PATHWORKS for DOS

digital

Memory Solutions for Client Administrators

PATHWORKS for DOS

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Preface

Purpose

This guide describes ways to reduce memory requirements and increase performance on your personal computer (PC) in a PATHWORKS environment.

Audience

This guide is written for system administrators of PC networks and assumes an intermediate understanding of PC architecture and DOS operation.

Organization

Use the following table to help you find information in this guide.

If You ...	Read ...
Need to understand PC memory and performance	Chapter 1
Need to understand how PATHWORKS affects PC memory and performance	Chapter 2
Need to understand how to configure a PC to affect memory requirements and performance	Chapter 3
Need to understand how to unload PATHWORKS components to free memory	Chapter 4
Want to examine configuration examples for 80386 PCs	Chapter 5
Want to examine configuration examples for 80286 PCs	Chapter 6
Want to examine configuration examples for 8086/88 PCs	Chapter 7

Conventions

This manual uses the following conventions:

Convention	Meaning
"enter"	Type all required text, spaces, and punctuation marks; then press Return, Enter, or ↵, depending on your keyboard.
UPPERCASE	In VMS, DOS, and OS/2 syntax, uppercase letters indicate commands and qualifiers. You can enter commands and qualifiers in any combination of uppercase or lowercase, unless otherwise noted. ULTRIX commands are case-sensitive. You must enter commands in the correct case, as printed in the text.
teal blue type	In examples of dialog between you and the system, teal blue type indicates information that you enter. In online (Bookreader) fil es, this information appears in boldface.
boldface	Boldface type indicates a new term that appears in the glossary. In online (Bookreader) files, boldface indicates information you enter.
/	A forward slash in command descriptions indicates that a command qualifier follows.
NOTE	Notes provide information of special importance.
CAUTION	Cautions provide information to prevent damage to equipment or software.
WARNING	Warnings provide information to prevent personal injury.

Terminology

The terms "personal computer" (PC) and "PC workstation" refer to standalone systems. The term "client" refers to a PC, connected to the network by PATHWORKS software, that can access resources on a server. A server is a system that offers services to clients.

The term "PATHWORKS" refers to PATHWORKS software. PATHWORKS is a trademark of Digital Equipment Corporation.

1

Understanding Memory and Performance

This chapter reviews personal computer (PC) memory and performance concepts and defines common memory and performance terminology.

If you are already familiar with PC memory concepts, read this chapter to learn the terminology used in this guide.

The topics covered in this chapter include:

- Memory basics
- System memory
- Extended memory
- Expanded memory

Memory Basics

Powerful versions of the original IBM PC have evolved in recent years. However, the architecture of the original machine and the DOS operating system limit the newer machines to the capabilities of the original IBM PC during normal operation. This section reviews the memory limitations of the original PC and the DOS operating system. It also describes memory maps and different types of memory.

PC Memory and DOS

References to the Intel 8086 processor apply also to Intel 8088, 80186, and 80188 and to the NEC V30 and V20 processors.

The original IBM PC was developed around the Intel 8086 processor. This processor had a 20-bit address bus and therefore could recognize only:

$$2^{20} = 1,048,576 \text{ addresses.}$$

The 1,048,576 memory addresses are commonly referred to as 1,024 Kbytes or 1 Megabyte (Mbyte). In the original PC, IBM reserved 384 Kbytes of the 1 Mbyte for hardware and startup requirements, leaving 640 Kbytes actually available for DOS and applications.

The DOS operating system was developed for the IBM PC with these limitations in mind. DOS, therefore, was designed to work within the 640 Kbytes of available memory and to recognize 1,048,576 addresses.

References to the Intel 80386 processor apply to the Intel 80386SX and 80486 processors also.

Recent versions of the PC (including the IBM AT and PS/2 models) have been developed around the more powerful Intel 80286 and 80386 processors. These processors have greatly increased addressing capabilities (16 Mbytes on the 80286 processor and 4 Gbytes on the 80386 processor). However, when they are used with DOS, they operate with the same system memory restrictions as the 8086 processor. These restrictions are detailed in the sections that follow.

When these processors are operating in this 8086-compatible mode they are said to be operating in **real address mode**, or simply **real mode**. The 80286 and 80386 processors have additional modes of operation that allow for special memory allocation techniques. These modes of operation are discussed later in this chapter.

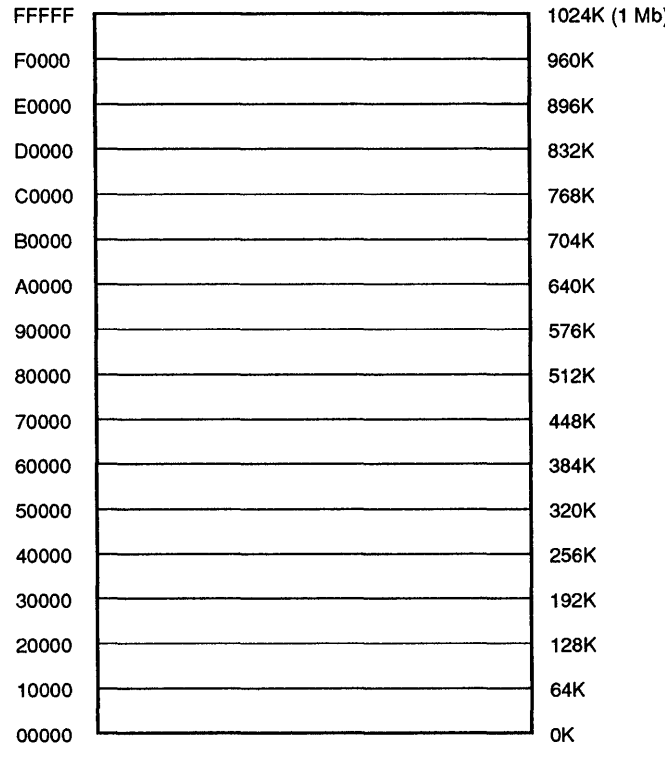
Memory Maps

A memory map is a diagram used to indicate the contents of a range of memory addresses. Figure 1–1 is a memory map of the 1 Mbyte of addressable memory that is available on the original IBM PC.

The memory in Figure 1–1 is partitioned into sixteen 64-Kbyte segments. The column on the left of the memory map identifies the starting hexadecimal address of each 64-Kbyte segment. The column on the right of the memory map identifies the total amount of memory available up to each hexadecimal address. For example, the segments up to hexadecimal address 30000 represent 3 x 64 Kbytes or 192 Kbytes of memory.

These partitions do not represent physical boundaries. They are logical designations that make it easier to refer to specific areas of memory. Memory maps of this or similar type are used in this guide to illustrate the allocation of memory addresses. Some applications can generate a similar map.

Figure 1–1 Memory Map of IBM PC Memory



RAM and ROM

Two common terms associated with memory are RAM and ROM. **RAM** stands for **random-access memory**. RAM memory is any memory location from which data can be read *and* to which new data can be written. **ROM** stands for **read-only memory**. ROM memory is a memory location from which you can read data, but to which you are prevented from writing new data.

Memory Types

Conserving memory requires an understanding of the types of memory available in the DOS environment. Three types of memory are available on most PCs. These include:

- **System Memory**

  System memory corresponds to the 1 Mbyte of memory addresses available on the original IBM PC. System memory is made up of two sections:

  - **Conventional memory**

    The first 640 Kbytes of memory addresses. Applications running in conventional memory generally have the best performance. However, the standard 640 Kbytes may be insufficient for large applications.

  - **Upper memory**

    Memory addresses in the range of 640 Kbytes to 1 Mbyte. Upper memory is usually reserved to store code for startup operations and for PC hardware and options.

- **Extended Memory**

  Extended memory, available only on 80286 and 80386 processors, is the memory beyond the 1 Mbyte addressable boundary. The larger address space supported by these processors is normally not available to DOS. Applications and components that conform to the **Extended Memory Specification** (**XMS**) 2.0 can use extended memory.

- **Expanded Memory**

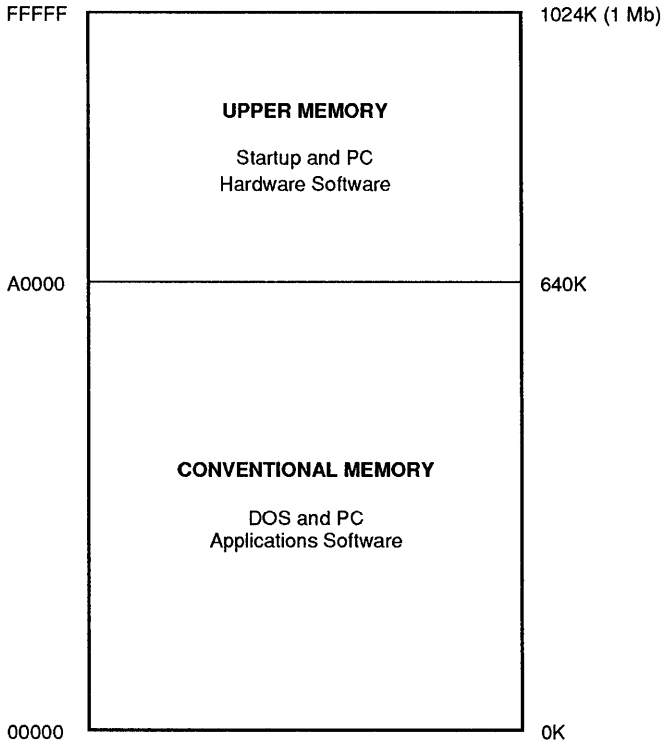
  Expanded memory is memory outside of the linear address range and is accessed through a designated group of addresses within upper memory. Applications and components that conform to the Lotus/Intel/Microsoft LIM **Expanded Memory Specification** (**EMS**) can use expanded memory.

Each of these types of memory is explained in more detail in the following sections.

System Memory

System memory, illustrated in Figure 1–2, is the first 1,048,576 addresses on the PC and includes hexadecimal addresses 00000 to FFFFF. System memory consists of two sections: conventional memory and upper memory.

Figure 1–2 System Memory

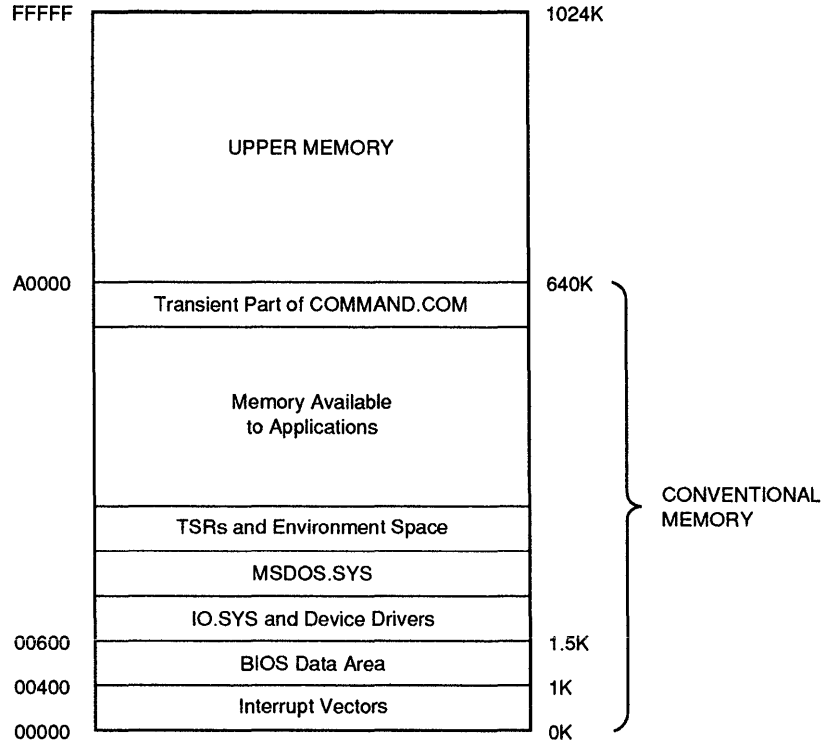


Conventional Memory

Conventional memory is sometimes referred to as low memory, base memory, base RAM, 640K, and free memory.

Conventional memory is the area of system memory between 0 Kbytes and 640 Kbytes (addresses 00000 to 9FFFF). The memory map in Figure 1–3 illustrates the allocation of conventional memory addresses in most PCs.

Figure 1–3 Conventional Memory



TA-0546-AC

The three largest users of conventional memory are:

- Standard user applications

  Standard user applications perform best when operated from conventional memory addresses. The amount of memory used by an application varies depending on the application. When standard user applications are shut down, they usually release the conventional memory addresses for other applications to use.

- TSRs

  A terminate-and-stay-resident (TSR) program is a program that, once loaded, remains loaded in conventional memory, even after the application is terminated. A common example of a TSR is Borland's Sidekick application.

- DOS

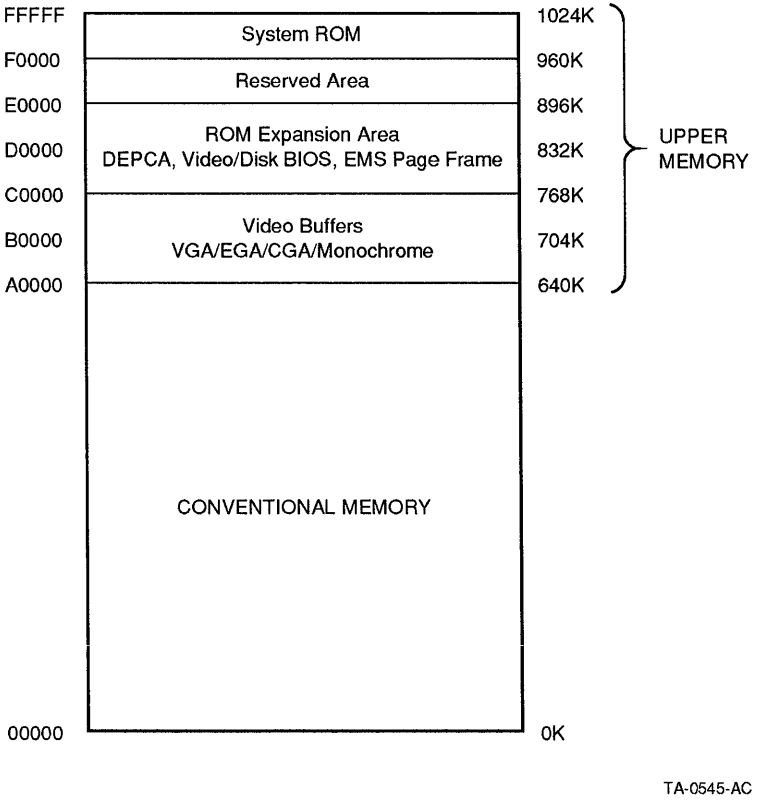
  The amount of memory the DOS operating system requires depends on the version and the definition of the various DOS parameters. DOS version 3.3 requires approximately 50 Kbytes; version 4.0 requires approximately 60 Kbytes.

Upper Memory

Upper memory is sometimes referred to as ROM, high memory, 384K, BIOS memory, adapter memory, and system memory.

Upper memory is the area of system memory between 640 Kbytes and 1 Mbyte (hexadecimal addresses A0000 to FFFFF). The memory map in Figure 1–4 illustrates the allocation of upper memory addresses in most PCs.

Figure 1–4 Upper Memory



Descriptions of each segment of upper memory follow.

- System ROM (64 Kbytes—F0000 to FFFFF)

  System ROM contains the following software code:

  - Bootstrap
  - Startup diagnostics
  - ROM BASIC code (in IBM system only)
  - BIOS (Basic Input/Output System)

- Reserved (64 Kbytes—E0000 to EFFFF)

  The reserved area of upper memory is used in the IBM PS/2 models for additional system ROM. It is not used on the IBM AT, and is available on the IBM XT and on some Compaq and DECstation systems.

- ROM Expansion Area (128 Kbytes—C0000 to DFFFF)

  These addresses are used by adapter options, such as network controller boards, I/O boards, and EMS page frames. Some video drivers use part of this area for control ROM.

- Video RAM (128 Kbytes—A0000 to BFFFF)

  These memory addresses are used to buffer video text and graphics for display.

Although technically upper memory is reserved, there are memory managers available for 80286 and 80386 PCs that can find unused portions of upper memory and form **upper memory blocks** (UMBs). You can load device drivers and other code into UMBs with memory managers. Additional information on using memory managers is provided in Chapter 3.

Extended Memory

Extended memory is any memory location with an address higher than FFFFF or 1 Mbyte. The memory maps in Figure 1–5 and Figure 1–6 illustrate extended memory in 80286 and 80386 PCs, respectively.

Extended memory can be addressed only by 80286 and 80386 processors. In addition to the real mode operation of 8086 processors, these processors have a second operating mode that allows them to use their full addressing abilities. This mode is known as **protected virtual address mode** or simply **protected mode**.

Both 80286 and 80386 processors have different amounts of extended addressing ability. An 80286 processor has 24-bit addresses and can address up to 16 Mbytes of memory (see Figure 1–5). An 80386 processor has 32-bit addresses and can address up to 4 Gbytes of memory (see Figure 1–6).

The processor cannot address these memory locations while the processor is running DOS in real mode. The processor must be switched into protected mode to access extended memory locations and then switched back to real mode to resume DOS operation.

An additional mode is available with 80386 processors. **Virtual 8086 (V86)** mode, like real mode, is used to run 8086 programs. However, V86 mode runs under the control of a protected mode environment. This provides many advantages, chiefly the ability to map a block or page of extended memory into a designated area of the V86 address space. This feature can be used to emulate expanded memory.

Figure 1–5 Extended Memory on a 80286 PC

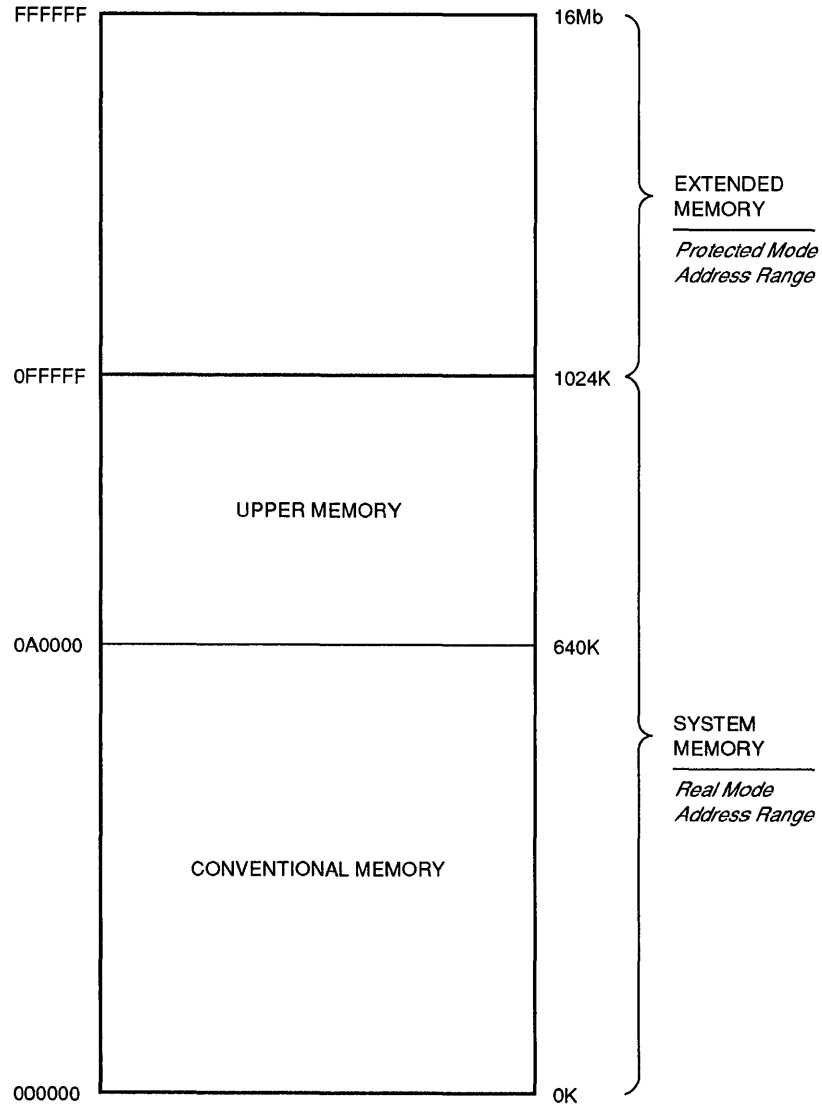
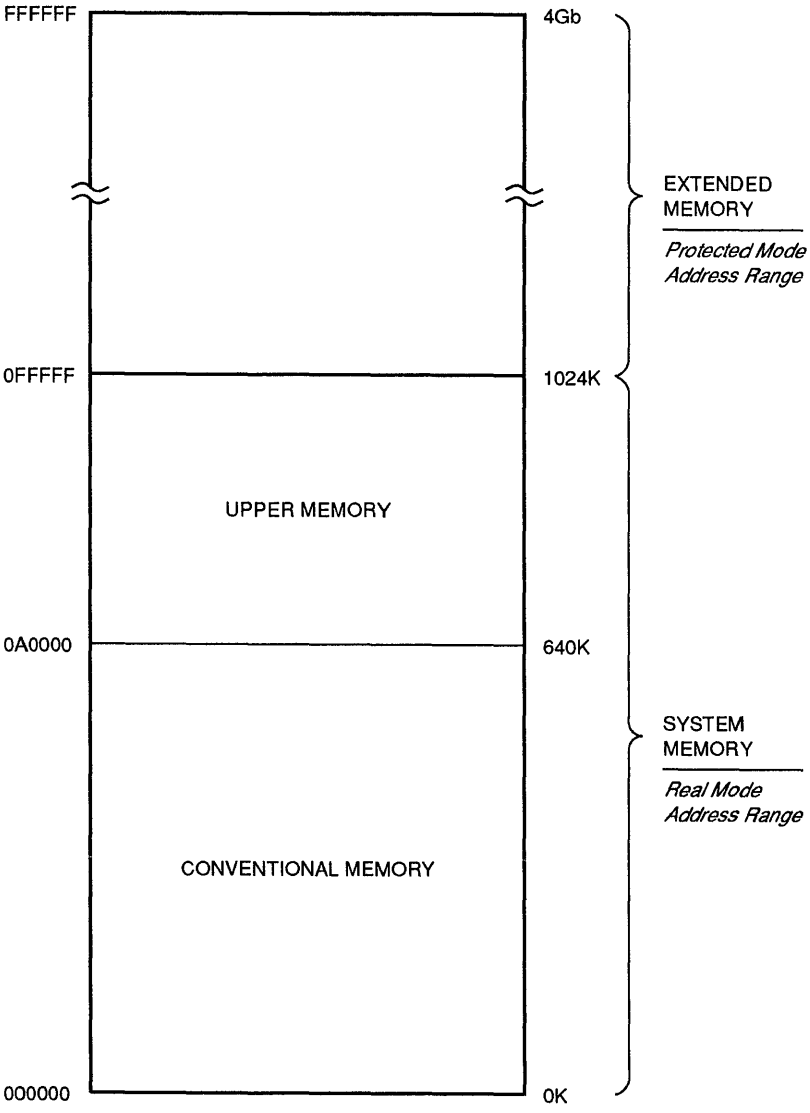


Figure 1–6 Extended Memory on a 80386 PC



Using Extended Memory

In order to use extended memory on an 80286 or 80386 PC, you must have the following two items installed on the PC:

- Physical extended memory

  You must add and configure physical memory on your PC to be accessed in memory addresses over 1 Mbyte (FFFFF).

  For better performance, you should physically locate extended memory with the system memory on the motherboard of your PC. If there is not room for additional memory on your motherboard, you can add a memory adapter board and configure some or all of its memory as extended.

- Extended memory driver

  DOS can manage only 1 Mbyte of system memory. Systems and applications that use extended memory require a separate memory driver to manage access to the extended memory. Many applications that use extended memory provide their own version of an extended memory driver, but many of these drivers are incompatible with each other.

XMS 2.0

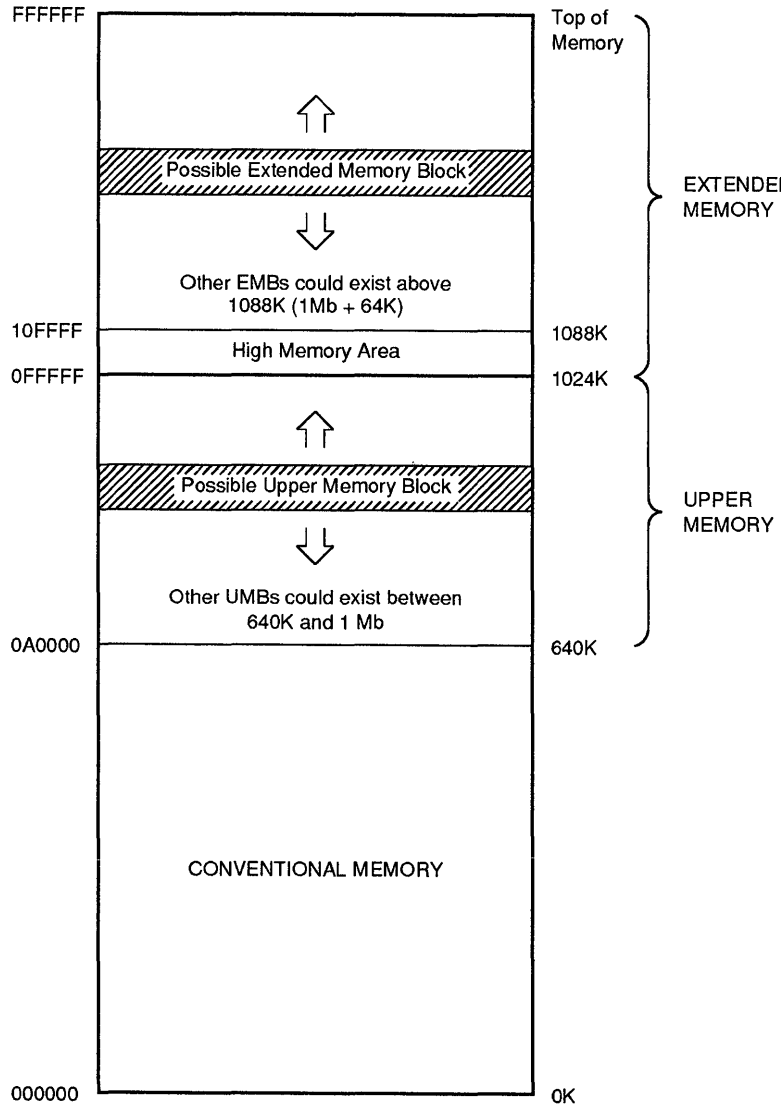
Extended memory is often referred to as XMS memory.

The XMS 2.0 specification defines allocation methods for three specific areas of addressable memory:

- High memory area
- Upper memory blocks
- Extended memory blocks

Figure 1–7 illustrates these three areas.

Figure 1–7 XMS Allocation Areas



High Memory Area

The **high memory area** (**HMA**) is a 64-Kbyte segment of extended memory just beyond the 1 Mbyte DOS boundary (addresses 0FFFFF to 10FFFF). Because of an unusual characteristic of the architecture of the 80286 and 80386 processors, the processors can address this area of memory while they are operating in real mode.

Unfortunately, HMA must be treated as a single 64-Kbyte block of memory. As a result, only a single application or component can be loaded into HMA. Because this area cannot be shared, you should use HMA for a single component that can use most of the 64 Kbytes.

Upper Memory Blocks

Upper memory blocks (UMBs) are groups of memory addresses from upper memory (A0000 to FFFFF). You can use special hardware or memory managers to create UMBs from unused portions of upper memory.

Processors can address these blocks while in real mode.

Extended Memory Blocks

Extended memory blocks (**EMB**s) are allocated from extended memory addresses beyond 10FFFF.

Processors can access EMBs only when they are in protected mode.

Expanded Memory

Expanded memory is physical memory outside the address range of the PC's processor. Expanded memory boards are usually added to an adapter slot of a PC. A segment of upper memory addresses is allocated as a page frame and portions of the expanded memory are mapped into the page frame as needed.

Unlike extended memory, which only 80286 and 80386 processors can use, all processors can use expanded memory.

Expanded Memory Specifications

The three major specifications that have been developed to govern the use of expanded memory are:

- Expanded Memory Specification (EMS) 3.2
- Enhanced EMS 3.2
- EMS 4.0

Expanded memory is often referred to as EMS memory.

EMS 4.0 specifies hardware (adapter memory board) and software (memory driver) requirements for addressing up to 32 Mbytes of physical memory outside the normal addressing range of the PC processor.

Using Expanded Memory on an 80286 or 8086 PC

To use expanded memory on your 80286 or 8086 PC, you must install two items on your PC:

- Expanded Memory Board

  You must install an expanded memory board in an adapter slot on your PC. Typically, to install a expanded memory board, you must:

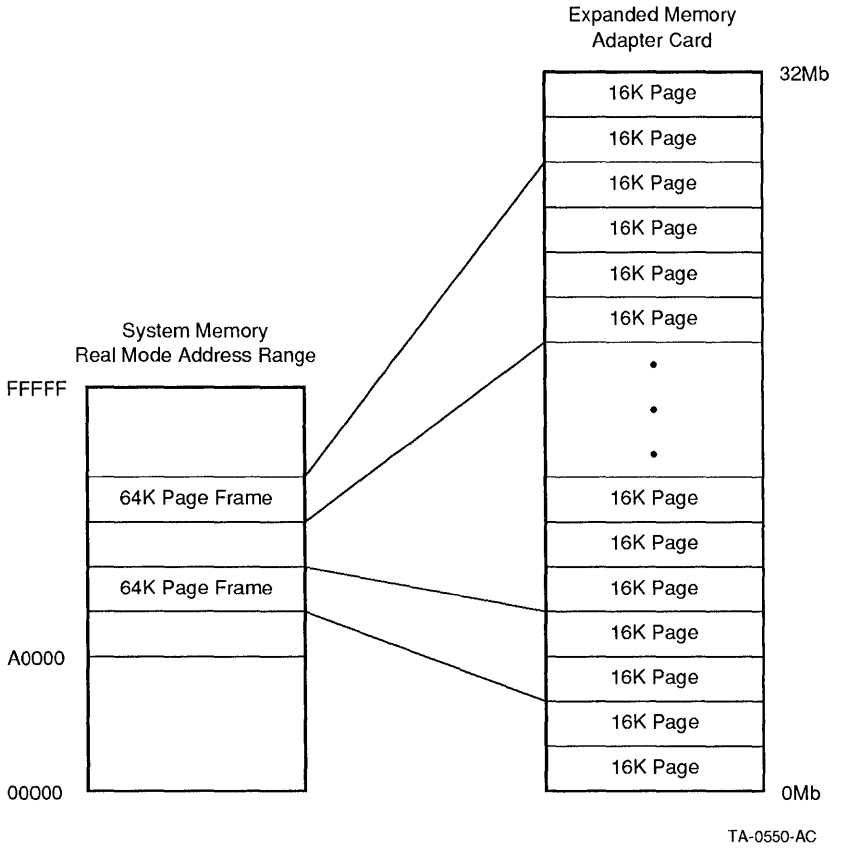
  1. Run a setup program that comes with the memory board to configure the memory as expanded
  2. Run a setup program for your PC to get it to recognize the new adapter and its configuration.

