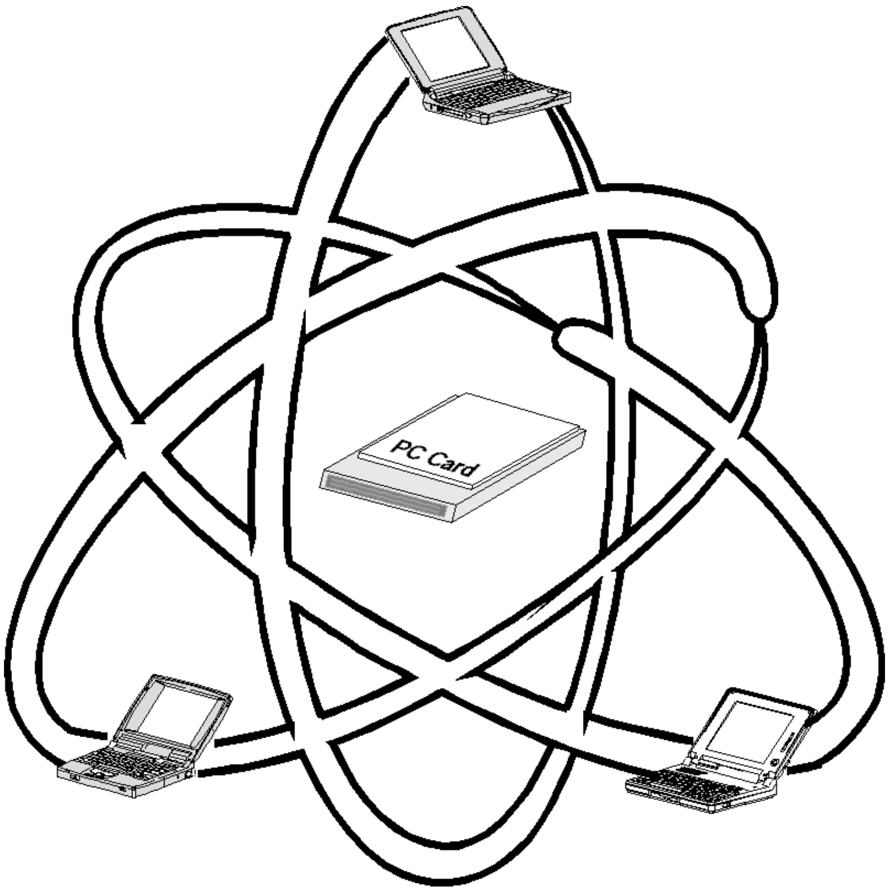
COMPAQ AND PCMCIA

COMPAQ PCMCIA WHITE PAPER
COMPAQ PCMCIA TESTED SOLUTIONS LIST
COMPAQ PCMCIA MEMORY OPTIMIZATION WHITE PAPER
COMPAQ PCMCIA THIRD PARTY NETWORK PC CARD CONFIGURATIONS

REVISION D



COMPAQ COMPUTER CORPORATION
February 1995

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Compaq PCMCIA White Paper, Revision D

Compaq Computer Corporation
February 1995

COMPAQ and PCMCIA

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Compaq PCMCIA White Paper

Compaq and PCMCIA

Compaq Computer Corporation has implemented PCMCIA technology on a variety of products, and continues to take an active role in delivering high-quality PCMCIA solutions. Since the PCMCIA market is challenging and complex, our goal is to provide you with a better understanding of PCMCIA technology.

1. Introduction

PCMCIA Environment

PCMCIA (Personal Computer Memory Card International Association) technology has been somewhat of a *rough-cut* diamond in the computer industry's jewel chest. The original concept of a credit-card size peripheral device excited and enticed the industry, since it offered flexibility and expandability in a very small footprint. These small footprints (integrated circuit boards) were named PC Cards by the PCMCIA Association. Proponents touted several key advantages to PCMCIA architecture:

- Host Independence (all PC Cards work in all PCs)
- Auto Configuration (ease-of-use)
- Hot Swapping (requires no reboot between PC Card swaps)
- Ease of Installation and Removal [1]

Three Development Elements

With the above advantages in mind, PC Cards were developed rapidly and adapted for all types of implementations. Three elements or groups impacted the development and usage of PC Cards: the hardware vendors who manufactured the PC Cards, the software vendors who wrote the software for the card to interact with the PC it was placed in, and PC vendors who designed their products to include this new and exciting technology. Unfortunately, card manufacturers, software developers, and PC designers did not always interpret the PCMCIA standard in the same manner.[2] These actions resulted in PCMCIA problems, which among them include:

- Incompatibilities that range across PC Cards, software, and PCs
- Poorly designed cards

Healthier Situation

Computer companies, vendors, and the PCMCIA Association have worked hard since 1990 to standardize the specification, and improvements have been made in the areas noted above. Since the PCMCIA organization is still relatively new, and its standard an evolving one, there are some issues and areas that need further clarification. These issues are not localized to one company or element of the PCMCIA solution, but rather impact the computer industry as a whole.

1. Introduction

Document Intent

Compaq recognizes these PCMCIA concerns. The intent of this paper is to:

- Offer reinforcement that **Compaq provides the *best* PCMCIA solution in the computer industry by:**
  - Developing robust PCMCIA features and functionality
  - Taking special steps to make PCMCIA technology more functional and easier to use
- Provide a basic understanding of the Compaq PCMCIA implementation
- Explain planned Compaq actions and solutions for dealing with PCMCIA industry issues

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Scope

The following Compaq-related PCMCIA topics are discussed:

- Advantages and Limitations
- Compaq's Differentiating Features
- Compatibility
- Functional Overview
- PC Card Purchase, Installation, and Use
- Informational Tools (Appendixes)

PCMCIA Background

☞ Please note that in this section, PCMCIA terms will be discussed only in the most general sense. For further technical details, please refer to Section 5, *Functional Overview*, and Section 6, *PC Card Purchase, Installation and Use*.

How it all began...

In 1989, PCMCIA was established, with the objective of "promoting interchangeability of Integrated Circuit Cards (IC Cards) among computer and other electronic products."[3] In 1990, the Association established its first specification, which has been revised to the current level: PCMCIA 2.1.

Card types defined by this standard are:

- Data Storage (Memory)
- Peripheral Expansion (Input/Output or I/O)

The PCMCIA specification defines a PC Card's:

- Electrical Interface
- Physical Characteristics
- Software Interface
- Card and Data Metaformats (Metaformats are used to capture the contents, layout and interpretation of the PC Card information structure).[4]

PCMCIA Background Continued

Defining the name: PC Cards
The PCMCIA standard governs a 68-pin interchange between a computer and a PC Card.

PC Card Types
☞ For more detailed information on PC Card specifications, please refer to Section 6, *PC Card Purchase, Installation and Use*.

There are three types of PC Cards. As the Type number increases, the PC Card form factor becomes thicker. (See Figures 11-13 in Section 6, *PC Card Purchase, Installation and Use* for dimensions).

- Type I (used typically for memory modules)
- Type II (used typically for I/O devices, such as modems)
- Type III (used typically for hard drives)

Each one of the PC Card types bulleted above also are available in an extended length. These extended boards are designated with the word "Extended" after their title, i.e. Type 1 Extended. The extended boards fit in the same slots as the standard cards fit in, but have an extension that's external to the system chassis (see Figure 14 in Section 6, *PC Card Purchase, Installation and Use).*

Card and Socket Services
Card Services is a higher level system software layer that manages PC resources for PC Cards, and coordinates all PC Card removal and insertion activity.

Socket Services is the lowest level of PCMCIA system software and manages the basic operations of the PCMCIA slot.

New Bus Standard Develops
Although the original focus for PCMCIA was to create a standard for developing and marketing credit-card size flash memory modules and their sockets, what evolved was a new computer bus standard.[5] Networking adapters, fax modems, hard drives, SRAM memory cards, multimedia sound cards and flash memory modules are among the predominant PC Card offerings. The PCMCIA market is growing; according to a recent Dataquest estimate, "Approximately 80% of notebook computers in the United States will ship with PCMCIA slots in 1994, and nearly 100% of the notebooks shipped in 1996 will contain them."[6]

PCMCIA in the Future
The next update to the PCMCIA specification announces in late October 1994, with the release scheduled for January, 1995. New features include Multi-function support, DMA and CardBus functionality (a 32-bit bus packaged in the same form factor). Operating system software developers are also working to make their software PCMCIA-aware.

1. Introduction

PCMCIA Background
Continued

Compaq's Commitment
PCMCIA is an evolving standard, and new PC Cards are continually being introduced. This means industry participation and industry relationships are vital. Compaq's strong relationships with worldwide vendors allow for the ability to quickly provide PC Card solutions. As a member of the PCMCIA Board of Directors and the Executive committee, Compaq is dedicated to the true standardization of PCMCIA technology.

Now that you've been introduced to some basic PCMCIA concepts and background, let's move to the next section which discusses the advantages and limitations of PCMCIA technology.

2. PCMCIA Advantages and Limitations

Advantages

There are several benefits to the PCMCIA concept, which Compaq strongly supports:

Standard Connector
A standard connector and size physically allows any PCMCIA card to plug into any PCMCIA slot of the same size. This is analogous to the ISA bus specification for desktop computers whereby all PC compatible ISA cards can plug into ISA machines.

