 1.20    Component ID 562119400
Current CSD level: WR00485
Prior   CSD level: WR00480

C:\OS2\INSTALL\SYSLEVEL.OS2
IBM OS/2 Base Operating System
Version 3.00    Component ID 562274700
Type 0
Current CSD level: XR03001
Prior   CSD level: XR03001

C:\OS2\INSTALL\SYSLEVEL.SDS
Distributed SOM Framework
Version 2.01.1    Component ID 96F8647DS
Current CSD level: SM20004
Prior   CSD level: SM20003

Press Enter {<--} to display the next page.
```

Figure 105. SYSLEVEL Command

Figure 105 shows the reference to the OS/2 Warp operating system that technical support will be most interested in.

Version It is the version number of the operating system loaded in the drive specified (in this example, drive C:) on your system, Version 3.00 is OS/2 Warp without WIN-OS/2 support.

Type The type refers to the specific version of the operating system. In this case, Type 0 means that this machine is running OS/2 Warp with WIN-OS/2. Refer to Appendix A, “OS/2 Warp CSD Levels” on page 323 for a chart of other types available.

Current CSD Level This line shows the CSD (Corrective Service Diskette) level which has been applied to the system. In OS/2 Warp, this level matches the Prior CSD level because no CSDs have been released for OS/2 Warp.

Prior CSD Level This line displays the previous CSD level of the operating system. In this example, the Prior CSD level is XR03001 which is the shipped level of OS/2 Warp with WIN-OS/2

You will be asked if you have applied any OS/2 FixPaks to your system. FixPaks differ from CSDs because they do not update the CSD level on your system. The current FixPak is FixPak 12 for OS/2 Warp. It is applicable to all version of OS/2 Warp. FixPak 9 was the first FixPak that could be applied to *all* versions of OS/2 Warp:

- OS/2 Warp Version 3
- OS/2 Warp with WIN-OS/2
- OS/2 Warp Connect
- OS/2 Warp Connect with WIN-OS/2

Any previous FixPaks were only applicable to OS/2 Warp Version 3. All FixPaks are cumulative, meaning that there are no prerequisites needed to apply them. All FixPaks include a README file that lists the APARs or problems fixed by that FixPak.

In previous versions of OS/2, applying a CSD such as XR06200 to an OS/2 2.11 system, changed the Current CSD level and the Prior CSD level values in the syslevel output. With the application of a FixPak to an OS/2 Warp system however, these values do not change. In order to verify if a FixPak has been applied to a WARP system, you must do the following :

1. Open an OS/2 command session (either windowed or full screen).
2. Change to \OS2\INSTALL subdirectory.
3. Search for a file called SERVICE.LOG.
4. If the file is present, a FixPak has been applied to your system.
5. Edit SERVICE.LOG with a text editor such as E.EXE or EPM.EXE to find out which FixPak has been applied.

8.4.2 Determine the Build Level

A second useful command is BLDLEVEL.EXE. It allows you to extract information from EXEs or DLLs if it has been set in these files by the developer of these files. If the information has not been provided by the developer and you run this command against DLL or an EXE, you will get an error message similar to the following example:

```
Error: Could not find the signature in C:\OS\VIOCALLS.DLL
```

To run the BLDLEVEL command, simply issue the command from an OS/2 command prompt. The only parameter needed is the name of the file that you wish to examine. You will get output similar to the example shown in Figure 106 which was run against the OS2KRNL file:

```
C:bldlevel os2krnl
Signature:   @#IBM:8.200#@ IBM OS/2 Kernel
Vendor:     IBM
Revision:    8.200
Description: IBM OS/2 Kernel

C:
```

Figure 106. BLDLEVEL Command

8.5 Resource Manager

A method which can be used to spot device driver conflicts is the Resource Manager. OS/2 Warp includes the ability during the boot process to arbitrate device driver requests for interrupts and other hardware. This is called the Resource Manager. The driver used by the Resource Manager is RESOURCE.SYS. It is loaded automatically without an explicit BASEDEV= statement in the CONFIG.SYS. It checks the following during system startup:

- I/O port allocation
  - Base address 0 - xFFFF.
  - The number of I/O ports needed.
  - Decode width. This is either 10 bits or 16 bits.
  - The sharing flags (exclusive, shared, time multiplexed).
- IRQ levels
  Checks the IRQ channel number and the sharing flags.
- Bios area memory allocation

Checks the memory attributes, such as the base physical memory (C0000 - Dffff), the length of the memory block, and the sharing flags.

- DMA channels
  Checks the channel number for the DMA channel and the sharing flags.
- Timers channels
  Checks the channel number (IRQ level, DMA channel) and the sharing flags.
- Device drivers
  Checks I/O ports, IRQ levels, and ownership of other adapters.

RESOURCE.SYS allocates any BIOS ROM detected during its initialization as shared.

Resource Manager-aware device drivers request access to a port before loading. This enables Warp to discover what resources have already been allocated to or requested by other devices. If the Resource Manager determines there is a conflict, it looks for another location to load the conflicting device driver.

If you wish to view an output listing of the resources that are currently used, type RMVIEW at an OS/2 command prompt. This utility is described in more detail in 8.5.2, “RMVIEW” on page 316.

A second device driver called RESERVE.SYS is also loaded by the OS/2 Warp kernel. RESERVE.SYS can be used in one of the following two ways:

1. It can be used to reserve the resources used by a device driver that is not Resource Manager-aware. You must know what resources the device driver uses so you can specify the correct parameters on the RESERVE.SYS statement in the CONFIG.SYS.

   To use RESERVE.SYS, it must be added as the first line in the CONFIG.SYS: BASEDEV=RESERVE.SYS <parameters>
2. If you have some hardware that doesn't allow its resources to be examined, you can reserve those resources so that they are not examined by the resource manager.

The parameters for RESERVE.SYS are not documented in the online help for OS/2 Warp. They are as follows:

```
      ──────────────────────────────
   --- - --------------  - -─---   -----------------------------
       -/IO:----------    -/EXC-
       - -----------      -/MUL-
      |  -/P:--/DW:-|    -/SHA-
       -/MEM:---------
       -/DMA:---------
       -/IRQ:---------

 keep=n

Switch     Format     Example     Description
-------    ------     -------     ------------------------------
/IO:    /IO:x,x     /IO:340,4     Reserve IO ports
                                 First number is base port in HEX,
                                 followed by length (# of ports).
                                 In OS/2 Warp this number
                                 is in DECIMAL.
                                 In OS/2 Warp with WIN-OS/2 and later
                                 versions this number is in HEX.
/P:   same as /IO:
/MEM:  /MEM:x,x   /MEM:CA00,1000 Reserve Memory.
                                 First number is base memory address
                                 (HEX), with the assumption that the
                                 address is XXXX:0, followed by the
                                 length (number of address) in HEX.
/DMA:     /DMA:x     /DMA:2      Reserve DMA
                                 Channel. Number is decimal.

/IRQ:     /IRQ:x     /IRQ:13      Reserve IRQ.
                                 Number is decimal

/EXC      /EXC       /EXC          Exclusive resource attribute
/MUL      /MUL       /MUL          Multiplexed resource attribute
/SHA      /SHA       /SHA          Shared resource attribute

/DW:      /DW:x      /DW:10   Decode width of IO
                                 address. Valid numbers are 10 and
                                 16. Only valid with /IO: switch.
```

Note

More than one resource attribute per resource entry is an error and is not allowed. If no attributes or decode width is set, the defaults used are EXCLUSIVE and 16.

For example, if you want to reserve IRQ 13 EXCLUSIVE, DMA 0 SHARED, MEMORY CA00:0hex for 1000 bytes shared, I/O ports 340hex for 10 ports EXCLUSIVE and decode width 16, and I/O ports 300hex for 64 ports, with a decode width of 10, have the following statement in your CONFIG.SYS file:

```
BASEDEV=RESERVE.SYS /IRQ:13 /DMA:0 /SHA /MEM:CA00,1000
                    /SHA /IO:340,10 /IO:300,64 /DW:10
```

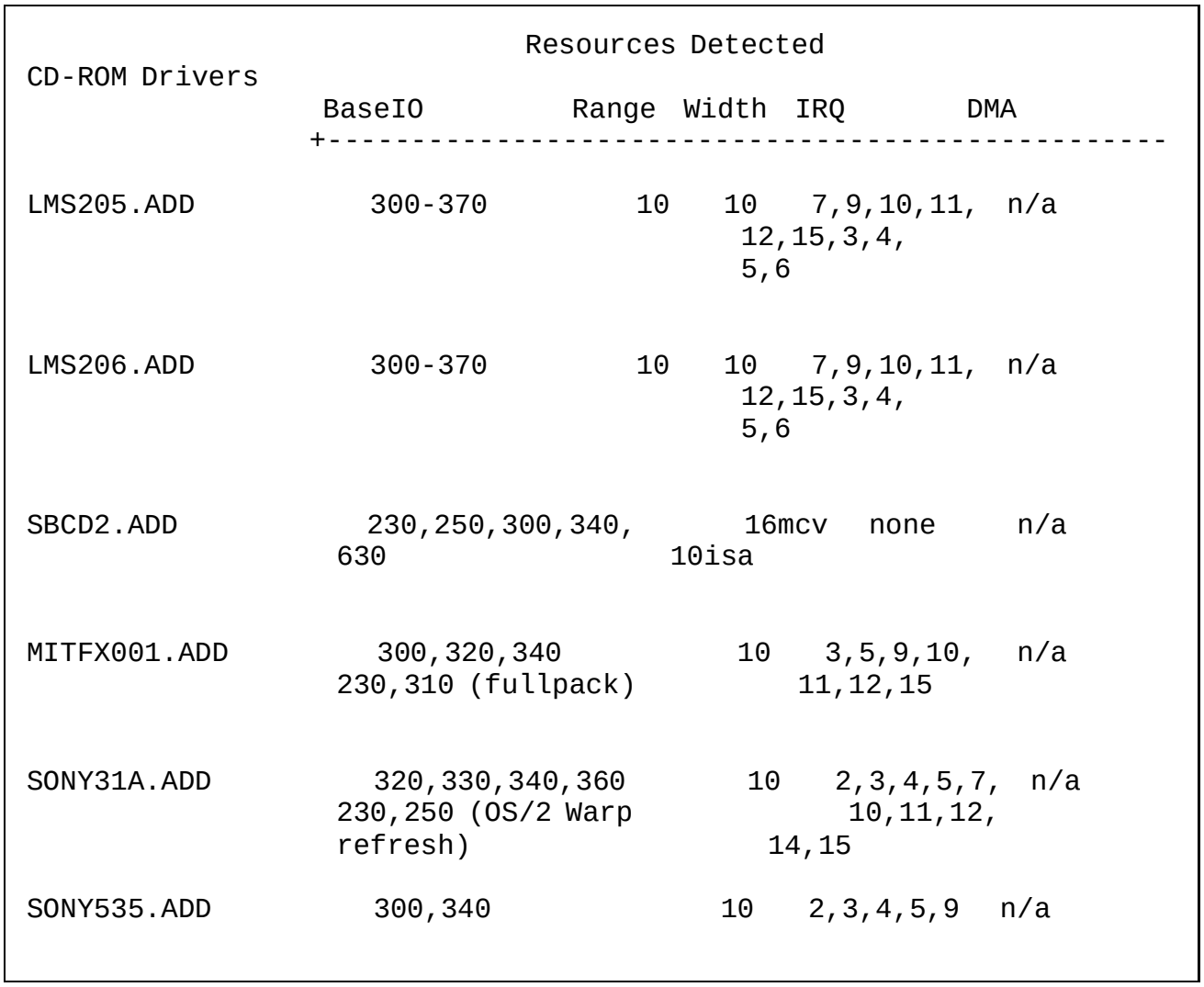
8.5.1 Autodetection of Resources

The Resource Manager automatically detects certain resources in the system. The figures in this section provide details of the resources that are *autodetected* and used in OS/2 Warp for the various driver types. This is achieved for Resource Manager-aware drivers.

Figure 107 on page 312 shows the resources allocated and used by OS/2 Warp when the system autodetects the presence of the resource. The audio driver being used will determine what resources are allocated to the driver.

```
                              Resources Detected
AUDIO DRIVERS
                   BaseIO          Range  Width  IRQ        DMA
                  +-----------------------------------------------
Sound Blaster         220,240         16     10    5,7,10(ISA) 1
                     388 (OPL-2/3)    4           3,5,7 (MCV)


Sound Blaster Pro      220,240         16     10    5,7,10(ISA) 1,3
                      388             4          3,5,7 (MCV)


Sound Blaster 16       220,240,260,280  16     10    5,7,10      1,3,5,6
                      388             4                    7
                      330,300

Sound Blaster AWE-32   220,240,260,280  16     12    5,7,10      1,3,5,6
                      388             4                    7
                      330,300
                      Ex2,Ex0,Ax0

ESS-688                220,240         16     10    3,5,7       1,3
                      388             4


Media Vision Jazz16    220,210,230     16     10    3,5,7,      1,3,5,7
(not RM aware)          240,250,260                 10,15
                      330,300         2


Media Vision PAS-16    0388            4     16    3,5,7,10,   1,3,5,6
                      0788            4           11,12,15    7
                      0b88            4
                      0f8a            1
                      1388            4
                      1788            4
                      1b88            3
                      8388            3
                      bf8a            1
                      f389            2
                      f788            2
                      220,240,260     16

AD1848 (Business Aud)  530,604,E80,F40   8     16    7,10,11     1,3


CS4231 (ThinkPad)      530,E80,F40      8     16    7,10        1,3
PC Co Mach 5 CS4231

IBM M-Audio/ACPA       310,318,330,338   8     16    3,4,5,      n/a
                      368,710,718,730             6,7
                      738,768


Sound Galaxy Nova 16   530,E80,F40,640   8     16    5,7,10      1,3
                      220,240         16

Reel Magic M-PEG
```

Figure 107. Autodetection of Audio Resources



CD-ROM Drivers	Resources Detected				
	BaseIO	Range	Width	IRQ	DMA
LMS205.ADD	300-370	10	10	7,9,10,11, 12,15,3,4, 5,6	n/a
LMS206.ADD	300-370	10	10	7,9,10,11, 12,15,3,4, 5,6	n/a
SBCD2.ADD	230,250,300,340, 630		16mcv 10isa	none	n/a
MITFX001.ADD	300,320,340 230,310 (fullpack)		10	3,5,9,10, 11,12,15	n/a
SONY31A.ADD	320,330,340,360 230,250 (OS/2 Warp refresh)		10	2,3,4,5,7, 10,11,12, 14,15	n/a
SONY535.ADD	300,340		10	2,3,4,5,9	n/a

Figure 108. Autodetection of CD-ROM Resources

Figure 108 shows the resources allocated and used by OS/2 Warp when the CD-ROM drivers are used.

```
                              Resources Detected
DASD  Drivers
                  BaseIO          Range  Width  IRQ        DMA
                 +-----------------------------------------------

IBM1FLPY.ADD       3F0-3F5               16     6          2
                  370-375


IBM1S506.ADD       1F0-1F8               16    14,15      n/a
                  170-178
                  3F6,376


AHA152X.ADD        340,140         32     16    9,10,
(AHA6360)                                      11,12

AHA154X.ADD        330,334          4     16    9,10,11,    5,6,7
                  230,234                     12,14,15
                  130,134

AHA164X.ADD        330,334,340      4     16    9,10,11,    5,6,7
                  230,234                     12,14,15
                  130,134

AHA174X.ADD        0C80                  16
                  2C80..FC80

AIC7770.ADD        0C00                  16
                  1C00..FC00
AIC7870.ADD        PCI autoconfigured

BTSCSI.ADD         330,340               16mca   9,10,11,   5,6,7
                  230,234               10isa   12,15
                  130,134


FD16-700.ADD       140-170         10     16mca   10,11,12,  n/a
                  1800-F800              16>3FF  3,5
                                        10isa   14,15


FD8XX.ADD          memory mapped                 3,4,5,10   n/a
                                                 11,12,14,15

FD7000EX.ADD       1000-F000       1000   16     10,12,     n/a
                                                 14,15
DPT20XX.ADD        C88-FC88 (EISA)  10     10     12,14,15   0,5,6,
                  1F0,170,330,230 (ISA)   16(>CFF)          7
TMVISCSI.ADD       388,384,38C           16     2,3,4,5,6, n/a
                  288,284,28C                   7,10,11,
                                                12,14,15
```

Figure 109. Autodetection of DASD Drivers

Figure 109 shows the resources allocated and used by OS/2 Warp for the various DASD drivers. These are the resources used when the system autodetects the presence of the driver.

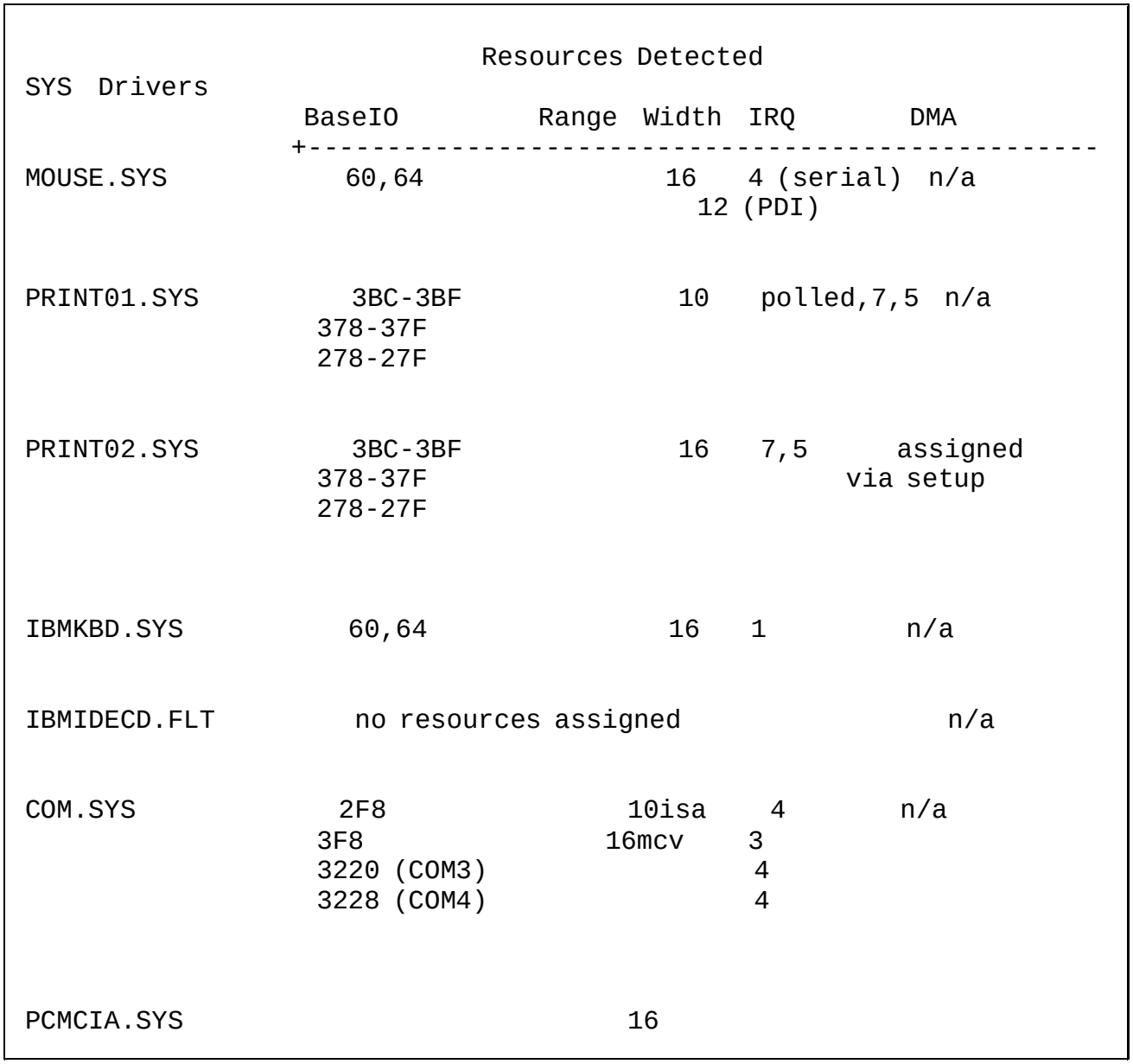


Figure 110. Autodetection of SYS Drivers

Figure 110 shows the resources allocated and used by OS/2 Warp

If a driver is not Resource Manager-aware, then no resources will be autodetected and allocated to the device.

8.5.2 RMVIEW

RMVIEW.EXE is used to determine which resources are currently in use. Online help is available for RMVIEW by typing:

```
RMVIEW ?
```

A number of different reports can be requested by running RMVIEW. The information below is taken from the online help:

```
Syntax: RMVIEW /switch
    /P    Display Physical view (default)
    /P1          Physical view with planar chipset
    /D    Display Driver view
    /D1          Driver view with planar chipset
    /L    Display Logical view
    /R      Display raw data. Use with P L D switch

    /IRQ   Display claimed Interrupt levels (IRQ)
    /IO    Display claimed IO ports above 100 Hex
    /IOA   Display all claimed IO ports
    /DMA   Display claimed DMA channels
    /MEM   Display claimed Memory regions
    /SO     Sort IO, IOA, IRQ, DMA, MEM by owner

    /HW    Display Hardware Tree
    /?    Help
```

The two most common areas, that users experience problems with their hardware are the IRQ or the DMA channel. Conflicts in either of these areas may be hard to determine if you have a machine that is loaded with many different adapters or peripherals. Running RMVIEW /IRQ or RMVIEW /DMA will help you determine if you have two adapters using the same IRQ or DMA.

Figure 111 on page 317 shows sample output that was generated when RMVIEW /IRQ was run on a PS/2 466DX2 &vp. machine.