- EMS 4.0 Expanded Memory Driver

  You must install an expanded memory driver on your PC to manage the allocation of expanded memory to applications that require it. An EMS driver is provided with each expanded memory board. More information on using memory drivers is provided in the next chapter, Chapter 2.

Figure 1–8 shows how EMS is used on a 80286 PC. Portions or pages of expanded memory are mapped into one or more 64-Kbyte page frames in upper memory. These pages are swapped in and out as the additional memory addresses on the expanded memory board are needed.

Figure 1–8 Using Expanded Memory on an 8086 or 80286 PC



Using Expanded Memory on an 80386 PC

Expanded memory use on an 80386 PC is different from that on 8086/88 and 80286 processors. Instead of being switched to an upper memory page frame from a memory adapter board in an option slot, expanded memory is switched from extended memory on the motherboard or from special extended memory slots of a 80386 PC. This increases the paging efficiency and overall performance of components that run in EMS memory because paging is much faster from these slots than from an option (expanded memory) slot.

To use expanded memory on your 80386 PC, you must install two items on your PC:

- Extended memory

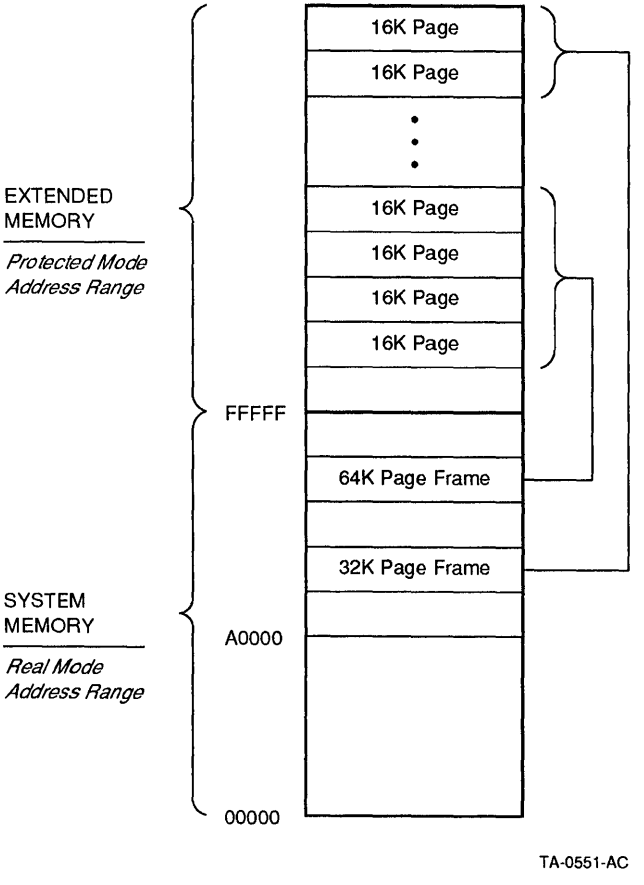
  You should add extended memory to the motherboard or to special extended memory slots of your PC. You can add memory in an standard option slot, but paging from an option slot degrades performance.

- 386 memory manager

  You should install a 386 memory manager, such as QEMM-386 or 386MAX. These memory managers take advantage of the advanced features of the 80386 processor and use extended memory to simulate expanded memory. The 386 memory manager you use should be compliant with XMS 2.0, EMS 4.0, and **Virtual Control Program Interface (VCPI)** standards. More information on memory managers is provided in Chapter 2 and Chapter 3.

Although an 80386 PC can use an expanded memory board, it is more efficient to use extended memory and a memory manage to simulate expanded memory. Figure 1–9 shows how EMS paging is simulated from extended memory on an 80386 PC.

Figure 1–9 Using Expanded Memory on an 80386 PC



2

How PATHWORKS Components Affect Memory and Performance

This chapter explains how PATHWORKS software for DOS affects the memory and performance of typical network clients. Topics covered in this chapter include:

- PATHWORKS memory requirements
- Using extended memory in a PATHWORKS network
- Using expanded memory in a PATHWORKS network
- Using an 80386 memory manager in a PATHWORKS network

PATHWORKS Memory Requirements

To understand how PATHWORKS affects memory and performance, you must consider four factors:

- Network components
- Drivers
- Network controller
- User applications

The impact of these components and applications depends on the type of client you are configuring and the amount and types of memory available on the client.

The effect on memory and performance of each of these factors is explained in the sections that follow.

Network Components

Network components provide protocols for network operation and the exchange of data among network clients. These components are terminate-and-stay-resident (TSR) applications that, when loaded into memory, remain in memory until they are unloaded.

You can load some network components into conventional memory; you can load other components into a combination of conventional, extended, or expanded memory. It is generally best to load network components into extended or expanded memory when possible, to save conventional memory for applications that require it.

By default, network components are loaded into conventional memory (referred to as RAM in the Netsetup utility). However, you can use the Netsetup utility to load most network components into extended or expanded memory, thereby freeing conventional memory for user applications.

If extended memory and expanded memory are unavailable on the client, you can unload one or more network components to free memory for user applications. Refer to Chapter 4 for procedures on unloading network applications.

When you load a network component into extended or expanded memory, a small portion of the software, called a **stub**, remains in conventional memory. Thus, network components require some conventional memory even when they are loaded into extended or expanded memory.

PATHWORKS supports two different types of network protocols: DECnet and TCP/IP. Each protocol has its own set of network components The memory requirements of both DECnet and TCP/IP network components are detailed in the following sections.

DECnet Components

The conventional memory requirements of DECnet components are specified in Table 2–1. Refer to the *DECnet User's Guide* for information on the functions of DECnet components.

Table 2–1 Memory Requirements of DECnet Components

Component	Description	RAM Size in Conventional Memory	RAM Size When Loaded in EMS or XMS
Redirector	Basic Redirector	34K	1K
Enhanced Redirector	Enhanced Redirector (no APIs)	64K	27K
	Enhanced Redirector (APIs)	77K	34K
	Enhanced Redirector (APIs, Messenger)	86K	43K
	Enhanced Redirector (APIs, Messenger, Netpopup)	93K	62K (XMS) 49K (EMS)
Scheduler	Network Interrupt Scheduler	7K ❶ ❷	-
CTERM	Command Terminal access interface	37K ❸	Not available
DLLDEPCA	Data Link Layer	7.6K ❶	-
DLLNDIS and DLLNDIST	Data Link Layer in NDIS Mode	32K ❶	-
DNP ❹	DECnet Network Process	32K	8K ❺
LAST	Local Area System Transport	8K	
LAD	Local Area Disk	5K	
LAT	Local Area Transport	10K	
RCV	Broadcast Receiver	6K	

❶ These components must be loaded in conventional or upper memory (UMB).

❷ SCH has two variants:

SCH.EXE	Provides all Scheduler functions, including EMS and 8088/8086 support. SCH requires about 7K of memory.
SCHK.EXE	Contains the kernel only, which requires about 3K of memory. SCHK does not offer EMS support. If the network is not loaded into EMS, SCHK.EXE does save some memory. SCHK requires an 80286 computer or higher and is available only for local boot.

❸ CTERM must be loaded before starting a task-switching environment (for example, Microsoft Windows or DOS 5.0) If you are not using a task switcher, CTERM can be loaded and unloaded dynamically by the SETHOST and VT320 emulators included with PATHWORKS.

❹ DNP has the four variants:

- DNNDCPLD loads DNNDCPEM.EXE, asynchronous DNP with NETBIOS, into expanded memory. DNNDCPEM provides wide-area-network, asynchronous DECnet with NETBIOS support. DNNDCPEM requires 19K of conventional memory.
- DNNDCPPC loads asynchronous DNP with NETBIOS into conventional memory. DNNDCPPC provides wide-area-network, asynchronous DECnet with NETBIOS support. DNNDCPPC requires 69K of conventional memory.
- DNNETH loads the LAN variant of DNP with or without NETBIOS (DECnet, over Ethernet of Token Ring). DNNETH requires 32K of conventional memory.
- DNPDCPPC loads asynchronous DNP without NETBIOS into conventional memory. DNPDCPPC requires 58K of conventional memory.

Most PATHWORKS clients use DNNETH with NETBIOS support.

❺ When DNP, LAST, LAD, LAT, and RCV are loaded into EMS, a total of 8 Kbytes of conventional memory is used. If any individual component is loaded into EMS, 8 Kbytes of conventional memory are still required for that single component. Load all six components into EMS for the largest conventional memory savings.

TCP/IP Components

The conventional memory requirements of TCP/IP components are specified in Table 2–2. Refer to the *TCP/IP Programmer's Reference* for information on the functions of TCP/IP components.

Table 2–2 Memory Requirements of TCP/IP Components

Component	Description	RAM Size in Conventional Memory	RAM Size When Loaded in EMS or XMS
Redirector	Redirector	34K	1K
TRCV	Broadcast Receiver	6K ❶	-
TCPTSR	TCP/IP Process	109K	70K
EMSBFR	Expanded Memory Buffer TSR	-	1K ❷
NBDRV	NETBIOS Driver	44K	7K
MINSES	Session to NETBIOS Driver	1K ❶	-
TN	Telnet	10K ❸	2K
BAPI	Bridge Application Program Interface	16K ❶	-
DNRTSR	Domain Name Resolver	15K	2K
SOCKTSR	Sockets	36K	18K
NMTSR	Network Management	6K	6K

❶ These components must be loaded into conventional or upper memory (EMS).

❷ This component is required with expanded memory.

❸ TELNET must be loaded before starting a task-switching environment (for example, Microsoft Windows or DOS 5.0) If you are not using a task switcher, TELNET can be loaded and unloaded dynamically by the SETHOST and VT320 emulators included with PATHWORKS.

Drivers

Drivers are device or function control programs that you must specify in the CONFIG.SYS file of the client. For example, an expanded memory module requires an expanded memory driver. Drivers typically have .SYS or .DOS filename suffixes.

Most drivers require only a small amount of conventional memory, typically 2K to 5K. Some memory managers allow you to load drivers into upper memory (A0000 to FFFFF).

You can modify some drivers to adjust memory consumption or performance with DOS parameters in the CONFIG.SYS file.

Separate drivers are required for DECnet and TCP/IP networks. In addition, drivers are required for controlling the use of extended and expanded memory. The following sections detail the memory requirements of DECnet, TCP/IP, and memory drivers.

DECnet Drivers

The list below provides a description of each DECnet driver. The amount of conventional memory needed by the driver is included in parentheses.

- LADCDDRV (6K)

  Local Area Disk CDROM Driver. LADCDDRV.SYS specifies the number of LAD CDROM drives to allocate. If you do not use CDROM services, delete the `Device=LADCDDRV.SYS` line from the CONFIG.SYS file.

- LADDRV (2.5K)

  Local Area Disk Driver. LADDRV.SYS specifies the number of LAD disks to allocate. If you do not use **virtual disk services**, delete the `Device=LADDRV.SYS` line from the CONFIG.SYS file.

- NDIS Driver (2 to 9K)

  Network Device Interface Specification Driver. The driver name and memory consumption depend on the make of the NDIS controller you use.

- NDDRV.SYS (8.8K)

  Network Disk Driver. NDDRV.SYS is the wide area virtual disk driver.

- NPDRV.SYS (8.1K)

  Network Print Driver. NPDRV.SYS is the wide area printer driver.

- PROTMAN.SYS (96 bytes)

  The protocol manager is used for NDIS controller operation.

TCP/IP Drivers

The list below provides a description of each TCP/IP driver. The amount of conventional memory needed by the driver is included in parentheses.

- TCPDRV.DOS (1K)

  TCP Protocol Driver.

- NDIS Driver (2 to 9K)

  Network Device Interface Specification Driver. The driver name and memory consumption depend on the make of the NDIS controller you use.

- PROTMAN.DOS (96 Bytes)

  The protocol manager is used for NDIS controller operation.

- NEMM.DOS (2K)

  Network Expanded Memory Manager. This driver is included as a TCP/IP driver because you must load it even if you do not use expanded memory or if you use a different memory driver for expanded memory control. It controls memory management for other TCP/IP components.

Memory Drivers

A memory driver is a program that allocates and deallocates memory for one or more applications, some of which may be running concurrently. Memory drivers are provided with memory expansion boards and with some applications.

Additional information on memory drivers is provided later in this chapter.

Unfortunately, many of these memory drivers allocate and deallocate memory in conflicting ways. In order for the client to work correctly, memory drivers should comply with either XMS V2.0, EMS V4.0, or both.

The following list describes the most common types of memory drivers used in PATHWORKS clients. The amount of conventional memory needed by the driver is included in parentheses.

- HIMEM.SYS (2K)
  PATHWORKS includes the memory driver, HIMEM.SYS, which manages memory in compliance with XMS V2.0. For PATHWORKS, HIMEM.SYS manages the high memory area (HMA) of extended memory. It typically is used to allocate HMA for the REDIR component in both DECnet and TCP/IP networks.
- Expanded memory managers (5 to 100K)
  Expansion memory boards are usually accompanied by their own memory drivers. For example, the Intel Above board comes with EMM.SYS, an expanded memory driver. Some expanded memory drivers themselves can be loaded into expanded memory.

Network Controller

Each PATHWORKS client must have a network controller board to provide an interface to the network. PATHWORKS supports the following boards:

- DEC EtherWORKS controllers

  DEC EtherWORKS controllers support the following modes:

  - Native mode

    Native mode is the default mode of operation for DEC EtherWORKS controllers in a PATHWORKS network. The Netsetup utility automatically configures an EtherWORKS controller for native mode operation.

    DEPCA Revisions H and earlier, when in small buffer mode, require up to 33 Kbytes of memory for the DLL component.

    EtherWORKS controllers also allow a choice of 64-Kbyte or 32-Kbyte buffer modes. A 64-Kbyte buffer provides the greatest performance. A 32-Kbyte buffer gives the greatest memory savings if other programs use upper memory.

- NDIS

  To operate an EtherWORKS controller in NDIS mode, you must enable it manually by modifying the appropriate DOS and network files. NDIS operation requires 33 Kbytes of conventional memory for the DLL network component. Netsetup automatically configures an EtherWORKS controller for NDIS operation if you specify TCP/IP transport protocol.

- Controllers that conform to the Network Device Interface Specification (NDIS). Netsetup automatically configures the controller for NDIS operation.

User Applications

When configuring a PATHWORKS client, you should attempt to leave at least is to leave at least 512 Kbytes of conventional memory available for DOS applications. This is sufficient memory for most standard DOS applications.

Some applications, including those provided by PATHWORKS, may require additional conventional memory or a combination of conventional and extended memory. The memory requirements of the user applications provided with PATHWORKS software are outlined in the following sections.

PC DECwindows Motif

PC DECwindows Motif uses the client's memory for its own code and data storage. Each application you run under PC DECwindows Motif requires additional memory for its own data.

PC DECwindows Motif includes a memory manager that swaps code and data between conventional (RAM) memory and secondary (disk) memory, as necessary. Swapping code between RAM and disk allows you to run a number of applications without running out of memory in which to store code. However, increased swapping degrades performance.

Determining Memory Requirements

Table 2–3 contains sample combinations of PC DECwindows Motif applications and the amount of available memory you need to run each combination. Use these sample combinations as guidelines when you determine the memory requirements for PC DECwindows Motif.

Table 2–3 PC DECwindows Motif Applications and Their Memory Requirements

	You need...	
To run ...	**DWDOS286**	**DWDOS386**
A window manager and Mail	1100 Kbytes	1250 Kbytes
A window manager, DECterm, and Bookreader	1100 Kbytes	1250 Kbytes
A window manager, VAX notes, the CDA Viewer, and DECterm with ReGIS	1300 Kbytes	1450 Kbytes
A window manager and DECwrite	1600 Kbytes	1750 Kbytes
A window manager, DECterm, DECwrite, DECdecision Chart, Calculator, DECpaint, FileView, and Mail	2200 Kbytes	2350 Kbytes

Use the following guidelines if you are using DWDOS286:

- If your PC has little extended memory, or you want PC DECwindows to use all of conventional memory, set the **Suspend session memory reserve** field in DWCONFIG to 0. You can also edit the DOS_RESERVE line in your DWDOS.INI file.
- If you want to use the Suspend Session feature, add the amount of memory you reserve for DOS applications (using the DOS_RESERVE parameter) to the appropriate amount listed in Table 2–3.

See the *PC DECwindows Motif Guide* for more information on:

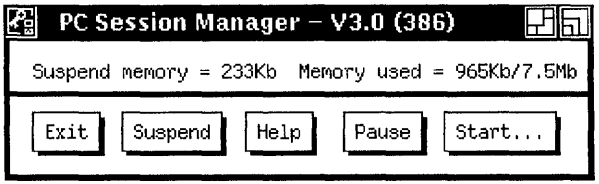
- The Suspend Session feature and the DOS_RESERVE parameter
- Window managers and PC DECwindows Motif applications

Determining Available Memory

The PC DECwindows Motif Session Manager displays the following memory information:

- Suspend Memory—This is the amount of memory available to use if you suspend the X server session.
- Memory Used—The amount of memory you are currently using is reported first, followed by the amount of memory presently available. The amount of memory used increases as DECwindows applications are started.

For example:



The amount of memory usable by PC DECwindows Motif depends on your PC's processor and if you use a memory manager. The following guidelines explain how to determine the amount of usable memory.

- If no memory managers are used:

  Usable memory is equal to the sum of available conventional memory and available extended memory.
- If an XMS 2.0 memory manager is used alone:

  Usable memory is equal to the sum of available conventional memory and available extended memory.
- If a VCPI (expanded memory) manager is used alone:

  Usable memory is equal to the sum of available conventional memory, available expanded memory, and available extended memory.
- If an XMS 2.0 memory manager and a VCPI (expanded memory) memory manager are used together:

  Usable memory is equal to the sum of available conventional memory and available expanded memory.

In this configuration, PC DECwindows Motif is unable to use any unused XMS memory. The limited usable memory may not be enough to allow PC DECwindows Motif to start. If this happens, you can increasing the amount of memory managed by the VCPI (expanded memory) manager to increase the amount of usable memory.

If the client is already installed on the network, you can use either of two PATHWORKS utilities to determine available memory:

- DWINFO2

  DWINFO2 tells you the amount of memory in your current client configuration that can be used by the DWDOS286 executable. To run DWINFO2, type:

  ```
  C:\>DWINFO2
  ```

  A typical DWINFO2 report is shown below:

```
     Protected Mode and Extended Memory Performance Measurement -- 3.95
            Copyright 1988, 1989, 1990 by Rational Systems, Inc.

DOS memory   Extended memory           CPU is 24.9 MHz 80386.
----------   ---------------
       639              4992   K bytes configured (according to BIOS).
       640              7168   K bytes physically present (SETUP).
       476              4992   K bytes available for DOS/16M programs.
                                  (DOS/16M memory range 3136K to 8128K)
11.7 (0.0)       11.7 (0.0)   MB/sec word transfer rate (wait states).
23.7 (0.0)       23.5 (0.0)   MB/sec 32-bit transfer rate (wait states).

Overall cpu and memory performance (non-floating point) for typical
DOS programs is 5.17 q 0.41 times an 8MHz IBM PC/AT.

Protected/Real switch rate = 2953/sec (338 fsec/switch, 183 up + 155
down), using DOS/16M switch mode 3 (386).
```

  In the DWINFO2 example above, the numbers that apply to PC DECwindows Motif are the Kbytes available to DOS/16M programs.

- DWINFO3

  DWINFO3 tells you the amount of memory in your current client configuration that can be used by the DWDOS386 executable. To run DWINFO3, type:

  ```
  C:\>DWINFO3
  ```

  A typical DWINFO3 report is shown below:

  ```
            80386 and 80486 Extended Memory Information Utility
              Copyright 1990 by Digital Equipment Corporation
                                 Version 1.0

  DOS memory   Extended memory
  ----------   ---------------
         442              4992   K bytes available to DWDOS386.EXE
  ```

Configuration Guidelines

The following additional guidelines apply when you configure clients for PC DECwindows Motif:

DECnet-DOS configurations

- To run PC DECwindows Motif on a client configured to use only the DECnet-DOS components (no redirector loaded), you must install all the PC DECwindows Motif files to the client's local hard disk.

TCP/IP components

- On a TCP/IP client:
  - PC DECwindows Motif requires the SOCKTSR component.
  - If any of the hosts used to run DECwindows applications is a VMS host, the Telnet and BAPI components are also required.
- On an 80286 client used for for both PC DECwindows Motif and local DOS applications, use a memory board with 256 Kbytes configured as expanded memory. (PATHWORKS network components that can run in expanded memory require only 256 Kbytes of that area.)
- If you use a 386 memory manager, it must be VCPI compliant.

SEDT

You can control how SEDT uses memory on the client by entering one of the following commands in the SEDT.CNF file in the SEDT directory:

- BUFFERING=EMS

  DOS files being edited in SEDT are buffered (temporarily stored) in expanded memory before overflowing to available conventional memory and the hard disk.

  This is the default BUFFERING command; you do not need to specify it in the SEDT.CNF file. Do not use this command if you are running Microsoft Windows Version 3.0 in Enhanced mode.

- BUFFERING=NOEMS

  DOS files being edited in SEDT are not buffered in expanded memory. This command is required for Microsoft Windows Version 3.0 Enhanced mode.

  Add BUFFERING=NOEMS to the SEDT.CNF file to disable buffering to expanded memory.

- BUFFERING=FREE

  DOS files being edited in SEDT are buffered in available conventional memory before overflowing to hard disk. If you select this option, you may not be able to spawn to the DOS prompt when editing large files.

  Add BUFFERING=FREE to the SEDT.CNF file to enable buffering of files in conventional memory.

- BUFFERING=NOFREE

  Conventional memory is not used for buffering SEDT files. SEDT files are buffered in expanded memory (if enabled) and overflow to hard disk. This allows you to spawn out of SEDT, but may degrade performance.

  Add BUFFERING=NOFREE to the SEDT.CNF file to disable buffering in conventional memory.

Using Extended Memory on a PATHWORKS Client

PATHWORKS requires that any applications that use extended memory be compliant with XMS 2.0 and use an XMS 2.0 memory driver.

HIMEM.SYS

HIMEM.SYS is the XMS 2.0 device driver that allows DOS programs on 80286 and 80386 processors to access extended memory. PATHWORKS provides HIMEM.SYS to manage access to the HMA of extended memory.

HMA is accessed by enabling the A20 line, which is the 21st address line of 80286 and 80386 processors. For most systems, the keyboard controller enables and disables the A20 line. Toggling the line can be slow and affect the performance.

When the Netsetup utility refers to XMS, it is actually referring to HMA. If you select XMS for the REDIR, it is loaded into HMA.

HMA is allocated as a single unit. Therefore, select an application or network component that requires most or all of the usable 64 Kbytes in HMA. This leaves more conventional memory available to other applications. For example, when you load the Basic Redirector (REDIR) into HMA, it requires about 1 Kbyte of conventional memory. When it is loaded totally into conventional memory, REDIR uses approximately 32 Kbytes.

Use of HIMEM.SYS depends on the kind of processor you have:

- If you have an 8088/8086 processor, you cannot use HIMEM.SYS.
- If you have an 80286 processor, you can use HIMEM.SYS to manage extended memory while you use an EMS 4.0 driver such as EMM.SYS to manage expanded memory.
- If you have an 80386 processor, you can use HIMEM.SYS to manage HMA in extended memory while you use a driver such as QEMM-386 to manage the rest of extended memory and all of expanded memory.

  Both 386MAX and QEMM-386 versions 5.0 and later provide the ability to manage HMA. Do not use HIMEM.SYS if you use 386MAX or QEMM-386 Version 5.0 or later.

Refer to the appropriate documentation for detailed instruction on using EMM and QEMM-386.

Installing HIMEM.SYS

To use HIMEM.SYS, you need one of the following:

- Extended memory board
- Expanded memory board with a minimum of 64 Kbytes configured as extended memory

Although Netsetup automatically modifies CONFIG.SYS, you may prefer to edit the file manually. Be sure to install HIMEM.SYS before other device drivers that use extended memory. The following command line shows the normal HIMEM.SYS load command in the client's CONFIG.SYS file.

```
DEVICE=HIMEM.SYS
```

As shown in Table 2–4, two options are available for HIMEM.SYS. PATHWORKS does not use these options, but other software may require them.

Table 2–4 HIMEM.SYS OPTIONS

Option	Function
/HMAMIN=h	Sets the minimum amount of space in Kbytes that a program can occupy when loaded into HMA. Programs that use less space than the specified number are not placed in HMA. Minimum = 0, Maximum = 63, Default = 0
/NUMHANDLES=n	Sets the maximum number of EMB (extended memory block) handles that can be used at any time. Minimum = 1, Maximum =128, Default = 32. Each additional handle requires 6 bytes of memory.

Possible Conflicts with HIMEM.SYS

Many extended memory drivers that are developed for a specific user application are incompatible with HIMEM.SYS. This incompatibility can cause the network to fail to start up or to hang when you boot the client. If this happens, you must edit the CONFIG.SYS file to remove the HIMEM.SYS load command. You can still use the extended memory managed by the other driver, but you cannot load the redirector into extended memory.

Any application that uses extended memory *must* be compatible with XMS 2.0. Keep in mind that many applications are incompatible. For example:

- HIMEM.SYS conflicts with some expanded memory drivers. These conflicting drivers include:
  - Zenith ZEMM.SYS
  - COMPAQ CEMM.EXE
  - IBM XMAEM.SYS

  One option is to use a third-party 80386 memory manager instead of the conflicting memory manager. Some 80386 memory managers incorporate XMS 2.0 support into their drivers. If you use such a memory manager, do not load HIMEM.SYS.
- To use HIMEM.SYS with a QEMM-386 version earlier than 5.0, you must make sure to leave some extended memory available for HIMEM.SYS by specifying one of the following:
  - ME= smaller than the total extended memory available
  - EXT= a value greater than 64
- HIMEM.SYS is incompatible with IBM PC-DOS VDISK prior to Version 4.0, but does work with VDISK Version 4.0 and later. HIMEM.SYS may not work with applications which allocate extended memory by a method other than that used by HIMEM.SYS as defined by Microsoft Corporation.
- HIMEM.SYS may not work on some PC-compatibles. Its operation is a function of the method used to control the A20 address line. It is known to work on IBM PC/AT, PS/2, COMPAQ, and DECstation models.
- RAMDRIVE.SYS from the Microsoft Windows Version 2.1 product is compatible with HIMEM.SYS.

Using Expanded Memory on a PATHWORKS Client

To configure an 8088, 8086, or 80286 client, you should install an EMS Version 4.0 board and driver. Then you can run network components from expanded memory and save conventional memory for application software.

To configure an 80286 or 80386 client, you can use extended memory also. Refer to the section Using Extended Memory on a PATHWORKS Client earlier in this chapter.

To configure an 80386 client, refer to Using an 80386 Memory Manager on a PATHWORKS Client later in this chapter.

The amount of conventional memory you save by using expanded memory depends upon many factors, such as the size of the expanded memory driver and the components you load into expanded memory.

Effects of Using Expanded Memory on Performance

The performance of PATHWORKS using expanded memory depends on the following factors:

- The driver and board selected to run expanded memory

  Each company uses different logic for paging and mapping memory on its expanded memory board. Each application uses memory in different ways. EMS 4.0 mapping could degrade the performance of a spreadsheet application, but it should not affect PATHWORKS performance.

- Memory access time

  Because of hardware factors, expanded memory tends to have a longer access time than conventional memory. Although this difference is apparent in benchmark tests, you probably will not notice it if fully EMS 4.0-compatible software and fast expanded memory hardware are used.

- Paging efficiency

  Paging time depends upon the efficiency of the expanded memory driver and memory board. A driver that maps data or code quickly in and out of the page frame provides the best performance. Performance discrepancy is most visible in benchmark tests.

- Component mixture

  Load only PATHWORKS components into expanded memory to improve performance and reduce paging time.

- PC configuration

  Some personal computers perform better than others, even with the same expanded memory hardware and software.

Expanded Memory Performance Tips

Regardless of the expanded memory board and driver you use, you can improve performance by doing the following:

- Load only PATHWORKS components into expanded memory.

  When PATHWORKS determines that it is the only application running in expanded memory, it switches to fixed mode, which requires less paging.

  When you load another application into expanded memory, PATHWORKS switches back to paged mode.

- To stay in fixed mode, run a RAM disk or disk cache in extended memory instead of in expanded memory.

- When you configure the expanded memory board for PATHWORKS, configure 256 Kbytes for expanded memory. (See the installation book supplied with the expanded memory board.) Configure the page frame in upper memory to be a maximum of 64 Kbytes.

  Configure at least 64 Kbytes of the board as extended memory.

Possible Conflicts in Expanded Memory

Beware of the following potential conflicts with the use of expanded memory:

- Background expanded memory applications

  If any part of PATHWORKS is placed in expanded memory, background expanded memory applications are not supported at the same time. An example of an unsupported background application is a TSR process that is activated by a **hotkey**. A hotkey is a key sequence used to activate a TSR.

  This kind of application pages expanded memory during hardware interrupt time. If you attempt to use a hotkey application while PATHWORKS components are in expanded memory, the system may lock up.

Some disk caching applications with WRITE BEHIND also may cause problems. WRITE BEHIND means that the application buffers all code and data to the hard disk and writes it out at a later time.

- Foreground expanded memory applications

  If a Direct Memory Access (DMA) processor actively copies data into expanded memory when the network is using expanded memory, data corruption can occur.

- Expanded Memory and PC-DOS Version 4.0

  Do not load PC-DOS Version 4.0 features into expanded memory. For example, do not use the X parameter with BUFFERS, VDISK.SYS, or FASTOPEN commands.

  Do not specify XMA2EMS.SYS parameters p254 and p255. These do not work when the network is using expanded memory.

- Customer developed programs

  Customer developed programs using the DECnet-DOS interface may not be able to run from expanded memory. See the *DECnet Programmer's Reference*.

- SCSI hard disk drives on DECstations

  If you are using a DECstation with a SCSI hard disk and you load the network in EMS, load SCSIHA.SYS in your CONFIG.SYS file. For example:

  ```
  DEVICE=C:\DOS\SCSIHA.SYS
  ```

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

Using an 80386 Memory Manager on a PATHWORKS Client

Memory managers are often supplied with 80386 PCs. These memory managers are called **native drivers**. They conform to the Expanded Memory Specification (EMS) 4.0, but not the Virtual Control Program Interface (VCPI) specification. Also, they are not usually compatible with HIMEM.SYS. Examples are CEMM, XMAEM, and ZEMM. (Version 4.1 of CEMM is compliant with VCPI.)

As an alternative to a native driver, you can purchase an 80386 memory manager from a third-party vendor. Examples of third-party memory managers are the Quarterdeck QEMM-386 and the Qualitas 386MAX. These memory managers include drivers that comply with EMS 4.0 and VCPI, and additional features such as the ability to load programs in upper memory.

More information on using an 80386 memory manager is provided in Using an 80386 Memory Manager, in the next chapter.

3

Procedures for Configuring a Client

This chapter provides general recommendations and procedures for configuring clients to save conventional memory and increase performance. Topics covered in this chapter include:

- PATHWORKS recommendations
- Configuration summary
- Configuration procedures
- Determining current memory configuration
- Adding memory
- Using an 80386 memory manager
- Configuring the network controller
- Loading PATHWORKS components
- Editing DOS and Network Files
- Running Microsoft Windows on a PATHWORKS Client
- Using DOS Version 5.0 on a PATHWORKS Client

PATHWORKS Recommendations

Configuring a client to conserve memory may affect performance or function. Although components that run in conventional memory generally provide the best performance, there may not be enough available conventional memory on the client to accommodate larger DOS applications.