Space Saving
The small dimensions defined in the PCMCIA specification have allowed manufacturers to further miniaturize their hard disks, modems and other devices. This space savings can translate into cards that are easier to carry, as well as smaller computers with greater functionality.

Cost Reduction with Greater Implementation Offerings
Because card vendors can design devices to one specification that is supported by different PC manufacturers, more brands of cards will be available for more PCs worldwide. Prices for PCMCIA devices are expected to drop as competitive offerings grow.

Limitations

Plug and Play...Not Yet Today...
Users can foresee a time when they will be able to plug any PCMCIA card into any PCMCIA slot of the same size and have that card automatically configure itself and operate with extreme reliability. This scenario will permit users to switch cards quickly without closing applications or restarting the computer. Although users expect these features from all PCMCIA devices, today this is still a future scenario because:

- Some enhanced functionality is not specifically defined in PCMCIA 2.1 specification. Items such as power management and the interface for configuring cards after insertion in the slot have been left to PC Card, software and PC vendors, making compatibility less than perfect.
- Recent additions to the PCMCIA standard are still being incorporated by card vendors and application developers. PCMCIA systems must implement the PCMCIA software (Card and Socket Services) and PC Cards must be well-designed in order to interface with the system's software. Also, end-user application software needs to be made PCMCIA-aware before full Plug and Play can be achieved.

2. PCMCIA Advantages and Limitations

Compaq Actions

Summary

Compaq PCMCIA products are **100% compliant** to the PCMCIA 2.1 Standard.

The Compaq PCMCIA features mentioned earlier are not available from all vendors. Compaq, however, has taken special steps for its customers to make this technology more functional and easier to use. In summary, Compaq provides:

- Complete Card and Socket Services
- Automatic Card Support for certain categories of PC Cards
- Windows-based Card Configuration Pop-up Utilities

As an Executive Member of the PCMCIA Association and a member of the Board of Directors, Compaq also is working to incorporate its open enhancements into the PCMCIA standard.

Compaq created the following to aid in the selection and troubleshooting of PC Cards:

Informational Tools

- *Appendix A: Sample Configuration Files*
- *Appendix B: Readme File for PCMCIA Support* (which is found on the PCMCIA Support Diskette)

Additional PCMCIA Documents

- *Compaq PCMCIA Tested Solutions List*
- *Compaq PCMCIA Memory Optimization White Paper*
- *Compaq PCMCIA Third Party Network PC Card Configurations*

In the next section we'll explain to you why the Compaq solution for PCMCIA is the **best** program in the computer industry.

3. Compaq's PCMCIA Differentiating Features

Compaq's PCMCIA Implementation

As mentioned earlier, the PCMCIA Standards Committee has established the specification, or design rules to which vendors must conform. However, each PC manufacturer's implementation of the standard and enhancements determines user's satisfaction with PC Cards. Compaq provides a number of **differentiating features** to ensure user satisfaction, which includes:

- Ease of Use
- Full Functionality
- User Assurance

Each feature is explained in the following text.

Ease of Use

Card Setup and Configuration Utilities

Compaq provides Windows 3.1 and DOS 6.0 user interfaces to PC Cards and slots. This software offers a clear description of the system's and card's current status and configuration alternatives.

Compaq Exclusive Setup Utility

A Compaq exclusive is the easy-to-use Windows-based Compaq Setup Utility, which combines *all* aspects of computer configuration (not just PCMCIA) in one application. These user-friendly screens are located under the *Compaq Utilities* tab in TabWorks or the *Compaq Utilities* group under Windows Program Manager. Shown in Figure 1 below is the *COMPUTER SETUP* screen. (Note that the PCMCIA icon has both slots empty).

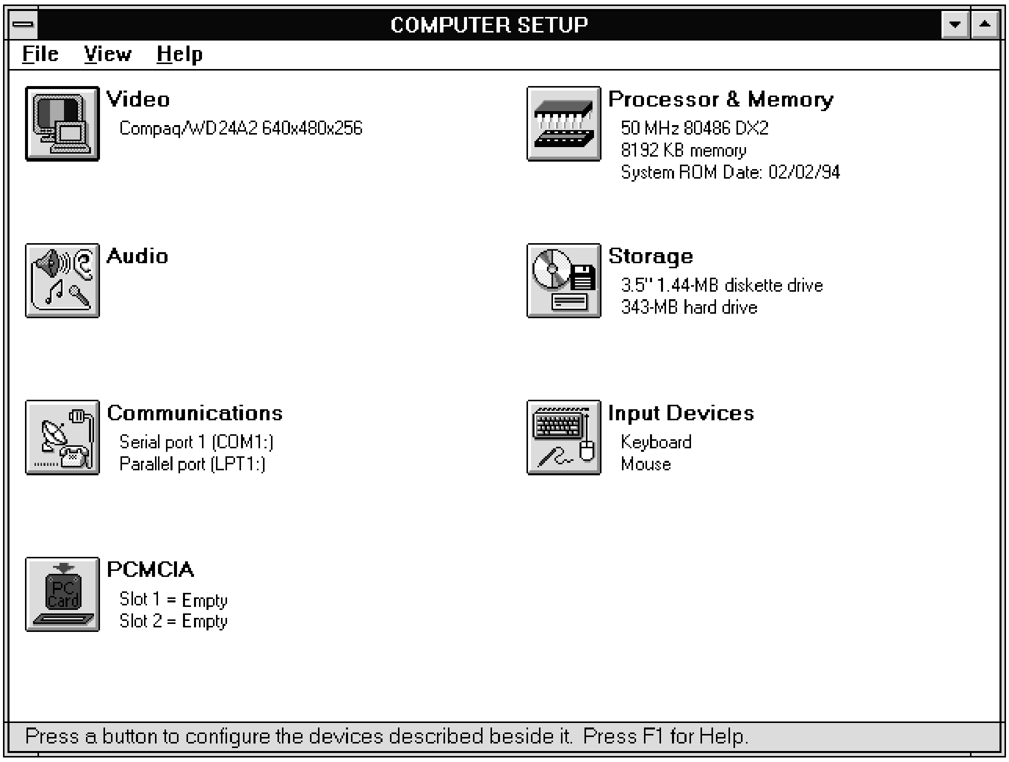


Figure 1. Compaq Computer Setup Screen

3. Compaq's PCMCIA Differentiating Features

Ease of Use
Continued

Compaq First

While some PC manufacturers may have similar DOS-based utilities, Compaq first developed exclusive pop-up Windows user interface screens, which indicate PC Card removal, insertion and configuration. This software is a primary reason Compaq is currently recognized as having the ***easiest, most reliable*** **and** ***most versatile*** PCMCIA implementation in the industry. For an example of this outstanding interface, follow Figures 2 through 4 in sequence. These figures show the response when a modem PC Card is inserted and then removed.

When the user inserts the PC Card into the slot, the screen in Figure 2 automatically appears.

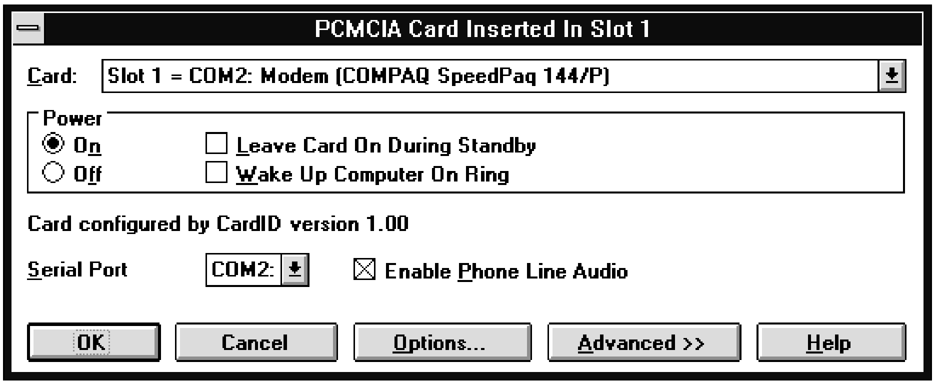


Figure 2. Compaq PCMCIA Screen with a PC Card Modem Installed

3. Compaq's PCMCIA Differentiating Features

Ease of Use
Continued

Notice in Figure 3 that the PCMCIA icon under the *COMPUTER SETUP* screen has changed to reflect that a modem has been loaded into slot 1.