```
IRQ Level =  0  PCI Pin = NONE  Flg = EXCLUSIVE    TIMER_CH_0
IRQ Level =  1  PCI Pin = NONE  Flg = EXCLUSIVE    KBD_0 Keyboard
                                             Controller
IRQ Level =  2  PCI Pin = NONE  Flg = EXCLUSIVE    PIC_1
IRQ Level =  3  PCI Pin = NONE  Flg = MULTIPLEXED  SERIAL_1 Serial
                                             Controller
IRQ Level =  4  PCI Pin = NONE  Flg = MULTIPLEXED  SERIAL_0 Serial
                                             Controller
IRQ Level =  6  PCI Pin = NONE  Flg = MULTIPLEXED  FLOPPY_0 Floppy
                                             Controller
IRQ Level =  8  PCI Pin = NONE  Flg = EXCLUSIVE    RTC
IRQ Level = 12  PCI Pin = NONE  Flg = SHARED      AUX_0 PS/2 Auxiliary
                                             Device Controller
IRQ Level = 14  PCI Pin = NONE  Flg = MULTIPLEXED  IDE_0 ST506/IDE
                                             Controller
```

Figure 111. RMVIEW /IRQ Sample Output

Figure 112 on page 318 shows a partial excerpt of the information generated on an IBM PS/2 ValuePoint 466DX2/D when a driver view is requested. In most cases, because so much information is generated, you will want to pipe the output to a file and then view the file with a text editor. You can do this by issuing the command: `RMVIEW /D >filename` .

```
RMVIEW /D
RMVIEW: Driver view
Driver: RESOURCE.SYS  -  IBM Resource Manager
Vendor: IBM OS/2  Version: 1.1  Date (MDY): 9/17/1994
Flag:   STATIC    Type-Subtype: SERVICE

  Adapter: PDEV Physical Device Tree
  Device Type: OTHER        Bus/Width: PLANAR 32 BIT

  Logical Device: LDEV Logical Device Tree
  Flg:  0000   Class: ROOT     Handle: 00000000

Driver: OS2KRNL  -  OS/2 Kernel Module
Vendor: IBM OS/2  Version: 1.1  Date (MDY): 9/17/1994
Flag:   STATIC    Type-Subtype: SERVICE

  Adapter: CPU_0 486
  Device Type: OTHER        Bus/Width: PLANAR 32 BIT

Adapter: X_Bus
  Device Type:   Bus/Width: PLANAR 32 BIT

  Adapter: PIC_0
  Device Type: PERIPH-PIC    Bus/Width: PLANAR 16 BIT

  I/O = 0X0020  Len =   2  Flg = EXCLUSIVE   Addr Lines = 16
```

Figure 112. Partial Excerpt From a RMVIEW /D Command

The RMVIEW utility offers you the ability to quickly check both hardware and software settings on your machine. You cannot change any settings via the utility but with the information it provides, it will aid you in your problem determination.

8.6 Some Known Problems

The *User's Guide to OS/2 Warp* and the Warp README files are your first sources of information when you encounter a problem. There is more than one README file shipped with OS/2 Warp. The following are the three main files:

- README (found in the root directory after installation)
- README.INS (on diskette number one and in \OS2\HELP
- README.CID (on diskette number one)

A sample of topics covered by these files include:

1. Changing Display Resolution Using the System Object

2. Using Laptop Computers with Monochrome Monitors
3. Video Screen Problems
4. Using a 700/720 Series ThinkPad with a Docking Station or a PS/2 Model 76
5. Using a ThinkPad 720
6. Considerations for IDE Hard Disk Drives greater than 528MB
7. Slow Diskette Drive Performance During Installation
8. Using a NEC CDR260 IDE CD-ROM
9. Installing a Windows Printer Driver from the OS/2 Warp CD
10. CID Enabled Multimedia

Another source for you to check to see if the problem you encountered is a known one is forums. The Internet and most BBSs contain forums or usergroups. Appendix B contains information detailing a large number of different companies' BBS numbers and Internet sites.

8.6.1 Video

Most video problems are a result of either installing the incorrect driver for your video chipset or installing a downlevel driver. If necessary, open your system unit and physically verify the type of chipset on the machine. Once you know the chipset type, get the latest version of the video driver. A number of the video drivers that were shipped with OS/2 Warp have been updated. The updated drivers include:

- S3_16M
- TSENG32
- WEITEK
- WDC33
- CIRRUS
- MACH32
- MACH64
- S3 864

Once you have installed the driver according to its README file's instructions, you may need to change the resolution, set the display type and the proper hertz rate. This is covered in Chapter 2, “OS/2 Warp Display Device Drivers” on page 25.

If you are unable to obtain high resolution, verify that you have sufficient VRAM in your system to support higher resolutions. Table 6 on page 52 lists the VRAM requirements to obtain various resolutions in most systems. In the case of laptops, be aware that laptops with Super-Twisted Nematode (STN) displays, even if 1MB of VRAM is shipped with the system, only 0.5MB is addressable by the software. The other 0.5MB is used internally by the controller. This restricts the number of supported resolutions available on laptops even those functioning with an external monitor attached. Most laptops with STN panels have model numbers ending with S.

8.7 Printing

If you are experiencing printing problems, verify if there is a later version of the printer driver than the one you are using. There are a number of updated printer drivers for OS/2 Warp available from the IBM PCC BBS (919-517-0001). The list of updated drivers includes:

- XR0P010 Plotter FixPak for OS/2 Warp
- XR0P011 PostScript FixPak for OS/2 Warp and OS/2 2.11
- XR0P012 LaserJet FixPak for OS/2 Warp
- XR0P013 Omni FixPak for OS/2 Warp
- XR0P014 IBM PCL5 Printer FixPak for OS/2 Warp and OS/2 2.11
- XR0P015 4019 Printer FixPak for OS/2 Warp and OS/2 2.11
- XR0P017 IBM PCL3 Printer FixPak for OS/2 Warp and OS/2 2.11
- XR0P018 IBM Null Printer FixPak for OS/2 Warp and OS/2 2.11

Check the printer manufacturer's BBS or Internet site for OS/2 Warp drivers. A listing of sites and BBS numbers is available in Appendix B, “OS/2 Device Driver Sources” on page 325.

If you still are having problems printing after installing the latest device driver for your printer, turn printer polling off in the CONFIG.SYS by adding a \IRQ parameter to the BASEDEV=PRINT0x.SYS statement.

For a complete overview of printing, please refer to Chapter 3, “OS/2 Warp Printer Device Drivers” on page 85

8.8 Updating BIOS

BIOS (Basic Input/Output System) is the core programming embedded on a ROM chip in your PC. BIOS runs first when your machine is powered on and because it starts first, it must pass control to OS/2 Warp so OS/2 Warp can initialize properly. OS/2 Warp relies heavily on BIOS both during installation and when running DOS programs in the VDM (Virtual DOS Machine). When troubleshooting OS/2 Warp problems, one of the things to check is that your BIOS is current. As a rule of thumb, OS/2 Warp will work with most BIOS dated 1990 or later. Many times BIOS updates are available, but you need to check with your BIOS manufacturer for this information.

BIOS is usually displayed when you power on your system and can also be seen by using the DOS DEBUG utility as follows:

1. Open **Command Prompts**.
2. Open a **DOS Fullscreen**.
3. Type DEBUG at the prompt and press **Enter**.
4. At the hyphen prompt, type D F000:FFF0.
5. The BIOS date will appear in the text dump at the right side of the screen. On some systems the BIOS date appears at location FFFF:00005.
6. EnterQ to exit the DEBUG utility.

Many IBM computer systems have what is called Flash BIOS. This means that the BIOS can be updated via a service diskette. Among the IBM systems that utilize Flash BIOS are ThinkPads, ValuePoints, and PC 300 and PC 700 series. If you are encountering any type of problem with OS/2 Warp, verify first whether you are at the most current BIOS release for your system. In most cases, you must boot into the system configuration information off the hard drive to determine what BIOS level you are at.

For example, to determine the BIOS level on a ValuePoint 466DX2/D system, you must:

1. Boot your system.
2. A box with wavy lines inside it will appear in the top right corner of the display while your system is counting memory.
3. Press F1 while this box is on your display.
4. Look for the line that begins Flash EEPROM Revision Level.

There will be an entry L6ETxxAUS where xx is the BIOS level that you are currently have. Once you have determined the level you are on, check the IBM PCC BBS to verify if there is a later version of the BIOS. You must be extremely careful that you download and apply the correct BIOS for your

system. Ensure that you read the file description before you apply the BIOS to your system. Each BIOS update includes a README file with instructions regarding how to apply the update.

8.9 Other Sources of Information

The Internet is a continually updating information source which is available for use 24 hours a day. A list of IBM, and specifically OS/2 Warp, related sites is contained in B.1.2, “World Wide Web and FTP Sites” on page 327. The Warp homepage (http://www.austin.ibm.co /pspinfo) contains a list of known problems and resolutions to those problems. Two excellent sources of device driver updates are the Device Driver Repository (http://www.europe.ibm.com/getdoc/psemea/progserv/device) and the IBM PC Company ftp site (ftp://ftp.pcco.ibm.com). A list of BBS sites is contained in B.3, “Bulletin Boards” on page 330.

Appendix A. OS/2 Warp CSD Levels

This chapter provides an overview of the existing OS/2 Warp CSD levels. At the time of writing, the following OS/2 Warp versions had been released:

- OS/2 Warp Version 3
- OS/2 Warp with WIN-OS/2
- OS/2 Warp Connect
- OS/2 Warp Connect with WIN-OS/2

It is important to note that the SYSLEVEL is different for each version of Warp that is released. When you make a trouble report to IBM, the technician will ask you for the SYSLEVEL of the operating system. See 8.4.1, “Determining the System Level” on page 306 for instructions regarding how to determine your SYSLEVEL.

Table 38 shows the different SYSLEVELs as well as the Internal Revision level of the OS2KRNL file.

Table 38. SYSLEVEL, Type and Revision for Warp Versions

Version	SYSLEVEL	Type	Internal Revision
OS/2 Warp Version 3	XR03000	W	8.162
OS/2 Warp Version 3 Refresh	XR03002		8.210
OS/2 Warp with WIN-OS/2	XR03001	0	8.200
OS/2 Warp Connect	XR03003	0	8.209
OS/2 Warp Connect with WIN-OS/2	XR03004	WC	8.210

Appendix B. OS/2 Device Driver Sources

This chapter describes the sources from which device drivers may be retrieved. The sources discussed here are covering the Internet including the World Wide Web and FTP sites, IBM specific sites and bulletin boards. Downloading the newest device drivers is important for solving problems or if you have a device that is not supported by OS/2 Warp by default.

B.1 Internet

The Internet is the largest network of computers incorporating many thousands of sub-networks. It is based on the TCP/IP standard for network communication.

B.1.1 How Can I Access the Internet?

To access the Internet, you have to dial up an Internet service provider which gives you a access password. One of the biggest service providers is IBM with over 100000 subscribers. These subscribers get full access to all Internet protocol including World Wide Web, FTP and E-Mail. To subscribe to the IBM Global Network under OS/2 Warp with BonusPak, follow the instructions below:

- Open the **IBM Internet Connection for OS/2** folder on your desktop.
- Open the **IBM Internet Dialer**.
- Select **Register**.
- Follow the instructions.
- After a few minutes you receive your user ID together with your password.
- To access the Internet, simply open the **Internet Dialer** again, type in your user ID and password and select **Dial**.

Once you are connected to the Internet, you can run all the applications in the IBM Internet Connection for OS/2 folder including the IBM WebExplorer. The table below shows all the online registration numbers worldwide.

Table 39 (Page 1 of 2). IBM Global Network Online Registration Numbers

Country	Phone Number
Argentina	319-7201
Australia	1800-811-094
Austria	0660-6832

Table 39 (Page 2 of 2). IBM Global Network Online Registration Numbers

Country	**Phone Number**
Belgium	0800-1-1997
Canada	1-800-463-8331
Columbia (Bogota)	571-6167555
Columbia (outside)	9800-17555
Curacao N.A.	368-039
Cyprus	0031-60228488
Denmark	8001-8278
Finland	0800-114465
France	0590-8561
Germany	0130-821202
Greece	00800-4412-2357
Hong Kong	(852)2515-2434
Ireland	1-800-709-905
Indonesia	62-21-52027
Italy	1678-72031
Israel	177-440-6299
Japan	0120-120-208
Luxembourg	0800-2943
Mexico City	52(5) 627 2444
Netherlands	060-228488
New Zealand	0800-105765
Norway	800-11783
Philippines	(632) 8436917
Philippines	(632) 8436918
South Africa	0800-998128
Spain	900-994443
Sweden	020-795181
Switzerland	155-9222
Turkey	00800-44914835
United Kingdom	0800-614012
US registration	1-800-933-3997

There are also over 330 access phone numbers all over the world. By year end 1995, 450 phone access numbers in over 40 countries will be established by IBM, including over 390 cities for Internet access in the U.S.

B.1.2 World Wide Web and FTP Sites

The World Wide Web, or "the WEB" for short is relatively new, but is so powerful and flexible that it is one of the fastest growing areas within the Internet. To access Web addresses, you can use the IBM Web Explorer which is included in the BonusPak of OS/2 Warp.

FTP stands for File Transfer Protocol and offers the capability of directly uploading and downloading of files. The convention usually used is that the user connects with user ID *anonymous* and password set to the E-mail address of the user. OS/2 supports FTP in two ways:

- Using the PM-Shell application FTP-PM which appears as the FTP-PM icon in the Internet Utilities folder.
- Directly from the command prompt.

For more information using FTP, see one of the many books on using the Internet.

B.1.2.1 OS/2 Related Sources

The following table shows a few OS/2 related Internet sites:

Table 40 (Page 1 of 2). OS/2 Related Internet Sites

Name	**Address**
IBM Software Homepage	http://www.software.ibm.com
IBM Personal Software Services	http://ps.software.ibm.com
IBM EMEA Device Driver Repository	http://www.europe.ibm.com/getdoc/psmemea/progserv/device
The Warp Homepage	http://www.austin.ibm.com/pspinfo/os2.html
Team OS/2 Homepage	http://www.teamos2.org

Table 40 (Page 2 of 2). OS/2 Related Internet Sites	
Name	**Address**
Warp Pharmacy Sydney Mirrors are located: Eastern Canada Eastern USA Singapore Switzerland	http://www.zeta.org.au/~jon/WarpPharmacy.html http://www.tuns.ca/~boutilmw/WarpPharmacy.html http://www.intac.com/nnjos2/pharmacy/WarpPharmacy.html http://137.132.218.143/pharmacy/WarpPharmacy.html http://p16.sma.ch:8080/~jos/WarpPharmacy.html
Walnut Creek CD-ROM	http://www.cdrom.com/os2
Intac Corp.	http://www.intac.com
IBM FTP site	ftp://ftp.ibm.net
Hobbes FTP server	ftp://hobbes.nmsu.edu/os2/
IBM PC Company	ftp://ftp.pcco.ibm.com http://www.pc.ibm.com/files.html
IBM Personal Software Files Library	ftp://service.boulder.ibm.com

The next table shows a short list of main OEM manufacturers. If the one your looking for is not listed, try to make a search with one of the search tools on the World Wide Web.

Table 41 (Page 1 of 2). Internet Addresses of OEM Manufacturers		
Name	**WWW Address**	**FTP Address**
3Com	http://www.3com.com	ftp://ftp.3com.com
Adaptec	http://www.adaptec.com	ftp://ftp.adaptec.com
ATI	http://www.atitech.com	ftp://ftp.acc.com
Cirrus	http://www.cirrus.com	ftp://ftp.cirrus.com
Compaq	http://www.compaq.com	ftp://ftp.compaq.com
Creative Labs	http://www.creaf.com	ftp://ftp.creaf.com
Dell	http://www.dell.com	ftp://ftp.dell.com
Diamond	http://www.diamondmm.com	ftp://ftp.diamondmm.com
Lexmark	http://www.lexmark.com	ftp://ftp.lexmark.com
Epson	http://www.epson.com	ftp://ftp.epson.com
HP	http://www.hp.com	ftp://ftp.hp.com
Media Vision	http://www.mediavision.com	

Table 41 (Page 2 of 2). Internet Addresses of OEM Manufacturers		
Name	**WWW Address**	**FTP Address**
NEC	http://www.nec.com	ftp://ftp.nec.com
Maxtor	http://www.maxtor.com	ftp://ftp.maxtor.com
Quantum	http://www.quantum.com	
Sony	http://www.sony.com	ftp://ftp.sony.com
Sun Microsystems	http://www.sun.com	
Western Digital	http://www.wdc.com	ftp://ftp.wdc.com
Zyxell	http://www.zyxel.com	ftp://ftp.zyxel.com

Internet addresses may vary, depending on the provider of each site. If you can't connect to the specified server, try to delete the last extension of the address until the '/' sign.
For example: If you can't connect to:
http://www.europe.ibm.com/getdoc/psmemea/progserv/device
try the following address:
http://www.europe.ibm.com/getdoc/psmemea/progserv
This site will not show up with the specific information. Instead you may have to select a menu option to connect to the desired site.If you still can not get a connection to the server, try to use a search tool like YAHOO or WebCrawler. Links to both search tools are provide by the IBM homepage (address is http://www.ibm.net) under option WWW Search Tools.

B.2 IBM Sources

IBM provides many OS/2 device driver sources as well as other kinds of information about OS/2. You can access them over the IBM internal VM system and also over public institutions such as the Internet and all the IBM BBS.

B.2.1 IBM Internal Tools Disks

IBM employees and customers who have authorized access can get OS/2 fixes and device drivers via VM from conferencing disks repositories, using Tools facilities. Use TOOLCAT or another method of access. The disks below are the master repositories; local shadows are often available.