In addition, running a network component or application in expanded or extended memory can lower its performance. For example, when a spreadsheet application, such as Lotus 1-2-3, uses expanded memory to store data, the recalculation rate is

slower because the data in expanded memory must be paged into system memory.

On the other hand, if you reduce the number of applications available in order to save memory, you lose the function of the removed applications.

If the client applications require additional memory, some components can be adjusted to minimize their memory use. To determine the best configuration for a specific client, experiment with the memory saving methods described in this chapter.

Consider the needs of the people using the PATHWORKS network. To find a comfortable balance between memory, performance, and function, you may need to try several different configurations.

Configuration Summary

Table 3–1 lists the required components for each of three memory areas by system type.

Table 3–1 Recommended Components

Type of Memory	Client/Required Components		
	8088	**80286**	**80386**
Expanded	EMS 4.0 device driver EMS board with 128 Kbytes minimum for network	EMS 4.0 device driver EMS board with 128 Kbytes minimum for network	386 memory manager that supports EMS 4.0 with minimum of 128 Kbytes of extended memory for network
Extended	Not available	64 Kbytes of extended memory with XMS/HMA device driver HIMEM.SYS	64 Kbytes of extended memory with XMS/HMA device driver
Upper Memory Block	Requires special hardware and software	Requires special hardware and software	386 memory manager that supports XMS 2.0 or DOS 5.0

Upper memory blocks (UMBs) are unused areas of memory between 640 Kbyte and 1 Mbyte. An 80386 memory manager can remap some extended memory to the UMBs, which can then be accessed in real mode.

You need 2 Mbytes of extended memory to take full advantage of the features of an 80386 memory manager.

The following list summarizes PATHWORKS configuration recommendations.

- Use a DEC EtherWORKS or NDIS-compliant controller.
- Modify the client's CONFIG.SYS file as follows:
  - BUFFERS=8
  - FILES=20
  - LASTDRIVE=s
  - Install EMS 4.0 driver
- Configure the client for local boot
- Load the Redirector into extended memory (XMS).
- Load DNP, LAT, LAST, LAD, and RCV into expanded memory (EMS).

Table 3–2 and Table 3–3 describe memory use for both DECnet and TCP/IP sample configurations, including:

- Conventional memory used by the PATHWORKS components.
- Conventional memory available to DOS applications This number may vary depending

Note

These tables offer a comparison between types of systems using different memory strategies. Actual numbers may vary depending on your system.

Table 3–2 Sample DECnet Configurations

	System Type				
	8086	**8086**	**80286**	**80286**	**80386**
Conventional memory	640K	640k	640K	640K	640K
Expanded memory (EMS)	None	128K	None	128K	None
Extended memory (XMS)	None	None	64K	64K	512K
EMS driver	None	EMS 4.0	None	EMS 4.0	EMS 4.0
XMS driver	None	None	XMS 2.0	XMS 2.0	XMS 2.0
386 Memory manager	No	No	No	No	Yes
Conventional memory used by PATHWORKS	119K	58K	85K	23K	None
Conventional memory available to DOS applications	480K	530K	505K	560K	600K

Table 3–3 Sample TCP/IP Configurations

	System Type				
	8086	**8086**	**80286**	**80286**	**80386**
Coventional memory	640K	640K	640K	640K	640K
Expanded memory (EMS)	None	176K	None	176K	None
Extended memory (XMS)	None	None	64K	64K	512K
EMS driver	None	EMS 4.0	None	EMS 4.0	EMS 4.0
XMS driver	None	None	XMS 2.0	XMS 2.0	XMS 2.0
Memory manager	No	No	No	No	Yes
Conventional memory used by PATHWORKS	168K	100K	134K	65K	0–44K
Conventional memory available to DOS applications	432K	494K	464K	526K	556–600K

Configuration Procedures

Each client should have 512 Kbytes of conventional memory available for DOS applications. One method of reaching this goal is to use expanded and extended memory for network components.

The following sections list the recommended procedure for configuring clients of various types to obtain 512 Kbytes of free conventional memory.

Detailed instructions for each of these recommendations are provided in the remainder of this chapter.

If you cannot add memory or if these procedures do not produce enough conventional memory to accommodate DOS applications, you may be able to load and unload network components as they are needed. Refer to Chapter 4 for instructions on unloading network components.

If You Are Configuring an 80386 Client

Use the following procedure to configure an 80386 client to leave at least 512 Kbytes of conventional memory free for local DOS applications.

1. Determine the current memory configuration.

   Gather preliminary information about the current memory configuration before attempting to configure the client.

2. Add and configure memory.

   Add base (nonadapter) memory and a driver to enable the use of expanded memory and extended memory.

3. Use an 80386 memory manager.

   80386 Memory Managers increase performance and allow you to load additional network components into upper memory and extended memory.

4. Configure the network controller.

   Configure the network controller to work compatibly with memory adapters and other options.

5. Load network components into EMS and XMS.

   Load those network components that you need into EMS. Redirector should be loaded into XMS.

6. Tune network and DOS files.

   Edit network and DOS files to minimize memory use or to increase performance.

If You Are Configuring an 80286 Client

Use the following procedure to configure an 80286 client to leave at least 512 Kbytes of conventional memory free for local DOS applications.

1. Determine the current memory configuration.

   Gather preliminary information about the current memory configuration before attempting to configure the client.

2. Add and configure memory.

   Add an EMS Version 4.0 memory adapter board and driver to enable the use of expanded memory. Load the PATHWORKS XMS 2.0 driver HIMEM.SYS to enable HMA in extended memory. Test the memory board with the EMSSPEED utility.

3. Configure the network controller.

   Configure the network controller to work compatibly with memory adapters and other options.

4. Load network components into EMS and XMS.

   Load Redirector into XMS. Load any remaining network components that you need in EMS.

5. Tune network and DOS files.

   Edit network and DOS files to minimize memory use or to increase performance.

If You Are Configuring an 8086/88 Client

Use the following procedure to configure an 8086/88 client to leave at least 512 Kbytes of conventional memory free for local DOS applications.

1. Determine the current memory configuration.

   Gather preliminary information about the current memory configuration before attempting to configure the client.

2. Add and configure memory.

   Add an EMS Version 4.0 Memory Adapter board and driver to enable the use of expanded memory. Use the EMSSPEED utility to determine the EMS performance of the memory board.

3. Configure the network controller.

   Configure network controller to work compatibly with memory adapters and other options.

4. Load network components into EMS.

   Load the network components that you need in EMS.

5. Tune network and DOS files.

   Edit network and DOS files to minimize memory use or to increase performance.

Determining Current Memory Configuration

Before attempting to configure the client, you should understand its current memory configuration.

Memman Utility

Memman is the PATHWORKS Memory Information Utility. Use memory maps and tables to check how much memory is currently being used by system components. Summary information is available on DOS memory usage and on upper, conventional, expanded, and extended memory.

The Client Commands Reference lists all the commands, qualifiers, and field descriptions for Memman.

To use Memman to generate memory configuration information about the client:

1. Use the Basic mode of the Netsetup utility to create a key diskette. Accept the default values and copy the key diskette to the hard disk.
2. Reboot the client. Network components are loaded into conventional memory.
3. Enter one or more of the Memman commands identified in the following sections.

MEMMAN/S/F

Use this command to generate a full memory summary, including a map of upper memory.

```
MEMMAN V4.1.2  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    639K
    Available conventional memory   491K

    Physical extended memory       7168K
    Reported extended memory         0K

    Expanded memory                Not Present

    XMS extended memory available  5056K
    Largest available EMB          5056K

System Memory Scan

    0000-9FBF 639K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-B7FF  96K Free
    B800-BFFF  32K RAM
    C000-C5FF  24K ROM COPYRIGHT WESTERN DIGITAL CORP. 1987,88,89
    C600-CBFF  24K Free
    CC00-CFFF  16K ROM
    D000-DFFF  64K RAM
    E000-EFFF  64K ROM Unknown
    F000-FFFF  64K System ROM (C) 1985,1986,1987
```

Use MEMMAN/S/F when you want to know:

- What segments of upper memory are already in use.

  When you install an expanded memory driver you must specify a block of upper memory, typically 64 Kbytes, that can be used as a page frame. You must also specify a nonconflicting frame address for the network controller.

- How much upper memory is available for memory managers.

  Third-party memory managers for 80386 clients, and some 80286 clients, allow you to load network components and drivers into upper memory. You can restrict the memory manager from using upper memory segments that are already in use.

MEMMAN

Use this command to display a map of the current contents of conventional memory.

```
MEMMAN V4.1.2  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
1361    3376  COMMAND.COM                        22-24 2E D3-D4
free      48
1361     528  COMMAND.COM  <ENVIRONMENT>
free     144
1465    6384  KEYBRD                             09 16
free     416
1611    1136  PCSA Mark
1659    3216  Scheduler    /H                    08 0D 6C
free     352
173A    8000  Datalink                           1C
192F   32800  DNP/NETBIOS  /rem:2                2A 5C 6E D1
2132    9856  LAST         /N:CLNT1 /c:d /M:D /g 69
239B     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free     400
23EC    5280  LAD          /R:-1 /W:-1 /A:-1     13
free  501888
```

Use MEMMAN when you want to know:

- How much actual conventional memory is used by each component.

  Chapter 2 lists the estimated memory requirements of each PATHWORKS component. However, to determine the actual memory that each component uses, read the memory map provided by the MEMMAN/M command.

- How much memory you can gain by unloading components.

  When you unload the network, all components up to and including the PATHWORKS Mark are unloaded. Add the numbers to calculate how much memory you can gain.

- Which component was loaded last. Look at the bottom of the map and find the last component listed.

- The effects of editing file parameters on the memory used by PATHWORKS components.

MEMMAN/E

Use this command to display information about expanded memory.

```
MEMMAN V4.1.2  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Expanded Memory Information

    EMM driver version           4.0
    EMM page frame address       C800
    Expanded memory size          32 pages (512K)
    Expanded memory available     24 pages (384K)

Allocated Pages

    Handle  Pages    Size   Attributes  Handle Name
    ------  -----    ----   ----------  -----------
       0        0     0K    volatile    [noname]
       1        4    64K    volatile    [noname]
       2        4    64K    volatile    [noname]
```

Use this table when you want to know:

- If you have expanded memory
- How much expanded memory is available
- The page frame address

MEMMAN/X

Use this command to display information about extended memory.

```
MEMMAN V4.1.2  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Extended Memory Information

    XMS driver version          2.00 (Rev 2.60)
    Driver API entry point      09DD:00DF
    High memory area            Allocated
    A20 line status             Disabled
    Extended memory available   5056K
    Largest available EMB       5056K
    Largest available UMB       1023K
    Available EMB handles       31

Allocated Memory

    ID  Handle    Size    Locks    Real Address
    --  ------    ----    -----    ------------
    87   0A87     2048      0        00110000
```

Use this table when you want to know if an XMS 2.0 driver is installed and the amount of extended memory currently configured on the client.

Third-Party Utilities

Various memory utilities are supplied with memory adapters and managers supplied by independent distributors. These utilities can often be used to determine the current memory configuration.

Adding Memory

The amount and type of memory you require depends on the type of client you are configuring and the predominant use intended for it.

How Much Memory?

The following recommendations apply in most cases:

- 8086/88 clients

  Purchase a 512-Kbyte EMS 4.0 memory board and driver. Fill conventional memory to 640 Kbytes if necessary. Configure remainder of memory as expanded.

- 80286 clients

  Purchase a 1-Mbyte EMS 4.0 memory board and driver. Back fill conventional memory to 640 Kbytes if necessary. If you intend to use PC DECwindows Motif or Microsoft Windows applications most of the time, configure the remainder of the memory as extended. If you plan to run standalone DOS applications at least half the time, configure 512 Kbytes as extended and the remainder (384 or 512 Kbytes) as expanded.

- 80386 clients

  For 80386 clients, purchase enough extended memory to reach a total of 2 Mbytes in the client. Purchase an 80386 memory manager also.

  You should not use expanded memory boards in an 80386 personal computer (PC) as a general rule. They usually provide lower performance and are more expensive. When adding memory to 80386 PCs, you should purchase extended memory of a type recommended by the manufacturer. On a 80386 PC, that memory is installed in special memory slots. If the memory is installed in standard adapter slots, memory access time is usually impaired.

Memory access time is a very important factor in the purchase of of memory boards. Buying memory boards with a faster memory access time usually increases performance, but the architecture of the client limits memory access time. Therefore, it is practical to buy a memory board with a speed that matches that of the client. This is where the EMSSPEED utility is helpful. It measures the speed of expanded memory in comparison to that of the conventional memory of the client.

Testing Expanded Memory Performance in the Client

To determine the performance and functionality of EMS configurations, you can run EMSSPEED, a program that checks the performance of expanded memory boards and software. Expanded memory performance depends primarily on the speed of expanded memory and the efficiency of changing memory pages.

EMSSPEED tests these two factors and produces three performance index numbers. The numbers increase with better performance and decrease with overhead or wait states.

To run EMSSPEED, enter the following at the prompt:

```
C:\> EMSSPEED
```

The following is an example of output from the EMSSPEED program:

```
EMS Performance Measuring Tool Version 4.1
Copyright (c) 1989,1991 by Digital Equipment Corporation

  32   Memory Access Time Index    (Fixed Mode)
  28   Paging Efficiency Index
  60   EMS Performance Index       (Paged Mode)
```

Memory Access Time Index

The Memory Access Time Index reflects the speed of expanded memory relative to conventional memory. The number indicates how efficient EMS performs. A typical good EMS implementation rates about 30.

This index reflects the performance of EMS operating in **fixed mode**. In fixed mode, less paging overhead occurs. Fixed mode also assumes that you are running only network components in EMS.

Paging Efficiency Index

The Paging Efficiency Index reflects how efficiently the driver maps logical pages into physical pages. Overhead is incurred if applications use EMS concurrently with the network. A value of 30 also is good for this index.

EMS Performance Index

The EMS Performance Index is the sum of the Memory Access Time Index and the Paging Efficiency Index. It measures the combined performance of expanded memory and the driver.

This index reflects the performance of EMS in **paged mode**. In paged mode, the background communication software is paging into conventional memory when executing. Paged mode also assumes you are running the EMS application software in the foreground.

A larger number for the EMS Performance Index indicates better performance. For example, an EMS Performance Index of 60 or higher for EMS used on a 6 MHz+ computer is considered excellent performance.

Configuring the Memory Board

Typically, you must perform two tasks to prepare the memory board for operation:

1. Configure the memory board according to the instructions provided by the manufacturer. Configuration usually involves setting hardware jumpers, running a software setup program, or both.
2. Configure the client to accept the new memory board. Client setup also involves setting hardware jumpers, running setup programs from a diagnostic disk, or both. Follow the instructions provided for the PC.

Using an 80386 Memory Manager

If you have an 80386 processor (386), the best choice is to use an **80386 memory manager**.

An 80386 memory manager is a software driver that manipulates the 386's memory map. Physical blocks of memory can be moved to different locations in logical memory space.

Table 3–4 summarizes the memory manager options available for 80386 clients. A check mark in a column means that the driver includes the memory management option or is compatible with other drivers that include the option. For example, 386MAX and QEMM version 5.0 include HIMEM.SYS functionality, and DEMM is not compatible with HIMEM.SYS.

Table 3–4 80386 Memory Manager Options

Type/Compatibility	Native Drivers (CEMM, DEMM, for example)	QEMM	386MAX
XMS 2.0/HIMEM.SYS		√	√
EMS 4.0/EMM.SYS	√	√	√
VCPI		√	√

Table 3–5 shows the types of memory manager that PATHWORKS needs for each type of processor.

Table 3–5 Memory Manager Requirements by Processor Type

	Need Support For		
Processor Type	EMS	XMS	VCPI
8086/8088	√		
80286	√	√	
80386	√	√	√[1]

[1]You need VCPI compliance only if you intend to run PC DECwindows Motif.

Although 386 memory managers vary according to vendor, most provide the following important features:

- Emulate EMS Version 4.0 capabilities without the need to install an EMS board. An 80386 memory manager converts the 80386's extended memory into expanded memory. In the 80386's extended memory space, you can run programs designed to use EMS, such as Lotus 1-2-3.

  Or you can run TSRs and device drivers that conform to EMS in expanded memory and save conventional memory for DOS programs.

- Provide XMS 2.0 compliance, negating the need for HIMEM.SYS, and VCPI compliance, ensuring that the memory manager does not interfere with PC DECwindows Motif and other DOS extender applications.

- Fill out memory in the option space between 640 Kbytes and 1 Mbyte, by mapping memory into unused buffers and spaces and creating upper memory blocks. You can gain about 100 Kbytes of memory. Most memory managers include a separate utility that allows you to load DOS programs or components and drivers into these blocks.

  In general, most network components can be loaded in upper memory. SAVE.COM cannot be loaded high. Some network components fail to load high on some clients because they require a large initialization area. For example,

  Once a network component is loaded high, the network can no longer be unloaded.

- Allow you to specify how much memory is needed for extended and expanded memory.

- Map slow ROMs into high-speed 32 bit memory.

Configuring the Network Controller

The network controller board is mounted in an adapter option slot of the client. You must ensure that the configuration of the network controller board does not conflict with other adapter options.

Most controllers, including the Digital EtherWORKS controllers, allow you to define various parameters that control operation. These parameters are usually set by the location of jumper plugs on the board or by software parameters in the CONFIG.SYS, STARTNET.BAT, or PROTOCOL.INI files of the client.

Three controller options to monitor are :

- Buffer mode
  Controllers typically buffer network data in the adapter area of upper memory. The size and location of the network data buffer may conflict with use of this area by other adapter options. For example, EtherWORKS controllers can operate with a large 64-Kbyte or small 32-Kbyte buffer.

  Note

  Be sure that the area of upper memory required by the network controller is free from conflicts with other devices. If you use a memory manager, be sure to reserve these areas of upper memory for the controller by defining them on the memory manager line of the CONFIG.SYS file. Refer to your memory manager documentation for specific procedures.

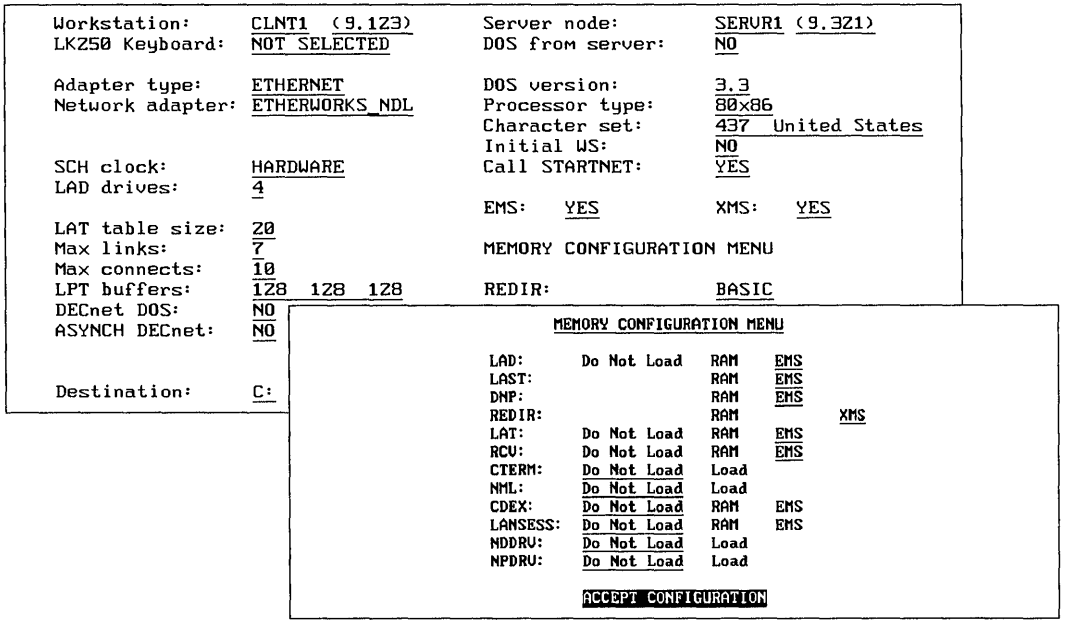
- I/O address range
  The controller uses the I/O address range to communicate with the processor. Be sure that the controller is configured for a unique I/O address range.
- Interrupt setting
  Each adapter option must have a unique interrupt request line.

Check the documentation for the controller to be sure that none of these parameters conflict with other adapter options.

Loading PATHWORKS Components

PATHWORKS components are configured for memory locations by using the advanced mode of the Netsetup utility. Figure 3–1 shows a typical Netsetup Profile screen and Memory Configuration Menu.

Figure 3–1 Typical Netsetup Screen



When you choose Write Key Diskette, Netsetup uses the values you specified to modify the CONFIG.SYS, AUTOEXEC.BAT, STARTNET.BAT, and PROTOCOL.INI files on the client. These files contain the appropriate load commands for each component based on your Netsetup selections.

Alternatively, you can configure components for loading by editing the files identified in the previous paragraph. Refer to Editing DOS Files and Editing Network Files later in this chapter for more information.

Choosing Components to Load

As a general rule, load only those components that you need and load them in XMS or EMS if possible. Refer to the *Client Commands Reference* for information on PATHWORKS DECnet network components and their functions. Refer to *TCP/IP User's Reference* for information on PATHWORKS TCP/IP components and their functions.

The loading options for each component are indicated on the Netsetup screen. For information on loading components into upper memory, refer to Using an 80386 Memory Manager earlier in this chapter.

Editing DOS Files

There are three DOS files that you can edit to affect memory and performance: CONFIG.SYS, AUTOEXEC.BAT, and AUTOUSER.BAT. Although the DOS version you use affects memory usage, you can use this section as a general guide for memory and performance tuning.

Editing CONFIG.SYS

You can conserve memory by editing values in the CONFIG.SYS file that is used to start DOS. Options that you can change in CONFIG.SYS are:

- LASTDRIVE
- FILES
- BUFFERS
- SHELL
- Device drivers

Table 3–6 lists the CONFIG.SYS options and their memory use.

Table 3–6 Options Set in CONFIG.SYS

Option	Memory Used (bytes)	Description
LASTDRIVE	80 per drive	Specifies the maximum number of block devices, (diskette, hard-disk, network and virtual disk drives) allowed by DOS.
FILES	64 per file	Specifies the maximum number of open files allowed by DOS.
BUFFERS	528 per buffer	Specifies the number of internal buffers used for DOS I/O. Ten buffers are usually sufficient. Values less than 10 or more than 30 can slow system performance.
SHELL /E:nnn	128 to 768	Specifies the command processor, usually COMMAND.COM. Use the /E qualifier to specify the size of the command processor environment.
ANSI.SYS	2 to 4.5 K, depending on DOS version	The supplied ANSI escape sequence device driver for DOS. Most applications do not require ANSI.SYS. See the application documentation for information.
RAM drives	Varies	Do not load a RAM disk into conventional memory space. Storing applications on virtual disk servers can reduce the need for RAM disk. Load a RAM drive only if you need a RAM disk larger than 128 Kbytes. If possible, RAM drives and disk caches should be loaded into extended memory.
LADCDDRV /N:n	80 per disk	Specifies the number LAD CDROM disks to allocate. The default is 4 disks.
LADDRV.SYS /D:n	80 per disk	Specifies number of LAD disks to allocate. The default is 4 disks.
NDDRV.SYS and NPDRV.SYS	NDDRV.SYS: 8.8 K; NPDRV.SYS: 8.1 K	Wide area virtual disk and printer drivers. Load only if needed to access disk services over wide area links.

The following example shows a typical CONFIG.SYS file.

```
buffers=8
files=20
device=\decnet\laddrv.sys /D:4
shell=\command.com /P /E:384
device=mouse.sys
lastdrive=s
```

Editing AUTOEXEC.BAT and AUTOUSER.BAT

You can conserve memory by editing DOS TSR values in the AUTOEXEC.BAT and AUTOUSER.BAT files. TSRs for the client are stored in the AUTOEXEC.BAT file. TSRs for the user are stored in the AUTOUSER.BAT file.

Table 3–7 lists memory use by DOS TSRs.

Table 3–7 Memory Used by TSRs

TSR	Memory Used (Kbytes)	Description
ASSIGN and APPEND	ASSIGN: 1.5; APPEND: 4.3	Use SUBST or JOIN instead of ASSIGN and APPEND. SUBST and JOIN provide capabilities that are similar to ASSIGN and APPEND, but they are not TSRs and use no memory.
GRAPHICS	8	Load only if you need to print graphics screen.
KEYBRD	4	Use only if you are configuring a PC with LK250 keyboard.
MOUSE.COM and MOUSE.SYS	6	Load as needed to use applications, such as PC DECwindows Motif that specifically require a mouse.
XONXOFF	4	Use only if a local printer is attached to a serial port using XON/XOFF protocol.
MODE and DECmode	1	Use one of these to extend the keyboard buffer only if you need more than a 15-character type-ahead capability. Exact memory used depends on buffer and environment sizes.
PRINT	5.5	PRINT is the DOS print spooler. Load this only if the client has a local printer in frequent use.
TFA and TTT	TFA: 47; TTT: 23	Load these only if needed by user developed programs.

The following example shows a typical AUTOEXEC.BAT file.

```
echo off
break on
REM
REM If you are adding a path to the autoexec.bat be sure to
REM leave off the trailing semi-colon:
REM e.g. path=c:\tools        (NO semi-colon at the end)
REM
SET COMSPEC=C:\SYSTEM\COMMAND.COM
PATH C:\WINDOWS;C:\SYSTEM;D:\PCAPP
rem: clear screen
cls
prompt $p$g
REM Insert any keyboard internationalization and character set
information here.
SET DOSX=-swapdir D:\swap
set TEMP=C:\WINDOWS\TEMP
REM  Add any post network startup procedures to STARTUP.BAT
REM Executing network startup procedure
if not exist \DECNET\STARTNET.BAT goto nostartup
call \DECNET\STARTNET
goto end
:nostartup
echo ** WARNING ** STARTNET.BAT file not found.  Network functions
  not performed
:end
if not %_SYSD%x==x PATH %PATH%;%_SYSD%\MSWINV30
```

Note

Any changes to AUTOEXEC.BAT should be made before the "REM Executing Network Startup Procedure" line in the file.

Editing Network Files

You can edit network files to reduce the amount of memory a network application uses or to increase the performance of the application. Network files include STARTNET.BAT file and, for NDIS controller operation, the PROTOCOL.INI file.

DECnet Environment

The STARTNET.BAT file starts the DECnet software for the client. This section describes how to modify the commands in the STARTNET.BAT file to conserve memory. You can change the amount of memory used by the following DECnet applications:

- Basic Redirector
- Enhanced Redirector
- LAT
- DLLDEPCA
- DNP
- SCH

Modifying the Basic Redirector

The Basic Redirector (REDIR.EXE) depends on the version of DOS the client uses. By using qualifiers when you start the redirector, you can change:

- Print buffers
- Simultaneous file servers
- The number of links the redirector can handle

The Basic Redirector is recommended for DOS clients that connect only to VMS or ULTRIX services. If you do not need full LAN Manager Version 2.0 functions, you can save memory by using the Basic Redirector.

You can load the Basic Redirector in either conventional or extended memory. Use the following guidelines:

- If you are using Microsoft Windows in enhanced mode, make sure to put the Basic Redirector in conventional memory.
- If the redirector is in XMS, you can increase all parameters without using additional conventional memory. Table 3–8 lists the qualifiers you can edit to conserve memory use.

Table 3–8 Memory Used by REDIR

Qualifier	Memory Used (bytes)	Description	Netsetup Field
/Pn:xxxxx	User-specified	Sets the number of the printer and the size of the print buffer. The default is 128 bytes. Using printer buffers of up to 2048 bytes for each printer improves performance slightly. Removing the /n:xxxxx qualifier can conserve memory.	LPT buffers
/S:n	72 per server	Sets the number of simultaneous file and print servers that the client can connect to at the same time. The default is 4. If you use only two servers at the same time, reset the default from 4 servers to 2 to conserve memory.	Max connects
/L:n	88 per link	Sets the maximum number of server links. The default is 10. Unless you use more than two servers at a time, limit the number of logical links to conserve memory.	Max links

The following example shows a typical REDIR load command line from the STARTNET.BAT file:

```
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /p3:128 /himem:yes
```

Modifying the Enhanced Redirector

Use the Enhanced Redirector when you want to access services offered by a server running Microsoft LAN Manager Version 2.0.

The following example shows a typical Enhanced Redirector command line from the STARTNET.BAT.

```
%BOOT%\LMDOS\NETPROG\net start wksta /lim:no /himem:yes /lanroot:%erdr%\lmdos
```

You can load the Enhanced Redirector in either conventional, extended, or expanded memory. Use the following guidelines:

- If you are using Microsoft Windows in enhanced mode, make sure to put the Enhanced Redirector in either conventional memory or expanded memory (EMS).
- You must edit the STARTNET.BAT file to add and change qualifiers. The command line Netsetup writes to STARTNET.BAT assumes all the defaults.

Netsetup also creates a LAN Manager initialization file, \LMDOS\LANMAN.INI, on your network key disk. Each time you start the Enhanced Redirector, the LANMAN.INI file is read and the appropriate values are used to configure the client.

Table 3–9 lists the Enhanced Redirector options you can edit to conserve memory use.

Hint

You can set these options from the either the STARTNET command line or in the LANMAN.INI file. Command line options set in STARTNET.BAT override values set in the LANMAN.INI.

Table 3–9 Memory Used by the Enhanced Redirector

Parameter	Memory Used (bytes/unit)	Description
maxcmds:n	64	Specifies the number of NETBIOS commands the client can run simultaneously. The range is 5-255; the default is 11 NETBIOS commands.
numbigbuf:n	0-65535	Specifies the number of big buffers the client uses to receive large files or amount of data from servers. The buffer size is set with the **sizbigbuf** entry. The range is 0-255; the default is 0 buffers.
numcharbuf:n	288	Specifies the number of character and pipe buffers the client uses. The range is 0-15; the default is 2 buffers.
numdgrambuf:n	528	Specifies the number of buffers available for receiving information (datagrams) from a server. The range is 3-112; the default is 3 buffers.
nummailslots:n	144	Specifies the number of mailslots available on the client. The range is 0-255; the default is 2 mailslots.
numresources:n	80	Specifies the maximum number of connections to shared resources allowed on the client at a time. The default is 1-255; the default is 9 connections.
numservers:n	80	Specifies the maximum number of servers to which the client can have active connections at a time. The range is 1-255; the default is 9 servers.
numservices:n	96	Sets the size of the internal service table. The number should be greater than or equal to the number of entries in the [services] section of the LANMAN.INI file. The ranges is 1-255; the default is 5 services.
numviewdservers:n	80	Specifies the maximum number of servers that can be viewed with the **net view** command. The range is 0-255; the default is 50 servers.
numworkbuf:n	1232	Specifies the number of buffers the client uses. The range is 3-50; the default is 5 buffers

(continued on next page)

Table 3–9 (Cont.) Memory Used by the Enhanced Redirector

Parameter	Memory Used (bytes/unit)	Description
sizebigbuf:n	User-specified	Specifies the size of big buffers used to receive large files or amount of data. The **numbigbuf** entry sets the number of buffers. The range is 0-65535; the default is 4096 bytes.
sizcharbuf:n	User-specified	Specifies the size in bytes of each character and pipe buffer. The range is 64-4096; the defualt is 128 bytes.
sizworkbuf:n	User-specified	Specifies the size in bytes of each client buffer. The range is 64-4096. The default is 1024 bytes.