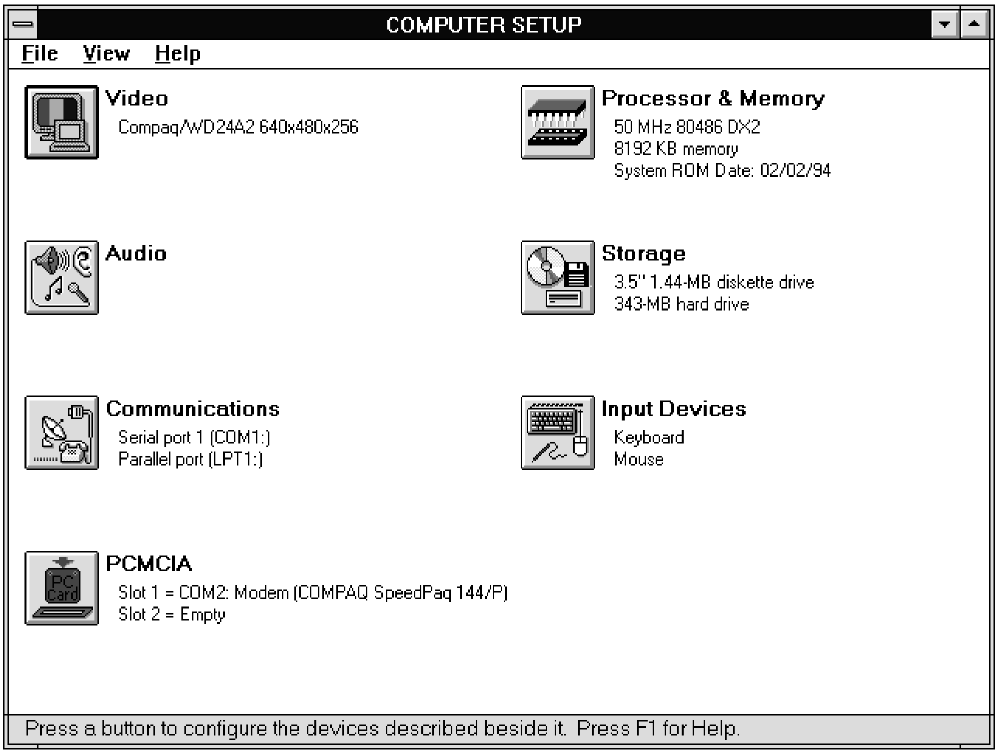


Figure 3. Compaq Computer Setup Screen after Modem PC Card has been installed

Figure 4 shows the pop-up screen that appears when the modem is removed.

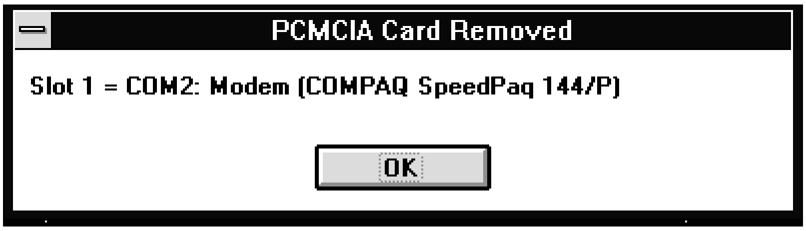


Figure 4. Compaq Computer Pop-up Screen after Modem PC Card has been removed

International Translations

To support worldwide use, Compaq translates its PCMCIA implementation into eleven different languages including English, French, German, Spanish, Italian, and Japanese, with other languages to follow. When Compaq introduced PCMCIA products in Japan, Kanji characters were supported through Windows 3.1J and DOS 6.OV.

3. Compaq’s PCMCIA Differentiating Features

Full Functionality

Complete Card and Socket Services
Compaq offers a complete implementation of PCMCIA 2.1 Card and Socket Services. Compaq also provides enhancements that allow support of most PC Cards without the need for additional software. Thus, Compaq's PCMCIA implementation supports a wider variety of PC cards than other vendor implementations.
NOTE: Compaq PCs do not need other PCMCIA software that may have been included with other vendor's PC Cards. This software is *not* needed and will write *over* the existing Compaq software, disabling its support of other PC Cards.

Power Management Utility
Compaq is driving the evolving power management standard for PCMCIA and will offer its technology to the PC industry as an open standard. Compaq offered the *first* PCMCIA computers that have the ability to turn power on and off to PC Cards from Windows or DOS, in order to conserve battery life.

User Assurance

Compaq PCMCIA Tested Solutions List
Compaq invites a variety of PC card developers worldwide to test their products at specially-designed Compaq facilities. PC Cards that test successfully on Compaq Portable Computers are listed in the *Compaq PCMCIA Tested Solutions List*, which notes over 160 PC Card solutions worldwide. Compaq PCMCIA Tested Solutions List includes:

- Vendor names
- Product names
- Model numbers
- Special PC Card configuration tips (as needed)
- European distribution information
- Configuration information
- Standard PC configuration & PC Card test environments

Updated versions of this list can be found on:
- TechPaq
- QuickFind
- PaqFax
- CompuServe
- Internet

The current list supports Compaq Concerto, Contura 400, Contura Aero, and LTE Elite family of products.

3. Compaq's PCMCIA Differentiating Features

User Assurance Continued

Qualification Criteria for the Compaq PCMCIA Tested Solutions List

If a PC Card is added to the *Compaq PCMCIA Tested Solutions List*, then the card meets this criteria:

- Successfully configures and functions on all Compaq PCMCIA PCs
- Vendors agree to partner with Compaq to quickly address issues and unique situations

However, if a PC Card is not on the list, then one or more of the following items is a possibility:

- Has not yet been tested
- Has not met all of Compaq's test goals
- Has not met the PCMCIA 2.1 Specification
- PC Card is distributed by an unresponsive vendor
- PC Card is not currently available

Scope of the Compaq PCMCIA Tested Solutions List

This list should be used as a guide in understanding which vendors support Compaq and to find out what PC Cards test successfully in Compaq PCs.

IMPORTANT The list does not guarantee that the PC Cards on the list have been tested in every environment, will work in every possible environment, or will function without the use of appropriate drivers or other necessary configuration modifications.

CompaqCare Support

Whether customers are just introducing themselves to PCMCIA or are expanding their collection of PC cards, they have access to Compaq's standard CompaqCare Service and Support. Support for PCMCIA is available worldwide. Customers who travel outside their home countries will especially appreciate this international support from Compaq. For additional information, contact your Compaq Service Provider.

Next...

The next section was designed to graphically explain the required elements needed for true PCMCIA compatibility.

rhaps best be defined as an equation:
mpatibility + PC Card Compatibility + Software Compatibility) = **True Compatibility**

	The Compatibility Equation	
	PCMCIA Controller	Provides hardware interaction between the PC Card and the PC.
	PCMCIA Slots	Designed to the PCMCIA 2.1 Specification.
	PCMCIA Software	Card and Socket Services provide interaction between the processor and the PCMCIA slot, and recognize when a card is inserted or removed.
	PC Cards	Once the PC card is inserted, the PC automatically recognizes it and assigns appropriate system resources.
	Third Party Software: Drivers	Some PC Cards may require additional software drivers. Such PC Cards are: LAN, SCSI, Audio, Video, GPS & Multi-function.
	Operating System Software	Currently, this is not PCMCIA-aware. It is not inherently capable of supporting PC Cards, nor does it provide automatic PC Card configuration or System Resources allocation.
	Application Software	Currently, this too, is not PCMCIA-aware. When a LAN card, modem card, or any other communications PC Card is actively connected to a remote device, the link drops if the PC Card is removed. To resume, the user must reestablish the link.
	Memory Allocation	Card and Socket Services and related drivers require a certain amount of conventional memory, which can conflict with some application requirements. This problem is industry-wide. Alternatives to Card and Socket Services have significant limitations and trade-offs. It is possible to adjust existing memory to maximize resources (See Section 6).

5. Functional Overview

How does the PCMCIA Solution Work?

"Plug and Play" is a current hot topic in the computer industry. The idea: you plug in a card, the system recognizes it, configures it, automatically allocates the system resources needed, and then makes the card's functionality available to the user. In theory, this should occur without any intervention by the user. In practice, full Plug and Play functionality for all types of devices is not yet available, because no single vendor controls all of the components and the market is still evolving.

Compaq implements the PCMCIA solution in such a way that it comes as close to the Plug and Play concept as possible. The hardware, which consists of the PC Card and the PC Card Controller in the PC, make up only one component of the solution. The other part of the solution consists of software programs that allow the PC Card to function properly. Compaq uses SystemSoft's Card and Socket Services to emulate the Plug and Play environment for most PC Cards. These services allow the user to take full advantage of the features of the PC Card hardware, which may include such features as power management, hibernation, standby, and others.

The PC Card Hardware and Software combine to make up the PC Card Solution. Each of these elements is discussed in this section.

The Big Picture

The PCMCIA Solution is an implementation which combines hardware and software.

The diagram below provides a basis for our discussion:

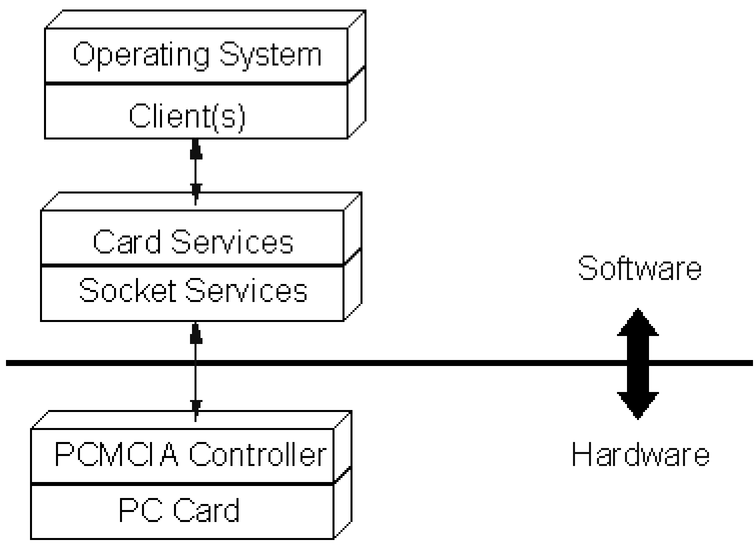


Figure 5. PCMCIA Implementation

In the following sections we'll look at the elements of this diagram in detail.