```
OS2CSD   managed by  CSDPROD  at  KGNVMZ   (OS/2 Fixes, Drivers)
OS2BETA  managed by  OS2BETA  at  KGNVMCB  (OS/2 Betas, Beta Driver)
IBMPC    managed by  IBMPC    at  YKTVMV   (OS/2 Forums, Conferences)
MKTTOLS  managed by  TOOLS    at  DALVM41B (OS/2 Marketing related)
DOSCSD   managed by  CSDPROD  at  KGNVMCB  (DOS Hardware related fixe
NLSTOOLS managed by  TOOLS    at  KGNVM2   (OS/2 Nation Language Suppo
```

B.2.2 IBM PCM Table

The IBM PC Manufacturers' (PCM) hardware and device compatibility table is a list of tested devices which are compatible with OS/2 Warp. All devices that appear in this list have been tested by IBM or independent product vendors and found to be compatible with IBM OS/2 products. The specific product listing will indicate if it has been tested by IBM, the vendor, or a third party. In addition, many of the products listed require device driver that may not be included with the OS/2 products; this information is also noted. You can download the PCM Table from several sources.

Table 42. PCM Table Sources

Name	Description
World Wide Web	Online information on the WEB at http://www.austin.ibm.com/psinfo/os2hw.htm
IBM Internal	Access via VM using TOOLCAT (MKTTOOLS)
IBM BBS	IBM bulletin boards around the world. For details refer to B.3, “Bulletin Boards”

Be aware that this is a long list which is constantly being updated.

B.3 Bulletin Boards

Bulletin Board Systems (BBS) provide some or all of the following about OS/2:

- Information
- Announcements
- Fixes
- Service Paks
- New or updated drivers
- Conference forums

This section lists several BBS such as CompuServe, IBM Bulletin Boards around the world and IHV Bulletin Boards. It also provides information on how to access them.

B.3.1 CompuServe

CompuServe is one of the biggest bulletin board systems (BBS) in the world, and provides a variety of general services as well as computer software libraries, conference forums, and online support.

CompuServe is also available worldwide. To access CompuServe you can use the CompuServe Information Manager which is included in the BonusPak of OS/2 Warp. The numbers to join CompuServe are listed in Table 43 on page 332. This table is not complete and tries only to give you a first logon possibility to CompuServe in your country.

After you have logged on in CompuServe the first time, you should also look for a node in your neighborhood (GO NODES).

IBM runs a lot of OS/2 related CompuServe forums. The easiest way to find them is to use the Find Index function of CompuServe Information Manager for OS/2 and look for OS/2 or simply go to IBMOS2. This is the keyword to get to all IBM OS/2 forums. If you know them by name you can go directly to them.

The most important OS/2 forums are listed below:

OS2SUPPORT IBM OS/2 Support Forum
In this forum you can get first level support for all OS/2 base operating system-oriented questions.
Library 17 of this forum is also a source for official IBM OS/2 device drivers.

OS2USER IBM OS/2 User's Forum
This is the general OS/2 user's forum. Here you can finds sections for TEAM OS/2 or other OS/2 user groups and more.

OS2DF1 IBM OS/2 Developer 1 Forum
Here you can get support for C Set/2, C++, REXX, or other languages. This forum also has sections for MMPM/2, Open DOC, and all other developer-oriented questions about the operating system.

OS2DF2 IBM OS/2 Developer 2 Forum
With this forum IBM provides developer information on the following themes: CM/2, DB/2, LAN Server, TCP/IP, CID, PEN, LAN NetView and some other products.

OS2UGER IBM PSM Deutschland Forum
This forum is the first German OS/2 user forum in the German language. Here you can get first level support from the German

OS/2 Line (hotline). The German magazine *Inside OS/2* is a guest in this forum and keeps two sections.

Table 43 (Page 1 of 2). Access Nodes for CompuServe

Country	City	Country Code	Area Code	Phone Number	Network	Max. Speed
American Samoa	American Samoa	684		633-9205	PAC	2400
Australia	Sydney	61	02	415 3155	FAL	9600
Austria	Vienna	43	222	5056178	CPS	9600
Belgium	Brussels	32	02	215-0530	CPS	9600
Brazil	Outside Brazil	55	011	1081212	INF	2400
	Within Brazil	55	011	000672	INF	2400
Bulgaria	Sophia	359	02	73361	SPR	9600
Canada	Toronto		416	367-8122	CPS	14400
Chile	Santiago	56	02	6954005	CHL	9600
Colombia	Bogota	57	01	320-3811	SPR	9600
Denmark	Copenhagen	45		36445464	CPS	9600
England	London	44	071	490 8881	CPS	14400
Estonia	Tallinn	372	06	31-2286	SPR	2400
Finland	Helsinki	358	0	2919	INF	2400
France	Outside Paris	33		36 06 24 24	TPC	2400
	Paris	33	1	47 89 39 40	CPS	9600
Germany	Munich	49	089	66530170	CPS	14400
Guam	Guam	671		477-1123	PAC	9600
Hong Kong	Hong Kong	852		304-1332	CPS	9600
Hungary	Budapest	36	01	2697023	SPR	9600
Indonesia	Jakarta	62	21	386-1044	SPR	2400
Ireland	Dublin	353		01-6768800	INF	2400
Israel	Tel Aviv	972	3	6393562	ISR	9600
Italy	Rome	39		6-2315728	INF	2400
Japan	Tokyo	81	03	5471 7650	CPS	9600
Kazakhstan	Alma-Ata	7	3272	50-7000	SPR	2400
Kuwait	Kuwait City	965		484-4133	SPR	2400
Latvia	Riga	371	02	22-3816	SPR	2400
Luxembourg	Luxembourg	352		498822	INF	2400
Mexico	Mexico City	52	5	629-8101	CPS	9600

Table 43 (Page 2 of 2). Access Nodes for CompuServe

Country	City	Country Code	Area Code	Phone Number	Network	Max. Speed
Netherlands	Amsterdam	31		020 688 0085	CPS	9600
New Zealand	Wellington	64	04	473 7949	FAL	9600
Northern Ireland	Belfast	44	0232	331284	GNS	2400
Norway	Oslo	47		22414010	INF	9600
Oman	Muscat	968		799455	TYM	2400
Peru	Lima	51		722-692	SPR	2400
Philippines	Manila	63		2-8171449	INF	2400
Portugal	Lisbon	351	1	3956446	INF	2400
Puerto Rico	San Juan		809	722-0995	CPS	9600
Romania	Bucharest	40	0	13112525	SPR	9600
Russia	Moscow	7	095	971-5101	INF	2400
Saipan	Saipan	670		234-1121	PAC	2400
Scotland	Edinburgh	44	031	557 5888	CPS	9600
Singapore	Singapore	65		5351940	INF	9600
South Africa	Johannesburg	27	011	403-5101	INF	9600
South Korea	Seoul	82	02	795-1002	INF	2400
Spain	Madrid	34	1	577-0686	CPS	9600
Sweden	Stockholm	46	8	140-500	CPS	9600
Switzerland	Zurich	41	01	2731028	CPS	9600
Taiwan	Taipei	886		2-395-5102	INF	9600
Ukraine	Kiev	7	044	245-0379	SPR	2400
USA	(toll free)	1		800-848-8990	CIS	9600
Uzbekistan	Tashkent	7	3712	49-0356	SPR	2400
Venezuela	Caracas	58	27	93-3233	VNZ	2400

B.3.2 OEM Manufacturer Bulletin Boards

There are many bulletin boards available for a variety of information. The Digicom BBS contains a list of Technical Support BBSs available and fax-back services. To obtain a copy of the latest edition of this list, you can dial the Digicom BBS on (812) 479-1310. IBM Internal users can obtain this list by sending the following command from a VM session:

```
REQUEST SUPPBBS FROM WLS AT RALVM13
```

The following is a short list of IHV bulletin board systems to access the latest OS/2 device drivers and assistance. The phone numbers are for access from the US, unless otherwise stated. These BBS numbers can be dialed from anywhere in the world. Local shadows may also exist that are not listed here.

Table 44 (Page 1 of 2). IHV Bulletin Board Systems

OEM	BBS Phone Number
Adaptec	(408) 945-7727 (800) 959-7274 (818) 597-1400
Advance Logic	(510) 226-7220
Always Technology	(818) 597-1440
ATI	(905) 764-9404 (905) 882-2600
BusLogic	(408) 492-1984
Canon	(714) 438-3325 (800) 848-4123
Canon (Netherlands)	(31) 20-6403406
Cirrus Logic	(510) 440-9080 (510) 623-8300
Compaq	(713) 378-1418
Colorgraphics	(404) 452-8238
Creative Labs	(405) 742-6660
Dell	(512) 728-8528
Diamond Tech Support	(408) 524-9301
Distributed Processing Technology (DPT)	(407) 831-6432
DPS Solutions	(415) 494-1621
Future Domain Corporation	(714) 253-0432
Hercules Computer Technology	(510) 623-7449 (510) 623-7142 (510) 623-7034
Hitachi (UK)	(44) 81-849-2086
Iomega	(801) 392-9819
Lexmark	(606) 232-5238
Laplink - Travelling Software	(206) 483-8088

Table 44 (Page 2 of 2). IHV Bulletin Board Systems	
OEM	**BBS Phone Number**
Media Vision	(510) 770-0527 (800) 348-7116
PC Company	1-919-517-0001
Sony Corporation of America	(408) 955-5107
Spider Graphics Inc	(408) 526-1219
Tektronix	(503) 685-4504
Trident	(415) 691-1016 (415) 691-0211
Western Digital	(714) 753-1234

B.3.3 IBM Bulletin Boards

The IBM Bulletin Boards are located all over the world. They are open for end users, dealers and developers.

The following table shows a list of some of the IBM Bulletin Boards worldwide. Where a line speed is not stated, it typically handles speed up to 9600 bps, with automatic speed configuration. The majority of lines support V32bis.

Table 45 (Page 1 of 2). IBM Bulletin Boards			
Name	**Location**	**Phone Number**	**Facts**
IBM Australia OS/2 BBS	Sydney	(61)-2-241-2466	14400 bps
IBM Austria BBS	Vienna	(43)-222-21145-6600	4 lines
IBM Belgium end user BBS	Brussels	(32)-2-725-6010	8 lines
IBM Canada OS/2 BBS	Halifax Montreal Markham Toronto Vancouver Winnipeg	902-420-0300 514-938-3022 905-316-4255 416-956-7877 604-664-6464 204-934-2735	19200 bps 19200 bps 19200 bps 19200 bps 19200 bps 19200 bps
IBM Denmark OS/2 BBS	Lyngby	(45)-45-88-72-22	6 lines
IBM Finland OS/2 BBS	Helsinki	(351)-90-45-95-900	
IBM Germany BBS	Ehningen	(49)-7034-15-2160	10 lines

Table 45 (Page 2 of 2). IBM Bulletin Boards

Name	Location	Phone Number	Facts
IBM Greece OS/2 BBS	Athens	(30)-1-3281303	
IBM Israel OS/2 BBS	Tel-Aviv	(972)-3-6951874	
IBM Italy OS/2 BBS	Milan	(39)-2-7531441	
IBM Netherlands OS/2 BBS	Utrecht	(31)-30-334771	8 lines
IBM New Zealand PC BBS	Wellington	(64)-4-576-5583	14400 bps
IBM Norway OS/2 BBS	Oslo	(47)-66-99-94-50	2 lines
IBM Portugal OS/2 BBS	Lisbon	(351)-1-791-5726 / 5480	
IBM Singapore OS/2 BBS	Singapore	(65)-227-7827	3 lines
IBM South Africa OS/2 BBS	Johannesburg	(27)-11-320-9201/2/3/4	4 lines
IBM Spain OS/2 BBS	Madrid	(34)-1-397-5580/5581/5873/5963	4 lines
IBM Sweden BBS	Vienna	(43)-222-21145-6600	10 lines
IBM Switzerland OS/2 BBS	Aarau	(41)-64-56-02-00 (41)-64-56-41-20	40+ lines 4 ISDN lines
IBM United Kingdom PC BBS	Basingstoke	(43)-222-21145-6600	15 lines
IBM US PC Company Bulletin Board (PCCBBS)	Raleigh	1-919-571-0001	40 lines

Appendix C. OS/2 Warp Supported Display Adapters and Systems

The following list shows the display adapters and systems supported by each display adapter in OS/2 Warp at the time this book was written.

Table 46 (Page 1 of 5). Supported Display Adapters and Systems

Display Driver	Display Adapter or System	VRAM	Chipset
ATI MACH 32	IBM ValuePoint P60/D (system board)		
	ATI Graphics Ultra Plus (ISA)	1MB	
	ATI Graphics Ultra Plus (ISA)	2MB	
	ATI Graphics Ultra Pro (ISA)	2MB	
	ATI Graphics Ultra Pro (PCI)	2MB	
	ATI Graphics Ultra Pro (VLB)	2MB	
	ATI VLB MACH 32(A) (VLB)	1MB	
ATI MACH 64	ATI Graphics Pro Turbo (ISA)	4MB	
	ATI Graphics Pro Turbo (VLB)	4MB	
	ATI Graphics Pro Turbo (VLB)	2MB	
	ATI Graphics Accel (VLB)	2MB	
	ATI Graphics Accel (VLB)	4MB	
	ATI Graphics Pro Turbo (PCI)	2MB	
	ATI Graphics Pro Turbo (PCI)	4MB	
	ATI WINTURBO (PCI)	2MB	
	ATI WINTURBO (PCI)	4MB	
	ATI Graphics Xpression (PCI)	2MB	
	ATI Graphics Xpression (VLB)	2MB	
ATI Technologies ATI28800	ATI VGA Wonder XL		
	ATI Graphics Ultra		
	ATI Graphics Ultra Pro		
	ATI Graphics Ultra+		
Cirrus Logic CL - GD 5422, 5426(5422 mode)	IBM ValuePoint 325T		
	Boca Research SuperVGA		5422
	Boca Research SuperVGA		5426
	Diamond SpeedStar Pro		5426

Table 46 (Page 2 of 5). Supported Display Adapters and Systems

Display Driver	Display Adapter or System	VRAM	Chipset
Cirrus Logic 5426, 5428, 5430, 5434	Boca Research Super X (ISA)	1MB	5426
	Boca Research VL-BUS SUPERX (VLB)	1MB	5426
	Boca Research VL-BUS SUPERX (VLB)	2MB	5426
	Cardinal Video Spectrum XL (ISA)	1MB	5426
	Diamond SpeedStar PRO (ISA)	1MB	5426
	Diamond SpeedStar PRO (VLB)	1MB	5426
	Genoa Audio Graphics (VLB)	1MB	5426
	Genoa Systems Windows VGA 24 (VLB)	1MB	5426
	2 the Max Cheetah XL (VLB)	1MB	5428
	Actix Prostar VL (VLB)	1MB	5428
	Dell NETPLEX 466/P (system board)		5428
	Diamond SpeedStar PRO (VLB)	1MB	5428
	Genoa Systems Windows VGA 24 (VLB)	1MB	5428
	Genoa Systems Windows VGA 24 8500VL (VLB)	2MB	5428
	Hewlett Packard VECTRA VL2 (system board)		5428
	NCR (system board)	2MB	5428
	Diamond Alpine (VLB)	2MB	5430
	Diamond Alpine (PCI)	2MB	5430
	ACTIX PROSTAR64 (PCI)	2MB	5434
	Diamond Alpine (3-1-94) (VLB)	2MB	5434
	Diamond Alpine (6-15-94) (PCI)	1MB	5434
	Diamond SpeedStar 64 (PCI)	2MB	5434
	Orchid Kelvin 64 (1.02) (PCI)	2MB	5434
	Orchid Kelvin 64 (1.02) (ISA)	2MB	5434
	Orchid Kelvin 64 (1.01) (VLB)	1MB	5434
	#9 Flashpoint (PCI)		5434
Headland Technology HT209	Headland VRAM II Ergo		
IBM VGA 256C	IBM ThinkPad 700C (system board)		
	IBM PS/1 2135 (system board)		
S3 864	IBM ValuePoint	2MB	
	Actix GraphicsENGINE 64 (PCI)	2MB [1]	
	Number 9 GXE 64 (VLB)	2MB	
	Number 9 GXE 64 (PCI)	2MB	

Table 46 (Page 3 of 5). Supported Display Adapters and Systems

Display Driver	Display Adapter or System	VRAM	Chipset
S3 86C801, 86C805, 86C928	Actix GE Ultra Plus		801
	Actix Graphics ENGINE 32		801, 928
	Actix Graphics ENGINE 32 LB		805i
	Actix Graphics ENGINE ULTRA		928
	Actix Graphics ENGINE ULTRA+		801, 928
	Actix Graphics ENGINE VL+		805i
	AIR AVIEW2		805
	Artist Graphics Winsprint		928
	Colorgraphic Twin Turbo Accelerator		928
	Diamond Stealth 24		801
	Diamond Stealth 24 LB		805
	Diamond Stealth Pro		928 [2]
	Diamond Stealth Pro LB		805
	ELSA Winner 1000		928
	Focus 2 the Max Truespeed		801
	HELIO		928
	IBM ValuePoint (system board)		805, 928
	Image Sharpener		805
	Metheus Premier		928
	Mirage Storm 1280-256V		805
	MiroCRYSTAL 8S		801, 805
	MiroCRYSTAL 24S		928
	MiroCRYSTAL 32S		928
	MiroMAGIC		928
	Nth Advantage		805
	Nth Graphics S3 Advantage		801
	Nth Graphics S3 Advantage LB		805
	Number 9 #9GXE (Brooktree)		928
	Number 9 #9GXE (AT&T/BT)		928p
	Orchid Fahrenheit 1280 Plus		801
	Orchid Fahrenheit LB		805
	PCG Photon Torpedo		801
	PCG Photon Torpedo LB		805
	STB Systems Pegasus		928
	STB Systems VL-24		805
	Vermont Microsystems		801, 805
	Video 7 Win.Pro		801
	Volante Warp 10		801
	Volante Warp 10 Plus		801
	Volante Warp 10LB		805
	WinMach 1600		928
	WinMach 1600XP		928
	Dell 433/L, 433/M, 466/L (system boards)		805

Table 46 (Page 4 of 5). Supported Display Adapters and Systems

Display Driver	Display Adapter or System	VRAM	Chipset
Trident Microsystems TVGA8900C	Trident VGA Graphics Trident JAX-8212		
Tseng Laboratories ET4000	Boca Research SuperVga Orchid ProDesigner II/MC STB PowerGraph VGA Amdek SmartVision/SVGA Diamond SpeedStar SuperVGA Everex Viewport NI SigmaVGA Legend II STB Ergo-VGA/MC CompuAdd 320Sc, 325 (system board) Cumulus GLC 33MHz (system board) Dell 433DE, 450SE (system boards) Siemens/Nixdorf PCM-4t (system board)		
Tseng Laboratories ET4000/W32, /W32i, /W32p	DFI WG-5000VL (VLB) Hercules Dynamite Pro (VLB) Dell 466/L (system board) DFi Wg-5000 (ISA) DFI WG-5000VL (VLB) Hercules Dynamite (ISA) Hercules Dynamite Pro (VLB) Micro Labs Ultimate VGA (AT&T, ISA) Micro Labs Ultimate VGA (AT&T, ISA) Micro Labs Ultimate VGA (AT&T, VLB) IBM ValuePoint (system board) Diamond Stealth 32 (PCI) Diamond Stealth 32 (VLB) Genoa Phantom32I (PCI) Genoa Phantom32I (VLB) Hercules Dynamite (PCI) Hercules Dynamite (VLB) Mirage Wind (PCI)	1MB 1MB 1MB 1MB 2MB 2MB 2MB 1MB 2MB 2MB 2MB 2MB 2MB 2MB 2MB 2MB	W32 W32 W32i W32i W32i W32i W32i W32i W32i W32i W32p W32p W32p [3] W32p W32p W32p W32
Weitek Power 9000	AIR Star2000 (VLB) American Megatrends Fast View (VLB) American Megatrends FASTVIEW PCI (PCI) Diamond Viper (VLB) Diamond Viper (PCI) Genoa VideoBlitz 9200Vl (AT&T, VLB) Photon Torpedo GXA9000 (VLB) Sixgraph Wizard 9000 (VLB)	2MB 2MB 2MB 2MB 2MB 2MB 2MB 2MB	

Table 46 (Page 5 of 5). Supported Display Adapters and Systems

Display Driver	Display Adapter or System	VRAM	Chipset
Weitek Power 9100	Diamond Viper Pro (VLB)	2MB	
	Diamond Viper SE (VLB)	4MB	
	Diamond Viper SE (PCI)	4MB	
	Diamond Viper SE (PCI)	2MB	
	Sigma Design Imaging Systems f/64 (PCI)	4MB	
Western Digital 90C24, 90C31	Dell 486P/25 (system board)		C31
	Diamond SpeedStar 24-X (ISA)	1MB	C31
	AST Ascentia 800N (system board)		C24
	AST Ascentia 900N 4/75 CT10 (system board)		C24
	Paradise 9211 (ISA)	1MB	C31
	Paradise 9210 (ISA)	1MB	C31
	Paradise Accelerated 24 9303 (ISA)	1MB	C31
	Paradise Accelerated 24 9334 (ISA)	1MB	C31
	CompuAdd (ISA)	1MB	C31
	Dell Latitude XP (system board)		C24
	IBM ThinkPad 750c, 750p, 750 Mono (system board)		C24
	IBM ThinkPad 755 (system board)		C24
	IBM ThinkPad 360		C24
	IBM ThinkPad 510CS		C24 [4]
	NEC VERSA PC440-1531 (system board)		C24
	Toshiba 1960CT (system board)		C24
	Toshiba 2400CS (system board)		C24
	Toshiba T200CS/80 (system board)		C24
	Toshiba T2400 CT (system board)		C24
	Toshiba T3400/120 (system board)		C24
	Toshiba T4700 CT (system board)		C24
	Toshiba T4700 CS (system board)		C24
	Toshiba T4800 CT (system board)		C24
Western Digital 90C33	Paradise Accelerated VL Plus (VLB)	1MB	
	Paradise Ports O'Call (VLB)	1MB	
	Paradise Ports O'Call (VLB)	2MB	
Western Digital WD90C11, C30, C31(C30mode)	Western Digital Paradise		C11, C30, C31
	Diamond SpeedStar SuperVGA		C31
	ALR (Bus Stat, M/C)		C11
	ALR (PS Modular)		C11
	ALR (Bus Stat, EISA)		C11
	AST Power Premium 213V, 4/25s		C11
	AST Power Premium 333V, 4/33		C11
	Dell 325D		C11
	Dell 486P-25		C11

Notes

1280x1024 is not supported.

You must load STLBIOS (provided by the manufacturer) in a DOS fullscreen session before **SVGA ON INIT** is run.

The STLBIOS utility sets the correct registers for this adapter

16,777,216 color mode is not supported.

65,526 color mode is not supported.

Appendix D. OS/2 Warp Trap Guidelines

The following is a guide on how to handle most trap (and Internal Processing) errors. A trap error, which can be caused by either software or hardware, occurs when the processor "traps" an interrupt or exception and reports it to the operating system. An interrupt is defined as an event external to the processor that occurs randomly during system operation. The only time an exception can occur is when a special condition is detected by the processor during the execution of a set of instructions.

There are actually 256 possible trap errors, although we will cover only the first 17 (0-16). These are all exceptions, except for trap 0002, which is a non-maskable interrupt (NMI). Trap errors 17-31 are exceptions reserved by Intel and errors 32-255 are user defined maskable interrupts.

D.1 General Problem Determination

If you are experiencing a trap error either during startup of OS/2 Warp or while using OS/2 Warp, try the following general problem solutions.

- A lot of trap errors occur because of file corruption. To solve these problems run CHKDSK as described below:
  - Start the operating system with diskette one.
  - For FAT formatted disk drives type on the command line:
    ```
    CHKDSK C: /F
    ```
  - For HPFS formatted disk drives type on the command line:
    ```
    CHKDSK c: /F:3
    ```

    Attention

    Do not use the /f:3 parameter on a LAN server with HPFS 386.

  Make sure you run CHKDSK after booting from diskette and not while in an OS/2 window or full screen. The system will not allow the /F parameter on a drive that it is in use.
- It may also be helpful to copy the default CONFIG.SYS from the \OS2\INSTALL directory to the root directory. Some trap errors can be caused by problems in the CONFIG.SYS file. In particular, a faulty device driver loading in CONFIG.SYS could cause the system to trap.
- Install the latest FixPak for OS/2 on your system. A FixPak for OS/2 contains corrective service diskettes.

If these steps do not help in solving the problem, refer to D.2, “List of Trap Errors” on page 345.

D.1.1 An Example of a Trap Error

The following is an example of an OS/2 32-bit trap error, with the most important registers highlighted:

```
TRAP 000e  ERRCD=0000  ERACC=****  ERLIM=****
EAX=00000000 EBX=abdecc38 ECX=ffffffff EDX=fff27190
ESI=abdecbdc EDI=00000096 EBP=00004b48 ELG=00013246
CS:EIP=0160:fffe2b05  CSACC=C09b  CSLIM=ffffffff
SS:ESP=0030:00004b38  SSACC=1097  SSLIM=00003ffff
DS=0158  DSACC=C0f3  DSLIMM=ffffffff  CR0=8001001b
ES=0158  ESACC=C0f3  ESLIMM=ffffffff  CR2=fffe2b05
FS=03b8  FSACC=00f3  FSLIMM=00000023
GS=0000  GSACC=****  GSLIMM=********

Error at location ##0160:fff5c34c-000d:a34c.
60000, 9084
048600b4
Internal Revision 8.162, 94/09/19
```

It is important to have the exact register information of any trap error, particularly the CS:EIP and CSLIM registers, as well as any IPE (Internal Processing Errors) locations. Many known problems are specific to the CS:EIP and CSLIM locations, so searching on these values could greatly reduce the time spent on trouble shooting.

D.1.2 What is an Internal Processing Error?

An Internal Processing Error (IPE) is associated with a SYS1915 message of OS/2 and is not exactly a trap error. Still, it can be caused by the same conditions as a trap error and subsequently is solved in the same manner. To determine the type of error you have to read the message carefully.

Locate the error message by finding the three zeros followed by a letter or number. In the IPE message, it will generally fall after the first cluster of digits.

An example is shown below:

```
The system has detected an internal processing error at location
##0160:FFF6FC01-000D:00015C01
```

This message would tell you that you should follow the trouble shooting procedures for a trap 000D in D.2, “List of Trap Errors” on page 345.

D.2 List of Trap Errors

The following is a list of the first 17 trap errors with some of the most common problem solutions for each trap.

Table 47 (Page 1 of 4). Trap Table

Number	Description	What to do
0000	Division by zero	• Make sure you have the latest CSD level installed. • Copy the default CONFIG.SYS from \OS2\INSTALL to the root directory. Trap 0000 errors can be caused by an exception in a device driver. If the Trap 0000 does not occur with the default CONFIG.SYS, check the original CONFIG.SYS for the offending device driver.
0001	Debug exception	Contact software vendor.

Table 47 (Page 2 of 4). Trap Table

Number	Description	What to do
0002	An NMI interrupt is generated by the system	Trap 0002 usually indicates a RAM problem. Read the error message carefully. There is a ERRCD register which indicates the reason an NMI interrupt has been generated: - 0 - The system detected an interrupt that cannot be masked. - 1 - The system detected an hardware memory error on the system board. - 2 - The system detected an hardware memory error on an option card. - 3 - The system detected a DMA timeout (could be hardware or software). - 4 - The system detected a watchdog timeout (could be hardware or software). If the system found a hardware memory error, try to - Check Memory for same speed. If they are not the same speed, make sure you installed the faster memory before the slower memory. - Reseat all memory SIMMs. - Ensure the memory SIMMs are supported by the system. • Contact hardware support. • If hardware troubleshooting does not help, contact software support.
0003	A special instruction for debugging software was left in the code.	• Check hardware (the failing hardware is usually not the memory). • If using OS/2 2.1, use IBMINT13.I13 instead of IBM1S506.ADD (change BASEDEV statement in CONFIG.SYS to do this).
0004	Overflow occurred while doing a arithmetical operation.	Contact software vendor.
0005	Bound instruction exceeded the specified limits.	Contact software vendor.

Table 47 (Page 3 of 4). Trap Table

Number	Description	What to do
0006	Processor tried to execute an unreserved invalid opcode.	• Check hardware (the failing hardware is usually not the memory). • Most trap 0006 errors during installation can be corrected by disabling cache, ROM shadowing, turbo etc.). • Ensure the installed memory is the correct speed for the system board. • Run chkdsk /f for any corrupt files. • Contact software vendor.
0007	Coprocessor not available.	• Run chkdsk /f for any corrupt files. • Run Coprocessor Diagnostic. • If diagnostic runs error-free contact software vendor.
0008	Processor detected an exception while processing an exception.	• Ensure the installed memory is the correct speed for the system board. • If during installation, put a REM in front of BASEDEV=IBM1S506.ADD in the CONFIG.SYS on the installation diskette. • Check software. Install latest CSD. • Check hardware. Trap 0008 errors can sometimes be caused by hardware problems. • Check for IRQ conflicts. • If the error occurs every time within the same application and CHKDSK does not correct the problem, contact software support.
0009	Coprocessor overrun	Contact software vendor
000A	Invalid Task State Segment.	Contact software vendor..
000B	Segment not present	Contact software vendor.
000C	Stack Fault	Contact Software Support.
000D	General Protection Exception.	• A number of Trap 000D are generated by software bugs. Make sure you installed the latest CSDs. • If the error occurs always in the same application, contact the software developer. • Check hardware. Trap 000D are occasionally generated by hardware errors. • Make sure all adapters are supported by OS/2. • If the error occurs while printing, install the latest printer driver.

Table 47 (Page 4 of 4). Trap Table

Number	Description	What to do
000E	Page Fault	• If the error occurs every time within the same application and CHKDSK does not correct the problem, contact software support. • Check hardware. Trap 000E errors are occasionally caused by hardware problems.
000F	Intel Reserved	
0010	Coprocessor error	• Run Coprocessor Diagnostic. • If Diagnostic runs error-free contact software vendor.

D.3 Creating a Memory Dump Disk

You can use an OS/2 tool to capture the memory at the time of a trap error. This process is called a *memory dump*. It can be performed by the user when a problem is too difficult to reproduce or other methods of problem determination do not identify the problem. A dump can then be analyzed by a team of technical experts.

Attention

Do not perform a memory dump unless your Service and Support Group has recommended this action.

There are two types of memory dumps:

- Manual memory dump (used for system hangs and traps that cause the system to stop).
- Automatic memory dump (used for application programs, system traps, and internal processing errors).

D.3.1 Performing the Memory Dump

You can perform a memory dump either to your hard disk or to diskettes.

- If you want to store the memory dump to diskettes, you must use formatted diskettes. One 1.44 MB Diskette is used for each 2 MB of RAM.
- If you want to store the memory dump to a hard disk, you must first create a FAT partition called SADUMP. The size of the partition has to be greater than the amount of memory in your system.

Before you start to save the memory dump do the following:

- Add the statements listed below to your CONFIG.SYS. This enables your system to perform event tracing.
  ```
  TRACEBUF=63
  TRACE=ON
  ```
- Restart your system afterwards to activate TRACE.
- Type on an OS/2 command line:

  ```
  TRACE ON KERNEL
  TRACE ON DOSCALL1
  ```

  This turns on two dynamic trace points.

You may choose to start the dump either manually or automatically. Select the automatic start only if the trap error occurs during startup.

To start the memory dump manually do the following:

- Press Ctrl+Alt+NumLock+Numlock (press NumLock twice).
- After a few seconds, the screen clears. After a minute the system beeps and one of the following messages is displayed:
  - When dumping to diskettes:
    ```
    Insert a formatted diskette to commence dumping
    ```
  - When dumping to a hard disk:
    ```
    The memory dump is being performed.
    The total amount of memory to be dumped is xxxx
    ```

To start the memory dump automatically follow the steps below:

- Type one of the following statements in your CONFIG.SYS file and restart your system.
  - TRAPDUMP=OFF,drive letter:
    Indicates that no automatic dump is to be taken. This is the default value; it is generally used when initiating a manual memory dump.
  - TRAPDUMP=ON,drive letter:

specifies the drive to which system dump information is written for any access violation. The system will restart after the process has completed.

- TRAPDUMP=R0,drive,letter:
  specifies the drive to which system dump information is written for system traps and internal processing errors. The system will restart after the process has completed

- TRAPDUMP now initiates a memory dump.

Warning

Setting TRAPDUMP to ON or R0 enables your system automatically to initiate a memory dump. Do not enable TRAPDUMP unless you have been instructed by your technical coordinator.

D.4 Gathering Information about a Trap

The following information will be be especially helpful to software support center personnel.

The most important thing to find out is the type of error (trap or IPE) and the exact message given by the system. On top of that, having the following will further help in problem determination:

1. **What is the full trap error displayed on the screen?**
   - Check the important registers (see D.1, “General Problem Determination” on page 343).
   - Is there a message displayed?
     For example:
     HARDWARE MEMORY ERROR AT LOCATION XXXX,YYYY
   - On trap 0002, record the ERRCD register.

2. **When does the error occur?**
   - At boot up?
   - Within an application?

3. **Can the customer get out of it? If so, how?**
   - Example: Power on/off? CTRL + ALT + DEL?

4. **What is the hardware configuration of the system?**
   - Model?
   - Adapters? Which slots?
   - Memory? (This could be key to a trap 2 and/or D error).

- OEM cards?

5. **What is the software configuration of the system?**
   - Version of Operating System?
   - CSD level?
   - Additional applications and version?

6. **What is the system configuration?**
   - If there is a LAN, what type, version?
   - What software is running the LAN?
   - Number of machines on the LAN?

7. **Is the error intermittent or reproducible?**
   - If it is reproducible, how?

8. **What occurred before the error?**
   - What tasks were the system performing?

9. **What was the customer doing at time of error?**

10. **Were there any recent changes to the system?**
    - Newly installed hardware or software?
    - Added memory?
    - Updated the CSD?
    - Added new software?
    - Added new requesters (if on LAN)?

Appendix E. Appendix F: PCMCIA Additional Information

This appendix provides additional and miscellaneous information on PCMCIA device drivers and PCMCIA in general. In the course of writing this book we came across lots of information, some which is indirectly to device drivers. If it didn't get included in the actual chapter of a particular subject, but was considered good information relating to the PCMCIA topic, you'll find it here.

Due to the vast amounts of information available and the rate at which computer technology changes, it is possible that some of the information placed here is not the most current. Please always verify from the original source that you have the most recent information possible.

E.1 PCMCIA.TXT

The PCMCIA.TXT is a file containing basic step-by-step installation instructions as well as some sample configuration files, these being CONFIG.SYS, AUTOEXEC.BAT, PROTOCOL.INI and NET.CFG. Cards covered here are the Token-Ring and Ethernet credit card adapter. Except where otherwise indicated, these sample files are assuming the case where the IBM credit card adapter is being used in the ThinkPad 720 or 720C. The install instructions are basic enough that they should work installing these cards in any OEM supported machine (a list of the tested and therefore supported OEM machines for use with our adapters can be obtained by calling 1-800-643-7409. It is a recorded listing and is updated when necessary). The exception, and it is marked, is the ThinkPad 350/350C, which has its own devoted section, since it is different in configuration than the 720/ 720C ThinkPads. Support for OEM credit card adapters, whether or not they are in IBM machines, must be provided by their technical support or their vendor.

Before using the instructions and samples in this text file, make sure you have the latest drivers from the Bulletin Board System (BBS), which will probably be located in two or more separate files on the BBS. For help on finding the files and information about the BBS, call 1-800-772-2227.

Unless otherwise marked, any sample CONFIG.SYS, PROTOCOL.INI, NET.CFG or AUTOEXEC.BAT files found herein are those I have tested on the ThinkPad 720/720c. OEM machines may have a slightly different configuration. For a list of machines that have been tested with our Credit Card adapters, call 1-800-643-7409.

Also assumed is that you already have the latest drivers off of our BBS (Bulletin Board System); as of August, 27 1993, the latest card and socket services for the 720/720c ThinkPad is TPPCM112.EXE, the latest Token-Ring Credit Card adapter diskette is TRENG120.EXE and the latest Ethernet credit card adapter diskette is ETENG120.EXE. These files are sometimes updated, so keep an eye on the BBS listings.

E.1.1 Token-Ring Adapter

E.1.1.1 A. With OS/2 (2.1 ONLY)

INSTALL:

1. Make sure you have the most current Credit Card adapter diskette off of our BBS.
2. Make sure you have the most current ThinkPad 720/720c PCMCIA device driver diskette off of our BBS.
3. Install OS/2 2.1 and PCMCIA support. This will add PCMCIA.SYS and VPCMCIA.SYS in the CONFIG.SYS . If this driver is not in the CONFIG.SYS then go through the OS/2 selective install to install the PCMCIA support.
4. Type uinstall from the 720/720c PCMCIA driver diskette to install the correct drivers. They will be placed at the end of the CONFIG.SYS .
5. Install LAPS from NTS/2 or ES v1.0. Do not configure the workstation until you have copied the *.OS2 and *.NIF for the card into the \IBM\COM\MACS directory. This will add the PCMCIA card as a valid choice when you choose the configure option on the LAPS menu. You can also add the *.OS2 and *.NIF files into the correct directory by choosing Install on the LAPS menu after you have LAPS installed. This choice will assume you have additional drivers and will pop up a box for you to enter the path such as A:\OS2.
6. Configure the machine and choose the PCMCIA card and add the 802.2 and NETBIOS protocols as needed. Highlight the PCMCIA card and choose Edit to see what parameters you can add to the PROTOCOL.INI. The speed for the token-ring card defaults to 4. You will have to change that to 16 if you need that speed.
7. Shut down and reboot your machine and make sure you have the card initialized with no errors. If you do have errors, do normal trouble shooting to find the culprit. The readme file on the PCMCIA disk will have possible errors and suggestions.

8. Once the card installs without reporting errors, install your networking program such as LAN Requester or NetWare for OS/2.

SAMPLE CONFIG.SYS:

```
IFS=E:\OS2\HPFS.IFS /CACHE:64 /CRECL:4
PROTSHELL=E:\OS2\PMSHELL.EXE
SET USER_INI=E:\OS2\OS2.INI
SET SYSTEM_INI=E:\OS2\OS2SYS.INI
SET OS2_SHELL=E:\OS2\CMD.EXE
SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,CONNECTIONS
SET RUNWORKPLACE=E:\OS2\PMSHELL.EXE
SET COMSPEC=E:\OS2\CMD.EXE
LIBPATH=.;E:\IBMLAN\NETLIB;E:\MUGLIB\DLL;E:\IBMCOM\DLL;
   E:\OS2\DLL;E:\OS2\MDOS;E:\;E:\OS2\APPS\DLL
SET PATH=E:\IBMLAN\NETPROG;E:\MUGLIB;E:\OS2;E:\OS2\SYSTEM;
   E:\OS2\MDOS\WINOS2;E:\OS2\INSTALL;E:\;E:\OS2\MDOS;E:\OS2\APPS
SET DPATH=E:\IBMLAN\NETPROG;E:\IBMLAN;E:\MUGLIB;E:\IBMCOM;
   E:\OS2;E:\OS2\SYSTEM;E:\OS2\MDOS\WINOS2;E:\OS2\INSTALL;E:\;
     E:\OS2\BITMAP;E:\OS2\MDOS;E:\OS2\APPS
SET PROMPT=$I[$P]
SET HELP=E:\OS2\HELP;E:\OS2\HELP\TUTORIAL
SET GLOSSARY=E:\OS2\HELP\GLOSS
SET IPF_KEYS\SBCS
PRIORITY_DISK_IO=YES
FILES=20
DEVICE=E:\IBMCOM\LANMSGDD.OS2 /I:E:\IBMCOM
DEVICE=E:\IBMCOM\PROTMAN.OS2 /I:E:\IBMCOM
DEVICE=E:\OS2\TESTCFG.SYS
DEVICE=E:\OS2\DOS.SYS
DEVICE=E:\OS2\PMDD.SYS
BUFFERS=30
IOPL=YES
DISKCACHE=512,LW,AC:E
MAXWAIT=3
MEMMAN=SWAP,PROTECT
SWAPPATH=E:\OS2\SYSTEM 2048 4096
BREAK=OFF
THREADS=256
PRINTMONBUFSIZE=134,134,134
COUNTRY=001,E:\OS2\SYSTEM\COUNTRY.SYS
SET KEYS=ON
REM SET DELDIR=C:\DELETE;512;D:\DELETE,512;E:\DELETE,512
BASEDEV=PRINT02.SYS
BASEDEV=IBM2FLPY.ADD
BASEDEV=IBM2ADSK.ADD
BASEDEV=IBM2SCSI.ADD /LED
BASEDEV=IBMINT13.I13
BASEDEV=OS2DASD.DMD
SET BOOKSHELF=E:\IBMLAN\BOOK;E:\OS2\BOOK
SET EPMPATH=E:\OS2\APPS;
DEVICE=E:\OS2\APPS\SASYNCDB.SYS
PROTECTONLY=NO
SHELL=E:\OS2\MDOS\COMMAND.COM E:\OS2\MDOS
FCBS=16,8
RMSIZE=640
DEVICE=E:\OS2\MDOS\VEMM.SYS
DOS=LOW,NOUMB
```

```
DEVICE=E:\OS2\MDOS\VDPX.SYS
DEVICE=E:\OS2\MDOS\VXMS.SYS /UMB
DEVICE=E:\OS2\MDOS\VDPMI.SYS
DEVICE=E:\OS2\MDOS\VCDROM.SYS
DEVICE=E:\OS2\MDOS\VWIN.SYS
DEVICE=E:\OS2\APM.SYS
DEVICE=E:\OS2\PWRMGMT.SYS
DEVICE=E:\OS2\MDOS\VAPM.SYS
DEVICE=E:\OS2\PCMCIA.SYS
DEVICE=E:\OS2\MDOS\VPCMCIA.SYS
DEVICE=E:\OS2\MDOS\VMOUSE.SYS
DEVICE=E:\OS2\POINTDD.SYS
DEVICE=E:\OS2\MOUSE.SYS
DEVICE=E:\OS2\COM.SYS
DEVICE=E:\OS2\MDOS\VCOM.SYS
CODEPAGE=437,850
DEVINFO=KDB,US,E:\OS2\KEYBOARD.DCP
DEVINFO=SCR,VGA,E:\OS2\VIOTBL.DCP
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGA,BVHSVGA)
DEVICE=E:\OS2\MDOS\VSVGA.SYS
RUN=E:\IBMCOM\PROTOCOL\NETBIND.EXE
RUN=E:\IBMCOM\LANMSGEX.EXE
DEVICE=E:\IBMCOM\PROTOCOL\NETBEUI.OS2
DEVICE=E:\IBMLAN\NETPROG\RDRHELP.200
IFS=E:\IBMLAN\NETPROG\NETWKSTA.200 /I:E:\IBMLAN /N
DEVICE=E:\IBMCOM\PROTOCOL\NETBIOS.OS2
DEVICE=E:\IBMCOM\PROTOCOL\LANDD.OS2
DEVICE=E:\IBMCOM\PROTOCOL\LANDLLDD.OS2
DEVICE=E:\IBMCOM\MACS\IBMTOKCS.OS2
RUN=E:\IBMCOM\PROTOCOL\LANDLL.EXE
DEVICE=E:\OS2\$ICPMOS2.SYS
DEVICE=E:\OS2\IBM2SS02.SYS
DEVICE=E:\OS2\ICRMU02.SYS
RUN=E:\IBMLAN\NETPROG\LSDAEMON.EXE
```

PROTOCOL.INI:

```
[PROT_MAN]
DRIVERNAME=PROTMAN$

[IBMLXCFG]
IBMTOKCS_NIF=IBMTOKCS.NIF
LANDD_NIF=LANDD.NIF
NETBEUI_NIF=NETBEUI.NIF

[LANDD_NIF]
DRIVERNAME=LANDD$
BINDINGS=IBMTOKCS_NIF
ETHERAND_TYPE="I"
SYSTEM_KEY=0x0
OPEN_OPTIONS=0x2000
TRACE=0x0
LINKS=8
MAX_SAPS=3
MAX_G_SAPS=0
USERS=3
TI_TICK_G1=255
T1_TICK_G1=15
```

```
T2_TICK_G1=3
TI_TICK_G2=255
T1_TICK_G2=25
T2_TICK_G2=10
IPACKETS=250
UIPACKETS=100
MAXTRANSMITS=6
MINTRANSMITS=2
TCBS=64
GDTS=30
ELEMENTS=800

[NETBEUI_NIF]

DRIVERNAME=NETBEUI$
BINDINGS=IBMTOKCS_NIF
ETHERAND_TYPE="I"
USEADDRREV="YES"
OS2TRACEMASK=0x0
SESSIONS=40
NCBS=95
NAMES=21
SELECTORS=5
USEMAXDATAGRAM="NO"
ADAPTRATE=1000
WINDOWERRORS=0
MAXDATARCV=4168
TI=30000
T1=500
T2=200
MAXIN=1
MAXOUT=1
NETBIOSTIMEOUT=500
NETBIOSRETRIES=8
NAMECACHE=0
PIGGYBACKACKS=1
DATAGRAMPACKETS=2
PACKETS=350
LOOPPACKETS=1
PIPELINE=5
MAXTRANSMITS=6
MINTRANSMITS=2
DLCRETRIES=5

[IBMTOKCS_NIF]

DRIVERNAME=IBMTOK$
ADAPTER="PRIMARY"
MAXTRANSMITS=6
RECVBUFS=2
RECVBUFSIZE=256
XMITBUFS=1
PCMCIA
RINGSPEED=16
```

E.1.2 With IBM DOS 5.0 and above

INSTALL:

** Can use Card and Socket Services or a Point Enabler.

For Point Enabler:

1. Put in the Credit Card Adapter Diskette (one that came with adapter) into the ThinkPad and type `a:install`.
2. Choose `NDIS environment for LAN support`, or `NetWare environment` for NetWare. If the customer has already installed the point enabler and you are trying to install a newer version, first choose "remove enablers" then return to the main menu and choose NDIS or NetWare environment.
   a. The version 1.0 Adapter Diskette has no choice for the IBM ThinkPad on its selection list. in this case choose NCR. On version 1.10, the IBM ThinkPad 720 is listed.
   b. NDIS: Say `no` to installing the NDIS driver
   c. NetWare: Say `yes` to installing the driver -- all this does is update NET.CFG. despite specifying a directory in Install, NET.CFG is always saved to the root directory.
3. For card enabler parameters, see the READ.ME file on the credit card adapter diskette that came with the adapter.

For Card and Socket services:

Note:

Card and Socket Services are required for the NetWare token.com driver to load correctly in most cases that we have encountered; definitely for use of this card with the data/fax modem.

1. Put in the 720/720c PCMCIA diskette that came w/ the ThinkPad. Type a:uinstall. This installs the 4 card and Socket Services drivers. Unless you have the Ethernet card and the 1.2 Version of the credit card adapter diskette (off BBS -- one for the `a:install`.) then there is no OS/2 support and you must choose to install DOS drivers.
2. Reboot the machine to affect the changes.
3. Put in the credit card adapter diskette (one that came with adapter) into the ThinkPad and type `a:install`.

4. Choose NDIS environment for LAN support, or NetWare environment for NetWare.
   a. NDIS: Say no to installing the NDIS driver
   b. NetWare: say yes to installing the driver -- All this does is update NET.CFG. despite specifying a directory in "install", NET.CFG is always saved to the root directory.
5. Make sure in the CONFIG.SYS that the CS20TOK.SYS driver is there and is positioned below the Card and Socket Services drivers. This is not a point enabler; it is a card enabler used in conjunction with Card and Socket Services. Card and Socket Services may work without it, but it is recommended for use with NetWare. Make sure any memory managers are loaded below these drivers in the CONFIG.SYS and have ROM/RAM excluded.
6. For card enabler parameters, see the READ.ME file on the credit card adapter diskette that came with the adapter.

Sample files:

Card and Socket Services with NDIS Support, PC Support and NetWare Interoperability.

CONFIG.SYS:

```
DEVICE=C:\DOS\SETVER.EXE
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH
FILES=15
DEVICE=C:\IBMDSS02.SYS         \
DEVICE=C:\IBMDOSCS.SYS           \   CARD AND SOCKET
DEVICE=C:\DICRMU02.SYS           /     SERVICES
DEVICE=C:\$ICPMDOS.SYS         /
DEVICE=\LSP\PROTMAN.DOS /I:\LSP  \
DEVICE=\LSP\IBMTOKCS.DOS          \
DEVICE=\LSP\DXMA0MOD.SYS 001        > NDIS DRIVERS FOR
DEVICE=\LSP\DXME0MOD.SYS          /   LAN SUPPORT
DEVICE=\LSP\DXMT0MOD.SYS  O=N    /
DEVICE=C:\PCS\EIMPCS.SYS        \    PC SUPPORT
DEVICE=C:\PCS\ECYDDX.SYS        /     DRIVERS
```

AUTOEXEC.BAT:

```
@ECHO OFF
\LSP\NETBIND   ---   FOR NDIS
PROMPT $p$g
PATH C:\DOS
SET TEMP=C:\DOS
lsl          \
lansup         \   ODI DRIVERS FOR NETWARE; LANSUP TO BIND
route           > THE LAN SUPPORT AND ODI PROTOCOLS (ROUTE
```

```
ipxodi         /   ONLY IF NEED SOURCE ROUTING)
netx         /
call startpcs  ---   CALL TO START THE PC SUPPORT
```

PROTOCOL.INI:

```
[PROTMAN_MOD]
     DriverName = PROTMAN$
[DXMAIDXCFG]
     DXME0_MOD = DXME0.NIF
     IBMTOKCS_MOD = IBMTOKCS.NIF
     IBMTOKCS2_MOD = IBMTOKCS.NIF
[DXME0_MOD]
     DriverName = DXME0$
     Bindings = IBMTOKCS_MOD
[IBMTOKCS_MOD]
     DriverName = IBMTOK$
     EARLYRELEASE
     INTERRUPT = 9
     RAM = 0Xd800
     RINGSPEED = 4
     RAMSIZE = 16
     MMIO = 0Xcc00
     MAXTRANSMITS = 6
     RECVBUFS = 2
     RECVBUFSIZE = 256
     XMITBUFS = 1
     XMITBUFSIZE = 2040
[IBMTOKCS2_MOD]
     DriverName = IBMTOK2$
     EARLYRELEASE
     INTERRUPT = 9
     RAM = 0Xd800
     RINGSPEED = 4
     RAMSIZE = 16
     MMIO = 0Xcc00
     MAXTRANSMITS = 6
     RECVBUFS = 2
     RECVBUFSIZE = 256
     XMITBUFS = 1
     XMITBUFSIZE = 2040
```

NET.CFG:

```
LINK SUPPORT
  BUFFERS 1 9000
LINK DRIVER TOKEN
  PCMCIA
  DATA RATE 4
```

Card and Socket Services with EMM386 and LAN Support with NetWare Interoperability

CONFIG.SYS

```
DEVICE=C:\IBMDSS02.SYS           \
DEVICE=C:\IBMD0SCS.SYS             \  CARD AND SOCKET
DEVICE=C:\DICRMU02.SYS             /    SERVICES
DEVICE=C:\$ICPMDOS.SYS           /
DEVICE=C:\CS20TOK.SYS PROMPT      -- CARD ENABLER
                            (NOT POINT ENABLER)
DEVICE=C:\DOS\EMM386.EXE X=____-____ X=____-____ (*SEE NOTE*)
DOS=HIGH,UMB
DEVICEHIGH=C:\LSP\DXMA0MOD.SYS     \
DEVICEHIGH=C:\LSP\DXMC0MOD.SYS      >  LAN SUPPORT
DEVICEHIGH=C:\LSP\DXMT0MOD.SYS O=N  /
```

AUTOEXEC.BAT

```
LSL     \
LANSUP    \
ROUTE      >   ODI DRIVERS FOR NETWARE, LANSUP TO BIND
IPXODI    /    IEEE802.2 AND ODI PROTOCOLS (ROUTE ONLY IF
NETX    /      NEED SOURCE ROUTING)
```

Note

Make sure that any other devices not seen here are loaded either before or after this block; leave this block intact. We recommend HIMEM is loaded before and the rest after. You must load EMM386 after any and all Card and Socket Services drivers, card enablers, or point enablers or you may not be able to load card drivers, LAN support drivers or NetWare ODI drivers.

```
NET.CFG:

LINK SUPPORT
   BUFFERS 1 9000
LINK DRIVER TOKEN
   PCMCIA
   DATA RATE 4


CARD AND SOCKET SERVICES WITH CARD ENABLER, EMM386, LAN SUPPORT
AND DOS LAN REQUESTER

CONFIG.SYS

DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\IBMDSS02.SYS    \
DEVICE=C:\IBMDOSCS.SYS      \ CARD AND SOCKET SERVICES
DEVICE=C:\DICRMU02.SYS      /
DEVICE=C:\$ICPMDOS.SYS    /
DEVICE=C:\CS20TOK.SYS     -- CARD ENABLER (NOT POINT ENABLER)
DEVICE=C:\DOS\EMM386.EXE X=____-____ X=____-____ (*SEE NOTE*)
DOS=HIGH,UMB
DEVICE=C:\DOS\SETVER.EXE
FILES=30
BUFFERS=20
STACKS=9,256
```

```
DEVICE=\LSP\DXMA0MOD.SYS 001              \
DEVICE=\LSP\DXMC0MOD.SYS ,d800,0            > LAN SUPPORT
DEVICE=\LSP\DXMT0MOD.SYS O=N S=12 C=14 ST=12 /   DRIVERS
LASTDRIVE=Z
SHELL=C:\COMMAND.COM /E:2000 /P

AUTOEXEC.BAT

@ECHO OFF
PROMPT $P$G
PATH C:\DOSLAN;C:\DOS
SET TEMP=C:\DOS
C:\DOS\DOSKEY.COM
@ECHO OFF
YNPROMPT Y N 30 Start DOS LAN Requester (Y/N)? \
IF ERRORLEVEL 1 GOTO NODLR                  \  AUTOMATIC
NET START                                  \ DOS LAN
IF ERRORLEVEL 1 GOTO NODLR                   / REQUESTER
CALL INITFSI.BAT                            /  STARTUP
:NODLR                                    /
```

Note

EMM386 must be loaded below any and all Card and Socket Services, card enablers, or point enablers or you may have LAN support driver errors, card driver errors, or the CONFIG.SYS may load but you cannot start the requester and therefore cannot logon to the network.

```
CARD AND SOCKET SERVICES W/ EMM386 AND NETWARE

CONFIG.SYS

DEVICE=C:\IBMDSS02.SYS            \
DEVICE=C:\IBMD0SCS.SYS              \  CARD AND SOCKET
DEVICE=C:\DICRMU02.SYS              /    SERVICES
DEVICE=C:\$ICPMDOS.SYS            /
DEVICE=C:\CS20TOK.SYS PROMPT       -- CARD ENABLER
                             (NOT POINT ENABLER)
DEVICE=C:\DOS\EMM386.EXE X=____-____ X=____-____ (*SEE NOTE*)
DOS=HIGH,UMB

AUTOEXEC.BAT

LSL     \
TOKEN     \    ODI DRIVERS FOR NETWARE, TOKEN.COM FROM
ROUTE       >  THE CREDIT CARD ADAPTER DISKETTE (ROUTE
IPXODI    /    ONLY IF NEED SOURCE ROUTING).
NETX    /
```

Note

Make sure that any other devices not seen here are loaded either before or after this block; leave this block intact. We recommend HIMEM is loaded before and the rest after. You must load EMM386 after any and all Card and Socket Services drivers, card enablers, or point enablers or you may not be able to load card drivers, LAN support drivers or NetWare ODI drivers.

```
NET.CFG:

LINK SUPPORT
   BUFFERS 1 9000
LINK DRIVER TOKEN
   PCMCIA
   DATA RATE 4
```

E.1.3 Ethernet Adapter

E.1.3.1 With OS/2 (2.1 ONLY)

INSTALL:

1. Make sure you have the most current Credit Card adapter diskette off of our BBS.
2. Make sure you have the most current ThinkPad 720/720c PCMCIA device driver diskette off of our BBS.
3. Install OS/2 2.1 and PCMCIA support. This will add PCMCIA.SYS and VPCMCIA.SYS in the CONFIG.SYS . If this driver is not in the CONFIG.SYS then go through the OS/2 selective install to install the PCMCIA support.
4. Type `uinstall` from the 720/720c PCMCIA driver diskette to install the correct drivers. They will be placed at the end of the CONFIG.SYS .
5. Install LAPS from NTS/2 or ES v1.0. do not configure the workstation until you have copied the *.OS2 and *.NIF for the card into the \IBMCOM\MACS directory. This will add the PCMCIA card as a valid choice when you choose the configure option on the LAPS menu. You can also add the *.OS2 and *.NIF files into the correct directory by choosing install on the LAPS menu after you have LAPS installed. This choice will assume you have additional drivers and will pop up a box for you to enter the path such as A:\OS2.
6. Configure the machine and choose the PCMCIA card and add the 802.2 and NETBIOS protocols as needed. Highlight the PCMCIA card and

choose edit to see what parameters you can add to the PROTOCOL.INI. The speed for the token-ring card defaults to 4. You will have to change that to 16 if you need that speed.

7. Shut down and reboot your machine and make sure you have the card initialized with no errors. If you do have errors, do normal trouble shooting to find the culprit. The README file on the PCMCIA disk will have possible errors and suggestions.

8. Once the card installs without reporting errors, install your networking program such as LAN Requester or NetWare for OS/2.

SAMPLE CONFIG.SYS:

```
IFS=E:\OS2\HPFS.IFS /CACHE:64 /CRECL:4
PROTSHELL=E:\OS2\PMSHELL.EXE
SET USER_INI=E:\OS2\OS2.INI
SET SYSTEM_INI=E:\OS2\OS2SYS.INI
SET OS2_SHELL=E:\OS2\CMD.EXE
SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,CONNECTIONS
SET RUNWORKPLACE=E:\OS2\PMSHELL.EXE
SET COMSPEC=E:\OS2\CMD.EXE
LIBPATH=E:\IBMLAN\NETLIB;E:\MUGLIB\DLL;E:\IBMCOM\DLL;.;
E:\OS2\DLL;E:\OS2\MDOS;E:\;E:\OS2\APPS\DLL
SET PATH=E:\IBMLAN\NETPROG;E:\MUGLIB;E:\OS2;E:\OS2\SYSTEM;
  E:\OS2\MDOS\WINOS2;E:\OS2\INSTALL;E:\;E:\OS2\MDOS;E:\OS2\APPS
SET DPATH=E:\IBMLAN\NETPROG;E:\IBMLAN;E:\MUGLIB;E:\IBMCOM;
  E:\OS2;E:\OS2\SYSTEM;E:\OS2\MDOS\WINOS2;E:\OS2\INSTALL;E:\;
    E:\OS2\BITMAP;E:\OS2\MDOS;E:\OS2\APPS
SET PROMPT=$I[$P]
SET HELP=E:\OS2\HELP;E:\OS2\HELP\TUTORIAL
SET GLOSSARY=E:\OS2\HELP\GLOSS
SET IPF_KEYS\SBCS
PRIORITY_DISK_IO=YES
FILES=20
DEVICE=E:\IBMCOM\LANMSGDD.OS2 /I:E:\IBMCOM
DEVICE=E:\IBMCOM\PROTMAN.OS2 /I:E:\IBMCOM
DEVICE=E:\OS2\TESTCFG.SYS
DEVICE=E:\OS2\DOS.SYS
DEVICE=E:\OS2\PMDD.SYS
BUFFERS=30
IOPL=YES
DISKCACHE=512,LW,AC:E
MAXWAIT=3
MEMMAN=SWAP,PROTECT
SWAPPATH=E:\OS2\SYSTEM 2048 4096
BREAK=OFF
THREADS=256
PRINTMONBUFSIZE=134,134,134
COUNTRY=001,E:\OS2\SYSTEM\COUNTRY.SYS
SET KEYS=ON
REM SET DELDIR=C:\DELETE;512;D:\DELETE,512;E:\DELETE,512
BASEDEV=PRINT02.SYS
BASEDEV=IBM2FLPY.ADD
BASEDEV=IBM2ADSK.ADD
BASEDEV=IBM2SCSI.ADD /LED
```

```
BASEDEV=IBMINT13.I13
BASEDEV=OS2DASD.DMD
SET BOOKSHELF=E:\IBMLAN\BOOK;E:\OS2\BOOK
SET EPMPATH=E:\OS2\APPS;
DEVICE=E:\OS2\APPS\SASYNCDB.SYS
PROTECTONLY=NO
SHELL=E:\OS2\MDOS\COMMAND.COM E:\OS2\MDOS
FCBS=16,8
RMSIZE=640
DEVICE=E:\OS2\MDOS\VEMM.SYS
DOS=LOW,NOUMB
DEVICE=E:\OS2\MDOS\VDPX.SYS
DEVICE=E:\OS2\MDOS\VXMS.SYS /UMB
DEVICE=E:\OS2\MDOS\VDPMI.SYS
DEVICE=E:\OS2\MDOS\VCDROM.SYS
DEVICE=E:\OS2\MDOS\VWIN.SYS
DEVICE=E:\OS2\APM.SYS
DEVICE=E:\OS2\PWRMGMT.SYS
DEVICE=E:\OS2\MDOS\VAPM.SYS
DEVICE=E:\OS2\PCMCIA.SYS
DEVICE=E:\OS2\MDOS\VPCMCIA.SYS
DEVICE=E:\OS2\MDOS\VMOUSE.SYS
DEVICE=E:\OS2\POINTDD.SYS
DEVICE=E:\OS2\MOUSE.SYS
DEVICE=E:\OS2\COM.SYS
DEVICE=E:\OS2\MDOS\VCOM.SYS
CODEPAGE=437,850
DEVINFO=KDB,US,E:\OS2\KEYBOARD.DCP
DEVINFO=SCR,VGA,E:\OS2\VIOTBL.DCP
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGA,BVHSVGA)
DEVICE=E:\OS2\MDOS\VSVGA.SYS
RUN=E:\IBMCOM\PROTOCOL\NETBIND.EXE
RUN=E:\IBMCOM\LANMSGEX.EXE
DEVICE=E:\IBMCOM\PROTOCOL\NETBEUI.OS2
DEVICE=E:\IBMLAN\NETPROG\RDRHELP.200
IFS=E:\IBMLAN\NETPROG\NETWKSTA.200 /I:E:\IBMLAN /N
DEVICE=E:\IBMCOM\PROTOCOL\NETBIOS.OS2
DEVICE=E:\IBMCOM\PROTOCOL\LANDD.OS2
DEVICE=E:\IBMCOM\PROTOCOL\LANDLLDD.OS2
DEVICE=E:\IBMCOM\MACS\PCMNICCS.OS2
RUN=E:\IBMCOM\PROTOCOL\LANDLL.EXE
DEVICE=E:\OS2\$ICPMOS2.SYS
DEVICE=E:\OS2\IBM2SS02.SYS
DEVICE=E:\OS2\ICRMU02.SYS
RUN=E:\IBMLAN\NETPROG\LSDAEMON.EXE
```

PROTOCOL.INI:

```
[PROT_MAN]
     DRIVERNAME=PROTMAN$

[IBMLXCFG]
     PCMNICCS_NIF=PCMNICCS.NIF
     LANDD_NIF=LANDD.NIF
     NETBEUI_NIF=NETBEUI.NIF

[LANDD_NIF]
     DRIVERNAME=LANDD$
```

```
     BINDINGS=PCMNICCS_NIF
     ETHERAND_TYPE="I"
     SYSTEM_KEY=0x0
     OPEN_OPTIONS=0x2000
     TRACE=0x0
     LINKS=8
     MAX_SAPS=3
     MAX_G_SAPS=0
     USERS=3
     TI_TICK_G1=255
     T1_TICK_G1=15
     T2_TICK_G1=3
     TI_TICK_G2=255
     T1_TICK_G2=25
     T2_TICK_G2=10
     IPACKETS=250
     UIPACKETS=100
     MAXTRANSMITS=6
     MINTRANSMITS=2
     TCBS=64
     GDTS=30
     ELEMENTS=800

[NETBEUI_NIF]

     DRIVERNAME=NETBEUI$
     BINDINGS=PCMNICCS_NIF
     ETHERAND_TYPE="I"
     USEADDRREV="YES"
     OS2TRACEMASK=0x0
     SESSIONS=40
     NCBS=95
     NAMES=21
     SELECTORS=5
     USEMAXDATAGRAM="NO"
     ADAPTRATE=1000
     WINDOWERRORS=0
     MAXDATARCV=4168
     TI=30000
     T1=500
     T2=200
     MAXIN=1
     MAXOUT=1
     NETBIOSTIMEOUT=500
     NETBIOSRETRIES=8
     NAMECACHE=0
     PIGGYBACKACKS=1
     DATAGRAMPACKETS=2
     PACKETS=350
     LOOPPACKETS=1
     PIPELINE=5
     MAXTRANSMITS=6
     MINTRANSMITS=2
     DLCRETRIES=5

[PCMNICCS_NIF]

     DRIVERNAME=PCM_CS$
     IOBASE=0x300
```

```
INTERRUPT=5
PCMCIA
```

E.1.3.2 With IBM DOS 5.0 and above

INSTALL:

** CAN USE CARD AND SOCKET SERVICES OR A POINT ENABLER.

For point enabler:

1. Put in the Credit Card adapter diskette (that came with adapter) into the ThinkPad and type `a:install`.
2. Choose `NDIS environment for LAN support`, or NetWare environment for NetWare. If the customer has already installed the point enabler and you are trying to install a newer version, first choose **.remove enablers** then return to the main menu and choose **NDIS** or **NetWare environment**.
   a. The Version 1.0 Adapter Diskette has no choice for the IBM ThinkPad on its selection list. In this case choose **NCR.** On Version 1.20, the IBM ThinkPad 720 is listed.
   b. NDIS: Say `no` to installing the NDIS driver.
   c. NetWare: Say `yes` to installing the driver -- all this does is update NET.CFG. despite specifying a directory in Install, NET.CFG is always saved to the root directory.
3. For card enabler parameters, see the READ.ME file on the Credit Card adapter diskette that came with the adapter.

For Card and Socket Services:

Note

Card and socket services are required for the NetWare PCMDMCS.COM (or PCMSM.COM if it is Version 1.0 of the Credit Card Adapter Diskette) driver to load correctly in most cases that we have encountered; definitely for use of this card with the data/fax modem.

1. Put in the 720/720c PCMCIA diskette that came with the ThinkPad. Type `a:uinstall`. This installs the four Card and Socket Services drivers. Unless you have the Ethernet card and the 1.2 version of the Credit Card Adapter Diskette then there is no OS/2 support and you must choose to install DOS drivers.
2. Reboot the machine to affect the changes.

3. Put in the Credit Card Adapter Diskette (one that came with adapter) into the ThinkPad and type `a:install`.
4. Choose `NDIS environment for LAN support`, or `NetWare environment for NetWare`.
   a. NDIS: Say `no` to installing the NDIS driver
   b. NetWare: Say `yes` to installing the driver -- all this does is update NET.CFG. despite specifying a directory in Install, NET.CFG is always saved to the root directory.
5. For card enabler parameters, see the READ.ME file on the Credit Card adapter diskette that came with the adapter.

Sample files:

Card and Socket Services with EMM386 and NetWare

CONFIG.SYS:

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\SETVER.EXE
FILES=30
BUFFERS=20
STACKS=9,256
LASTDRIVE=Z
DEVICE=C:\IBMDSS02.SYS   \
DEVICE=C:\IBMDOSCS.SYS    \ CARD AND SOCKETS
DEVICE=C:\DICRMU02.SYS    /    SERVICES
DEVICE=C:\$ICPMDOS.SYS   /
DEVICE=C:\DOS\EMM386.EXE X=D400-D7FF
DOS=HIGH
```

AUTOEXEC.BAT:

```
LSL        \
PCMDMCS     \ NETWARE ODI DRIVERS (ROUTE
ROUTE       / ONLY IF NEED SOURCE ROUTING)
IPXODI     /
NETX


NET.CFG:

Link Driver PCMDMCS
   MEM FFFFFFFF
   FRAME ETHERNET_802.3  --IF SERVER IS 802.2, MAKE SURE THAT
                         IT IS "FRAME ETHERNET_802.2"; NORM
                         IS 802.3.  CAN HAVE MULTIPLE FRAME
                         STATEMENTS, BUT THE SERVER PROTOCOL
                         MUST BE FIRST.
```

Card and Socket Services with LAN Support

CONFIG.SYS:

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\SETVER.EXE
FILES=30
BUFFERS=20
STACKS=9,256
LASTDRIVE=Z
DEVICE=C:\IBMDSS02.SYS  \
DEVICE=C:\IBMDOSCS.SYS   \ CARD AND SOCKET
DEVICE=C:\DICRMU02.SYS   /   SERVICES
DEVICE=C:\$ICPMDOS.SYS  /
DEVICE=C:\DOS\EMM386.EXE X=D400-D7FF
DOS=HIGH
DEVICE=\LSP\PROTMAN.DOS /I:\LSP  \
DEVICE=\LSP\PCMNICCS.DOS        \
DEVICE=\LSP\DXMA0MOD.SYS 001     > LAN SUPPORT NDIS DRIVERS
DEVICE=\LSP\DXME0MOD.SYS        /   (REQ'D FOR ETHERNET)
DEVICE=\LSP\DXMT0MOD.SYS O=N    /
```

AUTOEXEC.BAT:

```
@ECHO OFF
\LSP\NETBIND  --- BIND THE NDIS MAC DRIVER
PROMPT $P$G
PATH C:\DOSLAN;C:\DOS
SET TEMP=C:\DOS
C:\DOS\DOSKEY.COM
```

PROTOCOL.INI:

```
[PROTMAN_MOD]
     DriverName = PROTMAN$
[DXMAIDXCFG]
     DXME0_MOD = DXME0.NIF
     PCMNICCS_MOD = PCMNICCS.NIF
     PCMNICCS2_MOD = PCMNICCS.NIF
[DXME0_MOD]
     DriverName = DXME0$
     Bindings = PCMNICCS_MOD
[PCMNICCS_MOD]
     DriverName = PCM_CS$
     IOBASE = 0X300
     INTERRUPT = 5
     RAMADDRESS = 0Xd4000
     PCMCIA
[PCMNICCS2_MOD]
     DriverName = PCM_CS2$
     IOBASE = 0X300
     INTERRUPT = 5
     RAMADDRESS = 0Xd4000
     PCMCIA
```

Point Enabler with LAN Support

CONFIG.SYS:

```
DEVICE=C:\POINTETH.SYS SA RS=16 --- POINT ENABLER
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\SETVER.EXE
FILES=30
BUFFERS=20
STACKS=9,256
LASTDRIVE=Z
DEVICE=C:\DOS\EMM386.EXE X=D400-D7FF
DOS=HIGH
DEVICE=\LSP\PROTMAN.DOS /I:\LSP \
DEVICE=\LSP\PCMNICCS.DOS       \
DEVICE=\LSP\DXMA0MOD.SYS 001     > LAN SUPPORT NDIS DRIVERS
DEVICE=\LSP\DXME0MOD.SYS       /    (REQ'D FOR ETHERNET)
DEVICE=\LSP\DXMT0MOD.SYS O=N   /
```

AUTOEXEC.BAT:

```
@ECHO OFF
\LSP\NETBIND  --- BIND THE NDIS MAC DRIVER
PROMPT $P$G
PATH C:\DOSLAN;C:\DOS
SET TEMP=C:\DOS
C:\DOS\DOSKEY.COM

PROTOCOL.INI:

[PROTMAN_MOD]
     DriverName = PROTMAN$
[DXMAIDXCFG]
     DXME0_MOD = DXME0.NIF
     PCMNICCS_MOD = PCMNICCS.NIF
     PCMNICCS2_MOD = PCMNICCS.NIF
[DXME0_MOD]
     DriverName = DXME0$
     Bindings = PCMNICCS_MOD
[PCMNICCS_MOD]
     DriverName = PCM_CS$
     IOBASE = 0X300
     INTERRUPT = 5
     RAMADDRESS = 0Xd4000
     PCMCIA
[PCMNICCS2_MOD]
     DriverName = PCM_CS2$
     IOBASE = 0X300
     INTERRUPT = 5
     RAMADDRESS = 0Xd4000
     PCMCIA
```

Card and Socket Services with LAN Support and NetWare Interoperability

CONFIG.SYS:

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\SETVER.EXE
FILES=30
BUFFERS=20
STACKS=9,256
LASTDRIVE=Z
```

```
DEVICE=C:\IBMDSS02.SYS   \
DEVICE=C:\IBMDOSCS.SYS    \ CARD AND SOCKET
DEVICE=C:\DICRMU02.SYS    /    SERVICES
DEVICE=C:\$ICPMDOS.SYS   /
DEVICE=C:\DOS\EMM386.EXE X=D400-D7FF
DOS=HIGH
DEVICE=\LSP\PROTMAN.DOS /I:\LSP  \
DEVICE=\LSP\PCMNICCS.DOS         \
DEVICE=\LSP\DXMA0MOD.SYS 001      > LAN SUPPORT NDIS DRIVERS
DEVICE=\LSP\DXME0MOD.SYS         /    (REQ'D FOR ETHERNET)
DEVICE=\LSP\DXMT0MOD.SYS O=N    /
```

AUTOEXEC.BAT:

```
@ECHO OFF
\LSP\NETBIND   --- BIND NDIS MAC DRIVER
PROMPT $P$G
PATH C:\DOSLAN;C:\DOS
SET TEMP=C:\DOS
LSL     \
PCMDMCS   \  NETWARE DRIVERS (ROUTE ONLY IF NEED SOURCE
ROUTE     > ROUTING -- ALSO, PCMDMCS BINDS NDIS TO ODI;
IPXODI    /  NEITHER ODI2NDI NOR LANSUP WORKS)
NETX    /
C:\DOS\DOSKEY.COM

PROTOCOL.INI:

[PROTMAN_MOD]
     DriverName = PROTMAN$
[DXMAIDXCFG]
     DXME0_MOD = DXME0.NIF
     PCMNICCS_MOD = PCMNICCS.NIF
     PCMNICCS2_MOD = PCMNICCS.NIF
[DXME0_MOD]
     DriverName = DXME0$
     Bindings = PCMNICCS_MOD

[PCMNICCS_MOD]
     DriverName = PCM_CS$
     IOBASE = 0X300
     INTERRUPT = 5
     RAMADDRESS = 0Xd4000
     PCMCIA
[PCMNICCS2_MOD]
     DriverName = PCM_CS2$
     IOBASE = 0X300
     INTERRUPT = 5
     RAMADDRESS = 0Xd4000
     PCMCIA


NET.CFG:

Link Driver PCMDMCS
  MEM FFFFFFFF
  FRAME ETHERNET_802.3  --IF SERVER IS 802.2, MAKE SURE THAT
                  IT IS "FRAME ETHERNET_802.2"; NORM
                  IS 802.3.  CAN HAVE MULTIPLE FRAME
```

```
STATEMENTS, BUT THE SERVER PROTOCOL
MUST BE FIRST.
```

E.1.4 The ThinkPad 350/350C

This section is of its own since the Credit Card adapters in these machines are configured quite differently than in the 720's; these ThinkPads come pre-loaded with DOS and the Card and Socket Services drivers for the PCMCIA adapters; as of yet, they have no OS/2 support (August 27, 1993).

The Card and Socket Services drivers should all be loading, and in this order:

```
DEVICE=C:\DOS\PCMSS.EXE
DEVICE=C:\DOS\PCMCS.EXE /WAIT=12 /ADDR=C8 /IRQ=10
DEVICE=C:\DOS\PCMMTD.EXE
DEVICE=C:\DOS\PCMSCD.EXE /BEEP /COM=2 /RS=4
```

The EMM386 is preconfigured as well and should be left as is. The only installation procedures for the card will be the networking software and drivers (like LAN support and DOS Requester, or NetWare) and if using NDIS drivers requiring a PROTOCOL.INI, the LAN Support Program will create that file for you or you can create it manually using the previous samples in the token-ring and ethernet DOS sections as guides. For creating a NET.CFG, use the above token-ring and ethernet DOS sections NET.CFG files as guides. For users of NetWare: If you find that the NETX hangs, try the /NODB parameter on the PCMSCD.EXE line: `DEVICE=C:\DOS\PCMSCD.EXE /BEEP /COM=2 /RS=4 /NODB`

Any other questions should be directed to 800-772-2227 for end users and 1-800-IBM-prod for IBM authorized dealers.

E.2 OS/2 Warp README File

This section is an excerpt from the OS/2 Warp with WIN-OS/2 README file. The complete README is in the root directory of the drive that you install OS/2 Warp on. The opening paragraphs are left untouched as is the table-of-Contents, showing all 18 Chapters. Only chapter 9 is reprinted in full here, as it pertains to PCMCIA support. This was done so that you could browse the complete README file contents to quickly determine if it contains other relevant data for you.

E.2.1 Actual README file

Welcome to OS/2* Warp Version 3 with DOS and Windows** Application Support (hereinafter called OS/2). This README contains the latest information available. It also contains helpful hints found in our testing.

The README is only one source of information provided with OS/2. Greater detail can be found in:

- *The User's Guide to OS/2* (of the according OS/2 Warp Version)
- *Using OS/2* (of the according OS/2 Warp Version)
- The Information folder located on the Desktop, which provides new online books to help you learn and develop skills using OS/2:
  - Master Help Index
  - Command Reference
  - REXX Information
  - Multimedia
  - Printing in OS/2
  - Performance Considerations
  - Application Considerations
  - Windows Programs in OS/2
- *The Application Considerations* online book, for example, contains helpful hints on running games under OS/2. The *Printing in OS/2* online book helps with installing new printers or solving problems. These are a few of the many items found in the new online books.