See the following for more information:

- *Microsoft LAN Manager User's Guide for MS-DOS*
- *Microsoft LAN Manager Administrator's Reference*

Modifying LAT

LAT (Local Area Transport) allows terminal emulators to communicate with a host without using a serial communications line. You use the LAT Control Program (LATCP) to manage LAT.

The following LATCP commands affect memory use.

- LATCP DEFINE SCB n

  This command allocates a selected number of session control blocks (SCBs) within LAT that can be used by LAT applications. An SCB is a data structure that must be provided to LAT by an application in order to create a session.

  In the above command, *n* is the number of SCBs you are allocating. The minimum number of SCBs is 0; this is the default. The maximum number is 10. Each SCB uses 1.9 Kbytes.

  For example, to increase the number of SCBs from 0, the default, to 4. Enter:

```
LATCP> DEFINE SCB 4
```

- LATCP DEFINE SCB BUFFER n

  This command specifies how many buffers are allocated for each SCB created by the DEFINE SCB command. In this command, *n* is the number of buffers allocated. The value of *n* is 1 to 8, the default is 6. Each buffer is 256 bytes.

  For example, to allocate 7 buffers for each SCB, enter:

  ```
  LATCP>DEFINE SCB BUFFER 7
  ```

  Use the following to calculate the total memory used by the SCB buffers:

  Total SCBs * Total SCB buffers * 256K = Total Memory Used

  For example, if you have 3 SCBs and use the default 6 buffers, then the total SCB buffers used is $3 * 6 * 256K = 4608K$

- LATCP DEFINE SERVICE TABLE n

  This command lets you specify the maximum number of services that can be stored in your service table.

  In the above command, *n* is the maximum number of services you want in the service table. The value of *n* is 1 through 255. The default is 10. Each addition to the service table requires approximately 62 bytes of memory: 31 bytes for the service, 31 bytes for the node.

  For example, to store 50 services in your service table, enter:

  ```
  LATCP>  DEFINE SERVICE 50
  ```

See the *Client Commands Reference* for more information on using LATCP.

Modifying DLLDEPCA

DLLDEPCA is the data link module that controls data-link layer protocols and error checking for DEC network controllers (DEPCAs and EtherWORKS modules) in native mode.

Maximum Buffers is an NCP DEFINE EXECUTOR parameter. Refer to DECnet Network Management Guide for information on NCP.

If you are using a DEPCA network controller Rev. E, F, G, or H in small mode (32-Kbytes), you can modify the maximum number of buffers with an NCP command. Table 3–10 lists the allowed modifications.

Table 3–10 Memory Used by DLLDEPCA.EXE

NCP Parameter	Memory Used (bytes)	Description
MAXIMUM BUFFERS	1528[1]	Sets the maximum number of large network communications buffers available to PATHWORKS. The number of buffers available is dependent on the number of active links you maintain. Usually the default number is sufficient. The default is 16.

[1]When you increase MAXIMUM BUFFERS above the default, you increase DNP by 44 bytes and DLL by 1528 bytes. This is true for DEPCA versions E through H in small mode only.

DEPCAs and EtherWORKS controllers in large mode (64-Kbytes) require no buffer modification.

Modifying DLLNDIS and DLLNDIST

DLLNDIS and DLLNDIST are the data link modules that control data link layer protocols for NDIS-compliant network controllers.

- DLLNDIS is the software interface that lets NDIS-compliant Ethernet drivers correspond with network transports.
- DLLNDIST is the software interface that lets NDIS-compliant Token Ring drivers correspond with network transports.

To modify DLLNDIS or DLLNDIST, you must edit the associated PROTOCOL.INI file. For example:

```
; PROTOCOL.INI file create by DNETOMO.V41
;                          via DNETWIK.V41

[protocol manager]
DRIVERNAME = PROTMAN$


[IPX4MAC]
DRIVER = IPX$MAC
BINDINGS     = ELNKII.SYS

[DATALINK]
DRIVERNAME   = DLL$MAC
LG_BUFFERS   = 16
SM_BUFFERS   = 6
OUTSTANDING  = 32
HEURISTICS   = 0
BINDINGS     = ELNKII.SYS
;Specify IRQ level used by workstations network adapter
;NI_IRQ       = 5
```

Table 3–11 lists the PROTOCOL.INI parameters that effect memory and performance.

Table 3–11 Memory Used by DLLNDIS

Parameter	Memory Used (bytes)	Description
LG_BUFFERS = n	1518	Specifies the number of large data link buffers. The default is 16. You may need to increase the value for n if you are running a large number of simultaneous DECnet links.
SM_BUFFERS = n	144	Specifies the number of small data link buffers. The default is 6. You may need to increase the value for n if you are running a large number of simultaneous DECnet links.
OUTSTANDING = n	12	Specifies the number of outstanding transmit or receive requests. The default is 16. The value for n should be increased in proportion to the number of large and small data link buffers.

Modifying the DECnet Network Program (DNP)

DNP.EXE consumes more memory than any other PATHWORKS component. DNP has the following variants:

- DNNDCPLD loads asynchronous DNP with NETBIOS, into expanded memory. DNNDCPLD provides wide-area-network, asynchronous DECnet with NETBIOS support.
- DNNDCPPC loads asynchronous DNP with NETBIOS into conventional memory. DNNDCPPC provides wide-area-network, asynchronous DECnet with NETBIOS support.
- DNNETH loads the Ethernet variant of DNP with or without NETBIOS
- DNPDCPPC loads asynchronous DNP without NETBIOS into conventional memory.

Table 3–12 lists the NCP parameters you can set that affect DNP memory size.

Table 3–12 Memory Used by DNP

NCP Parameter	Memory Used (bytes)	Description
MAXIMUM LINKS	256 per link	Sets the maximum number of active logical links for the client. Default is 7. For PC DECwindows Motif, add one link for each application. For NET TIME and PERMIT, add one link.

Maximum Links is an NCP DEFINE EXECUTOR parameter. Refer to *DECnet Network Management Guide* for information on NCP.

Most PATHWORKS clients use DNNETH with NETBIOS support. Only those clients that do not use file and print services forego the NETBIOS version of DNP. DNNETH uses EMSLOAD to operate in expanded memory (EMS). Table 3–13 lists the parameters that you can modify in the DNP load command line of the STARTNET.BAT file.

Table 3–13 Memory Used by DNP/NETBIOS

Qualifier	Memory Used (bytes/unit)	Description
/CMD:n	146	Command blocks. Additional command blocks to be added to base internal pool. Base pool provides about 2 blocks/link. Add additional blocks if you run NETBIOS programs that use many concurrent No-Wait commands or encounter NETBIOS 22 errors. Minimum is 0; maximum is 64.
MAX:n	212	Configures the maximum number of DECnet links. The value of n is from 4 to 256.
/MSN:n	18	Specifies the number of node names in the DECnet node database, DECNODE.DAT. The value for n is 0 plus the number of names defined in DECNODE.DAT.
/REM:n	170	Remote NETBIOS application names, used to describe remote NETBIOS applications. The default is 0.
/SDB:n	202	Sets the number of SDBs (small data blocks) that are allocated. SDBs store incoming and outgoing access control datat. The value of n is from 5 to 32. The default is 5

The following example shows a typical DNP load command line from a STARTNET.BAT file:

```
%BOOT%\decnet\dnneth /rem:2
```

Modifying SCH

SCH (Scheduler) provides timing services and background multitasking under the DOS operating system. SCH has two variants:

SCH.EXE	Provides all Scheduler functions, including EMS and 8088/8086 support. SCH requires about 7K of memory.
SCHK.EXE	Contains the kernel only, which requires about 3K of memory. SCHK does not offer EMS support. If the network is not loaded into EMS, SCHK.EXE does save some memory. SCHK requires an 80286 computer or higher and is available only for local boot.

You use the /M qualifier to conserve memory. Table 3–14 describes the /M qualifier.

Table 3–14 Memory Used by SCH

Qualifier	Memory Saved	Description
/M	1100 bytes	Memory is saved on 80386 based PCs. Without /M, SCH requires slightly more conventional memory. If the network is loaded in EMS, there is no support for Enhanced Mode Windows V3.0. The /M qualifier is available only for local boot and . The /M qualifier has no effect on 80286 and lower computers.

The following example shows a type SCH command line from STARTNET.BAT:

```
%BOOT%\DECNET\SCHK /H
```

TCP/IP Environment

This section explains how to tune TCP/IP parameters for performance or to conserve memory. Tuning is primarily useful when you use Telnet (for SETHOST and Terminal Emulation) or FTP (File Transfer Protocol) components on a DOS client. NMDRV and DNR drivers are not particularly performance-sensitive.

The tuning trade-off is between processing speed and the amount of available memory. Increased processing speed requires a greater number of bigger buffers. On the other hand, conserving memory particularly on a DOS client means fewer, smaller buffers, and slower processing speed.

Tuning Procedure

Use the following procedure to tune memory and performance on a TCP/IP client:

1. Make sure TCP/IP is properly installed on the client.
2. Edit the PROTOCOL.INI file on the client with a text editor.

   Change the values associated with one or more of the following parameters:

   - TCPCONNECTIONS

     More connections take more memory. The range of connections is 2 to 8 for DOS clients.

     To tune TCPCONNECTIONS, first determine the number of TCP connections you need. Each Telnet session requires one TCP connection, and each FTP session requires two connections. If you configure more connections than you need, you may use excessive memory.

     If the system displays error messages NET0103, NET0104, or NET0110 at load time, there is not enough memory to support the number of connections you specified. When that happens, reduce the number of TCP connections until there are no more error messages

   - TCPWINDOWSIZE

     If you use a 3Com EtherLink adapter, be sure the window size equals the segment size for all applications. Otherwise, you could have serious performance degradation.

     In general, a larger TCPWINDOWSIZE increases performance, but requires more memory. If tcpsegmentsize is 1024 (the default value), then TCPWINDOWSIZE should be 1024, 2048, 3072, or 4096.

     If the system displays error messages NET0103, NET0104, or NET0110 at load time, there is not enough memory to support the specified window size. When that happens, repeat the procedure to decrease the value of TCPWINDOWSIZE until there are no more error

   - LOADFACTOR

     In general, the amount of memory required decreases as LOADFACTOR decreases (the default value is 100%). However, lower values may result in performance degradation. When LOADFACTOR is too low, packets are lost and the software becomes unstable. The maximum LOADFACTOR is 100% and the minimum is 60%.

Use a higher load factor if you have fewer connections. For two connections, LOADFACTOR should be not less than 100%, and for eight connections, LOADFACTOR should be greater than 60%.

3. Save the PROTOCOL.INI file and exit the editor.
4. Restart the client.

   Parameter changes become effective when you restart the client.

Tuning Examples

The following are four examples of configuration tuning:

1. Minimum memory, low performance configuration:
   - TCPCONNECTIONS = 2
   - TCPWINDOWSIZE = 1024
   - LOADFACTOR = 100
   - TCPSEGMENTSIZE = 1024
2. High performance, low connection configuration:
   - TCPCONNECTIONS = 4
   - TCPWINDOWSIZE = 4096
   - LOADFACTOR = 100
   - TCPSEGMENTSIZE = 1024
3. High performance, high connection configuration:
   - TCPCONNECTIONS = 32
   - TCPWINDOWSIZE = 4096
   - LOADFACTOR = 100
   - TCPSEGMENTSIZE = 1024
4. Low memory, high connection configuration:
   - TCPCONNECTIONS = 8
   - TCPWINDOWSIZE = 1024
   - LOADFACTOR = 60
   - TCPSEGMENTSIZE = 1024

Microsoft Windows

Microsoft Windows can run in any one of three modes; the one you require depends on the amount and types of memory currently configured on the client. Use the following guidelines when configuring a client that uses Microsoft Windows:

- Put the Redirector (both Basic and Enhanced) into conventional memory or expanded memory (EMS). Putting the redirector into extended memory (XMS) could cause conflicts with Windows.
- Always start PATHWORKS, or individual PATHWORKS components, before starting Windows. For example, if you are using the SETHOST or VT320 terminal emulators, load LAT, CTERM, or TELNET before starting Windows.
- When running Windows from a disk or file service, putting all PATHWORKS components into conventional memory increases performance.
- For remote boot clients using the 386 Enhanced mode, make sure to run \MSWINV30\RPLMEM.EXE on the PCSAV41 system file service before starting Windows. RPLMEM reserves a part of conventional memory for the remote boot task image.
- If you use Windows in real mode with the network in EMS, you may have to experiment with moving the EMS bank line to increase global memory when starting Windows. The EMS bank line is the dividing line between global memory and banked memory. Global memory is available to all applications. Banked memory is available to one application at a time. For example, the following line moves the EMS bank line up 200 Kbytes:

  ```
  C:\>WIN/R/L+200
  ```

- If you have problems with Windows enhanced mode with the network in EMS, try moving the page frame of the Windows EMM386 expanded memory emulator. If conflicts occur, you may have to place the page frame at a particular location. The page frame is moved by editing the FRAME= qualifier of the EMM386 command line in your CONFIG.SYS file.

- Make sure the FILES= line in your CONFIG.SYS file is set to at least 40. You may need to set it higher, depending on the applications you are running.
- Run the PATHWORKS Windows support setup utility, WIN3SETU, after you configure the client.

For more information, see the following:

- *Microsoft Windows Support Guide* for more information on running PATHWORKS and Microsoft Windows.
- Microsoft Windows documentation for an explanation of Microsoft Windows memory requirements.

Using DOS Version 5.0 on a PATHWORKS Client

If your PATHWORKS client is running DOS Version 5.0 over the DECnet transport, you can take advantage of following features of DOS Version 5.0:

- The ability to run DOS in the high memory area (HMA). Loading DOS Version 5.0 into HMA saves a minimum of 45K on most 80286, 80386, and 80486 PCs.
- The ability to load PATHWORKS device drivers and programs (TSRs) in the upper memory block (UMB) to free up conventional memory. This feature is available only on 80386 and 80486 PCs.

Use the following guidelines when configuring a DECnet client that uses DOS Version 5.0:

- To load a PATHWORKS device driver into upper memory, use the DEVICEHIGH command in your CONFIG.SYS. For example:

  ```
  DEVICEHIGH C:\DECNET\LADDRV.SYS
  ```

  If there is not enough UMB space to fit the device driver, it will be loaded into conventional memory.
- Only one program can be loaded into the HMA at a time. Either DOS or the redirector can be loaded into extended memory, but not both.

  If DOS is loaded into HMA, the Basic Redirector (REDIR.EXE) must be loaded into conventional memory. The Enhanced Redirector can be loaded into EMS. See Editing Network Files for more information on the redirector.

- Use the LOADHIGH command in your AUTOEXEC.BAT file to load programs into upper memory.
- The versions of HIMEM.SYS and EMM386.SYS that come with DOS Version 5.0 supersede the HIMEM.SYS that comes with Microsoft Windows Version 3.0. Always use the latest versions of these files.

See your DOS Version 5.0 documentation for more information.

4

Unloading PATHWORKS Components

This chapter outlines procedures for unloading PATHWORKS DECnet and TCP/IP components to make more conventional memory available for use by DOS applications. Topics covered in this chapter include:

- Unloading DECnet components
  - Unloading all components
  - Unloading an individual component
  - Restrictions on unloading components
  - Creating batch files for unloading and reloading
  - Unloading and the Netsetup utility
- Unloading TCP/IP components
  - About Demand Protocol Architecture
  - Using the TCPUNLD utility
  - Using batch files to unload components

Unloading DECnet Components

You can unload all or some of the network components to manage memory needs, based on the client's requirements.

For example, you can unload network components from an individual client when you need the memory to run a local DOS application such as Lotus 1-2-3. You can reload the network components when required.

Unloading All Components

You can use STOPNET.BAT to unload all the network components from memory and stop the network.

To stop the network:

1. Run the STOPNET.BAT file from the client's boot drive. For example:
   - For DECnet:

     ```
     C:\>  \DECNET\STOPNET
     ```

   - For TCP/IP:

     ```
     C:\>  \TCPIP\STOPNET
     ```

STOPNET prevents errors by disconnecting all devices before unloading the network. It shuts down processes, known links, file services, and disk services and unloads all network components.

To restart the network, run the STARTNET.BAT file from the client's boot device. For example:

- For clients using the DECnet transport, enter:

  ```
  C:\> \DECNET\STARTNET
  ```

- For clients using the TCP/IP transport, enter:

  ```
  C:\> \TCPIP\STARTNET
  ```

The STARTNET.BAT file starts the network software and sets up the system for unloading components.

Unloading an Individual Component

You can unload some components individually if they are not in expanded memory. If you need to free only a small amount of memory, you can unload an individual component.

Be sure the component that you want to unload was the last component loaded. Look at the bottom of the conventional memory map (MEMMAN) to find out which component was the last one loaded.

Keep in mind that you should not unload a component if it was not the last one loaded. If you do try to unload such a component, you create a hole in conventional memory that DOS can rarely use.

The following components can be unloaded individually:

Component Name	Unload Command from DOS prompt:
DNP	C:> NCP SET EXECUTOR STATE OFF
LAT	C:> LAT/U
CTERM	C:> CTERM/U

Restrictions on Unloading Components

Keep these restrictions in mind. You cannot unload:

- Individual components from expanded memory.

  You can unload only the entire network from expanded memory.

- Any network components from clients that have been remote booted.

  You must unload DNP, LAT, and CTERM individually if the client is configured for remote boot.

- Network components stored in upper memory blocks between 640 Kbyte to 1024 Kbyte range.

  You cannot unload any network component if any one network component is loaded into upper memory.

Creating Batch Files for Loading and Unloading

You can write customized batch files to unload and reload the network components, as needed. Two sample batch files are provided as examples from which you can create and edit to match the client configuration.

The first sample command file, called UNLOAD.BAT, unloads all DECnet network components:

```
@echo off
echo PATHWORKS 4.1 Sample Unload Script
echo.
rem ** first save all connections in the file UNLOAD.INI in the
rem ** default DECnet directory
use @unload.ini/save
rem ** now disconnect from all devices; you must be on a local
rem ** device to use these batch scripts
use *:/d
rem ** now actually do the unload, make sure we prompt the user
rem ** in case there are existing connections floating around
\decnet\memman /u
set path=%_path%
```

To run the UNLOAD.BAT file, enter the following command at the DOS prompt:

```
C:\> UNLOAD
```

The second example command file, called LOAD.BAT, can be used to reload network components. Use this file to restore network services after you have unloaded the network in any of the following three manners:

- With the STOPNET.BAT file provided with PATHWORKS software
- With the example UNLOAD.BAT file previously provided
- With the Memman utility

For example, unload the network with STOPNET.BAT. Use the freed memory to run DOS applications. When you want to reload the network, use the following batch file:

```
save
sch /h
dlldepca
dnneth /REM:2 /CMD:30 /MAX:4
redir /L:30 /P1:128 /P2:128 /P3:128 /himem:yes
setname clnt1
emsload rcv /h:2,6 /m:5,1
emsload last /c:e /n:clnt1
use /fixup
use @unload.ini/restore
```

To run the example LOAD.BAT file, enter the following command at the DOS prompt:

```
C:\> LOAD
```

Unloading and the Netsetup Utility

Netsetup and the PATHWORKS client installation procedure are standard utilities that set up the network for unloading network components.

If you choose to install the software manually and do not use a standard procedure, install the following files from the installation kit in the order listed below.

- If using an NDIS configuration, load DLLNDIS first and then NETBIND
- Load SAVE.COM.

  This file saves the state of memory and interrupt vectors so that Memman can restore them when unloading the network.
- Load SCH after DLLNDIS
- If using the native EtherWORKS mode, load DLLDEPCA here
- Load DNP
- Load any remaining components except the redirector and LAT
- If you load redirector, do so next.
- Load LAT last.

Keep in mind that the network components you want to unload should be the last components loaded. When you run STOPNET, the network software and any other software that is in the way are also unloaded.

Unloading TCP/IP Components

Demand Protocol Architecture (DPA) makes it convenient for you to load and unload the TCP/IP components on the DOS client. DPA allows the use of modular network components that you can load and unload as needed. This enables you to load only the specific components that are required for the applications you wish to run.

A separate Unload utility easily unloads the components when you finish. The result is that you use the minimum memory necessary for running a TCP/IP application such as the File Transfer Protocol (FTP). When you are through running the

application, you can then unload the modules, maximizing the memory available to run DOS applications.

About Demand Protocol Architecture

The TCP/IP networking software is made up of protocol modules that are loaded separately. For example, to run the terminal emulator software, you load the following modules:

Function	Network Component
TCP/IP	TCPTSR.EXE
Domain Name Resolver	DNRTSR.EXE
Terminal Emulation	VT.EXE
Telnet	TN.EXE
BAPI	BAPI.EXE

These components are TSRs that you can load when you want to run an application, and unload when you are through with them. You can load these network components from the DOS command line or from a batch file.

Note

Load these components in the order listed, because each depends on the preceding one. You will get error messages if you load them out of order.

Since DOS has a limited memory management subsystem, you must unload network components in reverse load order (last to load is first to unload) in order to free memory. The network unload utility, TCPUNLD.EXE, unloads the programs. The Unload utility is described in the next section.

The network load order is maintained by the TSR locator service in the TCP/IP device driver. As network components are loaded, they bind to other portions of the networking software through calls to the TSR locator.

By maintaining a **bind count**, Unload determines when a given network component is in use (that is, it has a nonzero bind count). A zero bind count indicates the program is not in use. You can unload only network components with a zero bind count.

Using the TCPUNLD Utility

The Unload utility (TCPUNLD.EXE) is a network component that facilitates unloading portions of the TCP protocol stack.

Unloadable TCP/IP Modules

You can unload the following network components from conventional memory:

Module	Description
TCPTSR.EXE	TCP/IP transport
TN.EXE	Telnet protocol
BAPI.EXE	Interface to Telnet protocol module
SOCKTSR.EXE	Sockets
DNRTSR.EXE	Domain Name Resolver
NMTSR.EXE	Network Management Driver
EMSBFR.EXE	EMS Map Utility

Syntax

```
tcpunld [/verify|/toponly|/status|?] *?*
```

Description

/verify	Ask user at each step, "About to unload network component xyz, are you sure? (Y/N)." All network components are unloaded, in reverse load order, unless user responds with "N" for some program.
/toponly	Unload only the topmost network component (that is, last network component loaded).
/status	Display name of each loaded network component and its approximate size. Display in reverse load order (that is, in proper unload order from top of memory down).
?	Display help on command syntax.

If no arguments are specified, all network components are unloaded in reverse load order.

Usage Notes

Be sure to load network TSRs *last*. Any non-network TSR loaded after network TSRs will prevent the Unload utility from removing any subsequent TSR from memory.

Tcpunld Status Display

The following is a typical Unload status display:

```
C:\>tcpunld
3com Network Unload (v1.2)
Unloaded network program BAPI (14512 bytes) successfully.
Unloaded network program Telnet (9072 bytes) successfully.
Unloaded network program Sockets (35696 bytes) successfully.
Unloaded network program TCP/IP (74368 bytes) successfully.
```

Using Batch Files to Unload Components

You can load program modules manually or with a batch file. If you load the modules manually, you can then unload them manually. If you prefer to unload manually, always terminate all outstanding network connections before running the Unload utility.

TCP/IP comes with two batch files, one for Telnet operation with terminal emulation (VT) and the other for FTP operation. The contents of both files are listed in the following sections.

When you use one of the following batch files, the UNLOAD command is included in the file, so the programs will be unloaded automatically.

Telnet Batch File

The Telnet batch file is called VT.BAT. Its contents are as follows:

```
echo off
:begin
rem load tcp, telnet, and bapi tsr programs
echo Loading TCP/IP Protocols
TCPTSR
TN
BAPI
DNRTSR
rem run the virtual terminal program
SETHOST TELNET
rem run the unload program to unload all tsr programs
echo Unloading TCP/IP Protocols...
unload
:end
```

To run the example VT.BAT file, enter the following command at the DOS prompt:

```
C:\> VT
```

FTP Batch File

The FTP batch file is called FTP.BAT. Its contents are as follows:

```
echo off
:begin
rem load tcp, dnr, and socket library tsr programs
echo Loading TCP/IP Protocols
TCPTSR
DNRTSR
SOCKTSR
rem run the ftp program
FTP
rem run the unload program to unload all tsr programs
echo Unloading TCP/IP Protocols...
unload
:end
```

To run the example FTP.BAT file, enter the following command at the DOS prompt:

```
C:\> FTP
```

5

80386 Client Configuration Examples

This chapter contains a series of 80386 client configuration examples that illustrate how common personal computer (PC) characteristics affect the configuration of a typical 80386 PATHWORKS client.

The examples in this section do not apply to all 80386 PATHWORKS clients. The configuration that provides the best mix of memory and performance for a client depends on the type of client and the non-PATHWORKS requirements of its user.

Note

Do not rely on any one example as optimal for your client. Use these examples to help you to understand configuration requirements, but use the procedures outlined in Chapter 3 to configure each client.

The 80386 configuration examples in this section include:

- DECnet Configurations
  - DECstation 325 base configuration
  - With QEMM and 3 Mbytes extended memory
  - In remote boot configuration
  - In remote boot configuration with Microsoft Windows
  - With the Enhanced Redirector
  - With DOS Version 5.0
  - With EtherLink II network controller
  - With Microsoft Windows

  - IBM PS/2 Model 80 client
  - IBM PS/2 Model 80 client with the Enhanced Redirector
- TCP/IP Configurations
  - DECstation 325 base configuration
  - With QEMM and 3 Mbytes extended memory
  - With the Enhanced Redirector
  - With EtherLink II network controller
  - With Microsoft Windows
  - IBM PS/2 Model 80 client

DECnet Configurations

This section provides examples of 80386 client configurations that use the DECnet transport protocol.

DECstation 325 Base Configuration

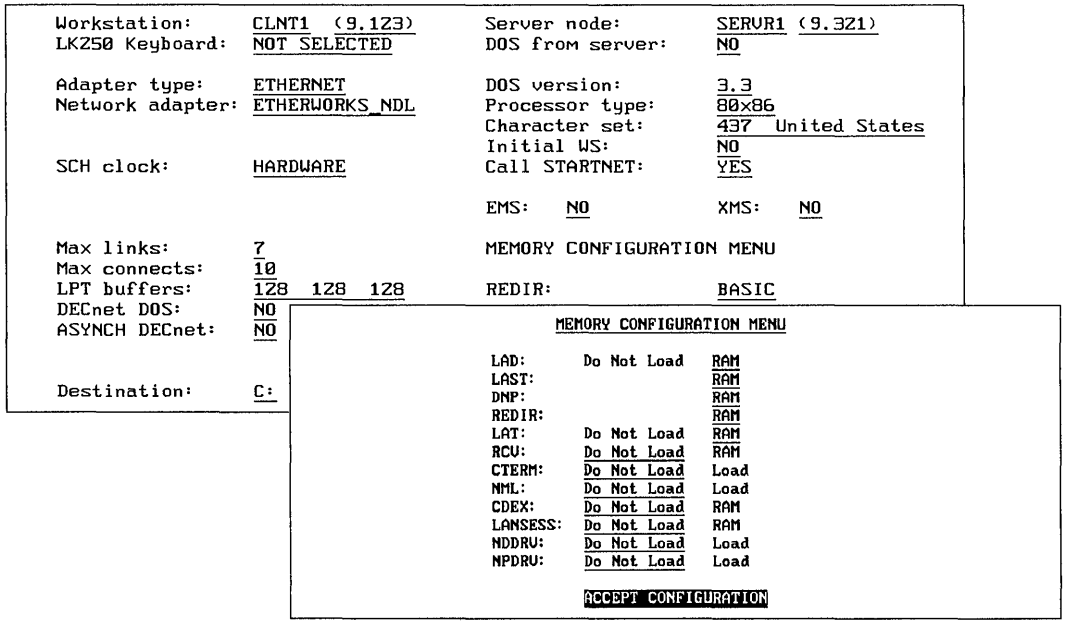
The base 80386 configuration consist of the following:

- DECstation 325 with 1 Mbyte of system memory and a VGA monitor
- DEC EtherWORKS Turbo network controller

Netsetup Screen

Figure 5–1 shows the Netsetup screen as configured to create a key diskette for this client.

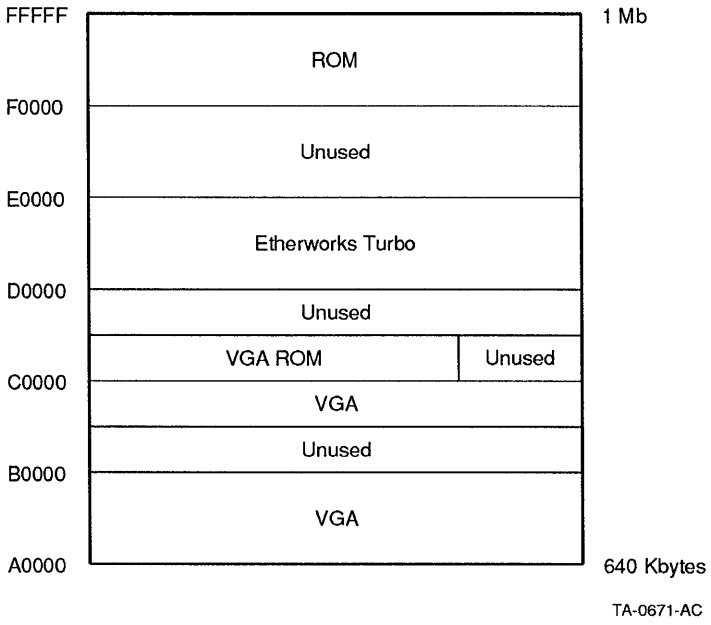
Figure 5–1 Netsetup Screen (80386/DECnet/Base)



Upper Memory Allocation

Figure 5–2 identifies the allocation of upper memory in this configuration.