5. Functional Overview

The PC Card

The PC Card is the pluggable and removable part of the equation. It has a 68 pin connector which plugs into a socket inside of the system chassis. Most PC Cards will be completely encased by the PC chassis when connected. Some PC Cards have extensions, which lengthens the PC Card. When the PC Card is inserted into the slot, it extends outside the PC chassis.

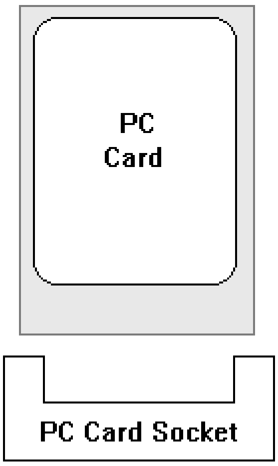


Figure 6. PC Card and Socket

The PC Card Connector provides electrical connections for:

- Card Address and Data Buses
- Card Detect and Enable
- Interrupt Request
- I/O Read and Write
- Power and Ground

Card Information Structure (CIS)

Crucial to the operation of PCMCIA is the Card Information Structure, or CIS, which is contained on the card. The CIS is a set of data stored permanently on a PC Card that indicates the type of card (e.g. modem), the system resources required by the card (interrupts, memory, etc.) and the way the card expects to be configured after insertion in a computer. It is *critical* for Card Services compatibility to have the content and format of a card's CIS structured according to the PCMCIA standard.

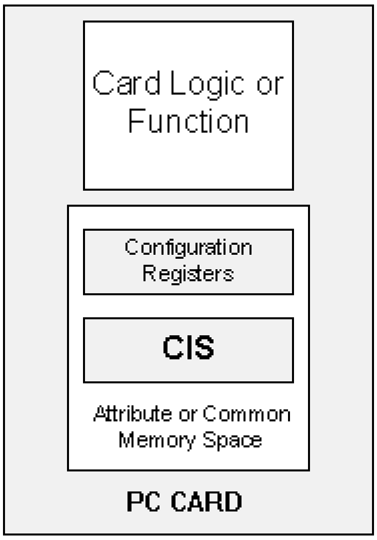


Figure 7. PC Card Registers

CIS: Impacts PCMCIA Success or Failure

CIS is one place where the PCMCIA standard can break down. Some PC Card manufacturers build a robust CIS into their cards making it easier to configure and use. Other manufacturers provide little or no CIS information, making it difficult to use the card in many different PCs. In these cases, it is difficult for the Card and Socket Services to work with the card.

The PCMCIA Controller

The PCMCIA Controller resides inside the PC chassis, and provides a hardware interface between the PC Card and the system bus.

Currently, the Compaq Concerto uses the Cirrus PCMCIA Controller chipset to provide this functionality. The Compaq Contura Aero, Contura 400, and LTE Elite family PCs use the VLSI chipset. The main difference between the Cirrus and VLSI chipsets in the Compaq implementation is the Socket Driver used to communicate with the hardware. The chipset impacts the remaining parts of the PCMCIA solution, namely which software drivers must be loaded in order for the PC Cards to work properly.

Other PC vendors use the Intel chipset to perform this functionality. The software interface for this chipset is also different. The PC Card, PCMCIA Controller, and system bus interact as shown in Figure 8.

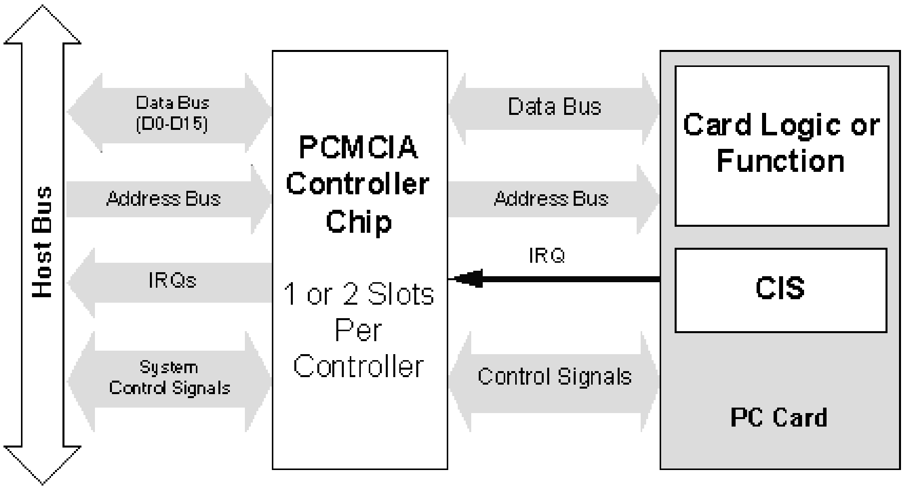


Figure 8. PCMCIA Controller, PC Card and System Bus Interaction

Socket Services

Socket Services is the only piece of the PCMCIA software architecture component that is "hardware knowledgeable." Among its functions are identifying the number of slots in a PC and detecting the insertion or removal of a PC Card while the computer is on. Socket Services make no decision regarding card setup or control. Socket Services bridge the gap between the PC Card and the higher level software services.

On Compaq PCs, Socket Services are loaded in CONFIG.SYS. In the Compaq Concerto, using a Cirrus chipset, the file that is loaded is called SSCIRRUS.EXE. For a PC using the VLSI chipset, SSVLSI.EXE is loaded. Shown below is a listing of CONFIG.SYS for a Compaq Concerto.

```
SHELL=C:\DOS\COMMAND.COM /P /E:1536
STACKS=9,256
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=D000-DFFF
DEVICEHIGH=C:\CPQDOS\SSCIRRUS.EXE      <------------- Socket Services loaded here
DEVICEHIGH=C:\CPQDOS\CS.EXE
DEVICE=C:\CPQDOS\CSALLOC.EXE
DEVICEHIGH=C:\CPQDOS\ATADRV.EXE
DEVICEHIGH=C:\CPQDOS\CARDID.EXE C:\CPQDOS\CARDID.INI
DEVICEHIGH=C:\CPQDOS\MEMDRV.EXE
;DEVICEHIGH=C:\CPQDOS\DBLFLASH.EXE
;DEVICEHIGH=C:\CPQDOS\MS-FLASH.SYS
DOS=UMB
DOS=HIGH
BUFFERS=20
FILES=35

DEVICEHIGH=C:\CPQDOS\POWER.EXE
```

5. Functional Overview

Card Services **Card Services** provides the interface to support different device drivers for different PC cards -- analogous to today's I/O cards needing option-specific I/O drivers. Among its functions, Card Services provide information upon request to the client software modules which allows each client to allocate resources and configure the PC Card. Card Services also transmits meaningful error messages to users and their applications. Card Services therefore isolates user applications from the details of the PCMCIA implementation.

Card Services are loaded via CONFIG.SYS. Regardless of the PCMCIA chipset, Card Services are loaded using CS.EXE. Another driver called CSALLOC.EXE is loaded as well; this is the resource allocation driver for the Card Services. Shown below is the same listing of CONFIG.SYS with a note showing the Card Services.

```
SHELL=C:\DOS\COMMAND.COM /P /E:1536
STACKS=9,256
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=D000-DFFF
DEVICEHIGH=C:\CPQDOS\SSCIRRUS.EXE
DEVICEHIGH=C:\CPQDOS\CS.EXE          <-- Card Services loaded here
DEVICE=C:\CPQDOS\CSALLOC.EXE         <-- Allocation Driver here
DEVICEHIGH=C:\CPQDOS\ATADRV.EXE
DEVICEHIGH=C:\CPQDOS\CARDID.EXE C:\CPQDOS\CARDID.INI
DEVICEHIGH=C:\CPQDOS\MEMDRV.EXE
;DEVICEHIGH=C:\CPQDOS\DBLFLASH.EXE
;DEVICEHIGH=C:\CPQDOS\MS-FLASH.SYS
DOS=UMB
DOS=HIGH
BUFFERS=20
FILES=35

DEVICEHIGH=C:\CPQDOS\POWER.EXE
```

CSALLOC.EXE uses a file called CSALLOC.INI to set up memory, IRQ, and I/O Base Address limitation parameters to be used by the program. A sample CSALLOC.INI is shown in *Appendix A: Sample Configuration Files*.

5. Functional Overview

Client Drivers

Clients represent additional software services that must be loaded in order to configure the PC Card. Examples of these are LAN-specific drivers, Memory Technology Drivers like for Flash Cards, or devices like ATA Additional Storage PC Cards. (AT is an acronym for Advanced Technology, i.e.; an AT bus device. ATA stands for AT Attachment. ATA devices may be traditional rotating media or silicon-based.) A "Super Client" driver, in the form of CARDID.EXE, provides support for many cards without using their specific drivers.