To locate information in this README, you can use the Find option in the Edit menu of the OS/2 System Editor. You can print the file by dragging it to your printer object or by using the Print choice on the pop-up menu for the README object.

```
CONTENTS
________

 1.0  Creating Diskette Images from the OS/2 CD
 2.0  Archiving the Desktop
 3.0  Receiving a Startup Warning Message
 4.0  Customizing the SET AUTOSTART Line in CONFIG.SYS
 5.0  Installing the New OS/2 Scheme Palette
 6.0  Correcting Sound Problems after System Installation
 7.0  Changing Display Resolution Using the System Object
 8.0  Using Laptop Computers with Monochrome Monitors
 9.0  Using a ThinkPad 720 with PCMCIA
10.0  Using an IBM  ThinkPad Dock II Expansion Unit
11.0  Installing a Windows Printer Driver from the OS/2 CD
12.0  Using Win32s Versions 1.0 and 1.1 Applications
```

```
13.0  Using the Comet Cursor in Lotus** Notes
14.0  Installing Pen for OS/2
15.0  Using DeScribe 4.0 for OS/2
16.0  Installing Microsoft Office on an IBM PS/2
17.0  Running Games Using OS/2
18.0  Trademarks
```

E.2.2 Using A ThinkPad 720 with PCMCIA

A ThinkPad 720 or 720C with OS/2 installed does not suspend when a PCMCIA modem card is plugged into it.

The following procedure can be used to correct this problem. (This procedure assumes that you already have Plug and Play for PCMCIA installed.)

1. Open an OS/2 Window.
2. At the OS/2 command prompt (C:\), type the following and then press Enter:

   MD ThinkPad

3. If you are using the ThinkPad 720 PCMCIA Utility diskette, do the following:

   a. Insert the ThinkPad 720 PCMCIA Utility diskette into drive A. (If you do not have the ThinkPad 720 PCMCIA Utility diskette, contact the IBM PC Co. BBS at (919) 517-0001 and request the file TPPCM112.EXE in section 37.)

   b. Type the following and then press Enter: `COPY A:\$ICPMOS2.SYS C:\THINKPAD`

4. If you are using PlayAtWill from PCWares, do the following:

   a. Insert the PlayAtWill diskette in drive A.

   b. Type the following and then press Enter: `CD THINKPAD`

   c. Type the following and then press Enter: `UNPACK A:\EZPLAY\$ICPMOS2.SY@`

5. At the OS/2 command prompt, type the following and then press Enter: `E CONFIG.SYS`
6. Add the following line to the end of the CONFIG.SYS file: `DEVICE=C:\THINKPAD\$ICPMOS2.SYS`
7. Change the following line in the CONFIG.SYS file from:

   - BASEDEV=IBM2SS02.SYS to:

- BASEDEV=IBM2SS02.SYS /RIO=2

8. Save the changes to the CONFIG.SYS file.
9. Shut down and restart your computer.

Appendix F. Installation of Non-Supported CD-ROM Drives

Installation of certain CD-ROM drives which are not supported in OS/2 Warp can be a problem. This chapter describes how to solve problems with non-supported CD-ROM drives.

The scenarios discussed here cover the following CD-ROM drives:

- Creative Labs:
  - Sound Blaster Value CD 4X
  - Sound Blaster Discovery 4X
  - Blaster CD 4X
  - Digital Schoolhouse 4X
- Mitsumi FX400
- Sony 55E

Other CD-ROM drives that are not supported under OS/2 Warp, can be added by installing the latest drivers. You can find the drivers in the /OTHERDR subdirectory on the CD-ROM in the back of this book.

These drivers also contain several modifications to the driver which allow other IDE CD-ROMs with not 100% compliant hardware to work with OS/2 Warp.

You must use these new files to replace the existing copies supplied by whatever version of OS/2 you are using. All four system files must be replaced (or added). This are the four system files:

```
IBM1S506.ADD
IBMIDECD.FLT
OS2CDROM.DMD
OS2DASD.DMD
```

You will find the latest drivers supplied on the CD-ROM labelled OS/2 Warp Device Drivers in the back of this book, in the /DENMKBBS/CDROM subdirectory, the /OTHERDR subdirectory or from the bulletin board listed in B.3, “Bulletin Boards” on page 330.

F.1 Installation if OS/2 Is Already Installed

To install the drivers on a existing OS/2 or OS/2 Warp follow this procedure. If you don't have OS/2 or Warp installed go to F.2, “Installation if No OS/2 Is Installed on Your Fixed Disk” on page 380 for the installation procedure.

1. Run Selective Install to install the files for the OS/2 CD-ROM Device Manager and OS/2 CD-ROM File System.
   a. Open the **OS/2 System** folder on the Desktop.
   b. Open the **System Setup** folder.
   c. Open **Selective Install**.
   d. Select the **CD-ROM Device Support** check box in the System Configuration notebook.
   e. Scroll to the bottom of the CD-ROM device list table and
      - Select the choice **OTHER** for OS/2 2.1.
      - Select the choice **Non-listed IDE CD-ROM** for OS/2 Warp.

   Figure 113 shows the System Configuration Notebook.

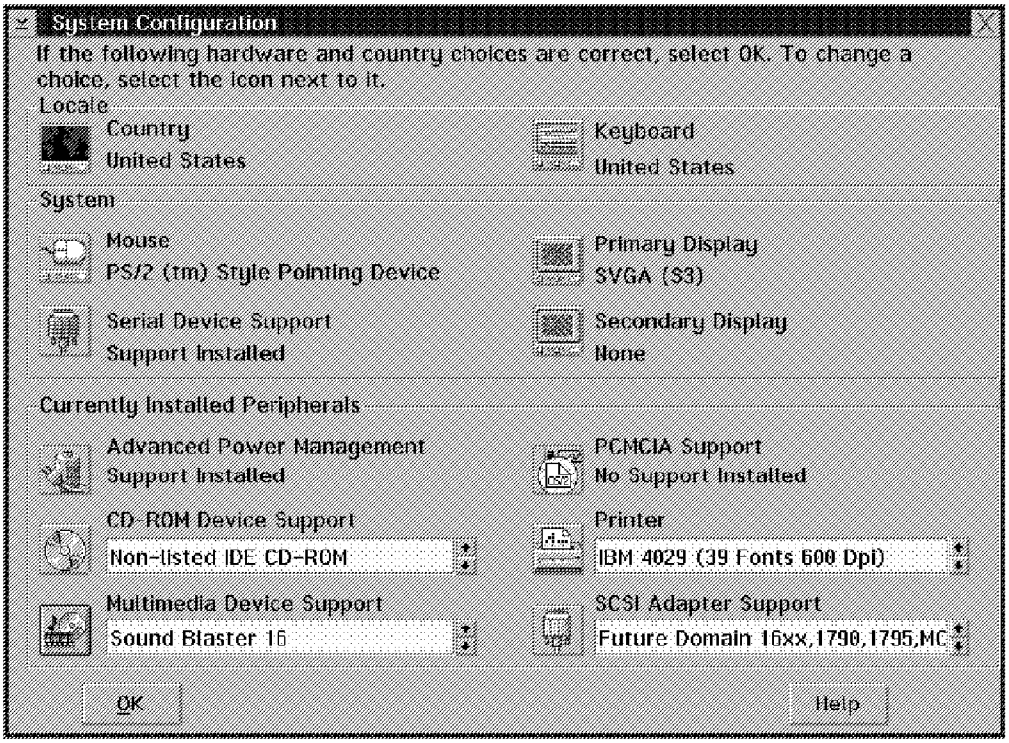


Figure 113. System Configuration Notebook

f. Select **OK** to close CD-ROM Device Support notebook.

g. Select the **OK** pushbutton to proceed from the System Configuration screen to the OS/2 Setup and Installation window.

h. Select **Install**.

i. When prompted to do so, insert the numbered installation diskettes.

j. Follow the installation instructions on the screen.

k. Reboot the system.

2. Use the the CD-ROM labelled OS/2 Warp Device Drivers in the back of this redbook. Copy the four files from the subdirectory \OTHERDR over the existing files which were installed in Step 1, to their proper location on your system. In OS/2 Warp it is the subdirectory \OS2\BOOT. Check by typing

   ```
   HELP IBM1S506.ADD /S
   ```

   on your system command line.

3. IDE CD-ROM drives that adhere to the ATAPI will be detected automatically if they are configured on the primary or secondary IDE channel.

   If your IDE channel is not the primary or secondary, or if your IDE channel is not using the default I/O ports and IRQs, type

   ```
   HELP IBM1S506.ADD
   ```

   at an OS/2 command prompt to get detailed information on changing or adding channels.

4. Some drives do not respond to an ATAPI command. These drives can not be auto detected and require an additional parameter on the IBM1S506.ADD line in CONFIG.SYS. This are the parameters you have to add after the BASEDEV=IBM1S506.ADD statement.

   ```
   BASEDEV=IBM1S506.ADD /A: x /U: y /ATAPI
   ```

   Where x is the adapter number and y is the unit number.

   Parameter /A: indicates which IDE drive connector on your adapter contains the cable that the CD/ROM IDE drive is connected to.
   If you have only one IDE controller, this is Adapter 0, /A:0
   If you have two IDE controllers, and the IDE CD-ROM is connected to the second controller cable, this is Adapter 1, /A:1.
   The Enhanced IDE specifications allow for four adapters, so /A: could also be 2 or 3 in your system.

Parameter /U: indicates which IDE controller you are using. Each IDE controller can drive up to two drives. If the CD-ROM drive is jumpered as the master then this is unit 0, /U:0; otherwise it is unit 1, /U:1. It is not possible to have a device configured as slave without a master on the same controller.

Parameter /atapi or /ATAPI informs the IBM1S506.ADD driver that this unit (/A: /U:) is an ATAPI (IDE attached) CD-ROM drive.

Edit now your CONFIG.SYS.

Locate the BASEDEV=IBM1S506.ADD line.

If you have NO parameters on this line, then ADD the parameters as defined above, /A:? and /U:? See here an example line with the CD as slave on controller 1.

```
BASEDEV=IBM1S506.add /A:0 /U:1 /ATAPI
```

If you already have parameters, and have an /A:? parameter already, make sure to add just the /U:? parameter for that adapter.

5. If you are using OS/2 2.11 or earlier, you will need to add the following statement in your CONFIG.SYS.

   ```
   BASEDEV=IBMIDECD.FLT
   ```

   If you have OS/2 Warp installed, choose `NON listed IDE CD-ROM` this will cause this line to be placed in the CONFIG.SYS automatically.

6. Shut down and restart your system.

F.2 Installation if No OS/2 Is Installed on Your Fixed Disk

Here you will find the procedure to install the CD-ROM drivers before you have installed any OS/2 or OS/2 Warp. To get your CD-ROM drive support, follow this description.

1. Create the CD Install Disk 1 from the OS/2 Warp CD-ROM, or XCOPY your existing Installation Diskette 1 to a new diskette.
2. There are four device driver files which you need to update on your Disk 1. You can find these files in the /OTHERDR subdirectory on the CD-ROM in the back of this book. These files are:

   ```
   IBM1S506.ADD
   IBMIDECD.FLT
   OS2CDROM.DMD
   OS2DASD.DMD
   ```

   Copy these four files over the files on Disk 1.

3. For some drives you have to edit the CONFIG.SYS on Disk 1 and modify the BASEDEV=IBM1S506.ADD line as described before (adding the /A and /U parameters).
4. If you are using OS/2 2.11 or earlier, add the following statement to the CONFIG.SYS and copy the associated file onto Disk 1.

   ```
   BASEDEV=IBMIDECD.FLT
   ```

5. If you are using OS/2 Warp, add the following statement to the CONFIG.SYS on Disk 1:

   ```
   SET COPYFROMFLOPPY=1
   ```

6. Boot with the Installation Disk, then insert Disk 1 when prompted and proceed with the first installation phase.
7. If you are using OS/2 Warp, skip to Step 8. Because the installation program uses copies of these files from a packed file on the installation diskettes, the updated drivers you copied in Step 2 are copied over with the older ones on your hard disk. You must fix this manually.

   When you are asked to reboot to continue the installation, insert the Installation Disk and press Ctrl-Alt-Del. Follow the installation procedure through Disk 1 up to the installation panel. Press F3 on the installation panel to get to to the command prompt. Go to the drive where you will install OS/2 Warp. You have to change the read-only attribute on the IBM1S506.ADD file. Do this by typing from the command line:

   ```
   /os2/attrib -r \os2\ibm1s506.add
   ```

   Copy the updated files (OS2CDROM.DMD, IBM1S506.ADD, and IBMIDECD.FLT) from Disk 1 to the proper location on the installation partition.
8. Type EXIT on the command line.
9. Remove the diskette from A: and reboot.
10. Complete the rest of the installation.

After installation of these drivers most CD-ROM drives should work now. If you do not get the CD-ROM drive to work, contact the hardware manufacturer for providing you with the correct drivers for the CD-ROM drive.

Follow the procedure as described before to install these drivers for that CD-ROM drive.

Appendix G. Information on Included CD-ROM Discs

This appendix describes the contents of the two CD-ROM discs which accompany this book. Each root directory on the disc contains a README file which lists the contents of the directory.

G.1 Hobbes CD-ROM

The `Hobbes OS/2 Archived` CD-ROM, published by Walnut Creek CDROM, contains thousands of OS/2 programs direct from the Hobbes Internet Software Collection at: hobbes.cdrom.com, including hundreds of device drivers.

Most of the files on the disk are either zip or zoo archives. There are programs provided in the UTILS\DOS and UTILS\OS2 directories for extracting these files.

There is a program included that will help you move around the disk. Type `view` or `os2view` when in the root directory of the CD-ROM drive. This program navigates through the complete zipped collection.

Here is a list of the important files and directories:

```
readme.txt         Contains this information and vendor contact data
00_index.txt       List of all the files and descriptions
filename.txt       List of all the files and absolute paths
docs\             Walnut Creek CD-ROM documentation
utils\dos\         Utility programs for using zip files from MS-DOS
utils\os2\         Utility programs for using zip files from OS/2
archiver\          Compressors/decompressors
comm\             Communication programs/utilities
demos\            Commercial software demos
dev16\            16-bit development utilities/source code
dev32\            32-bit development utilities/source code
diskutil\          File/directory/disk utilities
drivers\           Device drivers
editors\           Editors and browsers
games\            Games
graphics\          Graphics-related programs/utilities
info\             Various text/information files
mmedia\           Multimedia-related programs/utilities
network\           Network drivers/programs
newsltr\           Programming-related newsletters/columns
```

```
patches\          Warp patches/software updates
printer\          Printer utilities
tex\             TeX typesetting language utilities
textutil\         Various text-based utilities/programs
unix\            Unix-related programs/ports
warp\            OS/2 Warp.x-specific files
wpsutil\          Various PM/Workplace Shell-based utilities/progra

OS/2 treats all files that are on a CD-ROM as being read only.  This
attribute is carried with the file when it is either copied or "dragg
and dropped" to a hard disk or floppy.  This attribute must be cleare
before the file can be deleted.  From the command prompt type:
attrib -r <filename&rt. or, from the Program Manager, open the setti
pages for the file, select file, go to the third page, and un-check t
read-only box.
```

This CD-ROM disk is included with this book for the purpose of providing easy access to device drivers and other useful tools and information. It is an example of the many sources of such information and programs available, as listed in Appendix B, “OS/2 Device Driver Sources” on page 325.

Subsequent printings or updates to this redbook, if any, will not contain the Hobbes OS/2 Archive CD-ROM. This disk is intended to accompany the redbook and may not be replicated, sold, or redistributed.

Many programs on this disk are shareware. You are free to try each program for a limited amount of time. If you are satisfied, and want to continue to use the program, you are expected to register the program. You register by sending a specified amount of money directly to the author of the program. Often the author will send you the most up-to-date version of the program and a printed manual. Please check the individual files for specific information.

G.2 The OS/2 Warp Device Drivers CD-ROM

The second CD-ROM called **OS/2 Warp Device Drivers** provided with this redbook contains a huge collection of device drivers along with utilities, programs, graphics, movies, photos and sounds to help you test your devices and device drivers.

The largest collection of device drivers on the disk is provided courtesy of Anders Thue Pedersen from IBM Technical Dealer Support in Denmark. Anders maintains the files on a BBS and can be reached as follows:

```
e-mail:  anderst@vnet.ibm.com
VM    :  ANDERST at DKIBMVM2
SYSOP ON:
IBM OS/2 BBS - Denmark
Phone:  +45 - 4596 5077
10 lines, 28.8k BAUD, 24h
Running on XyZel 2864 modems with V.34
All drivers are located in the SYS.**** areas.  Contact the SYSOP if
in doubt.  New drivers are added daily.
```

These device drivers are located on the disk in the DENMKBBS directory in the following sub directories:

```
Display --- Display drivers
Printer --- Printer drivers
Multimed -- Multimedia device drivers
Netcard --- Netcard drivers
Pointing -- Pointing device drivers
Misc ------ Miscellaneous device drivers
Drives ---- Hard disk and floppy device drivers
Comm ------ Communications device drivers
CDROM ----- CD-ROM drivers
Apapter --- Adapter drivers
```

Each of the directories contains a README file which can be viewed to see the details of the directory contents.

The next set of device drivers was downloaded from the BBS at the IBM PC Company, via FTP from their web site at:

`http://www.pc.ibm.com/files.html/.`

The IBMPCDRV directory on the disk contains all of the drivers that were on the PC Company BBS at the time the disk was created. View the README file to see a list of the contents sorted alphabetically.

PCEWS contains employee-written software. See the README file for descriptions of the files.

PCGRAPH contains graphics files. See the README file for descriptions of the files.

PCUTIL contains utilities. See the README file for descriptions of the files.

MOVIES contains movies which you can use to test your devices and device drivers.

PHOTOS contains pictures in PhotoCD format which you can use to test your devices and device drivers.

SOUNDS contains music and sound effects files which you can use to test your devices and device drivers.

OTHERDR contains files referenced in Appendix F, “Installation of Non-Supported CD-ROM Drives” on page 377. See the README file for descriptions of the files.

OS/2 treats all files that are on a CD-ROM as being read only. This attribute is carried with the file when it is either copied or dragged and dropped to a hard disk or floppy. This attribute must be cleared before the file can be deleted. From the command prompt type: attrib -r <filename&rt. or, from the Program Manager, open the settings pages for the file, select file, go to the third page, and un-check the read-only box.

Glossary

A

access. An interaction to obtain information from any source or to communicate.

adapter. A part that electrically or physically connects a device to a computer or to another device.

address. In data communication , the unique code assigned to each device or workstation connected to a network.

APAR. Authorized Program Analysis Report. When a defect in an operating system is reported to IBM technical support, an APAR is opened. All APARs are assigned numbers. OS/2 Warp APARs are in the format PJxxxxx.

application program. A program written for or by a user that applies to the user's work, such as a program that does inventory control or payroll.

API. Application Program Interface. Interface through which programs can communicate.

ASCII. American National Standard Code for information interchange: a coded character set used on personal computers.

ASPI. Advanced SCSI Programming Interface is a software specification developed by Adaptec. It defines a standard software interface to the SCSI bus independent of the host bus adapter manufacturer's hardware implementation that allows multiple SCSI device drivers to submit I/O requests to one adapter card.

asymmetric multiprocessing. Unequal distribution of tasks across multiple processors.

asynchronous I/O. I/O operations that are performed separately from the job that requested them.

ATAPI. Advanced Technology (AT) Attachment Packet Interface: the specification that allows SCSI commands to be packetized and transmitted on the IDE channel. This includes CD-ROM drives and tape drives under OS/2 Warp.

B

Base Video Handler. Part of OS/2 Kernel that handles all OS/2 full-screen operations, including both text and graphics in different resolutions.

Base Video Services. Part of OS/2 kernel that provides services to the Presentation Device Driver, Base Video Handler and the Virtual Video Device Driver.

batch File. On a personal computer, a file having the extension .BAT, which contains a list of commands that are executed when the file is called.

BBS. Bulletin Board System: An online computer service that subscribers use to post and circulate messages. These services operate through modems, which connect the subscriber's computers to the BBS.

bitmap. (1) An area of memory or storage that contains the pixels representing an image, arranged in the sequence in which they are normally scanned, to display the image.
(2) A representation of an image by an array of bits.