Figure 5–2 Upper Memory Allocation (80386/DECnet/Base)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=20
shell=\command.com /P /E:384
device=\decnet\laddrv.sys /D:4
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
%BOOT%\decnet\schk /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1 /W:-1 /a:-1
%_SYSD%\DECNET\LAT
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    639K
    Available conventional memory   478K

    Physical extended memory          0K
    Reported extended memory          0K

    Expanded memory                 Not Present

    XMS extended memory             Not Present

System Memory Scan

    0000-9FBF 639K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-B7FF  96K Free
    B800-BFFF  32K RAM
    C000-C5FF  24K ROM COPYRIGHT WESTERN DIGITAL CORP. 1987,88,89
    C600-CBFF  24K Free
    CC00-CFFF  16K ROM
    D000-DFFF  64K RAM
    E000-EFFF  64K Unknown
    F000-FFFF  64K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

   MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0D16    3376  COMMAND.COM                        22-24 2E F8
free      48
0D16     384  COMMAND.COM  <ENVIRONMENT>
free     288
0E1B    1136  PCSA Mark
0E63    3216  Scheduler    /H                    08 0D 6C FC
free     224
0F3C    8000  Datalink                           1C CC-CD
1131   32720  DNP/NETBIOS  /rem:2                2A 5C 6E C9 D3-D4 DE
192F    9856  LAST         /N:CLNT1 /c:d /M:D /g  69 D1
1B98   33888  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free     272
23F1    5280  LAD          /R:-1 /W:-1 /A:-1     13
253C   12400  LAT                                6A
free  489392
```

Configuration Notes

- This configuration lacks sufficient memory to run PC DECwindows Motif. A minimum of 1 Mbyte is required.
- You might have to unload the network components to run large DOS applications. Refer to Chapter 4 for procedures on unloading network components.
- A mouse is not loaded in this configuration to save memory.
- In this configuration, LAT does not normally need to be loaded since it is loaded automatically by SETHOST when needed. Not loading LAT saves approximately 5K.

  However, if you are running Microsoft Windows or the DOS version 5.0 task switcher, you must load all TSRs, including LAT, before running these programs.

With QEMM and 3 Mbytes Extended Memory

Refer to the QEMM documentation for detailed explanation of QEMM386.SYS installation and operation.

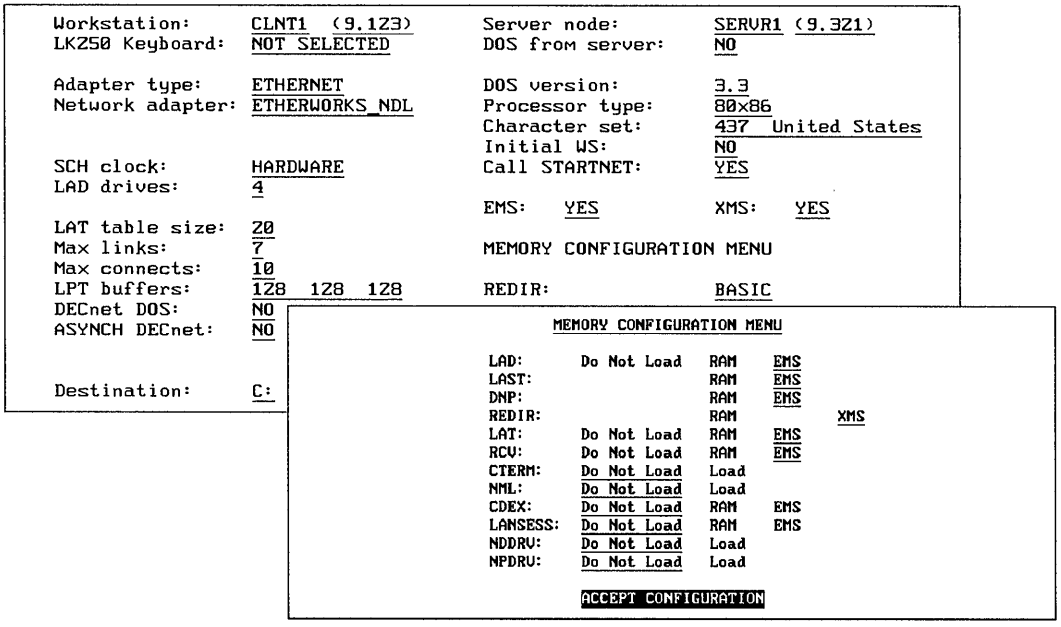
The following components are added to the base configuration for this example:

- 3 Mbytes extended memory
- Quarterdeck QEMM386.SYS, a 386 memory manager
- Mouse and driver

Netsetup Screen

Figure 5–3 shows the Netsetup screen as configured to create a key diskette for this client.

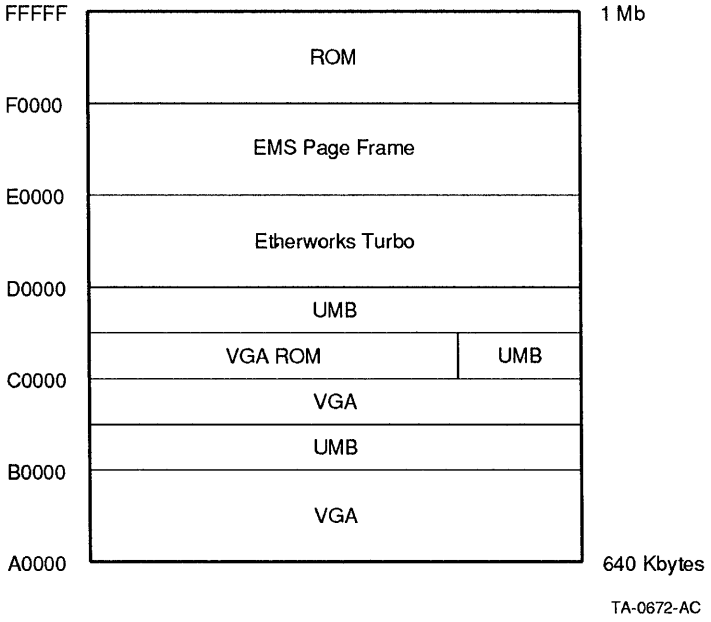
Figure 5–3 Netsetup Screen (80386/DECnet/QEMM)



Upper Memory Allocation

Figure 5–4 identifies the allocation of upper memory in this configuration.

Figure 5–4 Upper Memory Allocation (80386/DECnet/QEMM)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE=D:\QEMM\QEMM386.SYS fr=e000 x=1000-a000 nosh ns ram
files= 20
buffers=8
stacks=0,0
shell=C:\command.com /p /e:384
device=D:\QEMM\LOADHI.SYS C:\decnet\laddrv.sys /D:4
device=D:\QEMM\LOADHI.SYS C:\DOS\mouse.sys
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
D:\QEMM\LOADHI %BOOT%\decnet\sch /H
D:\QEMM\LOADHI %BOOT%\decnet\dlldepca.exe
D:\QEMM\LOADHI %BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\decnet\setname % WSNODE%
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
  /W:-1 /a:-1
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   584K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size           2880K
    Expanded memory available      2688K

    XMS extended memory available  2688K
    Largest available EMB          2688K
```

```
System Memory Scan

    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-B7FF  32K RAM
    B800-BFFF  32K Free
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-C7FF   8K ROM
    C800-CFFF  32K RAM
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-F7FF  32K RAM
    F800-FBFF  16K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987

C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0C53    3376  COMMAND.COM                        22-24 2E D2 F0
free      48
0C53     384  COMMAND.COM  <ENVIRONMENT>
free     256
0D56    1136  PCSA Mark
0D9E     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  598688
```

Configuration Notes

- Conventional memory is excluded from use by QEMM by specifying the parameter "X=1000-a000" on the QEMM command line of the CONFIG.SYS file.

  PATHWORKS uses only the 64 Kbyte EMS page frame. EMS paging is not done in conventional memory. By excluding conventional memory, you can improve performance and save memory.

- Netsetup automatically adds HIMEM.SYS to your CONFIG.SYS file. You must edit CONFIG.SYS and remove this line before using QEMM.

- You must edit CONFIG.SYS and STARTNET.BAT to add the LOADHI command.

  Refer to the QEMM documentation for more detailed information on the LOADHI command.

- The QEMM386 "nosh ns" parameter is machine dependent and may not be needed for other PCs.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

In Remote Boot Configuration

Refer to the QEMM documentation for detailed explanation of QEMM386.SYS installation and operation.

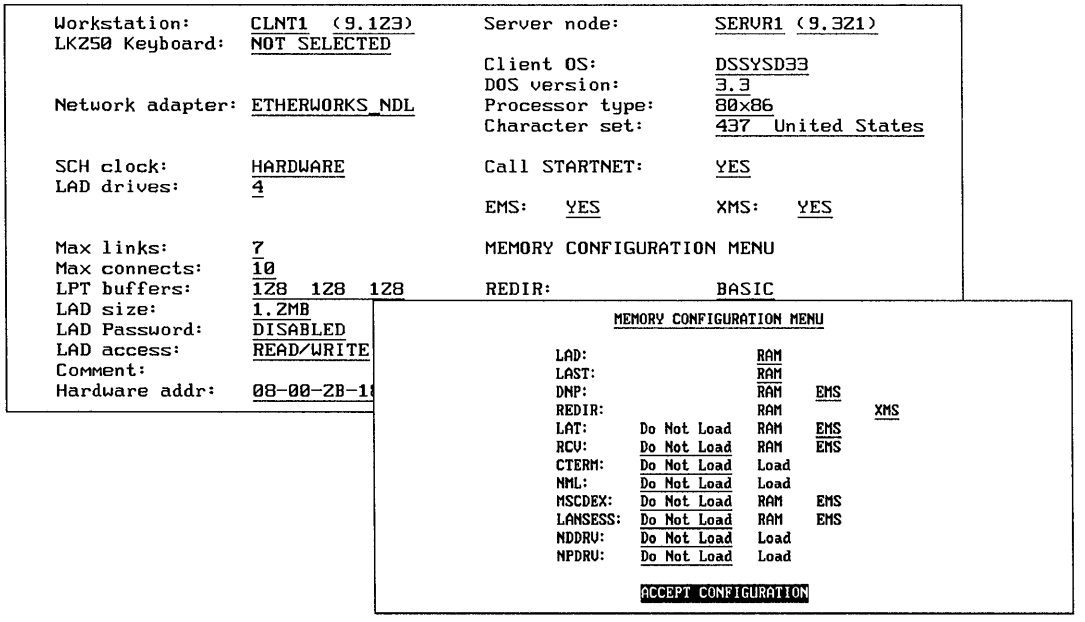
In this example, the base configuration is reconfigured for remote boot operation and the following components are added:

- 3 Mbytes extended memory
- Quarterdeck QEMM386.SYS, a 386 memory manager
- Mouse and driver

Netsetup Screen

Figure 5–5 shows the Netsetup screen as configured to create a key diskette for this client.

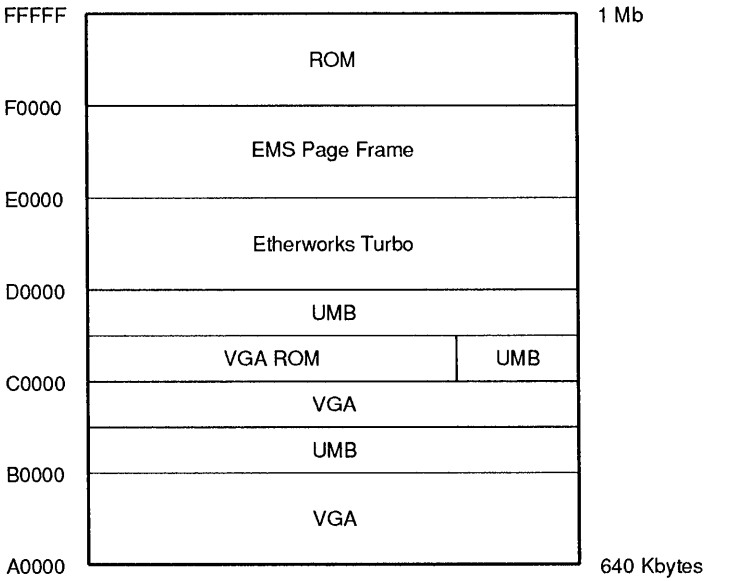
Figure 5–5 Netsetup Screen (80386/DECnet/Remote Boot)



Upper Memory Allocation

Figure 5–6 identifies the allocation of upper memory in this configuration.

Figure 5–6 Upper Memory Allocation (80386/DECnet/Remote Boot)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
device=D:\QEMM\QEMM386.SYS fr=e000 x=1000-a000 nosh ns ram
buffers=8
files=20
stacks=0,0
device=\decnet\laddrv.sys /D:4
shell=\decnet\bshell.exe /p /e:526
device=D:\QEMM\LOADHI.SYS C:\DOS\MOUSE.SYS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are used in the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
 D:\QEMM\LOADHI %BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\decnet\setname %_WSNODE%
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    607K
    Available conventional memory   550K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size           2880K
    Expanded memory available      2880K

    XMS extended memory available  2688K
    Largest available EMB          2688K

System Memory Scan

    0000-97BF 607K Conventional
    97C0-9FBF  32K Remote Boot Image
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-BFFF  64K RAM
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-C7FF   8K ROM
    C800-CFFF  32K RAM
    D000-D7FF  32K Free
    D800-DFFF  32K RAM
    E000-EFFF  64K Page Frame
    F000-F7FF  32K RAM
    F800-FBFF  16K ROM
    FC00-FCFF   4K RAM
    FD00-FFFF  12K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0CC8     208  n/a          /P /E:526
0CD6    3376  COMMAND.COM                        22-24 2E
free      48
0CD6     528  COMMAND.COM  <ENVIRONMENT>
free     240
0DE1     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  563824
```

Configuration Notes

- The 32 Kbyte Remote Boot Image shown in the memory map (MEMMAN/S/F) contains the SCH, DLL, LAST, and LAD PATHWORKS components.
- This remote boot configuration cannot be unloaded.
- Netsetup automatically adds HIMEM.SYS to your CONFIG.SYS file. You must edit CONFIG.SYS and remove this line before using QEMM.
- You must edit CONFIG.SYS and STARTNET.BAT to add the LOADHI command.

  Refer to the QEMM documentation for more detailed information on the LOADHI command.
- The QEMM386 "nosh ns" parameter is machine dependent and may not be needed for other PCs.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

In Remote Boot Configuration with Microsoft Windows

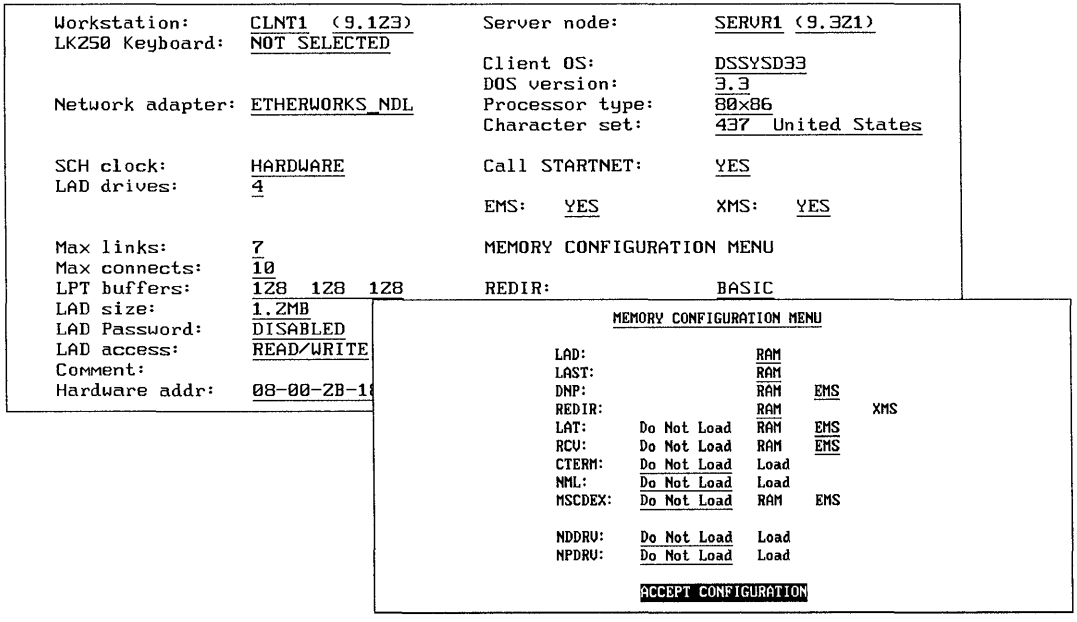
In this example, the base configuration is reconfigured for remote boot operation and the following components are added:

- 3 Mbytes extended memory
- Quarterdeck QEMM386.SYS, a 386 memory manager
- Microsoft Windows Version 3.0

Netsetup Screen

Figure 5–7 shows the Netsetup screen as configured to create a key diskette for this client.

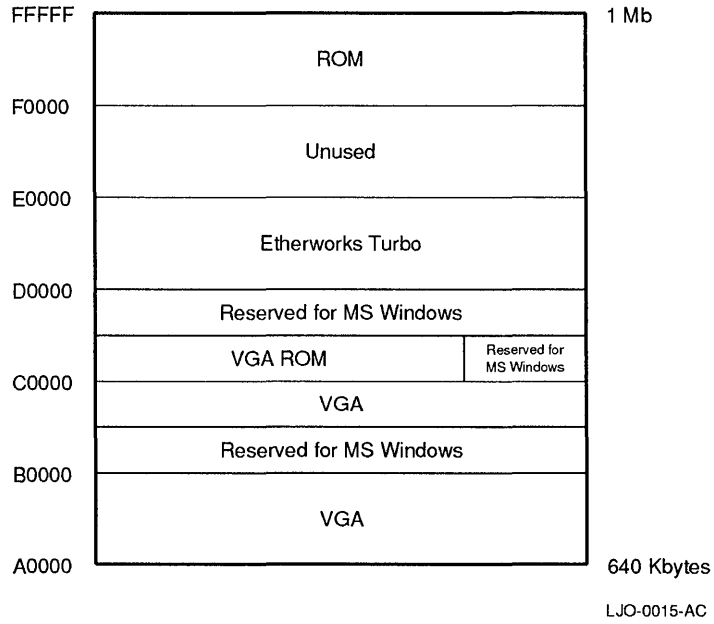
Figure 5–7 Netsetup Screen (80386/DECnet/Remote Boot/Microsoft Windows)



Upper Memory Allocation

Figure 5–6 identifies the allocation of upper memory in this configuration.

Figure 5–8 Upper Memory Allocation (80386/DECnet/Remote Boot/Microsoft Windows)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=40
device=C:\HIMEM.SYS
device=C:\WIN\EMM386.SYS frame=e000 d=48 x=d000-dfff
device=C:\WIN\SMARTDRV.SYS 2048 1024
DEVICE=\decnet\laddrv.sys /D:4
shell=\decnet\bshell.exe /P /E:526
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are used in the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\decnet\setname % WSNODE%
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\rcv /r:2
%BOOT%\DECNET\emsload %_SYSD%\DECNET\LAT
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    606K
    Available conventional memory   480K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size            608K
    Expanded memory available       128K

    XMS extended memory available   584K
    Largest available EMB           584K

System Memory Scan

    0000-977F 606K Conventional
    9780-9FBF  33K Remote Boot Image
    9FC0-9FFF   1K Extended BIOS Area
    A000-B7FF  96K Free
    B800-BFFF  32K RAM
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-D7FF  72K Free
    D800-DFFF  32K RAM
    E000-EFFF  64K Page Frame
    F000-FBFF  48K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987

C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
13A0     208  n/a          /P /E:526
13AE    3376  COMMAND.COM                        22-24 2E D3-D4
free      48
13AE     528  COMMAND.COM  <ENVIRONMENT>
1F44     224  RPLMEM.EXE   <ENVIRONMENT>
free      32
14BA    8320  EMS Stub     /rem:2                2A 5C 69-6A 6E
16C3   34816  n/a          /L:10 /P1:128 /P2:12  05 17 D1 EF
1F44     576  RPLMEM.EXE                         2F
free  491856
```

Configuration Notes

- The 32 Kbyte Remote Boot Image shown in the memory map (MEMMAN/S/F) contains the SCH, DLL, LAST, and LAD PATHWORKS components.
- This remote boot configuration cannot be unloaded.
- Before you can run Windows in 386 Enhanced Mode, you must load the TSR program \MSWINV30\RPLMEM.EXE on the PCSAV41 system file service. RPLMEM informs Windows that the area in memory from just below the 640K mark is being used by the Remote Boot task image.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

With the Enhanced Redirector

The following components are added to the base configuration for this example:

- 3 Mbytes extended memory
- Quarterdeck QEMM386.SYS, a 386 memory manager
- Enhanced Redirector

Netsetup Screen

Figure 5–9 shows the Netsetup screen as configured to create a key diskette for this client.

Figure 5–9 Netsetup Screen (80386/DECnet/Enhanced Redirector)

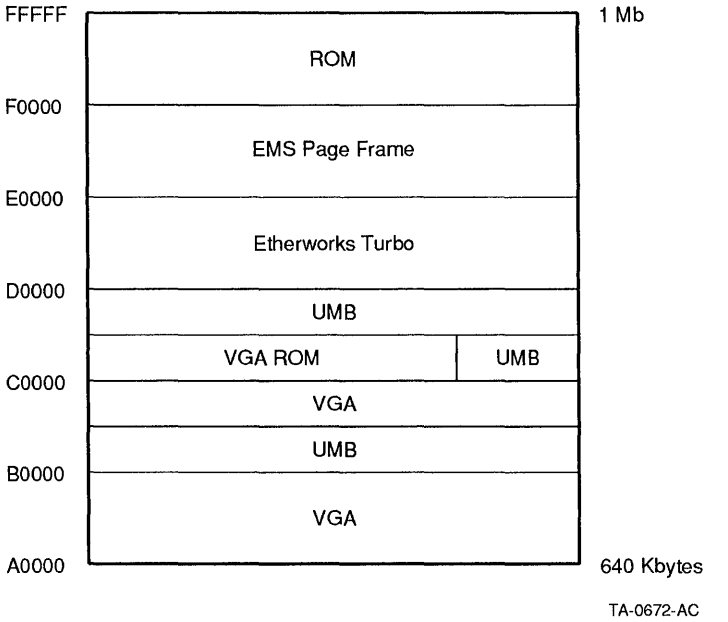
```
Workstation:      CLNT1  (9.123)        Server node:          SERVR1 (9.321)
LKZ50 Keyboard:   NOT SELECTED         DOS from server:      NO

Adapter type:     ETHERNET             DOS version:          3.3
Network adapter:  ETHERWORKS_NDL       Processor type:       80x86
                                       Character set:        437  United States
                                       Initial WS:           NO
SCH clock:        HARDWARE             Call STARTNET:        YES
LAD drives:       4
                                       EMS:   YES            XMS:   YES
LAT table size:   20
Max links:        7                    MEMORY CONFIGURATION MENU
Max connects:     10
LPT buffers:      128  128  128        REDIR:                ENHANCED
DECnet DOS:       NO
ASYNCH DECnet:    NO


Destination:      C:
```

```
                    MEMORY CONFIGURATION MENU

LAD:      Do Not Load   RAM   EMS
LAST:                   RAM   EMS
DNP:                    RAM   EMS
REDIR:                  RAM   EMS   XMS
LAT:      Do Not Load   RAM   EMS
RCV:      Do Not Load   RAM   EMS
CTERM:    Do Not Load   Load
NML:      Do Not Load   Load
CDEX:     Do Not Load   RAM   EMS

NDDRV:    Do Not Load   Load
NPDRV:    Do Not Load   Load

                    ACCEPT CONFIGURATION
```

Upper Memory Allocation

Figure 5–10 identifies the allocation of upper memory in this configuration.

Figure 5–10 Upper Memory Allocation (80386/DECnet/Enhanced Redirector)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE=D:\QEMM\QEMM386.SYS fr=e000 x=1000-a000 nosh ns ram
files= 20
buffers=8
stacks=0,0
shell=C:\command.com /p /e:384
device=D:\QEMM\LOADHI.SYS \decnet\laddrv.sys /D:4
device=D:\QEMM\LOADHI.SYS \DOS\MOUSE.SYS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
D:\QEMM\LOADHI %BOOT%\decnet\sch /H
D:\QEMM\LOADHI %BOOT%\decnet\dlldepca.exe
D:\QEMM\LOADHI %BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\LMDOS\NETPROG\net start wksta /lim:no /himem:yes /lanroot:%erdr%\lmdos
%BOOT%\LMDOS\NETPROG\net logon USER1 *
% SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe
 /R:-1 /W:-1 /a:-1
% SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory     640K
    Reported conventional memory     640K
    Available conventional memory    552K

    Physical extended memory        3072K
    Reported extended memory           0K

    Expanded memory size            2880K
    Expanded memory available       2688K

    XMS extended memory available   2688K
    Largest available EMB           2688K

System Memory Scan
```

```
    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-B7FF  32K RAM
    B800-BFFF  32K Free
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-C7FF   8K ROM
    C800-CFFF  32K RAM
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-F7FF  32K RAM
    F800-FBFF  16K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987

C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0C76    3376  COMMAND.COM                        22-24 2E D2 F0
free      48
0C76     384  COMMAND.COM  <ENVIRONMENT>
free     256
0D79    1136  PCSA Mark
free    2416
0E59   33536  n/a          %                     08 17 28 2F CC-CD D3-D5 DE

free  563024
```

Configuration Notes

- Netsetup automatically adds HIMEM.SYS to your CONFIG.SYS file. You must edit CONFIG.SYS and remove this line before using QEMM.
- You must edit CONFIG.SYS and STARTNET.BAT to add the LOADHI command.

  Refer to the QEMM documentation for more detailed information on the LOADHI command.
- The QEMM386 "nosh ns" parameter is machine dependent and may not be needed for other PCs.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.
- If you are using Microsoft Windows or DOS version 5.0, make sure to put the redirector into conventional memory or EMS.

With EtherLink II Network Controller

Refer to the QEMM documentation for information about QEMM386.SYS

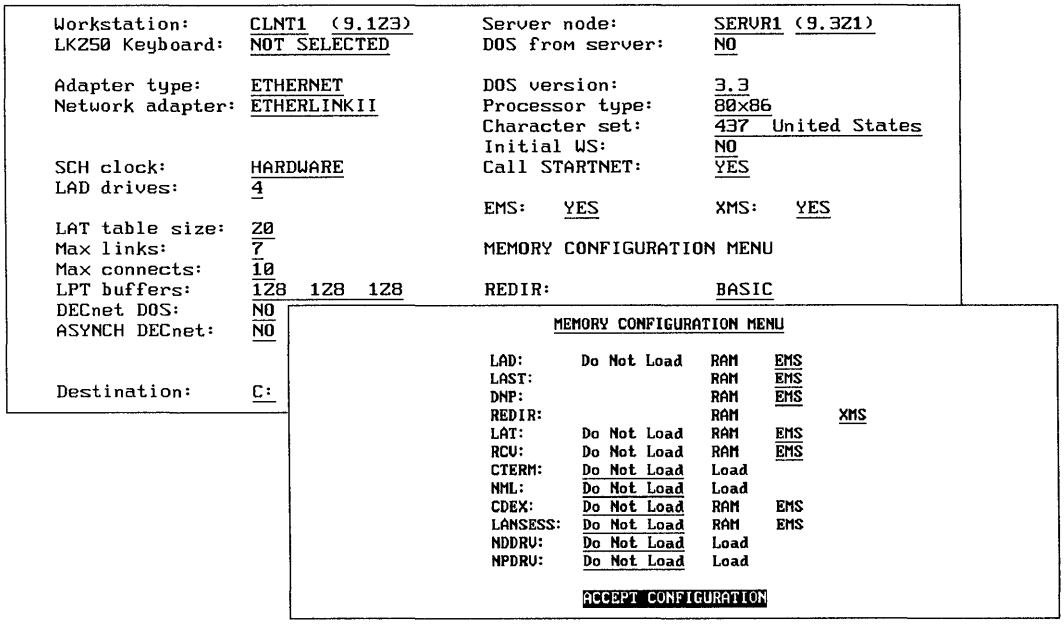
In this example, the base configuration is changed as follows:

- 3 Mbytes extended memory added
- Quarterdeck QEMM386.SYS, a 386 memory manager, added
- 3Com EtherLink II network controller used

Netsetup Screen

Figure 5–11 shows the Netsetup screen as configured to create a key diskette for this client.

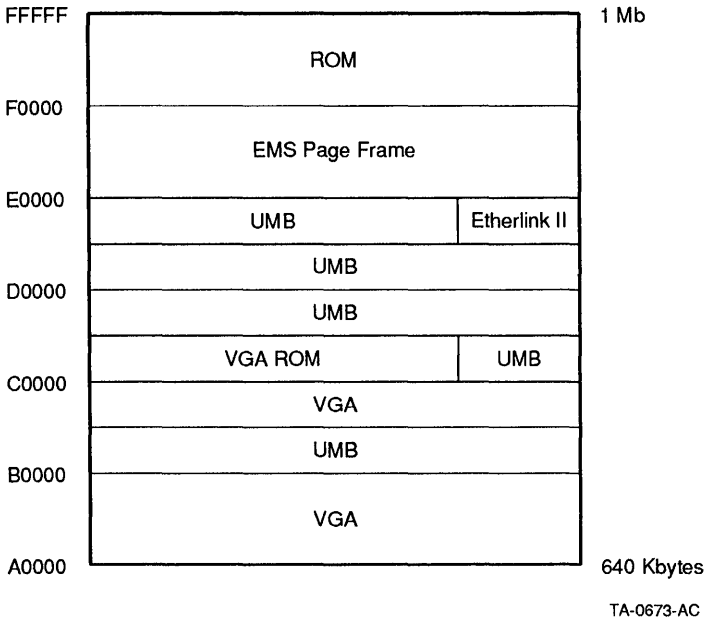
Figure 5–11 Netsetup Screen (80386/DECnet/EtherLink II)



Upper Memory Allocation

Figure 5–12 identifies the allocation of upper memory in this configuration.

Figure 5–12 Upper Memory Allocation (80386/DECnet/EtherLink II)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE=D:\QEMM\QEMM386.SYS fr=e000 x=1000-a000 nosh ns ram
files= 20
buffers=8
stacks=0,0
shell=C:\command.com /p /e:384
device=D:\QEMM\LOADHI.SYS \decnet\laddrv.sys /D:4
DEVICE=\DECNET\PROTMAN.SYS /I:A:\DECNET
DEVICE=D:\QEMM\LOADHI.SYS \DECNET\ELNKII.SYS
DEVICE=D:\QEMM\LOADHI.SYS \DOS\MOUSE.SYS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
d:\qemm\loadhi %BOOT%\decnet\dllndis
%BOOT%\decnet\netbind
D:\QEMM\LOADHI %BOOT%\decnet\sch /H
d:\qemm\loadhi %BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
d:\qemm\loadhi %BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128
  /himem:yes
%BOOT%\decnet\setname % WSNODE%
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
  /W:-1 /a:-1
% SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1 /W:-1 /a:-1
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   586K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size           2816K
    Expanded memory available      2624K

    XMS extended memory available  2624K
    Largest available EMB          2624K

System Memory Scan
```

```
    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-B7FF  32K RAM
    B800-BFFF  32K Free
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-C7FF   8K ROM
    C800-CFFF  32K RAM
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-F7FF  32K RAM
    F800-FFFF  32K System ROM (C) 1985,1986,1987

C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0C7C    3376  COMMAND.COM                       22-24 2E CF F0 F2
free      48
0C7C     384  COMMAND.COM  <ENVIRONMENT>
free  600336
```

Configuration Notes

- Netsetup automatically adds HIMEM.SYS to your CONFIG.SYS file. You must edit CONFIG.SYS and remove this line before using QEMM.
- You must edit CONFIG.SYS and STARTNET.BAT to add the LOADHI command.

  Refer to the QEMM documentation for more detailed information on the LOADHI command.
- The QEMM386 "nosh ns" parameter is machine dependent and may not be needed for other PCs.
- The memory map (MEMMAN/S/F) indicates 2624 Kbytes of EMS expanded memory and 2624 Kbytes of XMS extended memory. Actually, there are only 2624 Kbytes total available EMS and XMS memory. QEMM manages the available memory and can provide it to meet either specification, depending on the requirements of user applications.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

With DOS Version 5.0

The following components are added to the base configuration for this example:

- 3 Mbytes extended memory
- DOS Version 5.0
- SCSI hard drive

Netsetup Screen

Figure 5–13 shows the Netsetup screen as configured to create a key diskette for this client.