Some of these clients are shown in the CONFIG.SYS.

```
SHELL=C:\DOS\COMMAND.COM /P /E:1536
STACKS=9,256
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=D000-DFFF
DEVICEHIGH=C:\CPQDOS\SSCIRRUS.EXE
DEVICEHIGH=C:\CPQDOS\CS.EXE
DEVICE=C:\CPQDOS\CSALLOC.EXE
DEVICEHIGH=C:\CPQDOS\ATADRV.EXE   <-- ATA Storage Device Driver
DEVICEHIGH=C:\CPQDOS\CARDID.EXE C:\CPQDOS\CARDID.INI
      (The above line is for "Super Client".)
DEVICEHIGH=C:\CPQDOS\MEMDRV.EXE   <-- Memory Card Driver
;DEVICEHIGH=C:\CPQDOS\DBLFLASH.EXE  <-+
;DEVICEHIGH=C:\CPQDOS\MS-FLASH.SYS   <-+- Flash Card Drivers
DOS=UMB
DOS=HIGH
BUFFERS=20
FILES=35
DEVICEHIGH=C:\CPQDOS\POWER.EXE
```

The ATA Storage, Memory Card, and Flash Card drivers are made available in case such cards are installed.

CARDID.INI is used by the Super Client (CARDID.EXE) as a Common Information section regarding devices that the client has identified. A sample CARDID.INI is shown in *Appendix A: Sample Configuration Files*. SystemSoft provides Card and Socket Services, while Microsoft provides Flash Card Drivers.

The Operating System

Once the Client Drivers are loaded, then the operating system and user applications are able to use the PC Card functionality. The Card and Socket Services functions have been fulfilled and become transparent to the user. At this point the card may appear to the operating system simply as an ISA card that is ready to be used. Furthermore, Plug and Play capability may be limited by the operating system or application.

5. Functional Overview

How does it all work?

Figure 9 shows the interaction between the various components of the PCMCIA solution.

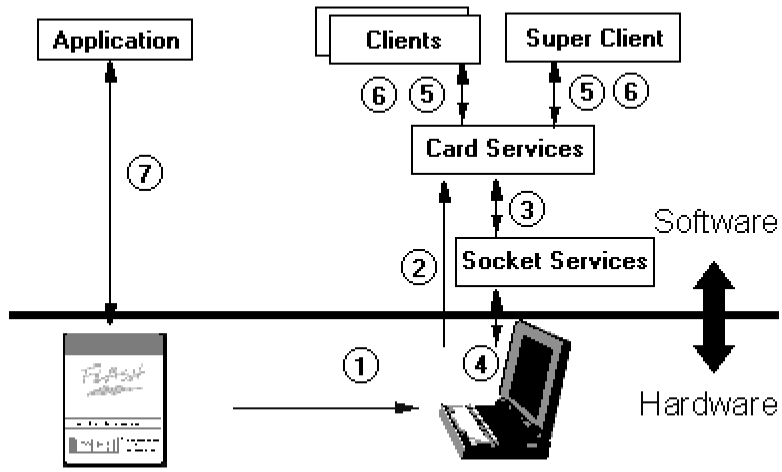


Figure 9. PCMCIA Interaction

Note: Each step listed below refers to the circled number in Figure 9 above.

Step	Action
1	The PC Card is inserted or removed from the PC Card in the system chassis.
2	The PC Card status IRQ is generated by the PCMCIA Controller and routed to the Card Services.
3	The Card Services ask the Socket Services about the card-status-change IRQ.
4	The Socket Services checks the PCMCIA Controller and reports back to the Card Services on the change.
5	The Card Services notifies all clients of the particular event (in this case: card insertion).
6	Each client processes the event with one (or more) taking responsibility for “owning” the card. One client configures and enables it.
7	Applications can then use the card after initialization occurs. Note that the PCMCIA software is NOT involved in the Application-Card Link.

☞ The Card and Socket Services exist to facilitate configuration and enabling of the PC Card. For a full list of the Compaq PCMCIA Support Software, see *Appendix B: README File.*

5. Functional Overview

Enablers

Certain existing PC Cards - especially some network interface cards - developed without PCMCIA Socket Services and Card Services compliance, come with "direct enablers."

What is it?
A direct enabler is a software module that circumvents PCMCIA Socket and Card Services, and communicates directly with the hardware. Direct enablers originally served as vendor-proprietary solutions to socket/card-like functionality. However, enablers may not work with the PCMCIA controller chip contained in a particular computer.

CAUTION

Direct enablers conflict with Card and Socket Services and can lock-up or disable the computer. *Compaq therefore recommends users purchase PC Cards that utilize the PCs Card and Socket Services.*

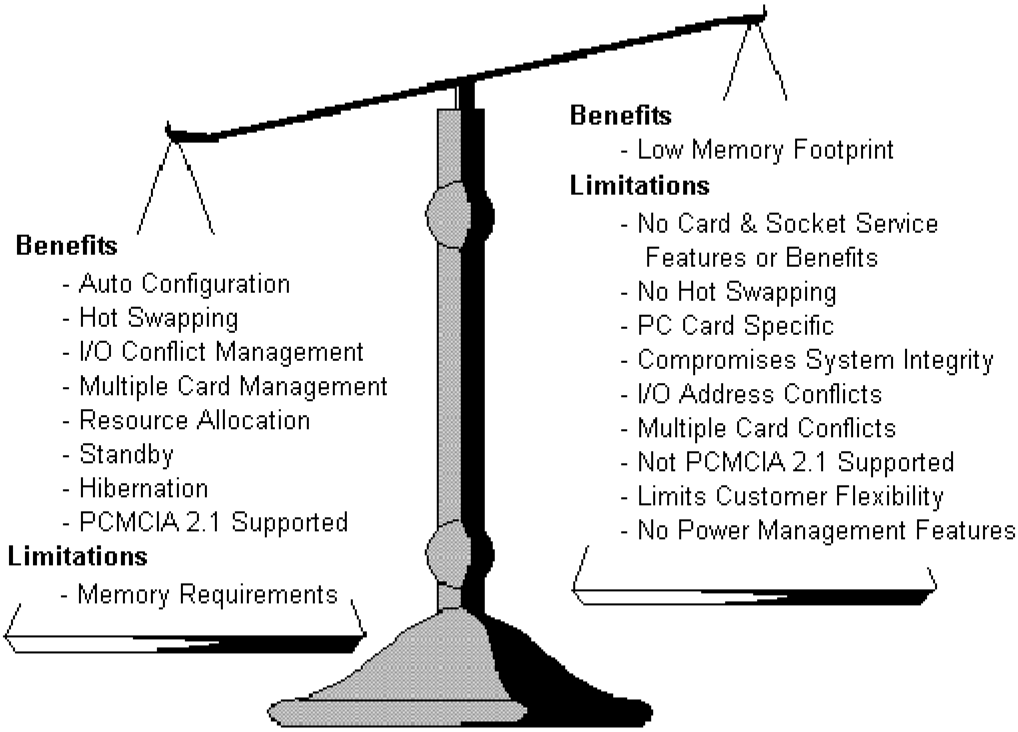
When should Enablers be used?

Since Enablers effectively replace both the Client driver, *and* the Card and Socket Services, they should be considered only as a last resort. The following chart indicates some tradeoffs to be considered. This choice should be made only with a clear understanding of the limitations of enablers. Some customers choose to use direct enablers either to address specific memory limitation issues or in environments where Card and Socket Services aren't provided.

5. Functional Overview

Advantages of Compaq PCMCIA Software

Compaq advocates the use of Card and Socket Services to help fulfill PCMCIA promises. Other more limited software solutions (like direct enablers), provide less functionality. Figure 10 summarizes the advantages of using Compaq's Card and Socket Services.



Compaq Card & Socket Services **Third Party Software (Direct Enablers)**

Figure 10. Advantages Of Compaq PCMCIA Software

6. PC Card Purchase, Installation, and Use

So you want to buy a PC Card?

A PC Card represents a different way of enhancing the functionality of your PC. One advantage of the PC Card solution is that you can install the card for use simply by sliding it into the slot and then removing it when the card is not in use.

Flexibility

Another advantage of PCMCIA technology is that you can use the same PC Card slot to accommodate different kinds of PC Cards.

For example, in the morning at the office you may wish to be connected to a Local Area Network, while later that evening you may wish to call into your office using a PC Card modem. Both of these activities can easily occur if there is a single PC Card slot in your notebook PC; just swap the cards as needed.

Choose carefully

Purchasing a PC Card for your notebook PC can be an adventure. You have an idea of what you want to buy, but you don’t know if such a PC Card is available, whether or not it will plug into your machine, and if your software will interact with it once it is installed in your notebook.

6. PC Card Purchase, Installation, and Use

What PC Card devices are available?

Generally, you have some idea of what functionality you wish to add to your PC when you are investigating a PC Card solution.