BIOS. The area of the computer that controls incoming and outgoing signals.

boot. The process of starting up a personal computer.

boot drive. Logical drive from which the operating system is loaded. Generally it is the disk drive (C). It can, however, also be a floppy drive (A).

Boot Manager. Feature of OS/2 which allows multiple partitions to exist on fixed disks in the same machine, with a separate operating system on each partition. At boot time, the user may select the desired operating system with which to start the machine.

boot protection. Prevention of a system start from a medium other than the hard disk (or boot ROM). A system start with an operating system diskette is prevented.

bus. In a processor, a physical facility to transfer data; for example, ISA, MCA. Adapter cards are connected to a bus.

byte. A string that consist of a number of bits, treated as a unit, and representing a character.

C

Card Services. A key element of PCMCIA software architecture. A software management interface that allows you to allocate the system resources (such as memory interrupts) automatically, once the Socket Services detects that a PC Card has been added. Card Services also releases these sources when the PC Card has been removed.

CDFS. CD-ROM File System is a device driver loaded by OS/2 Warp when a CD-ROM drive. is attached to a computer system. It provides read-only access to data on the CD-ROM. stored on CD-ROM media.

CD-ROM. Compact Disc Read Only Memory. A Compact disc specifically for storing data.

CD-ROM XA. Compact disk read-only-memory extended architecture. A partial implementation of CDI and DVI standards.

Central Service Task. A part of VWIN that contains a list of all Presentation Task and the VDM. It routes the broadcast messages from the VDM or Presentation Task.

CGA. Color Graphics Adapter. A video adapter that provide low-resolution color adequate for some older DOS-based applications.

channel. A connection between a personal computer and one or more input/output devices.

checksum. The sum of a group of data, used for checking purposes.

chipset. An integrated circuit or a set of integrated circuits that provide hardware support for a related set of functions, such as video.

CID. The IBM architected way to automate installation and customization for Workplace and other products. CID enables LAN connected machines to be installed and maintain remotely.

CID enabled.. CID enabled product can access its product images on the code server. The configuration and installation is done via response file. The product's installation program, which interprets the response file leaves CID standard return codes.

client. In the Workplace architecture client-server environment, the consumer of a service. An example is an application or shared service using a client library to communicate with the Workplace Naming Services to retrieve information from the system's name space.

Client/Server System. A client/server system is a LAN local network.

clip board. A temporary storage area used to pass information within a program or from a program to another.

CMOS. A chip technology that requires little power, used to store vital configuration data of a PC.

COM. Serial interface for data communication. Is used to connect a modem, for example. Can only be achieved by encryption.

configuration. The manner in which the hardware and software of an information processing system are organized and interconnected.

CONFIG.SYS. A file that the operating system adds to the root directory during installation. This file contains statements that set up the system configuration each time you restart the operating system.

controller. A device that controls the operation of input/output devices.

conventional memory. Random Access memory in a PC that DOS or OS\2 uses as the first 640K byte.

CRC. Cyclic Redundancy Check. Checksum which is not cryptographic.

CSD. Corrective Service Diskette are issued to apply maintenance to IBM operating systems.

D

DAC. Digital-to-Analog Converter converts the digital description of the monitor into red, green and blue signal to display on your monitor.

DASD. Direct Access Storage Device including fixed disks, CD-ROM drives, optical drives.

DCA. Data Communications Adapter.

device. A physical unit of a computer system, often used for input/output operations, which can be used in a logical order or have a logical address.

device driver. Code which handles the translation of generic device commands into specific commands for the required physical device and vice versa, allowing operating system interaction with physical devices attached to the system.

DDK. Device Driver Kit; a set of programming tools provided for external device drivers developers.

Device Driver Interface (DDI). Part of Graphics Engine that is responsible for serializing all the calls from PMGPI.

Device Manager. A Device Manager is a hardware-independent module that services the standard OS/2 request packet interface.

directory. A hierarchically structured logical area for storing files on a hard disk or diskette, which may include one or more sub-directories.

DLL. Dynamic Link Library: application module containing routines and/or resources, which is dynamically linked with its parent application at load time or runtime rather than during the linkage editing process. The use of DLLs enables decoupling of application routines and resources from the parent program, enhancing code independence, facilitating maintenance and reducing resident memory consumption.

DMA. Direct Memory Addressing is a technique by which transfers to and from system memory are made by an independent control chip rather than by the system's main processor, thereby resulting in improved overall performance.

DMF. Distributed Management Facility.

DMQS. Display Mode Query and Set is a feature of XGA-2 adapters.

DOS. Disk Operating System, an operating system for personal computers.

domain. Organizational unit which is commonly managed. Also known as system.

downlevel. Not being at the current release of code.

download. To transfer programs or data from a computer to a connected device.

DPMI. DOS Protected Mode Interface.

DSC. Display Configuration Files are ASCII files called during video display driver installation which contain commands for installing the required drivers for each video resolution available.

Dynamic Data Exchange (DDE). A messaging protocol that allows PM applications to exchange data via shared memory. DDE transactions always take place between a client application and a server application. The client initiates a dialog with the server by requesting data from the server. The server responds by providing the request data to the client.

Dynamic Link Library (DLL). A file containing executable code and that bound to a program at load time or run tome, rather during linking. The code and data in a dynamic link library can be shared by several applications simultaneously.

E

EGA. Enhanced Graphics Adapter is a PC display standard that specifies 640x350 pixels with 16-color capability from a palette of 64 colors.

emulate. To imitate one system with another so that the imitating system accepts the same data, processes the same programs, and achieves the same results as the imitated system.

ESDI. Enhanced Small Device Interface: a hard disk interface that provides a link between the disk drive and the system bus.

extended attribute. The OS/2 method of attaching additional information to a file object. Extended attributes can be used to store notes on file objects (for example, version, history), categorize file objects (e.g, file type, associations), describe the format of data contained in the file object, or append additional data to the file object. They are stored separately from the file object they are associated with and are managed by the file system attached to the file object.

extended data. User-defined information, including multimedia information, about Light Table folder objects. Such information goes beyond what is available in OS/2 standard data. Extended data includes user-defined columns, and may come either from a supported database or from extended attributes.

extension. In the name of a file, the three letters following the dot, which often indicates the type of file, for example, BAT in AUTOEXEC.BAT indicates batch file.

F

FAT. File Allocation Table is the file system implemented by DOS and also supported by OS/2. This file system uses a file allocation table to contain the physical sector addresses of all files on the disk.

FixPak. FixPaks are collections of operating system fixes which are issued by IBM for OS/2 Warp.

file system. In Workplace architecture, software that supports storing data on a storage device. File systems manage the physical locations of data on the storage devices for applications. File systems also manage file I/O operations and control the format of the stored data.

Filter Device Drivers. These drivers monitor the stream of commands between a Device Manager and a regular Adapter Device Drivers.

Flash RAM. An Integrated Circuit (IC) PCMCIA memory card that contains a battery source to maintain information on the card when it is written to memory.

folder. A directory as represented on the OS/2 Desktop.

Font. The characters available for text with a given set of attributes.

G

FTP. File Transmission Protocol

generation. The number of copies away from the original.

graphic. Any pictorial representation of information.

graphical user interface (GUI). A type of computer interface consisting of a visual metaphor of a real world scene, often of a Desktop. Within that scene are icons representing objects, that the user can access and manipulate with a pointing device.

graphics (video). Text or pictorial artwork created by a variety of means, such as electronic generated graphics software and the pressed onto the video-discs.

graphics engine. The drawing engine for a system. It manages display resources such as colormaps and bitmaps. The interface between the graphics transportation protocols and the presentation (display) and printer device drivers.

Graphics Programming Interface (GPI). Part of Presentation Manager which provides the means used by application to do graphics request.

H

hertz. A measure of frequency equivalent to cycles per second, abbreviated Hz.

HPFS. High Performance File System. HPFS provides long file name support and fast access to very large disk volumes.

I

Icon. A pictorial representation of a function that you can select to carry out this function.

IDE. Integrated Drive Electronics. This means that the controlling circuitry is contained on the hard disk itself instead of on an add-on PC adapter.

IFS. Installable file system, the mechanism in OS/2 that permits users to have multiple file systems active at the same time. Installable file systems are loaded during system startup and are attached to storage devices that they have formatted. File system requests for a storage device is directed to the file system that formatted that device.

image. A still picture or one frame.

INI. This refers to a file with an extension of .INI. These files contain configuration information. There are two main .INI files in OS/2 Warp: OS2.INI holds general configuration information about your system while OS2SYS.INI holds information about fonts and printers.

interface. Hardware and/or software that links systems, programs, or devices.

I/O. Input/Output: pertaining to a device that performs input and/or output operations.

IPL. Initial Program Load; the initialization of a computer.

IRQ. Interrrupt Request Signal. This is a hardware feature that lets a peripheral device interrupt the CPU when the peripheral device needs attention. The processor waits until the current instruction is completed before recognizing the request.

ISA. Industry Standard Architecture: IBM's original bus design found in XTs, ATs and compatibles. The ISA bus comes in both 8-bit and 16-bit versions.

ISO. International Standards Organization.

Interlace. The technique of using more than one vertical scan to reproduce a complete image. In television, a 2:1 interlace is used, giving two vertical scans per frame. One scan will be odd lines, the other will be even lines.

K

KB. Kilobyte: 1024 bytes.

Kilohertz (kHz). Thousands of cycles per second.

L

Local Area Network (LAN). A data network located on the user's premises in which serial transmission is used for direct data communication between workstations.

LAN. Local Area Network - local network consisting of server(s), the actual network and PCs as workstations. Safe Guard Professional OS/2 secures LANs.

link. (1) A logical connection, (2) A physical connection, (3) An interconnection between data or programs.

LPT. Parallel interface to attach a printer, streamer, etc.

M

Maintenance Desktop. OS/2 Warp saves the original "install" configuration of your Desktop and calls it the Maintenance Desktop. If your Desktop information becomes corrupt, you can revert back to the Maintenance Desktop during bootup by pressing ALT+F1 and choosing the correct option.

master-slave. A configuration in which one device or function, the master, always has control over another device or function, the slave.

MCA. MicroChannel Architecture was introduced with the IBM PS/2 . It is a 32 bit bus (some low end PS/2s have a 16 bit MCA bus) designed to allow more than one CPU in a single machine.

MFM. Modified Frequency Modulation pertains to the number of bytes of storage that can be stored on the recording media. The number of bytes is twice the number contained on the same unit area of recording media at single density.

migrate. (1) To move data from one storage media to another, (2) To change to a new operating environment.

module. Program module which takes over a specific function. Example: logging in a linear file on the server, or logging in a local ring buffer file. Modules can be swapped by the system administrator.

multimedia. The combination of different elements of media (text, graphics, audio and still images) for display and control from a personal computer

multi-user. Pertaining to serial or concurrent use by more than one user. Capable of distinguishing between different users and assigning individual user ownership of information.

multi-tasking. A technique that allows several processes to appear to run simultaneously, even though the computer only has one CPU. This is achieved by sequentially switching the CPU between tasks.

multiprocessor. A processing unit consisting of two or more independent processors acting as parallel.

N

network. (1) A network of devices and software connected for information interchange, (2) An arrangement of modes and connecting branches to interconnect computers, terminals and workstations.

National Language Support (NLS). The modification or conversion of a United States English product to conform to the requirements of another language or country. This can include the enabling or retrofitting of a product and the translation of nomenclature, MRI or documentation of a product.

non-interlace. The technique of using one vertical scan to reproduce a complete image. The scan refreshes each line sequentially in a display screen.

O

object. (1) Resource of the DP system, such as files, interfaces, networks, etc. (2).A visual component of a user interface that a user can work with to perform a task.

object linking and embedding (OLE). An application protocol established by Microsoft Corp. that allows objects created by one application to be linked to or embedded in objects created by another application.

object module. A binary executable or data component or both resulting from source assembly or compilation, or from secondary linkage of such object modules.

OEM. Equipment sold by another manufacturer.

P

panel. The set of information displayed on the screen of a display station.

parallel. Pertaining to the simultaneous transmission of individual parts of a whole. When a printer is connect to a parallel port, it receives an entire byte at a time.

password. In computer security, a string of characters used to gain access to a computer file or system, during sign-on or at a later time. A PIN can be considered as a password.

path. (1) In a network, any route between two nodes, (2) The route traversed by information exchanged between two network devices, (3) A command in DOS related to the path through its (sub)directory structure to reach a file.

PCC BBS. IBM PC Company Bulletin Board. This BBS contains a number of updated device drivers, reference diskettes and announcement letters all relating to IBM PC products.

PCI. The Peripheral Component Interconnect bus defines the data and control signals that travel between the CPU and its peripheral devices such as hard disk controllers. It has a 32-bit or 64-bit width.

PCMTABLE. Personal Computer Manufacturers' System Compatibility Table. This table depicts those PCM's systems that have passed compatibility testing with the IBM OS/2 products. The list is updated several times yearly and can be obtained from the PCC BBS, CompuServ, Prodigy as well as from internal IBM tools disks (MKTTOOLS).

PCMCIA (Personal Computer Memory Card International Association). A non-profit technical standards and trade association established to develop a common format for integrated circuit PC Cards. PCMCIA standards describe the physical requirements, electrical specifications, and software architecture for these cards. The key elements of the PCMCIA

software architecture are Socket Services and Card Services.

pel. Picture element. The smallest building block that a screen or bit-mapped image can display. Pel and pixel can be used interchangeably.

physical device driver. Protected mode device driver used by the OS/2 operating system and protected mode processes to access hardware devices. DOS applications running in VDMs do not directly access physical device drivers, instead they utilize virtual device drivers which communicate with the physical device driver.

pixel. A single point of an image, having a single pixel value, abbreviated pel.

PMI File. A file that contains data and commands necessary to provide support for modes beyond VGA in a non-BIOS environment. The information is used by VIDEOPMI to support display adapter.

PMWIN. Part of Presentation Manager which is responsible for creating, maintaining and destroying windows on the PM Desktop.

polling. Interrogation of devices for purposes such as to avoid contention, to determine operational status, or to determine readiness to send or receive data.

pooling. The means to combine print resources. Pooled printers appear on the Desktop as a single printer object that can print to two or more port, and routes the next print job to the first available port.

ppp-up. A window which appears on the screen to display text, graphics, messages, or documents.

port. In the Workplace architecture, a unidirectional asynchronous communication channel between a client and a server. A port has a single receiver and may have multiple senders. If a reply is provided to a service request a second port must be used.

presentation device drivers. Device drivers that process the high level function calls to the Presentation Manager interface and communicate with physical device drivers or the display hardware.

Presentation Manager (PM). The Workplace services that presents a graphics based interface to applications.

Presentation Driver (PD). Device-dependent tools used by Graphics Engine to map its graphics layout. Presentation Driver will be different for every hardware supported.

protocol. Rules and agreements for communication between devices.

Q

queue. A line or list formed by items waiting to be processed. For example, a list of print jobs waiting to be printed.

R

RAID. Redundant Array of Independent Devices. This is a scheme where data is written to several disk drives simultaneously and the parity data is collected or is sufficient to reconstruct data that is lost or corrupted

RAM. Random Access Memory: Memory where data can be written and read directly.

REM. Abbreviated form of REMARK which is the comment placed in front of lines that you do not wish to process in executable files such as CONFIG.SYS.

resolution. The density or sharpness of an image, either a displayed image or a printed image. The measurement is usually dots per inch.

RLL. Abbreviation for Run Length Limited which is an enhanced version of the MFM

format for hard disk drives that features 25 or 26 sectors per track. RLL formatted drives use the ST-506 interface.

ROM. Read Only Memory: memory to store programs or data permanently It may be read, but not written to, during system operations. ROM is typically used to store basic hardware initialization instructions, BIOS or self-testing code, which is required to be available prior to accessing the disk subsystem.

S

scanner. A device which performs scanning.

SCSI. Small Computer Systems Interface is a specification that allows up to seven SCSI devices to be attached to one SCSI controller. Each SCSI device can support an additional eight devices.

seamless Windows. A Windows application that runs in OS/2 Desktop, side by side with OS/2 applications and other Windows applications.

Serial. The sequential transmission of one element at a time.

Server. On a LAN, a station that provides services to other stations; for example, file server, print server, and security server.

session. The period of time that a network connection lasts, including the establishment and release of the connection.

shutdown. The process of selecting the Shutdown choice before the computer is powered off so that the data and configuration information is not lost.

slave. See **Master-Slave**.

spooler. A program that intercepts data going to a device driver and writes it to disk. The data is later printed or plotted when the required device is available. A spooler prevents output from different sources from being intermixed.

static RAM. Integrated Circuit (IC) PCMCIA memory cards on which information is burnt onto the card. This is in contrast with Flash RAM cards.

subject. A subject is a user or process which accesses objects (files etc.).

subsystem. A secondary or subordinate system, usually capable of operating independently.

SVGA. Super Video Graphics Array refers to video adapters that support both monochrome and color high resolution graphics and provides extended resolutions of 1024x768 and higher.

symmetrical multiprocessing. Equal distribution of tasks across multiple processors.

T

Token-Ring. An IBM network with a ring topology that passes tokens from one attaching device to another.

U

unpack.. To recover the original form of the data from the packed data. For example, to decompress a compressed file.

upload. To transfer data in a microcomputer to a storage device in a larger computer. For example, to transfer files to a BBS or online service.

user. Anyone who requires the use of services or programs from a computer.

V

VDD. See *Virtual Device Driver*.

VGA. Video Graphics Adapter mode which provides up to 256 colors.

VIDEOPMI. A shared module which communicates to/from the protected mode video device driver (BVHSVGA) as well as the virtual video device driver (VSVGA).

VIO API. Set of functions that is used to create application in OS/2 full screen.

Virtual Device Driver. A module that virtualizes hardware and ROM BIOS services on a per-VDM basis. They provide support for direct manipulation of memory-mapped I/O devices, and the direct programming of I/O ports.

Virtual DOS Machine (VDM). The place that each DOS application runs in v86 mode. It is a v86-mode variant of an OS/2 single-thread process. Each VDM executes a DOS application and emulates the functions of DOS in a virtual PC environment.

Virtual Video (VVIDEO). A component of Multiple Virtual Machine (MVM) that is responsible for routing all the video requests to hardware.

Virtual Video Device Driver. It is used by DOS applications which are running in a DOS session. It will provide direct manipulation of memory-mapped video I/O devices. It manages all access to the video memory, registers and video ROM BIOS.

Virtual Windows (VWIN). A virtual device driver that allows a Windows program to run on the OS/2 desktop. It is the link that passes messages from on GUI to another so that both environments can know about and adjust for each other.

VRAM. Video Random Access Memory is a variation of dynamic RAM that has two ports: the usual random-access port for access by a CPU, and a separate serial port that can output or input a serial stream of data at high rates independent of the activity on the random access port.

W

wildcards. Placeholders for any number of other characters. An asterisk (*) stands for a permitted set of any other characters. A question mark (?) stands for any other single character.

Windows Seamless Device Driver. It is a standard Windows display device driver. It is derived from the standard Windows driver by conditional compile

WinShield. It is the Windows counterpart of PMShield. WinShield serves a complementary purpose, maintaining Workplace Shell windowing state information for its VDM.

workstation. A terminal or microcomputer that often is connected to a main frame or a network, at which the user can perform applications.

WORM. Write-once-read-many. This usually refers to optical disks.

WPS. Workplace Shell.

X

XDF. eXtended Density Format. This is the format used to compress the OS/2 Warp installation package with the exception of the Installation Diskette and Diskette 1.

XGA. Extended graphics array. A high resolution display with a display matrix (pels) of 1,024 x 768 at 256 colors. XGA can also provide more colors with reduced resolution (640 x 480 at 65,536 colors).

Index

Numerics

A

B

C

D

E

F

G

H

I

J

N

O

P

Q

R

S

T

U

V

W

X

IBM®

Printed in U.S.A.