Figure 5–13 Netsetup Screen (80386/DECnet/DOS Version 5.0)

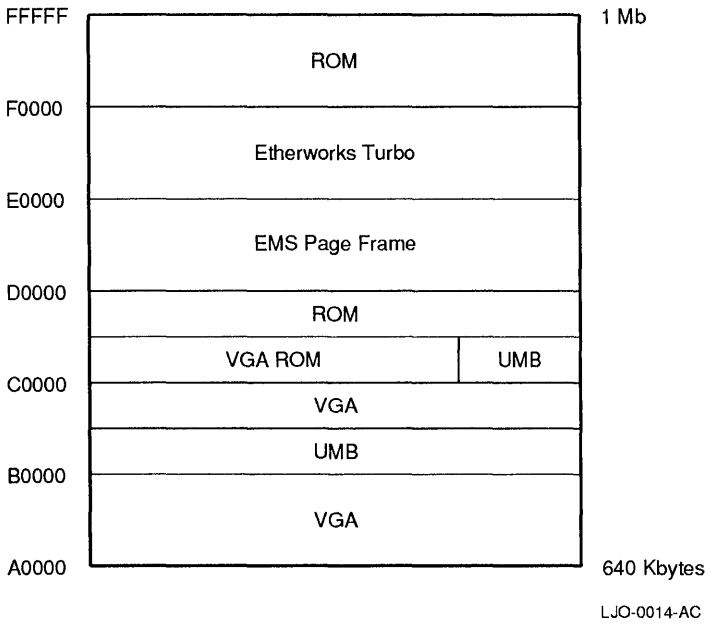
```
Workstation:      CLNT1  (9.123)        Server node:          SERVR1 (9.321)
LKZ50 Keyboard:   NOT SELECTED          DOS from server:      NO

Adapter type:     ETHERNET              DOS version:          5.0
Network adapter:  ETHERWORKS_NDL        Processor type:       80x86
                                        Character set:        437  United States

SCH clock:        HARDWARE              Call STARTNET:        YES

                                        EMS:   YES            XMS:   YES

Max links:        7                     MEMORY CONFIGURATION MENU
Max connects:     10
LPT buffers:      128  128  128         REDIR:                BASIC
DECnet DOS:       NO
ASYNCH DECnet:    NO

Destination:      C:
```

```
                MEMORY CONFIGURATION MENU

LAD:        Do Not Load   RAM   EMS
LAST:                     RAM   EMS
DNP:                      RAM   EMS
REDIR:                    RAM         XMS
LAT:        Do Not Load   RAM   EMS
RCV:        Do Not Load   RAM   EMS
CTERM:      Do Not Load   Load
NML:        Do Not Load   Load
MSCDEX:     Do Not Load   RAM   EMS
LANSESS:    Do Not Load   RAM   EMS
NDDRV:      Do Not Load   Load
NPDRV:      Do Not Load   Load

            ACCEPT CONFIGURATION
```

Upper Memory Allocation

Figure 5–14 identifies the allocation of upper memory in this configuration.

Figure 5–14 Upper Memory Allocation (80386/DECnet/DOS Version 5.0)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
files= 30
buffers=20
stacks=0,0
shell=c:\dos\command.com c:\dos\ /P /e:512
device=c:\dos\himem.sys
dos=high,umb
device=C:\dos\emm386.exe 2048 ram x=e800-efff
device=C:\DOS\SCSIHA.SYS
devicehigh=\decnet\laddrv.sys /D:4
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
LOADHIGH %BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:5 /P1:80 /P2:80 /P3:80 /himem:no
%BOOT%\decnet\setname % WSNODE%
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe
 /R:-1 /W:-1 /a:-1
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   544K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size           2432K
    Expanded memory available      1920K

    XMS extended memory available   2624K
    Largest available EMB           2624K

System Memory Scan

    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-B7FF  96K Free
    B800-BFFF  32K RAM
    C000-C5FF  24K ROM COPYRIGHT WESTERN DIGITAL CORP. 1987,88,89
    C600-C7FF   8K ROM
    C800-CBFF  16K RAM
    CC00-CFFF  16K ROM
    D000-DFFF  64K Page Frame
    E000-EFFF  64K RAM
    F000-FBFF  48K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0008      64  MS-DOS       <DATA>
0A5D    2368  COMMAND.COM                        22-24 2E
free      64
0A5D     512  COMMAND.COM  <ENVIRONMENT>
free     400
0B33    1136  PCSA Mark
0B7B    8160  Datalink                           1C CA D2 EE
0D7A    8320  EMS Stub     /rem:2                13 2A 5C 69 6E D6 EF-F0 F2
                                                F9 FC
0F83   34336  REDIR        /L:5 /P1:80 /P2:80 /  05 17 2F C9 D3-D4 DE ED
free  557440
```

Configuration Notes

- When DOS is loaded into HMA, the Basic Redirector (REDIR.EXE) must be loaded into conventional memory. The Enhanced Redirector can be loaded into EMS.
- You must edit CONFIG.SYS to add the DEVICEHIGH command and edit STARTNET.BAT to add the LOADHIGH command.

  Refer to the DOS version 5.0 documentation for more detailed information on these commands.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software.

With Microsoft Windows

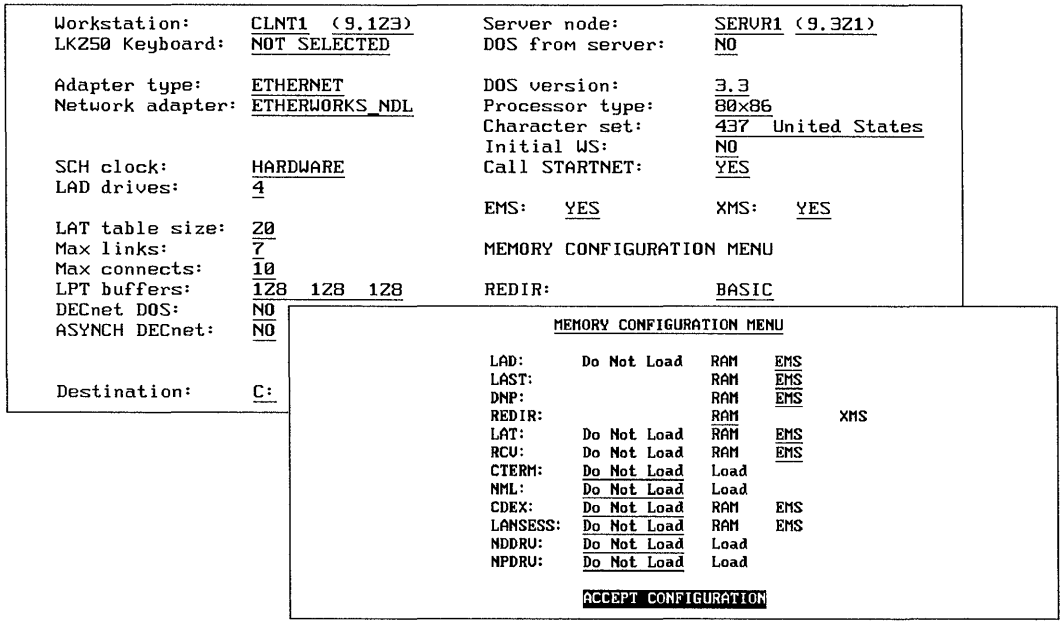
This example is defined for Microsoft Windows operation on the client. The following change is made from the base configuration:

- EMM386, a 386 memory manager provided with Microsoft Windows, is used.

Netsetup Screen

Figure 5–15 shows the Netsetup screen as configured to create a key diskette for this client.

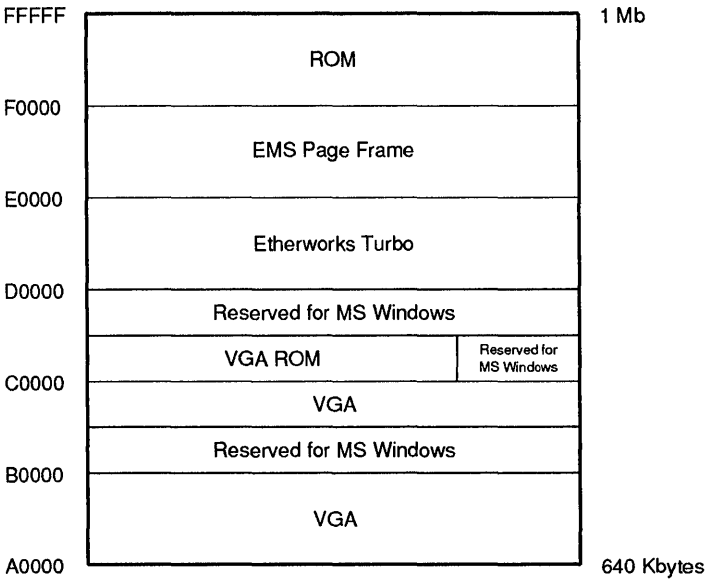
Figure 5–15 Netsetup Screen (80386/DECnet/Microsoft Windows)



Upper Memory Allocation

Figure 5–16 identifies the allocation of upper memory in this configuration.

Figure 5–16 Upper Memory Allocation (80386/DECnet/Microsoft Windows)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
files= 30
buffers=8
shell=\command.com /P /E:384
device=C:\himem.sys
device=C:\WINDOWS\EMM386.SYS frame=e000 d=48 x=d000-dfff
device=C:\WINDOWS\smartdrv.sys 768
device=\decnet\laddrv.sys /D:4
device=mouse.sys
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save%BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
   /W:-1 /a:-1
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    639K
    Available conventional memory   490K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size            640K
    Expanded memory available       128K

    XMS extended memory available  1864K
    Largest available EMB          1864K

System Memory Scan

    0000-9FBF 639K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-B7FF  96K Free
    B800-BFFF  32K RAM
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-CFFF  40K Free
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-FBFF  48K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
15F5    3376  COMMAND.COM                        22-24 2E
free      48
15F5     384  COMMAND.COM  <ENVIRONMENT>
free     288
16FA    1136  PCSA Mark
1742    7184  Scheduler    /H                    08 0D 16 67 6C
free     224
1913    8000  Datalink                           1C D1
1B08    8208  EMS Stub     /rem:2                13 2A 5C 69-6A 6E
1D0A   33888  n/a          /L:10 /P1:128 /P2:12  05 17 2F EF
free  501472
```

Configuration Notes

- Do not load REDIR into XMS.
- Microsoft Windows may not work with QEMM386.SYS or 386MAX.SYS memory managers. Use the 386 memory manager supplied by Microsoft Windows, EMM386.SYS.
- EMM386.SYS supplied with Microsoft Windows V3.0 does not provide the capability to load network components and drivers into upper memory. The version of EMM386.SYS supplied with DOS V5.0 does support this feature.
- Use the Microsoft Windows Smartdrive utility (called out in the CONFIG.SYS file) to increase performance on the client.

  The utility uses approximately 22 Kbytes of conventional memory.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

IBM PS/2 Model 80 Client

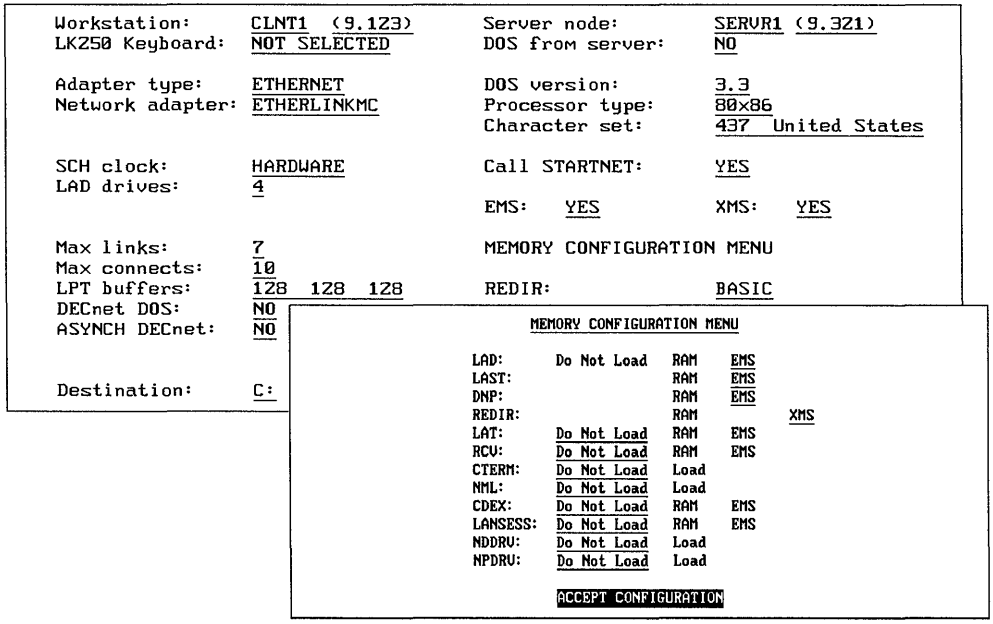
This example uses the following components:

- IBM PS/2 Model 80 PC with 1 Mbyte extended memory
- VGA video monitor
- EtherLink/MC network controller
- Quarterdeck QEMM386.SYS, a 386 memory manager

Netsetup Screen

Figure 5–17 shows the Netsetup screen as configured to create a key diskette for this client.

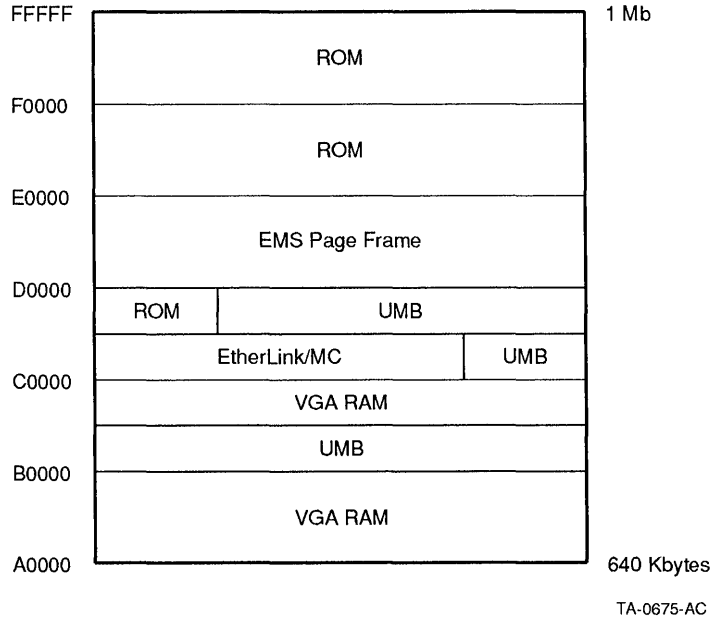
Figure 5–17 Netsetup Screen (80386/DECnet/IBM Model 80)



Upper Memory Allocation

Figure 5–18 identifies the allocation of upper memory in this configuration.

Figure 5–18 Upper Memory Allocation (80386/DECnet/IBM Model 80)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
device=C:\QEMM\QEMM386.sys fr=d000 x=c000-c5ff ram x=1000-b000
buffers=8
files=20
device=\decnet\laddrv.sys /D:4
shell=\command.com /P /E:526
DEVICE=\DECNET\PROTMAN.SYS /I:A:\DECNET
DEVICE=\DECNET\ELNKMC.DOS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
C:\QEMM\LOADHI %BOOT%\decnet\dllndis
%BOOT%\decnet\netbind
%BOOT%\decnet\save
C:\QEMM\LOADHI %BOOT%\decnet\sch /H
C:\QEMM\LOADHI %BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\decnet\setname % WSNODE%
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\LMDOS\DRIVERS\PCSA\lad.exe
 /R:-1 /W:-1 /a:-1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory     640K
    Reported conventional memory     640K
    Available conventional memory    571K

    Physical extended memory        1408K
    Reported extended memory           0K

    Expanded memory size            1152K
    Expanded memory available        960K

    XMS extended memory available    960K
    Largest available EMB            960K

System Memory Scan

    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-BFFF  64K RAM
    C000-C3FF  16K RAM
    C400-C5FF   8K Free
    C600-CFFF  40K RAM
    D000-DFFF  64K Page Frame
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1981, 1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0FC2    3376  COMMAND.COM                        22-24 2E EF
free      48
0FC2     528  COMMAND.COM  <ENVIRONMENT>
free     224
10CC    1136  PCSA Mark
1114     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  584512
```

Configuration Notes

- The upper memory area that is used by the EtherLink/MC network controller, C000-C5FF, is excluded from QEMM use on the QEMM command line of the CONFIG.SYS file.
- The system memory scan (MEMMAN/S/F) in this example says that E000-EFFF is Unknown. Actually, it is used for system ROM. The scan also says that A000-AFFF is free, but it is used by the VGA controller in graphics mode.

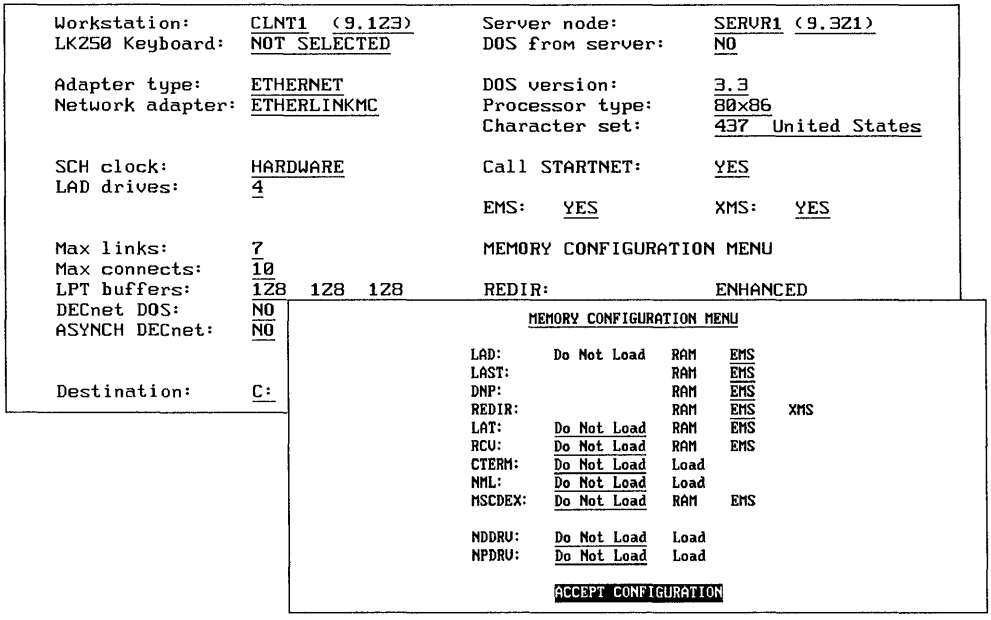
IBM PS/2 Model 80 Client and Enhanced Redirector

This example adds the Enhanced Redirector to the IBM PS/2 Model 80.

Netsetup Screen

Figure 5–19 shows the Netsetup screen as configured to create a key diskette for this client.

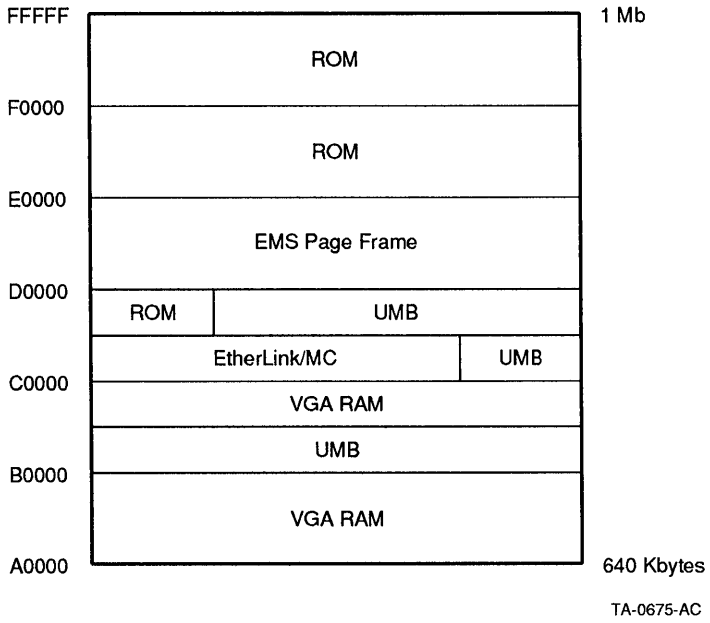
Figure 5–19 Netsetup Screen (80386/DECnet/IBM Model 80/Enhanced Redirector)



Upper Memory Allocation

Figure 5–20 identifies the allocation of upper memory in this configuration.

Figure 5–20 Upper Memory Allocation (80386/DECnet/IBM Model 80/Enhanced Redirector)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
device=C:\QEMM\QEMM386.sys fr=d000 x=c000-c5ff ram x=1000-b000
buffers=8
files=20
device=\decnet\laddrv.sys /D:4
shell=\command.com /P /E:526
DEVICE=\DECNET\PROTMAN.SYS /I:A:\DECNET
DEVICE=\DECNET\ELNKMC.DOS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
C:\QEMM\LOADHI %BOOT%\decnet\dllndis
%BOOT%\decnet\netbind
%BOOT%\decnet\save
C:\QEMM\LOADHI %BOOT%\decnet\sch /H
C:\QEMM\LOADHI %BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\LMDOS\NETPROG\net start wksta /lim:no /himem:yes /lanroot:%erdr%\lmdos
%BOOT%\LMDOS\NETPROG\net logon USER1 *
% SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe
 /R:-1 /W:-1 /a:-1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   546K

    Physical extended memory       1408K
    Reported extended memory          0K

    Expanded memory size           1152K
    Expanded memory available       960K

    XMS extended memory available   960K
    Largest available EMB           960K

System Memory Scan

    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-BFFF  64K RAM
    C000-C3FF  16K RAM
    C400-C5FF   8K Free
    C600-CFFF  40K RAM
    D000-DFFF  64K Page Frame
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1981, 1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0FC2    3376  COMMAND.COM                        22-24 2E EF
free      48
0FC2     528  COMMAND.COM  <ENVIRONMENT>
free     224
10CC    1136  PCSA Mark
free    2560
B3F5   25984  n/a          <DATA>
free  556816
```

Configuration Notes

- The upper memory area that is used by the EtherLink/MC network controller, C000-C5FF, is excluded from QEMM use on the QEMM command line of the CONFIG.SYS file.
- The system memory scan (MEMMAN/S/F) in this example says that E000-EFFF is Unknown. Actually, it is used for system ROM. The scan also says that A000-AFFF is free, but it is used by the VGA controller in graphics mode.

TCP/IP Configurations

This section provides examples of 80386 client configurations that use the TCP/IP transport protocol.

DECstation 325 Base Configuration

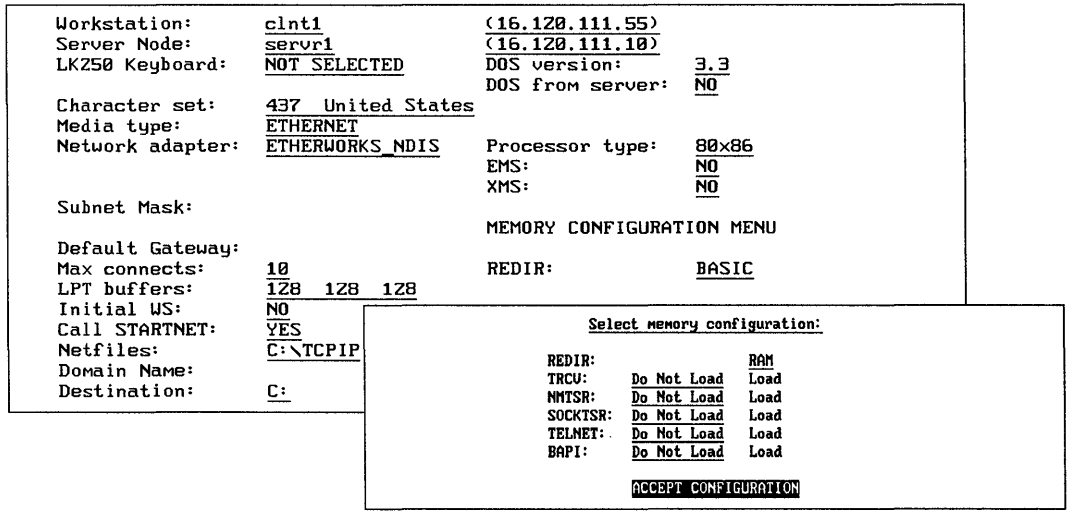
The base configuration for 80386 client configuration examples consists of the following components:

- DECstation 325 with 1 Mbyte system memory
- VGA video controller
- DEC VGA monitor
- DEC EtherWORKS Turbo network controller

Netsetup Screen

Figure 5–21 shows the Netsetup screen as configured to create a key diskette for this client.

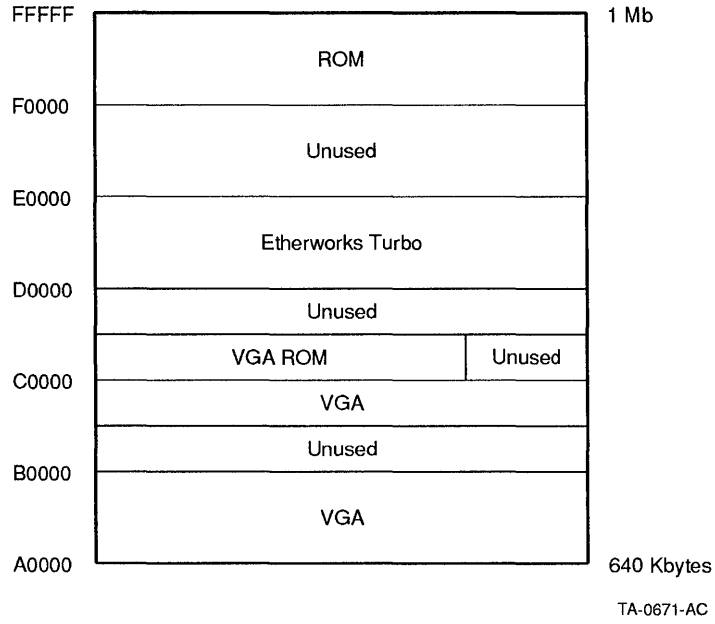
Figure 5–21 Netsetup Screen (80386/TCPIP/Base)



Upper Memory Allocation

Figure 5–22 identifies the allocation of upper memory in this configuration.

Figure 5–22 Upper Memory Allocation (80386/TCPIP/Base)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=20
shell=\command.com /P /E:384
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:C:\tcpip
device=\tcpip\depca.dos
device=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\TCPIP\setname client1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    639K
    Available conventional memory   422K

    Physical extended memory          0K
    Reported extended memory          0K

    Expanded memory                 Not Present

    XMS extended memory             Not Present

System Memory Scan

    0000-9FBF 639K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-B7FF  96K Free
    B800-BFFF  32K RAM
    C000-C5FF  24K ROM COPYRIGHT WESTERN DIGITAL CORP. 1987,88,89
    C600-CBFF  24K Free
    CC00-CFFF  16K ROM
    D000-DFFF  64K RAM
    E000-EFFF  64K Free
    F000-FFFF  64K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0EA1    3376  COMMAND.COM                        22-24 2E FC
free      48
0EA1     384  COMMAND.COM  <ENVIRONMENT>
free     240
0FA3   78304  n/a                                08 C9 CC-CD D1 D3-D4 DE
22C2   43264  n/a                                5C
2D53    1136  PCSA Mark
2D9B    1504  n/a                                21 2A
2DFA   33888  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  432096
```

Configuration Notes

- This configuration lacks sufficient memory to run PC DECwindows Motif. A minimum of 1 Mbyte is required.
- The Netsetup utility automatically configures the network controller for NDIS operation when TCP/IP is specified.
- You must unload TCP/IP components to run DOS applications. Refer to Chapter 4 for information on unloading TCP/IP components.
- A mouse typically is not used in a low-memory configuration like this one, so the mouse driver is not loaded to save memory.

With QEMM and 3 Mbytes Extended Memory

Refer to the QEMM documentation for detailed explanation of QEMM386.SYS installation and operation.

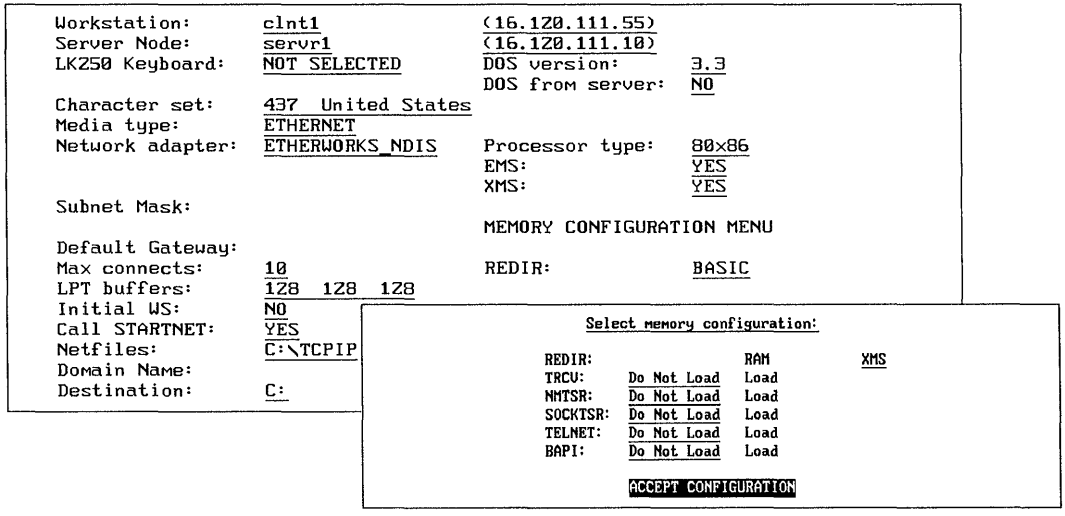
The following components are added to the TCP/IP base configuration for this example:

- 3 Mbytes extended memory
- Quarterdeck QEMM386.SYS, a 386 memory manager
- Mouse and driver

Netsetup Screen

Figure 5–23 shows the Netsetup screen as configured to create a key diskette for this client.

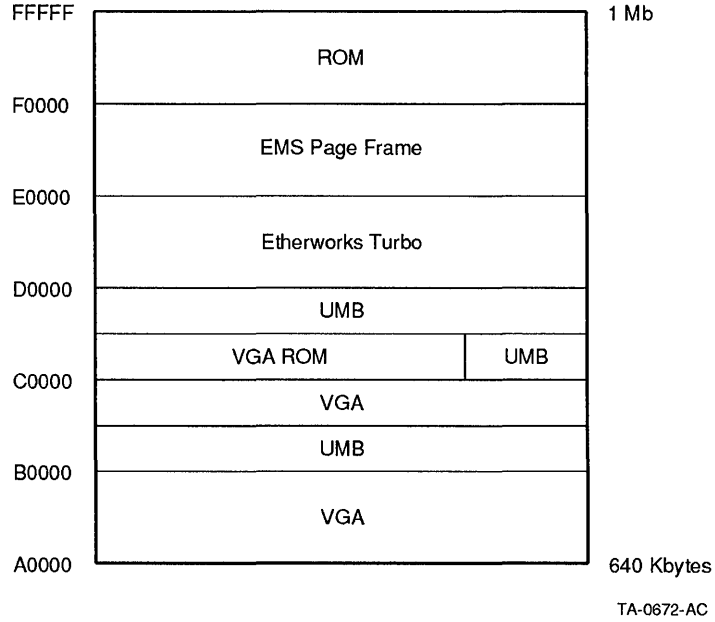
Figure 5–23 Netsetup Screen (80386/TCPIP/QEMM)



Upper Memory Allocation

Figure 5–24 identifies the allocation of upper memory in this configuration.

Figure 5–24 Upper Memory Allocation (80386/TCPIP/QEMM)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE=D:\QEMM\QEMM386.SYS fr=e000 x=1000-a000 nosh ns ram
buffers=8
files=20
stacks=0,0
shell=\command.com /P /E:526
device=D:\QEMM\LOADHI.SYS \tcpip\nemm.dos
device=\tcpip\protman.sys /I:A:\tcpip
device=D:\QEMM\LOADHI.SYS \tcpip\depca.dos
device=D:\QEMM\LOADHI.SYS \tcpip\tcpdrv.dos /I:A:\tcpip
device=D:\QEMM\LOADHI.SYS c:\DOS\MOUSE.SYS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
D:\QEMM\LOADHI %BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\TCPIP\setname client1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   533K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size           2880K
    Expanded memory available      2720K

    XMS extended memory available  2720K
    Largest available EMB          2720K

System Memory Scan

    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-B7FF  32K RAM
    B800-BFFF  32K Free
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-C7FF   8K ROM
    C800-CFFF  32K RAM
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-F7FF  32K RAM
    F800-FBFF  16K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0C88    3376  COMMAND.COM                        22-24 2E D2 F0 F2
free      48
0C88     528  COMMAND.COM  <ENVIRONMENT>
free     176
0D8F   44192  n/a                                08 CC-CD D3-D5 DE F1 F4 F7
                                                 FD
185A    6128  n/a                                5C
19DA    1136  PCSA Mark
1A22    1504  n/a                                21 2A D1
1A81     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  545904
```

Configuration Notes

- SOCKTSR must be loaded before you run PC DECwindows Motif. SOCKTSR requires 18 Kbytes of expanded memory.
- Netsetup automatically adds HIMEM.SYS to your CONFIG.SYS file. You must edit CONFIG.SYS and remove this line before using QEMM.
- You must edit CONFIG.SYS and STARTNET.BAT to add the LOADHI command.