There are many offerings for PC Cards. Some of these are noted in the following chart:

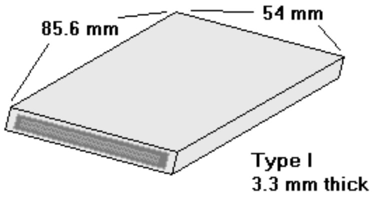
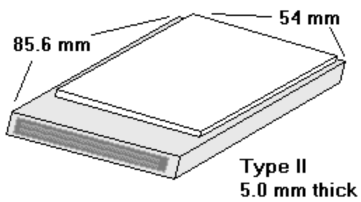
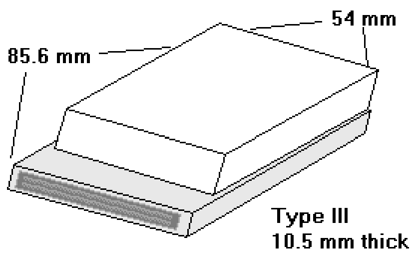
Type	Comment
Modems	Modems of varying speeds and types. Combination FAX/Modems are very popular PC Cards. Wireless Modems are now available as well.
Local Area Network Interface Cards (LANs)	Ethernet and Token Ring (the most common types) and wireless LAN cards are available.
Modem/LAN	Combination Modem/LAN Cards are also available, allowing the opportunity for network or telephone connections on the same card.
SCSI Adapter Cards	Allows for the connection of a wide variety of SCSI I/O devices including hard disk and tape drives.
Serial I/O Adapter Cards	Provides standard serial port communications
Memory Cards	These are used to emulate disk drives on the system. Generally, these cards use static RAM. "Flash ROM" cards are used to store programs. They do *not* offer additional system memory.
Additional Storage Cards	Also known as ATA Cards, these cards represent an easy way to add disk space to your PC. These cards can use traditional rotating magnetic media technology or can be silicon-based.
Sound Cards	These cards offer audio capability to PCs and can be used in conjunction with CD Roms.
Other	Other cards such as security cards, satellite positioning and pagers are becoming available.

Will any PC Card work in your machine?

There are hardware considerations as well as software considerations that determine whether or not a particular PC Card will work in your PC. Once a card is plugged into your Compaq PC, it still has to be able to recognize that the card is plugged in, configure it, and allocate system resources to it.

Hardware Considerations

There are three types of PC Cards available today: Type I, Type II, and Type III, which are shown in the following table. The PCMCIA 2.1 Specification dictates physical standards. Note that the depth and width of these cards are the same, but the height or thickness of each card is different. The different sizes allow for more or less complex devices.

Type	Height	Width	Depth
Type I  **Figure 11.** Type 1 PC Card	3.3 mm	54 mm	85.6 mm
Type II  **Figure 12.** Type II PC Card	5.0 mm	54 mm	85.6 mm
Type III  **Figure 13.** Type III PC Card	10.5 mm	54 mm	85.6mm
Tech Tip: On Type II and III PC Cards, the base (in gray) is always the same thickness (3.3 mm). The additional package on the top of each card adds to the overall thickness.			

6. PC Card Purchase, Installation, and Use

Extended Types

The PC Cards listed on the previous page plug into the PC so that no part of the card is external to the PC Card slot. Note that the base of each card is the same size to allow it to plug in to a compatible slot.

Since some devices require more space than the slot can provide, there are also extended versions of PC Cards. The same internal width, height, and depth exists, but for these cards there is an external “bulge” which extends for an additional length. The amount of length depends on the type of PC Card. The external bulge may be used to house a connector too wide for the PC Card, for example, an antenna on a wireless communication card. The following table and conceptual illustration summarizes these points:

Card Type	Height	Width	Depth
Type I Extended	3.3 mm plus 10 mm external bulge	54 mm	85.6 mm (Internal)
Type II Extended	5.0 mm plus 10.85 mm external bulge	54 mm	85.6 mm (Internal)
Type III Extended	10.5 mm plus 10.85 mm external bulge	54 mm	85.6 mm (Internal)

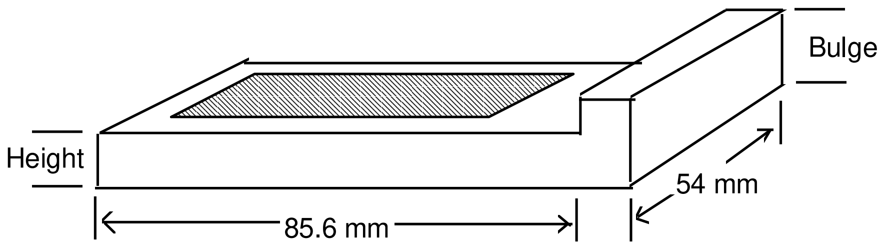


Figure 14. Extended PC Card

Tech Tip: This bulge may also accommodate connectors that are not as thin as the PC Card (i.e.; a telephone jack or a LAN connector).

How many slots?

What type of PC Card that your PC can accommodate and how many available slots the PC has are other items to consider. For the Compaq line of Notebook and Subnotebook Portable Computers, see the table on the following page.

6. PC Card Purchase, Installation, and Use

How many slots?
Continued

A Compaq PCMCIA Slot Support Table is shown below.

Compaq Product	PC Card Slots Available	PC Cards Supported
Concerto	Two Type II slots, or use one slot for a Type III Card	One Type III PC Card -or- Two Type II PC Cards -or- Two Type I PC Cards (Supports all Type I, II, or III Extended PC cards)
Contura Aero Family	One Type II slot	One Type II PC Card -or- One Type I PC Card Aero does *not* support Type III PC Cards. Type I and II Extended PC Cards *are* supported
LTE Elite Family	Two Type II slots, or use one slot for a Type III card	One Type III PC Card -or- Two Type II PC Cards -or- Two Type I PC Cards (Supports all Type I, II, or III Extended PC cards)
Contura 400 Family	Two Type II slots, or use one slot for a Type III card	One Type III PC Card -or- Two Type II PC Cards -or- Two Type I PC Cards (Supports all Type I, II, or III Extended PC cards)
☞ Important Notes:	The PC Card interface in all of these PCs conform to the PCMCIA 2.1 specification. A PC Card Slot for Type II cards can support Type I cards as well. Because the Type I card is thinner, it can fit into the Type II slot. Although the Type III card has a single connector, it physically occupies the space needed for two vertically stacked Type II cards. The physical dimensions of the PC Card as well as the slots in your PC determine which PC Card will fit.	

6. PC Card Purchase, Installation, and Use

Compaq's PC Card Implementation

Armed with the PCMCIA and PC Card knowledge that you've gained from this paper, use the *Compaq PCMCIA Tested Solutions List* to select a PC Card. This list provides crucial information, since these cards have been qualified and tested in Compaq PCs. Some of them may require configuration verification and driver installation.

Software Considerations

Once you have purchased the card PC Card, be aware that most cards ship with product-specific PC Card Enabler software or Card and Socket Services of their own.

△**CAUTION**

Contrary to what the PC Card instructions might say, DO NOT INSTALL THIS VENDOR-PROVIDED SOFTWARE ON YOUR Compaq PC. It may cause your PC to stop working.

Also, be aware that some Windows programs may replace drivers in SYSTEM.INI. This may cause problems with the operation of the PC Card.

Plug and Play

Compaq provides SystemSoft's Card and Socket Services that are designed to work with Compaq's implementation of the PCMCIA standard. These services provide close to Plug and Play functionality for the PC Cards. For the PC Cards on the *Compaq PCMCIA Tested Solutions List*, additional configurations may be required. See *Compaq PCMCIA Tested Solutions List* for more information.

Note that Card and Socket Services are preinstalled on your Compaq PC. If this becomes corrupted or overwritten by another vendor's Card and Socket Services, you need to request the PCMCIA Support Diskette from Compaq.

For most Compaq approved PC Cards, the only action required is to simply plug the PC Card into the PC Card slot. The Card and Socket Services software preinstalled on your Compaq PC should detect, configure, and then allocate resources so the card can operate.

At this point, you still may have to load drivers in PC memory to use the card. An example of this would be network software drivers that need to be loaded in the same manner as a standard ISA Network Interface Card, only they are tailored specifically to the needs of the PC Card. Let's review the process in the following pages.

6. PC Card Purchase, Installation, and Use

What happens when the PC Card is installed?

Once you have considered your alternatives and purchased your PC Card, there are some installation steps you should follow. When installing an ISA card into a desktop PC, there are certain configuration procedures you need to follow in order for it to work properly. Configuring PC Cards into a portable require similar actions. One major difference is that the PC Card's physical installation is much easier; the other major difference is that additional pieces of software are required to configure the card.

Compaq PCs are preinstalled at the factory with PCMCIA software (Card and Socket Services). Software preinstallation offers the user the advantage of having the PC Card Configuration Drivers load when the computer boots up.

The following sequence on the next few pages depicts how the Pop-up screen changes when installation and then removal of a PC Card takes place.

☞ For complete information on how to install a PC Card, see *Appendix B: Compaq PCMCIA README File.*

IMPORTANT

First, simply plug the PC Card into your PC -- it may require no additional software or configuration.

CAUTION

The PCMCIA software that ships with some PC Cards should *not* be installed on Compaq PCs. This software is not needed and will write over the existing PCMCIA software, and may disable your computer.

Note that drivers, which *are* needed, may also ship with the PC Card. Consult your PC Card vendor to ensure you are loading the proper software.

What happens when the PC Card is installed? Continued

Read on to continue the sequence from the previous page.

Next...

If you are installing your PC Card under a ...	Then this can occur...
DOS environment...	What sounds like a happy beep (Lo-Hi Tone) occurs when card recognition takes place, followed by configuration. *- OR -* What sounds like a sad beep (Hi-Lo Tone) occurs when a card is not recognized or configured. NOTE: If this happens, call for additional support.
Windows environment...	A pop-up window comes up automatically with a message. Shown in Figure 15 is an example of a pop-up window that occurs when plugging in a Compaq SpeedPaq Modem.