  Refer to the QEMM documentation for more detailed information on the LOADHI command.
- The QEMM386 "nosh ns" parameter is machine dependent and may not be needed for other PCs.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

With the Enhanced Redirector

Refer to the QEMM documentation for detailed explanation of QEMM386.SYS installation and operation.

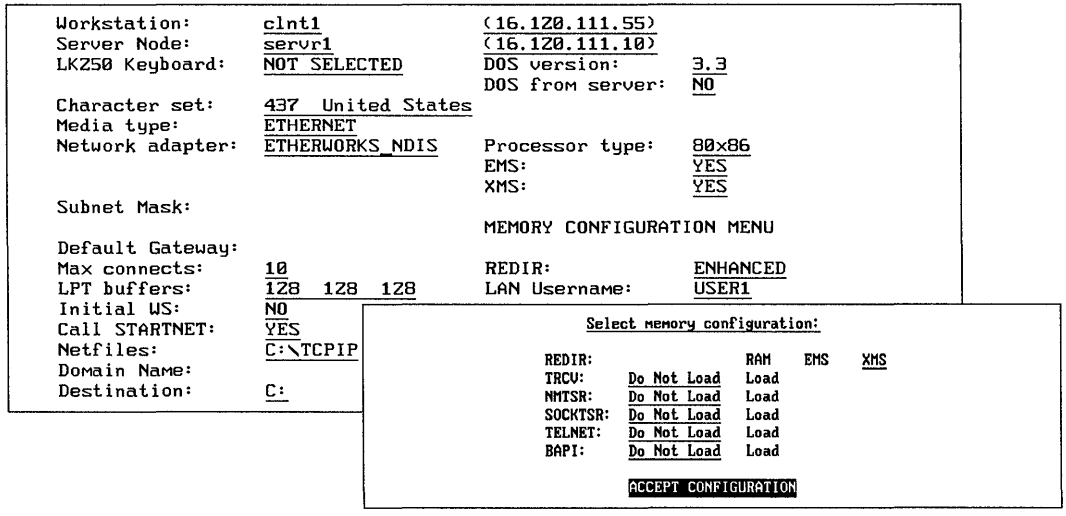
The following components are added to the TCP/IP base configuration for this example:

- 3 Mbytes extended memory
- Quarterdeck QEMM386.SYS, a 386 memory manager
- Mouse and driver
- Enhanced Redirector

Netsetup Screen

Figure 5–25 shows the Netsetup screen as configured to create a key diskette for this client.

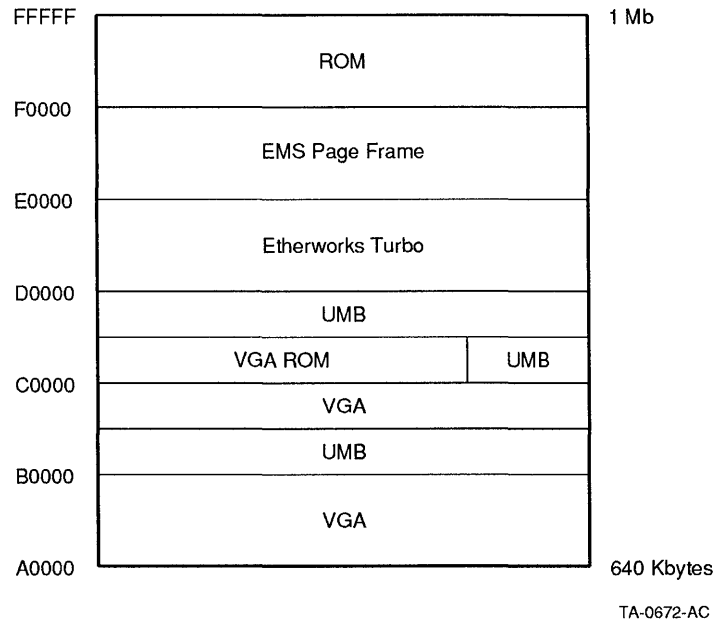
Figure 5–25 Netsetup Screen (80386/TCPIP/Enhanced Redirector)



Upper Memory Allocation

Figure 5–26 identifies the allocation of upper memory in this configuration.

Figure 5–26 Upper Memory Allocation (80386/TCPIP/Enhanced Redirector)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE=D:\QEMM\QEMM386.SYS fr=e000 x=1000-a000 nosh ns ram
buffers=8
files=20
stacks=0,0
shell=\command.com /P /E:526
device=D:\QEMM\LOADHI.SYS \tcpip\nemm.dos
device=\tcpip\protman.sys /I:A:\tcpip
device=D:\QEMM\LOADHI.SYS \tcpip\depca.dos
device=D:\QEMM\LOADHI.SYS \tcpip\tcpdrv.dos /I:A:\tcpip
device=D:\QEMM\LOADHI.SYS c:\DOS\MOUSE.SYS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
D:\QEMM\LOADHI %BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\tcpip\use /next=0 /env=erdr
%BOOT%\tcpip\use %erdr% %BOOT%\ /subst
%BOOT%\LMDOS\NETPROG\net start wksta /lim:no /himem:yes /lanroot:%erdr%\lmdos
cd %BOOT%\LMDOS
%BOOT%\LMDOS\NETPROG\net logon  *
%BOOT%\tcpip\use %erdr% /d
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   497K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size           2880K
    Expanded memory available      2720K

    XMS extended memory available  2720K
    Largest available EMB          2720K

System Memory Scan
```

```
0000-9FFF 640K Conventional
9FC0-9FFF   1K Extended BIOS Area
A000-AFFF  64K Free
B000-B7FF  32K RAM
B800-BFFF  32K Free
C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
C600-C7FF   8K ROM
C800-CFFF  32K RAM
D000-DFFF  64K RAM
E000-EFFF  64K Page Frame
F000-F7FF  32K RAM
F800-FBFF  16K ROM
FC00-FDFF   8K RAM
FE00-FFFF   8K System ROM (C) 1985,1986,1987

C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0D8C    3376  COMMAND.COM                        22-24 2E F7
free      48
0D8C     528  COMMAND.COM  <ENVIRONMENT>
free     176
0E93   44192  n/a                                CC-CD D3-D5 DE F1 F4 FD
195E    6128  n/a                                5C D1
1ADE    1136  PCSA Mark
free    2304
1BB7    1760  n/a                                21 2A
1C26   33536  n/a          %T                    08 17 28 2F EF
free  506496
```

Configuration Notes

- SOCKTSR must be loaded before you run PC DECwindows Motif. SOCKTSR requires 18 Kbytes of expanded memory.
- The Netsetup utility automatically configures the client network controller for NDIS operation when TCP/IP is specified.
- Netsetup automatically adds HIMEM.SYS to your CONFIG.SYS file. You must edit CONFIG.SYS and remove this line before using QEMM.
- You must edit CONFIG.SYS and STARTNET.BAT to add the LOADHI command.

  Refer to the QEMM documentation for more detailed information on the LOADHI command.

- The QEMM386 "nosh ns" parameter is machine dependent and may not be needed for other PCs.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

With EtherLink II Network Controller

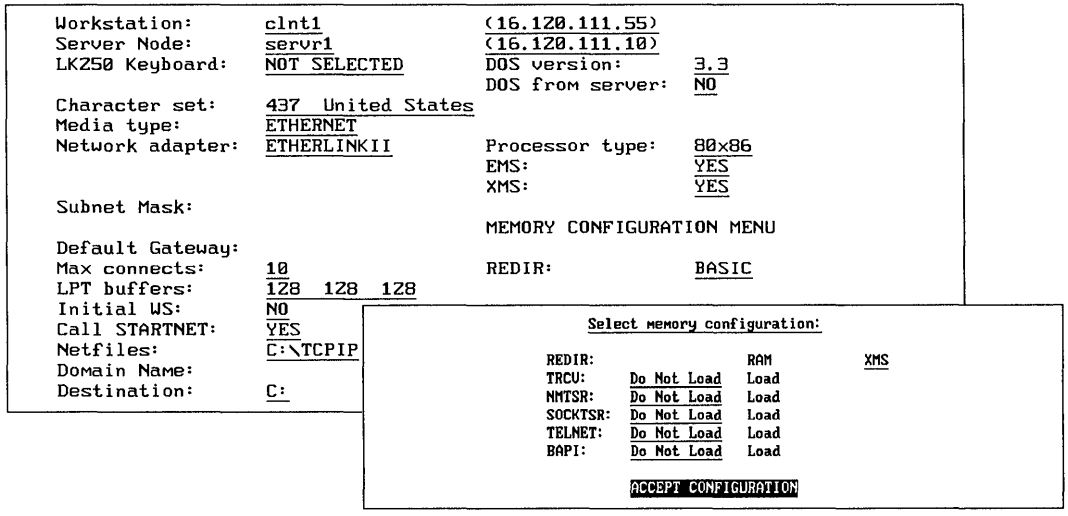
In this example, the base configuration is changed as follows:

- 3 Mbytes extended memory added.
- Quarterdeck QEMM386.SYS, a 386 memory manager, added.
- Mouse and driver added.
- EtherWORKS Turbo network controller replaced by a 3Com EtherLink II network controller.

Netsetup Screen

Figure 5–27 shows the Netsetup screen as configured to create a key diskette for this client.

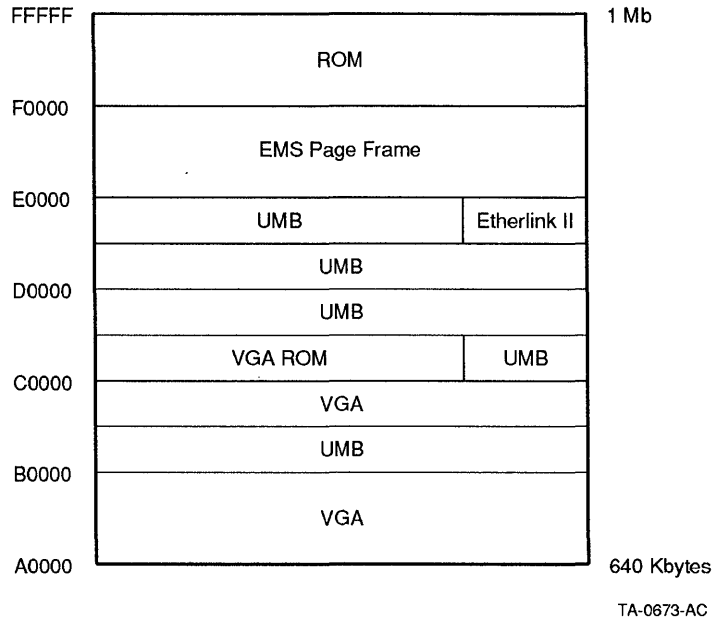
Figure 5–27 Netsetup Screen (80386/TCPIP/EtherLink II)



Upper Memory Allocation

Figure 5–28 identifies the allocation of upper memory in this configuration.

Figure 5–28 Upper Memory Allocation (80386/TCPIP/EtherLink II)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE=D:\QEMM\QEMM386.SYS fr=e000 x=1000-a000 nosh ns ram
buffers=8
files=20
stacks=0,0
shell=\command.com /P /E:384
device=D:\QEMM\LOADHI.SYS \tcpip\nemm.dos
device=\tcpip\protman.sys /I:A:\tcpip
device=D:\QEMM\LOADHI.SYS \tcpip\ELNKII.SYS
device=D:\QEMM\LOADHI.SYS \tcpip\tcpdrv.dos /I:A:\tcpip
device=D:\QEMM\LOADHI.SYS C:\DOS\MOUSE.SYS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
D:\QEMM\LOADHI %BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
D:\QEMM\LOADHI %BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\TCPIP\setname client1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   534K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size           2816K
    Expanded memory available      2656K

    XMS extended memory available  2656K
    Largest available EMB          2656K

System Memory Scan

    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-B7FF  32K RAM
    B800-BFFF  32K Free
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-C7FF   8K ROM
    C800-CFFF  32K RAM
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-F7FF  32K RAM
    F800-FBFF  16K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0C88    3376  COMMAND.COM                        22-24 2E CF F0 F2
free      48
0C88     384  COMMAND.COM  <ENVIRONMENT>
free     176
0D86   44192  n/a                                08 CE D1 F1 F4 F7 FD
1851    6128  n/a                                5C
19D1    1136  PCSA Mark
1A19    1504  n/a                                21 2A
free  546928
```

Configuration Notes

- SOCKTSR must be loaded before you run PC DECwindows Motif. SOCKTSR requires 18 Kbytes of expanded memory.
- The Netsetup utility automatically configures the network controller for NDIS operation when TCP/IP is specified.
- Netsetup automatically adds HIMEM.SYS to your CONFIG.SYS file. You must edit CONFIG.SYS and remove this line before using QEMM.
- You must edit CONFIG.SYS and STARTNET.BAT to add the LOADHI command.

  Refer to the QEMM documentation for more detailed information on the LOADHI command.
- The QEMM386 "nosh ns" parameter is machine dependent and may not be needed for other PCs.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

With Microsoft Windows

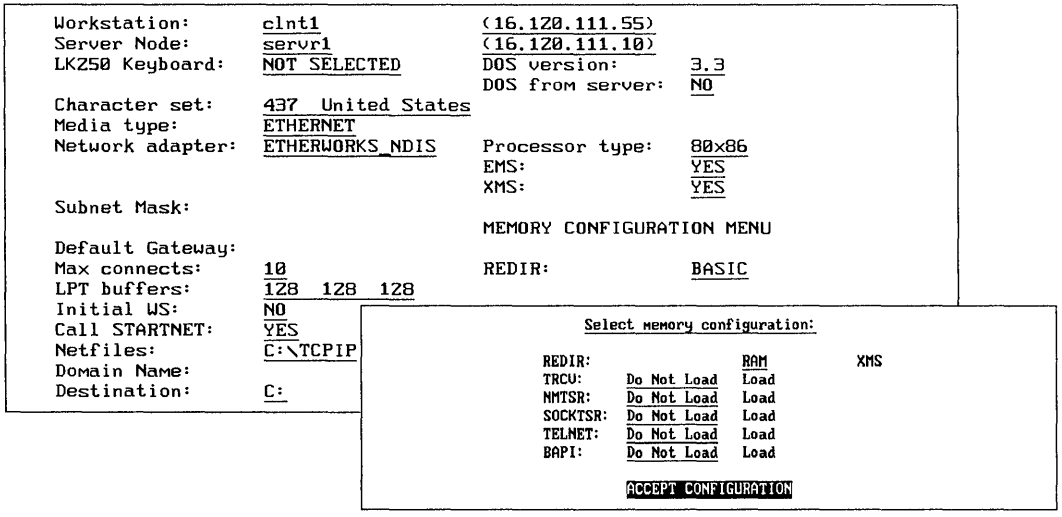
In this example, Microsoft Windows is installed on the client. The following change is made from the base configuration:

- EMM386, a 386, memory manager provided with Microsoft Windows, is used.

Netsetup Screen

Figure 5–29 shows the Netsetup screen as configured to create a key diskette for this client.

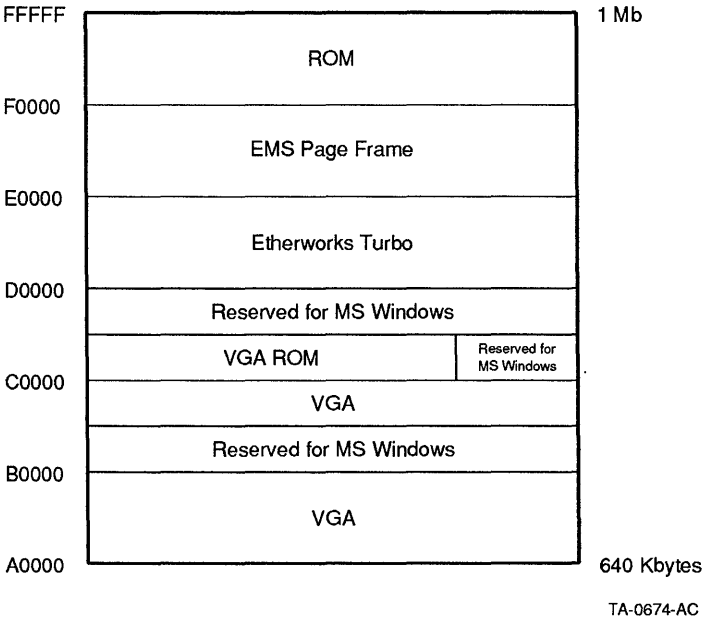
Figure 5–29 Netsetup Screen (80386/TCPIP/Microsoft Windows)



Upper Memory Allocation

Figure 5–30 identifies the allocation of upper memory in this configuration.

Figure 5–30 Upper Memory Allocation (80386/TCPIP/Microsoft Windows)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=20
shell=\command.com /P /E:384
device=C:\HIMEM.SYS
device=C:\win\EMM386.SYS frame=e000 d=48 x=d000-dfff
device=C:\win\smartdrv.sys 768
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:A:\tcpip
device=\tcpip\depca.dos
device=\tcpip\tcpdrv.dos /I:A:\tcpip
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\TCPIP\setname CLNT1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    639K
    Available conventional memory   465K

    Physical extended memory       3072K
    Reported extended memory          0K

    Expanded memory size            640K
    Expanded memory available       160K

    XMS extended memory available  1864K
    Largest available EMB          1864K

System Memory Scan

    0000-9FBF 639K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-B7FF  96K Free
    B800-BFFF  32K RAM
    C000-C5FF  24K ROM COPYRIGHT PARADISE SYSTEMS INC. 1987,1988
    C600-CFFF  40K Free
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-FBFF  48K ROM
    FC00-FDFF   8K RAM
    FE00-FFFF   8K System ROM (C) 1985,1986,1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
14CF    3376  COMMAND.COM                        22-24 2E
free      48
14CF     384  COMMAND.COM  <ENVIRONMENT>
free     240
15D1   44192  n/a                                08 D1 EF
209C    6128  n/a                                5C
221C    1168  n/a
2266    1136  PCSA Mark
22AE    1504  n/a                                21 2A
230D   33888  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  476848
```

Configuration Notes

- Do not load redirector into XMS.
- Microsoft Windows may not work with QEMM386.SYS or 386MAX.SYS memory managers. Use the 386 memory manager supplied by Microsoft Windows, EMM386.SYS.
- The EMM386.SYS supplied with Microsoft Windows V3.0 does not provide the capability to load network components and drivers into upper memory. The EMM386.sys supplied with DOS V5.0 does support this feature.
- Use the Microsoft Windows Smartdrive utility (called out in the CONFIG.SYS file) to increase performance on the client.

  The utility uses approximately 22 Kbytes of conventional memory.
- If you are using a DECstation with a SCSI hard disk and the system hangs when trying to access expanded memory (EMS), load SCSIHA.SYS in your CONFIG.SYS.

  SCSIHA.SYS is included with the SCSI adapter software. If you are using QEMM, make sure to load SCSIHA.SYS before QEMM.

IBM PS/2 Model 80 Client

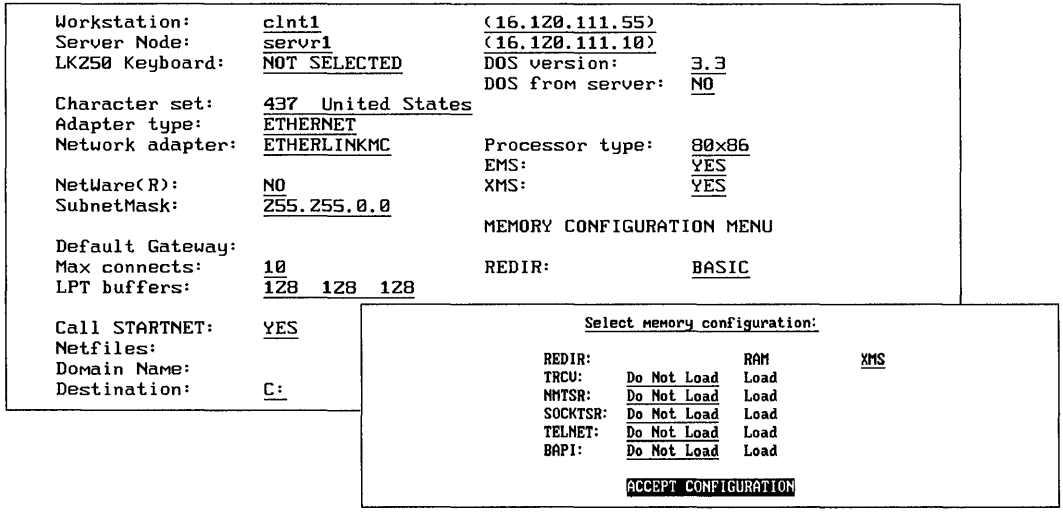
This example uses the following components:

- IBM PS/2 Model 80 PC with 1 Mbyte extended memory
- VGA video controller
- EtherLink/MC network controller
- Quarterdeck QEMM386.SYS, a 386 memory manager

Netsetup Screen

Figure 5–31 shows the Netsetup screen as configured to create a key diskette for this client.

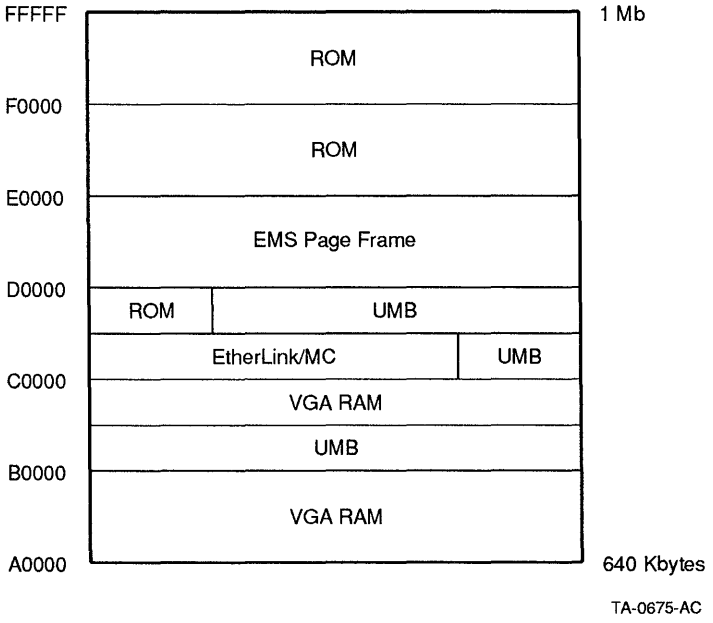
Figure 5–31 Netsetup Screen (80386/DECnet/IBM PS/2 Model 80)



Upper Memory Allocation

Figure 5–32 identifies the allocation of upper memory in this configuration.

Figure 5–32 Upper Memory Allocation (80386/DECnet/IBM PS/2 Model 80)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
device=C:\QEMM\QEMM386.sys fr=d000 x=c000-c5ff ram x=1000-b000
buffers=8
files=20
shell=\command.com /P /E:526
lastdrive=z
device=C:\QEMM\LOADHI.SYS \tcpip\nemm.dos
device=\tcpip\protman.sys /I:A:\tcpip
device=C:\QEMM\LOADHI.SYS \tcpip\ELNKMC.DOS
device=C:\QEMM\LOADHI.SYS \tcpip\tcpdrv.dos /I:A:\tcpip
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
C:\QEMM\LOADHI %BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\TCPIP\setname client1
%BOOT%\TCPIP\setlogon
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   523K

    Physical extended memory       1408K
    Reported extended memory          0K

    Expanded memory size           1152K
    Expanded memory available       992K

    XMS extended memory available   992K
    Largest available EMB           992K

System Memory Scan

    0000-9FFF 640K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K Free
    B000-BFFF  64K RAM
    C000-C3FF  16K RAM
    C400-C5FF   8K Free
    C600-CFFF  40K RAM
    D000-DFFF  64K Page Frame
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1981, 1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line    .      Hooked Interrupts
0D44    3376  COMMAND.COM                         22-24 2E
free      48
0D44     528  COMMAND.COM  <ENVIRONMENT>
free     176
0E4B   44192  n/a                                 EF
1916    6080  n/a                                 5C
1A93    1152  PCSA Mark
1ADC    1504  n/a                                 21 2A
1B3B     864  n/a          /L:10 /P1:128 /P2:12   05 17 2F
free     144
1B7C    7264  n/a          /r:2                   08 10
free  535488
```

Configuration Notes

- The upper memory area that is used by the EtherLink/MC network controller, C000-C5FF, is excluded from QEMM use on the QEMM command line of the CONFIG.SYS file.
- The system memory scan (MEMMAN/S/F) in this example says that A000-AFFF is free, but it is used by the VGA controller in graphics mode.

6

80286 Client Configuration Examples

This chapter contains a series of 80286 client configuration examples that illustrate how common personal computer (PC) characteristics affect the configuration of a typical 80286 PATHWORKS client.

The examples in this section do not apply to all 80286 PATHWORKS clients. The configuration that provides the best mix of memory and performance for a client depends on the type of client and the non-PATHWORKS requirements of its user.

Note

Do not rely on any one example as optimal for your client. Use these examples to help you to understand configuration requirements, but use the procedures outlined in Chapter 3 to configure each client.

The 80286 configuration examples in this section include:

- DECnet Configurations
  - IBM PC AT base configuration
  - With 1-Mbyte Intel Above Board
  - In remote boot configuration
  - With EtherLink II network controller
  - With Microsoft Windows
  - With the Enhanced Redirector
  - With DOS Version 5.0

- TCP/IP Configurations
  - IBM PC AT base configuration
  - With 1-Mbyte Intel Above Board
  - With EtherLink II network controller
  - With the Enhanced Redirector

DECnet Configurations

This section provides examples of 80286 client configurations that use the DECnet transport protocol.

IBM PC AT Base Configuration

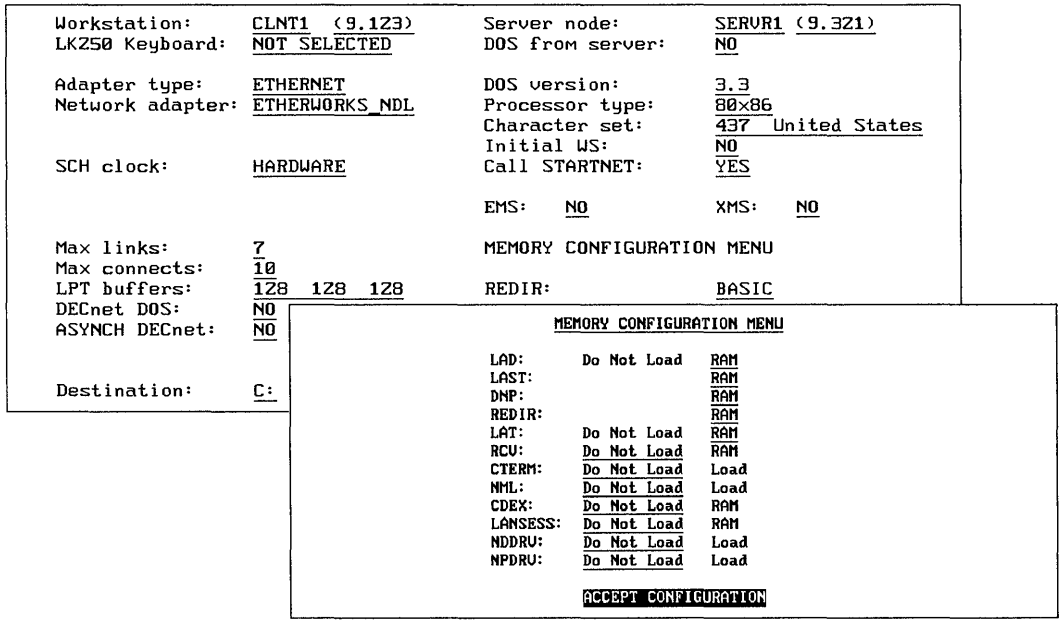
The base configuration for 80286 client configuration examples consists of the following components:

- IBM PC AT with 640 Kbyte conventional memory and EGA monitor
- DEC EtherWORKS LC network controller

Netsetup Screen

Figure 6–1 shows the Netsetup screen as configured to create a key diskette for this client.