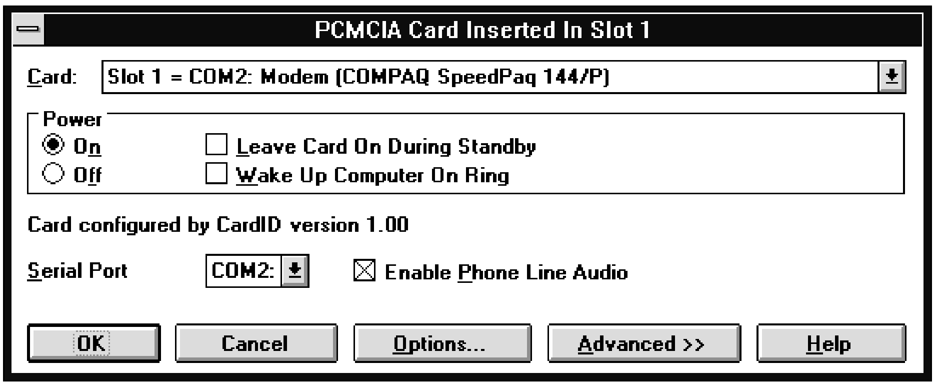


Figure 15. PCMCIA Card Inserted in Slot 1

What happens when the PC Card is installed?
Continued

Read on to continue the sequence from the previous page.

Then...
When you remove the modem PC Card, Card and Socket Services performs its duty and informs you that the card has been removed. This action is depicted in Figure 16.

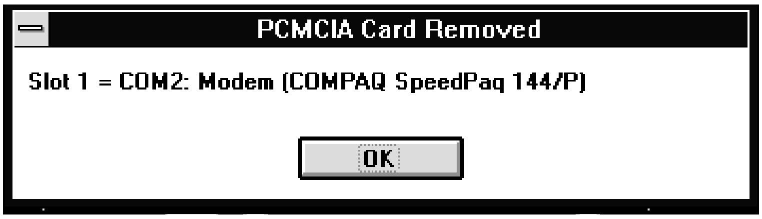


Figure 16. PCMCIA Card Removed

6. PC Card Purchase, Installation, and Use

Other Issues

In order to implement Plug and Play, a Compaq PC loads substantial software into memory at bootup time. The sample MEM /C printout shown below reflects this.

```
Modules using memory below 1 MB:
  Name          Total       =   Conventional   +   Upper Memory
  --------  ----------------   ----------------   ----------------
  MSDOS       15,917   (16K)     15,917   (16K)          0    (0K)
  HIMEM        1,168    (1K)      1,168    (1K)          0    (0K)
  EMM386       4,144    (4K)      4,144    (4K)          0    (0K)
  MEMDRV      17,440   (17K)     17,440   (17K)          0    (0K)
  COMMAND      4,208    (4K)      4,208    (4K)          0    (0K)
  SMARTDRV    29,024   (28K)     29,024   (28K)          0    (0K)
  MOUSE       17,168   (17K)     16,992   (17K)        176    (0K)
  CARDID      20,272   (20K)          0    (0K)     20,272   (20K)
  SSCIRRUS     4,096    (4K)          0    (0K)      4,096    (4K)
  CS          39,392   (38K)          0    (0K)     39,392   (38K)
  ATADRV       6,560    (6K)          0    (0K)      6,560    (6K)
  POWER        4,544    (4K)          0    (0K)      4,544    (4K)
  Free       584,336  (571K)    566,320  (553K)     18,016   (18K)

Memory Summary:

  Type of Memory       Total   =    Used    +    Free
  ----------------  ----------   ----------   ----------
  Conventional         655,360       89,040      566,320
  Upper                 93,056       75,040       18,016
  Reserved             131,072      131,072            0
  Extended (XMS)    11,703,424    2,331,776    9,371,648
  ----------------  ----------   ----------   ----------
  Total memory      12,582,912    2,626,928    9,955,984

  Total under 1 MB     748,416      164,080      584,336

  Largest executable program size        566,224   (553K)
  Largest free upper memory block         10,992    (11K)
  MS-DOS is resident in the high memory area.
```

Note that the Card and Socket Services and associated drivers take up a large portion of upper memory. It's enough to cause SMARTDRV to load into low memory, which decreases the amount of usable conventional memory. Some DOS applications (especially when invoked from Windows), will not run because there is not enough conventional memory available. There are several actions you can try if this situation occurs.

In such cases, you may have to optimize your memory so that more drivers are able to load into high memory. For example, you could:

- Remark out any drivers in CONFIG.SYS that you know you won't be using. In the above example, ATADRV comes to mind.

- Tweak your memory settings that are set up by EMM386, so that you can use upper memory blocks normally used by outmoded video ROM addresses, and then
  load as many of the other drivers as you can into upper memory. It is strongly recommended that you DO NOT use MEMMAKER from DOS 6.x to accomplish this. See *Compaq PCMCIA Memory Optimization White Paper* for more information on how to accomplish Memory Optimization.

7. Summary

Compaq's PCMCIA Solution is the Industry's Best!

As we have outlined in this document, PCMCIA offers excellent flexibility and functionality, yet in some situations can be challenging. Awareness of the dynamics of the technology, and an understanding of how it is designed to be used, can increase user adaptability and satisfaction.

At Compaq, we have developed sophisticated standards-compatible PCMCIA software, and we have added enhancements and utilities that provide a **robust** and **easy-to-use** PCMCIA solution.

In this White Paper, we've shared with you the real information you need to know so that you can understand PCMCIA and make good choices.

PCMCIA technology, because of its evolution, is somewhat of a rough-cut diamond in the computer industry. When you choose the Compaq PCMCIA solution, know that we'll be with you every step of the way as PCMCIA technology continues to process through this evolutionary period. During this time, PCMCIA technology continues to offer powerful expansion alternatives, with greater enhancements for flexibility and expandability unfolding as the technology continues to develop.

In closing, Compaq is committed to PCMCIA and to ensuring customer satisfaction as exemplified by providing information and reference tools to increase compatibility. With Compaq, you are assured of having the **best** PCMCIA solution available today.

8. References

Footnote Item	Works Cited
1	Oliver Rist, "Power and Potential," PC Magazine December 21, 1993: 263.
2	Oliver Rist, "Power and Potential," PC Magazine December 21, 1993: 266.
3	PCMCIA, PC Card Standard, Release 2.0, (September, 1991), 1-1.
4	PCMCIA, PC Card Standard, Release 2.0, (September, 1991), A-3.
5	Cynthia Morgan and Florence Olsen, "Compatibility Already an Issue for Newly Hatched Cards; After Shedding PCMCIA Moniker, Standards for PC Card Interface Continue to Evolve," Government Computer News November 22, 1993: 52.
6	Dataquest, "Dataquest Predicts U.S. PCMCIA Modem Shipments Will Take Off," Dataquest September 28, 1994: BW1014.

Appendix A: Sample Configuration Files

CONFIG.SYS for Compaq Concerto

```
SHELL=C:\DOS\COMMAND.COM /P /E:1536
```

```
STACKS=9,256
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS X=D000-DFFF
DEVICEHIGH=C:\CPQDOS\SSCIRRUS.EXE
DEVICEHIGH=C:\CPQDOS\CS.EXE
DEVICE=C:\CPQDOS\CSALLOC.EXE
DEVICEHIGH=C:\CPQDOS\ATADRV.EXE
DEVICEHIGH=C:\CPQDOS\CARDID.EXE C:\CPQDOS\CARDID.INI
DEVICEHIGH=C:\CPQDOS\MEMDRV.EXE
;DEVICEHIGH=C:\CPQDOS\DBLFLASH.EXE
;DEVICEHIGH=C:\CPQDOS\MS-FLASH.SYS
DOS=UMB
DOS=HIGH
BUFFERS=20
FILES=35

DEVICEHIGH=C:\CPQDOS\POWER.EXE
```


CSALLOC.INI for Compaq Concerto

```
RIO=170-177,2E8-2EF,370-377,3E8-3F7
MEMEXCLUDE=C000-CFFF,E000-EFFF
IOEXCLUDE=100-107
IOINCLUDE=3F0-3F7
IRQINCLUDE=9
```

CARDID.INI for Compaq Concerto

```
[Common]
;
; Common Information section created by Config
;
ComPort1=3F8
ComIRQ1=4
ComPort2=2F8
ComIRQ2=3
ComPort3=3E8
ComIRQ3=4
```

```
ComPort4=2E8
ComIRQ4=3
ComBySocket=Yes        <-- Specifies that a COM1, 2, 3, or 4 will be assigned to a PC Card
Socket
ComBDAAbsolute=No      <-- Left-justifies Bios Data Area to a COMx Base Address Offset if Yes
FirstModem=2          <--+
SecondModem=2            +-- Specifies which COM port number will be assigned
ThirdModem=3             |     to which modem (1st, 2nd, 3rd, or 4th.)
FourthModem=4         <--+
Audio=Yes              <-- Enables Modem Audio
RingIndicate=No        <-- Allows system wakeup when in Standby to receive incoming call
Lan1Port=300
Lan1IRQ=5
Lan1MemoryBase1=D8
Lan1MemoryBase2=DC
Lan2Port=310
Lan2IRQ=10
Lan2MemoryBase1=D8
Lan2MemoryBase2=DC
ATATryPrimary=No        <--+ If Yes, try to see if an ATA PC Card is present and which
ATATrySecondary=Yes     <--+    controller it will be assigned as (Primary or Secondary)
ATATryLinear=Yes
FastTokenRing=Yes
DetectNonCompliant=No
ContinueOnConfigFailure=No  <-- If Yes, try to configure an "unrecognizable" PC Card
anyway
BeepInDOS=Yes
BeepInWindows=Yes
GrabInitFile=Yes
InitBufferSize=512

[Libraries]
;
; The Libraries section contains references to any card libraries the
user
; wishes to include.  Libraries are searched in the specified order.
Path
; names are relative to the directory containing CARDID.INI.
;
CardLib=cardid.clb
```


Appendix B: Compaq PCMCIA "Readme" File

```
PCMCIA Support Diskette Version 1.24
Copyright 1994 Compaq Computer Corporation

------------------------------------------------------------------------
--
CONTENTS

1. Installation
2. PCMCIA Documentation
3. Technical Notes
4. How to Obtain Customer Support
5. Packing List

------------------------------------------------------------------------
--
1. INSTALLATION

The Compaq PCMCIA Support Diskette contains drivers and utilities that
enable you to use PCMCIA cards in Compaq computers that feature PCMCIA
slots.
```

To install the PCMCIA drivers and utilities,

1. Insert the diskette in drive A.

2. At the drive A system prompt, type:

   CPQINST

   This creates the directory \CPQDOS on drive C, and copies the PCMCIA driver files into that directory. If Windows is installed on the Computer, the Windows PCMCIA files are copied into the \WINDOWS\SYSTEM directory.

3. CPQINST will add the following lines to your CONFIG.SYS file:

```
    DEVICE=C:\DOS\EMM386.SYS NOEMS -X=D000-DFFF

    ; PCMCIA Power Management driver for Contura Aero and LTE Elite

    DEVICEHIGH=C:\CPQDOS\PCMSMIX.EXE

    ; Only one of the following Socket Services drivers is installed:

    DEVICEHIGH=C:\CPQDOS\SSCIRRUS.EXE                      ; for Concerto
    DEVICEHIGH=C:\CPQDOS\SSVLSI.EXE                        ; for Contura
Aero
                                                           ;  and Elite

    ; PCMCIA drivers common for all Compaq computers:

    DEVICEHIGH=C:\CPQDOS\CS.EXE                             ; for all cards
    DEVICE=C:\CPQDOS\CSALLOC.EXE                            ; for all cards
    DEVICEHIGH=C:\CPQDOS\ATADRV.EXE                         ; for ATA cards
    DEVICEHIGH=C:\CPQDOS\CARDID.EXE C:\CPQDOS\CARDID.INI ; for I/O cards
    DEVICEHIGH=C:\CPQDOS\MEMDRV.EXE                       ;for SRAM/flash
cards
    ;DEVICEHIGH=C:\CPQDOS\DBLFLASH.EXE                      ; for flash
cards
    ;DEVICEHIGH=C:\CPQDOS\MS-FLASH.SYS                      ; for flash
cards
```

   NOTE: By default, the Microsoft Flash File System (DBLFLASH.EXE and MS-FLASH.SYS) is disabled. Only enable the Flash File System if you plan to use flash memory cards. Enable the drivers by editing the CONFIG.SYS file and removing the semicolon (;) from the front of the DEVICEHIGH lines.

   When adding EMM386.EXE, CPQINST excludes memory range D000-DFFF. This reserves a 64K region in upper memory for PCMCIA cards.

   TIP FOR ADVANCED USERS: To optimize memory usage, you may try successively excluding smaller ranges until you find the smallest range that still allows all of your PCMCIA cards to operate. However, any range specified must lie within D000-DFFF.

4. If Windows is installed, CPQINST modifies the SYSTEM.INI in the following manner:

   Example:

```
    [boot]
    Change: comm.drv=comm.drv
    To:     comm.drv=sscomm.drv

    Change: drivers=mmsystem.dll ...[Other Drivers]
```

```
    To:     drivers=mmsystem.dll sswincs.dll ...[Other Drivers]

    [386Enh]
    Add:    device=cs.386

    Change: device=vcd.386
    To:     device=csvcd.386

    Add:    EMMEXCLUDE=D000-DFFF
```

5. Restart your system to activate the drivers. DOS 6 users may run MEMMAKER to optimize memory usage after installing the drivers.

----

2. PCMCIA DOCUMENTATION

Information on how to use PCMCIA cards with your computer is available in the following documentation:

* Beyond Setup Manual
* Compaq Online Users Guide (Available under Windows from the Compaq Learning Center)
* The PCMCIA option in the Computer Setup Utility (Available under Windows from the Compaq Control Center)

----

3. TECHNICAL NOTES

This section contains advanced technical information. It is not necessary to read this information for normal PCMCIA card operation.

The PCMCIA software is pre-configured as follows. Items marked with an asterisk may be modified by running the Computer Setup utility under Windows, or the PCCARD utility under DOS.

```
   DESCRIPTION                                 SETTING

   Valid Card IRQ levels       Concerto:       3,4,5,6,7,9,10
                               Contura Aero:   3,4,5,6,7,9,10,11,12,14
                               LTE Elite:      3,4,5,6,7,9,10,11,12,14
```



```
 * Card status change IRQ                      9

   Reserved upper memory space                 D0000h-DFFFFh
```

NOTE: Depending on your PCMCIA card requirements, you can reserve less memory space for PCMCIA by changing the exclude parameter (X=) on the EMM386 device line in CONFIG.SYS. See "INSTALLATION" above for details.

```
 * Modem/FAX card COM port                     2
 * Modem/FAX card IRQ                          3
 * Modem/FAX card I/O ports                    2F8h-2FFh
```

NOTE: The following settings are only used for PCMCIA network cards that do NOT include network drivers that are Card Services clients.

Refer to your network card documentation or contact the card manufacturer to
determine whether or not the driver is a Card Services client.

* Network card IRQ	5
* Network card I/O ports base address	300h
* Network memory base address 1	D8000h
* Network memory base address 2	DC000h

Make sure the network settings match those specified in the network setup program or in the network driver initialization file. Also make sure the network driver is set up to use a valid PCMCIA IRQ from the list above.

--

4. HOW TO OBTAIN CUSTOMER SUPPORT

To obtain customer support to help you resolve any problems you may have when using the Compaq PCMCIA Support Diskette, call the Compaq customer support line at (800) 345-1518. Support technicians are on duty 7 days a week, 24 hours a day.

You can help the support technician to solve your problem in the most expedient manner possible by providing detailed information about your system configuration, the problem you are having, and the version of the Compaq PCMCIA Support Diskette you are using. You should specifically try to provide the following information:

INSPECT report (run the COMPAQ INSPECT.EXE utility)
Computer model
PCMCIA card manufacturer and model
Steps required to duplicate the problem

--

5. PACKING LIST

The files included on the Compaq PCMCIA Support Diskette are listed in the table below.

Name	Ext	Description
READPCM	TXT	This file
README	COM	README file viewer
CPQINST	EXE	Installation Utility
CPQINST	INF	Installation script file

Directory \CPQDOS

Name	Ext	Description
PCMSMIX	EXE	PCMCIA Power Management driver (Contura Aero, LTE Elite)
SSCIRRUS	EXE	PCMCIA Socket Services 2.1 driver for Concerto
SSVLSI	EXE	PCMCIA Socket Services 2.1 driver for Contura Aero
CS	EXE	PCMCIA Card Services 2.1 driver
CSALLOC	EXE	Card Services resource allocation driver
CSALLOC	INI	CSALLOC initialization file
CARDID	EXE	I/O card configuration driver
CARDID	INI	CARDID initialization file
CARDID	CLB	CARDID configuration database
ATADRV	EXE	IDE/ATA card driver
MEMDRV	EXE	Memory card driver
ATACARD	EXE	IDE/ATA card initialization utility

```
MS-FLASH  EXE    Microsoft Flash File System 2
DBLFLASH  EXE    Data compression driver for MS-FLASH
MEMCARD   EXE    Memory card initialization and maintenance utility
PC-CARD   EXE    PCMCIA card configuration utility for DOS
PCCARD    BAT    Batch file that allows PC-CARD to be run from any
directory
CARDINFO  EXE    PCMCIA card status & power utility for DOS
ATACARD   PIF    Windows Program Information File for ATACARD.EXE
MEMCARD   PIF    Windows Program Information File for MEMCARD.EXE
```

Directory \WINDOWS\SYSTEM

```
Name      Ext    Description
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CS        386    Card Services virtual driver
SSCOMM    DRV    Card Services serial port driver
CSVCD     386    Card Services serial port virtual driver
SSWINCS   DLL    Card Services interface for Windows
```

Appendix C: Compaq PCMCIA Product List

Compaq PCMCIA Product List

Here is a listing of Compaq products that feature PCMCIA technology.

- Compaq Concerto
- Compaq Contura Aero Family of Products
- Compaq LTE Elite Family of Products
- Compaq Contura 400 Family of Products
- Fax/Modem Family of Products including Compaq SpeedPaq 144/P Cellular
- Compaq External PCMCIA Diskette Drive (Floppy)

For more information, please contact your Compaq Service Provider.