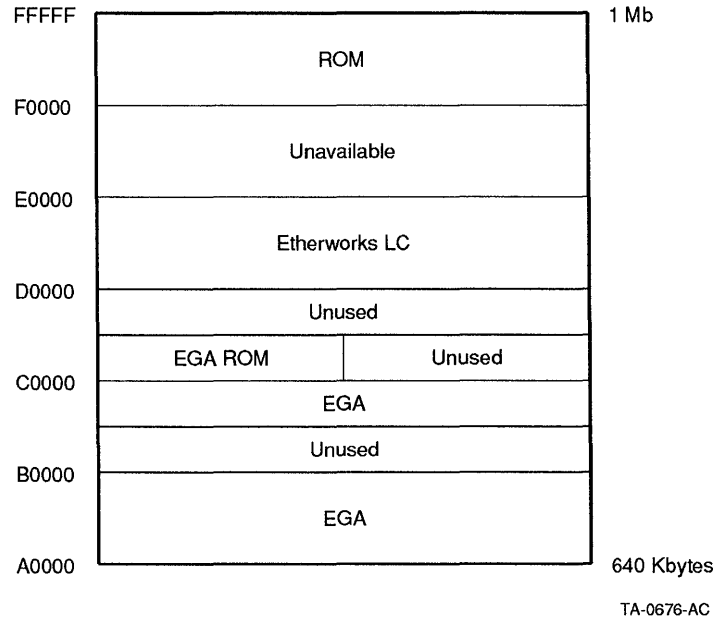
Figure 6–1 Netsetup Screen (80286/DECnet/Base)



Upper Memory Allocation

Figure 6–2 identifies the allocation of upper memory in this configuration.

Figure 6–2 Upper Memory Allocation (80286/DECnet/Base)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=20
device=\decnet\laddrv.sys /D:4
shell=\command.com /P /E:384
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\schk /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\decnet\setname %_WSNODE%
%_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1 /W:-1 /a:-1
%_SYSD%\DECNET\LAT
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   478K

    Physical extended memory        512K
    Reported extended memory        512K

    Expanded memory                 Not Present

    XMS extended memory             Not Present

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K ROM
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0CFF    3376  COMMAND.COM                        22-24 2E
free      48
0CFF     384  COMMAND.COM  <ENVIRONMENT>
free     320
0E06    1136  PCSA Mark
0E4E    3344  Scheduler    /H                    08 0D 6C FC
0F20    8160  Datalink                           1C EF
111F   33568  DNP/NETBIOS  /rem:2                2A 5C 6E F1 F5 FE
1952    9904  LAST         /N:CUPPC5 /c:d /M:D   69
1BBE   34032  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free     304
2422    5280  LAD          /R:-1 /W:-1 /A:-1     13
256D   12464  LAT                                6A F0
free  489568
```

Configuration Notes

- This configuration lacks sufficient memory to run PC DECwindows Motif. A minimum of 1 Mbyte is required.
- You might have to unload the network components to run large DOS applications. Refer to Chapter 4 for procedures on unloading network components.
- Even though the system memory scan (MEMMAN/S/F) for this example indicates that segment E000-EFFF is free, it is actually reserved on an IBM AT.
- A mouse is typically not used in a low-memory configuration like this one, so the mouse driver is not loaded to save memory.

With 1-Mbyte Intel Above Board

Refer to Intel Above Board documentation for detailed explanation of the installation and configuration of the memory board.

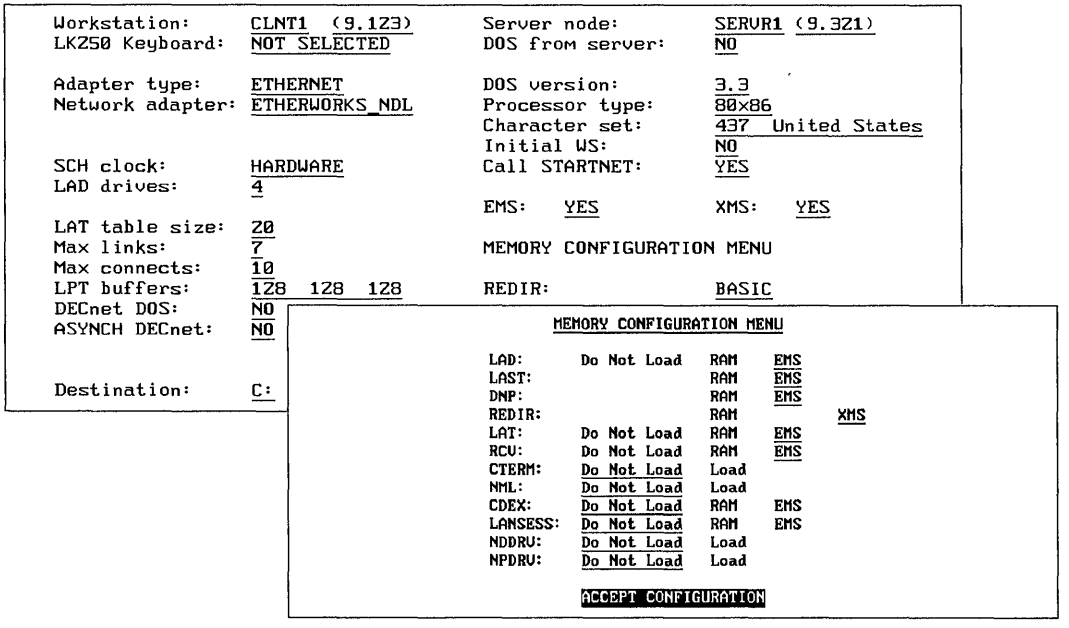
In this example, the following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Add 512 Kbytes of extended memory for XMS 2.0 use.
  - Add 512 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.

Netsetup Screen

Figure 6–3 shows the Netsetup screen as configured to create a key diskette for this client.

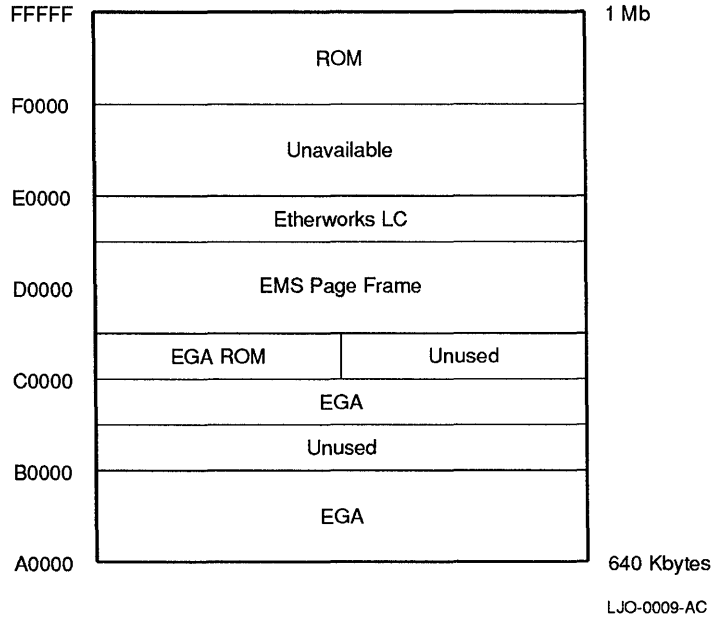
Figure 6–3 Netsetup Screen (80286/DECnet/Above Board)



Upper Memory Allocation

Figure 6–4 identifies the allocation of upper memory in this configuration.

Figure 6–4 Upper Memory Allocation (80286/DECnet/Above Board)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 248
buffers=8
files=20
shell=\command.com /P /E:526
device=c:\himem.sys
device=\decnet\laddrv.sys /D:4
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\decnet\setname % WSNODE%
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
  /W:-1 /a:-1
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\LAT
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   546K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       384K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
1060    3376  COMMAND.COM                        22-24 2E EF
free      48
1060     528  COMMAND.COM  <ENVIRONMENT>
free     224
116A    1136  PCSA Mark                          F1 FC
11B2    6080  Scheduler    /H                    08 0D 67 6C
free     160
133A    8000  Datalink                           1C
152F    8208  EMS Stub     /rem:2                13 2A 5C 69-6A 6E
1731     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  559472
```

Configuration Notes

- The addition of the memory board and the ability to load components in expanded memory increases available conventional memory by 60 Kbytes.
- This configuration is well-suited for a client that uses an equal mix of PC DECwindows Motif and DOS applications. If you use primarily PC DECwindows Motif applications, you should:
  1. Configure all remaining memory on the board as extended.
  2. Load REDIR into XMS and additional network components into conventional memory.

In Remote Boot Configuration

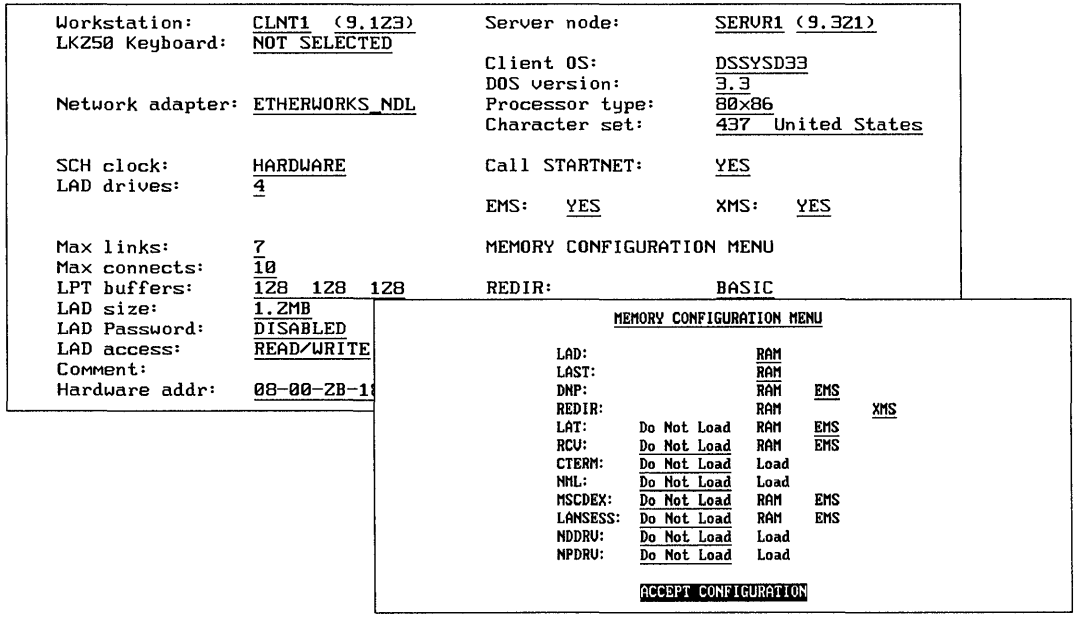
In this example, the base configuration is reconfigured for remote boot operation and the following changes made:

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Add 512 Kbytes of extended memory for XMS 2.0 use.
  - Add 512 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.

Netsetup Screen

Figure 6–5 shows the Netsetup screen as configured to create a key diskette for this client.

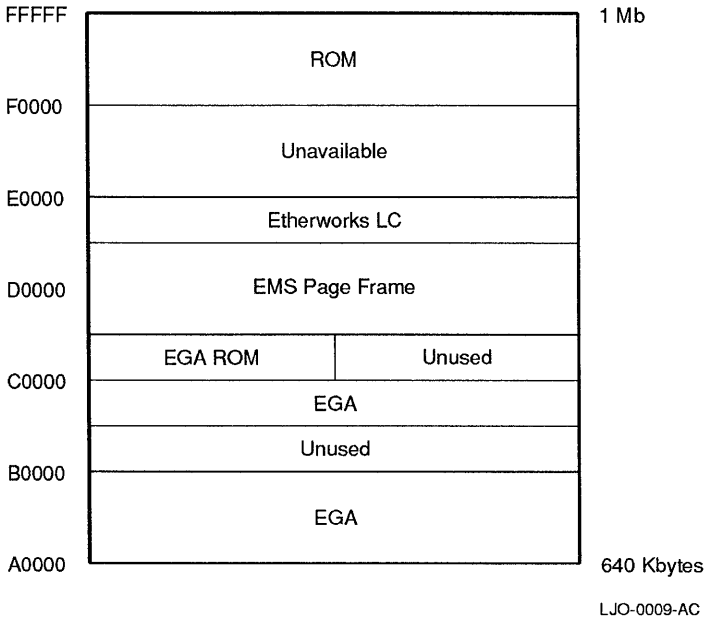
Figure 6–5 Netsetup Screen (80286/DECnet/Remote Boot)



Upper Memory Allocation

Figure 6–6 identifies the allocation of upper memory in this configuration.

Figure 6–6 Upper Memory Allocation (80286/DECnet/Remote Boot)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
device=c:\emm.sys AT 248 nd
buffers=8
files=20
shell=\decnet\bshell.exe /P /E:384
device=\decnet\laddrv.sys /D:4
lastdrive=z
device=\decnet\himem.sys
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\decnet\setname % WSNODE%
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    608K
    Available conventional memory   529K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       384K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-97FF 608K Conventional
    9800-9FFF  32K Remote Boot Image
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
1089     208  n/a          /P /E:384
1097    3376  COMMAND.COM                        22-24 2E
free      48
1097     384  COMMAND.COM  <ENVIRONMENT>
free     224
1198    8208  EMS Stub     /rem:2                2A 5C 69-6A 6E
139A     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  541408
```

Configuration Notes

- The 31 Kbyte Remote Boot Image shown in the memory map (MEMMAN/S/F) contains the SCH, DLL, LAST, and LAD PATHWORKS components.
- This PATHWORKS configuration cannot be unloaded.
- This configuration is well-suited for a client that uses an equal mix of PC DECwindows Motif and DOS applications. If you use primarily PC DECwindows Motif applications, you should:
  1. Configure all remaining memory on the board as extended.
  2. Load REDIR into XMS and additional network components into conventional memory.

With EtherLink II Network Controller

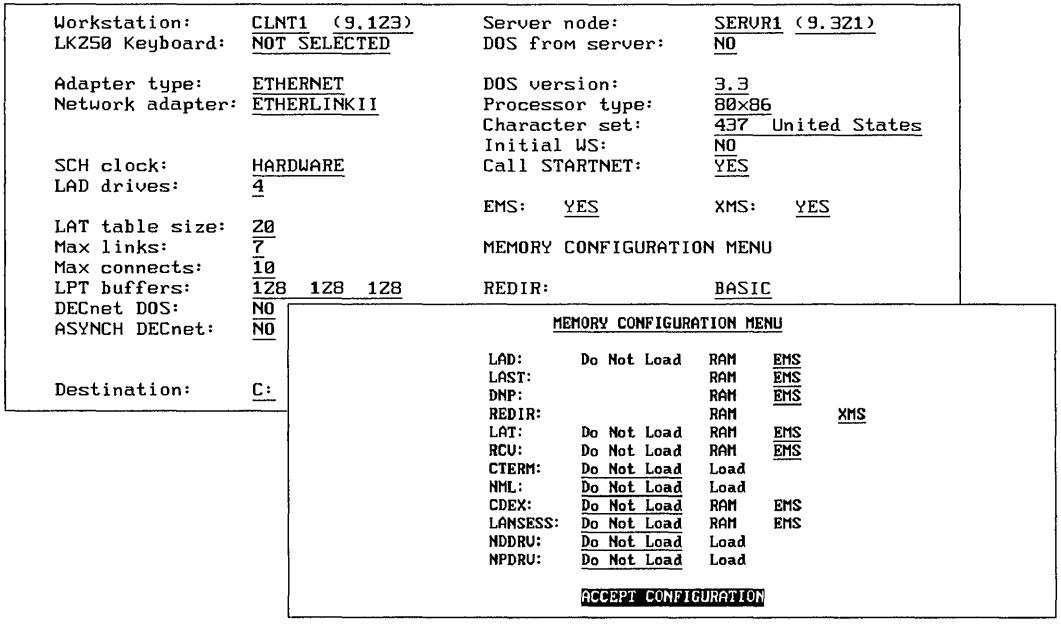
In this example, the following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured as in the previous examples.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.
- The EtherWORKS LC network controller is replaced with a 3Com EtherLink II network controller.

Netsetup Screen

Figure 6–7 shows the Netsetup screen as configured to create a key diskette for this client.

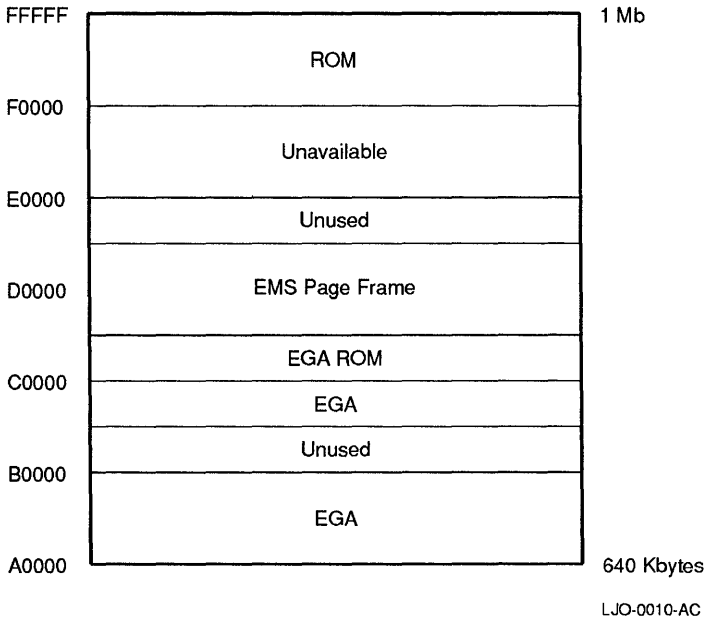
Figure 6–7 Netsetup Screen (80286/DECnet/EtherLink II)



Upper Memory Allocation

Figure 6–8 identifies the allocation of upper memory in this configuration.

Figure 6–8 Upper Memory Allocation (80286/DECnet/EtherLink II)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 248
buffers=8
files=20
shell=\command.com /P /E:526
device=c:\himem.sys
device=\decnet\laddrv.sys /D:4
device=\decnet\PROTMAN.SYS /I:C:\DECNET
device=\decnet\ELNKII.SYS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\dllndis
%BOOT%\decnet\netbind
%BOOT%\decnet\sch /H
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\decnet\setname % WSNODE%
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
 /W:-1 /a:-1
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   513K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       384K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-EFFF  96K Unknown
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
129B    3376  COMMAND.COM                        22-24 2E
free      48
129B     528  COMMAND.COM  <ENVIRONMENT>
free     224
13A5   32848  Datalink
1BAB    1136  PCSA Mark
1BF3    6080  Scheduler    /H                    08 0B 67 6C
free     160
1D7B    8208  EMS Stub     /rem:2                13 2A 5C 69-6A 6E
1F7D     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  525488
```

Configuration Notes

- When you specify a controller other than a DEC EtherWORKS model, the Netsetup utility automatically configures the network controller for NDIS operation.
- This configuration is well-suited for a client that uses an equal mix of PC DECwindows Motif and DOS applications. If you use primarily PC DECwindows Motif applications, you should:
  1. Configure all remaining memory on the board as extended.
  2. Load REDIR into XMS and additional network components into conventional memory.

With Microsoft Windows

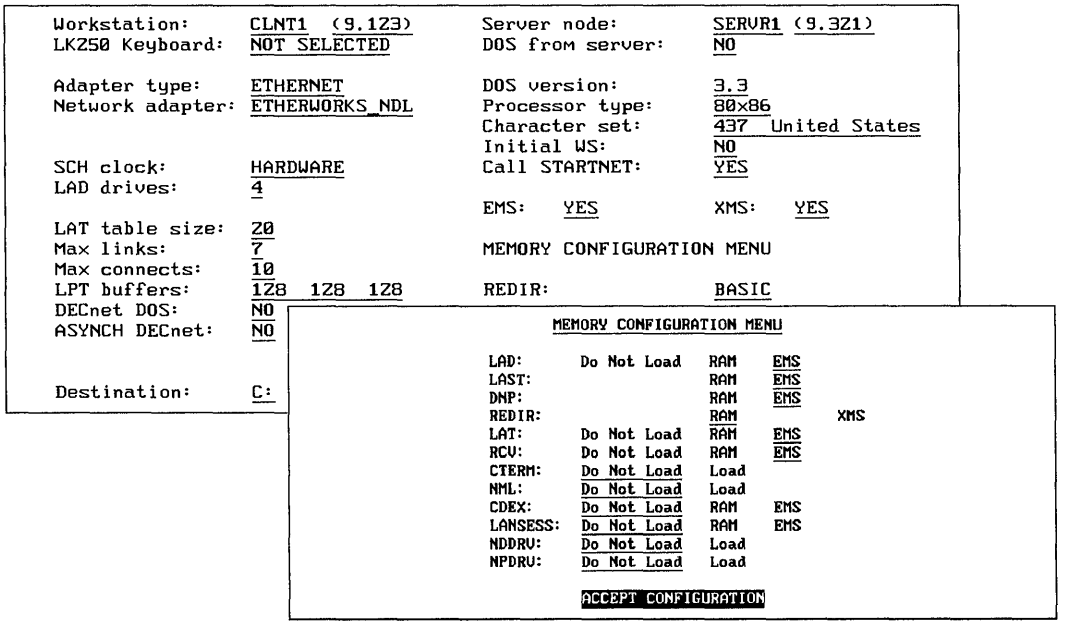
This example is defined for Microsoft Windows operation on the client. The following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured as in the previous examples.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.

Netsetup Screen

Figure 6–9 shows the Netsetup screen as configured to create a key diskette for this client.

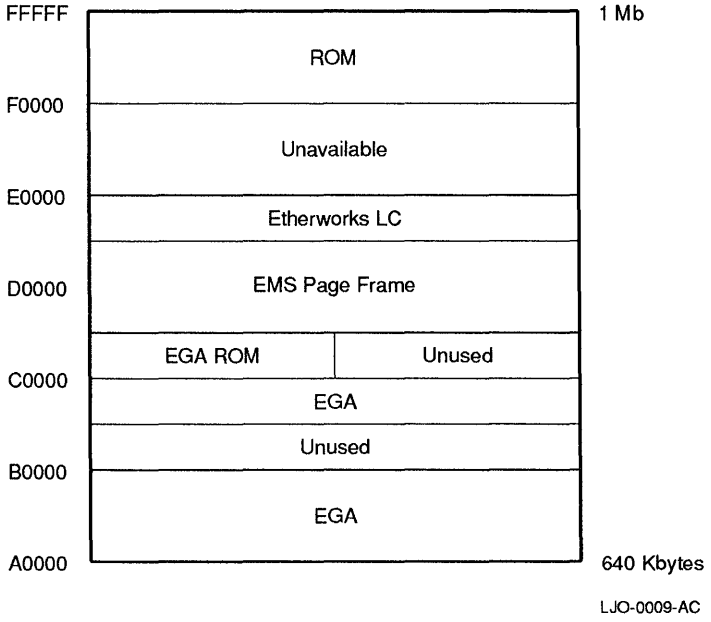
Figure 6–9 Netsetup Screen (80286/DECnet/Microsoft Windows)



Upper Memory Allocation

Figure 6–10 identifies the allocation of upper memory in this configuration.

Figure 6–10 Upper Memory Allocation (80286/DECnet/Microsoft Windows)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 248
files= 30
buffers=8
shell=\command.com /P /E:526
device=C:\himem.sys
device=C:\WINDOWS\smartdrv.sys 320
device=C:\WINDOWS\ega.sys
device=\decnet\laddrv.sys /D:4
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\decnet\setname % WSNODE%
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\LMDOS\DRIVERS\PCSA\lad.exe
 /R:-1 /W:-1 /a:-1
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\LAT
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   496K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       384K

    XMS extended memory available   128K
    Largest available EMB           128K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
14C1    3376  COMMAND.COM                        22-24 2E
free      48
14C1     528  COMMAND.COM  <ENVIRONMENT>
free     304
15D0    1136  PCSA Mark
1618    6080  Scheduler    /H                    08 0D 67 6C
1795    8000  Datalink                           1C
198A    8208  EMS Stub     /rem:2                13 2A 5C 69-6A 6E
1B8C   34096  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  508400
```

Configuration Notes

- REDIR could have been loaded into XMS to save additional memory.
- Use the Microsoft Windows Smartdrive utility (called in the CONFIG.SYS file) to increase performance on the client.

  The utility uses approximately 22 Kbytes of conventional memory.

With the Enhanced Redirector

Refer to Intel Above Board documentation for information about installation and configuration.

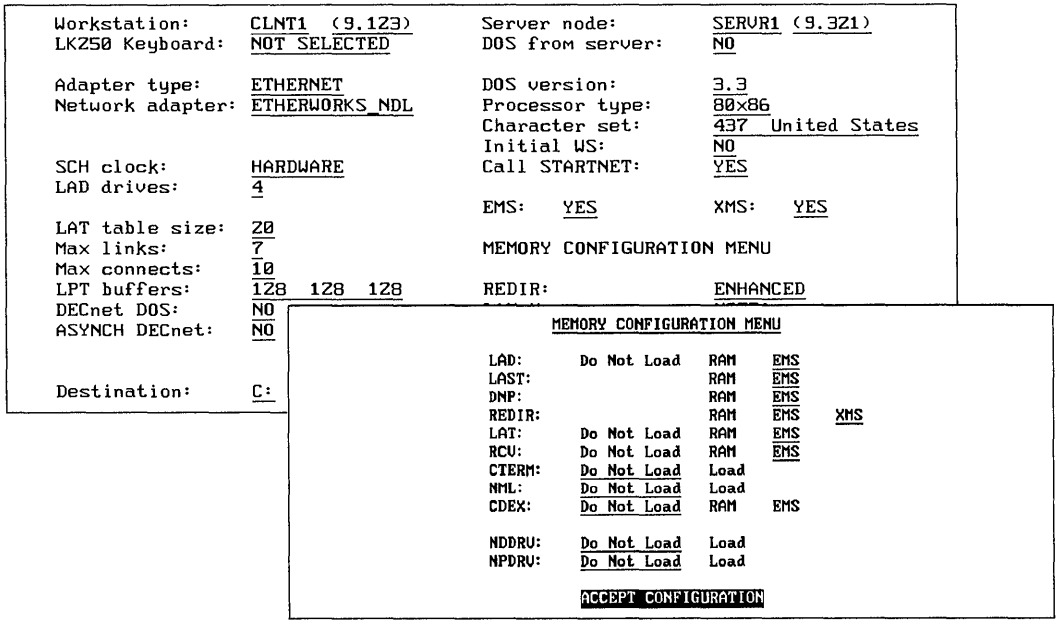
In this example, the following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured as in the previous examples.
- The Enhanced Redirector is used.

Netsetup Screen

Figure 6–11 shows the Netsetup screen as configured to create a key diskette for this client.

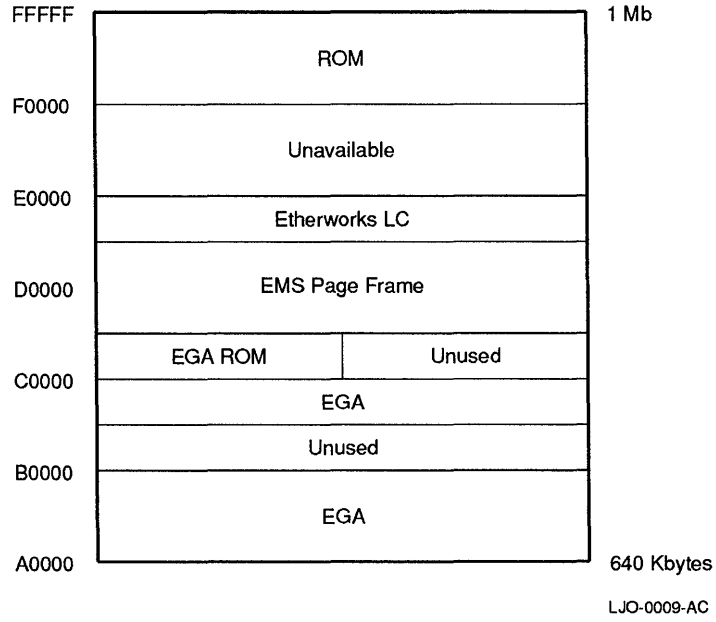
Figure 6–11 Netsetup Screen (80286/DECnet/Enhanced Redirector)



Upper Memory Allocation

Figure 6–12 identifies the allocation of upper memory in this configuration.

Figure 6–12 Upper Memory Allocation (80286/DECnet/Enhanced Redirector)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 248
buffers=8
files=20
shell=\command.com /P /E:526
device=c:\himem.sys
device=\decnet\laddrv.sys /D:4
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\LMDOS\NETPROG\net start wksta /lim:no /himem:yes /lanroot:%erdr%\lmdos
%BOOT%\LMDOS\NETPROG\net logon USER1 *
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\LMDOS\DRIVERS\PCSA\lad.exe
 /R:-1 /W:-1 /a:-1
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\rcv /r:2
%BOOT%\DECNET\emsload % SYSD%\DECNET\LAT
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   512K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       384K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
10AF    3376  COMMAND.COM                        22-24 2E F1 F5
free      48
10AF     528  COMMAND.COM  <ENVIRONMENT>
free     320
11BF    1136  PCSA Mark
1207    6304  Scheduler    /H                    0D 67 6C
1392    8160  Datalink                           1C
1591    8320  EMS Stub     /rem:2                13 2A 5C 69-6A 6E
free    2736
1846   34624  n/a          %H                    08 17 28 2F
free  521280
```

Configuration Notes

- The addition of the memory board and the ability to load components in expanded memory increases available conventional memory by 60 Kbytes.
- Put the Enhanced Redirector into either EMS or conventional memory if you plan on using Microsoft Windows.

With DOS Version 5.0

This example uses the following:

- An Intel Above Board expanded memory board. EMM.SYS is installed in CONFIG.SYS to manage the allocation of expanded memory.
- A 3Com EtherLink II network controller
- EGA monitor
- DOS version 5.0

Netsetup Screen

Figure 6–13 shows the Netsetup screen as configured to create a key diskette for this client.

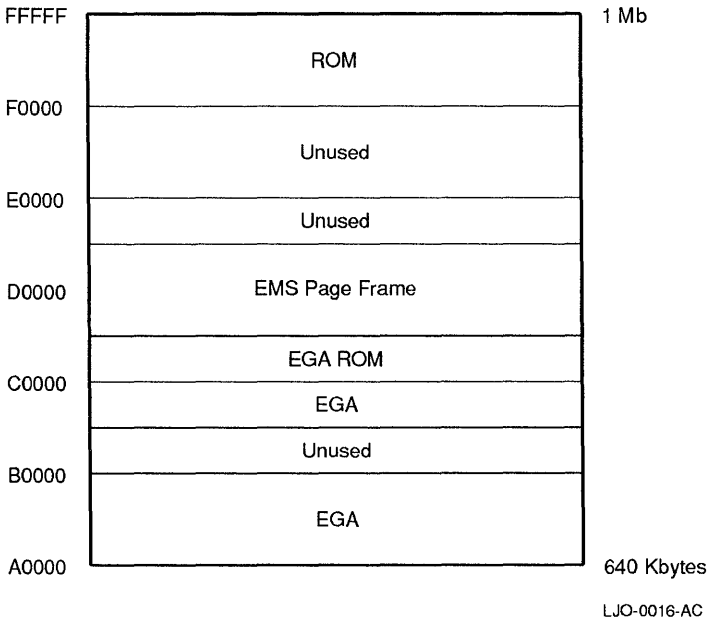
Figure 6–13 Netsetup Screen (80286/DECnet/DOS 5.0)

```
Workstation:      CLNT1  (9.123)        Server node:          SERVR1 (9.321)
LK250 Keyboard:   NOT SELECTED          DOS from server:      NO

Adapter type:     ETHERNET              DOS version:          5.0
Network adapter:  ETHERLINKII           Processor type:       80x86
                                        Character set:        437  United States

SCH clock:        HARDWARE              Call STARTNET:        YES
LAD drives:       4
                                        EMS:    YES           XMS:    YES
LAT table size:   20
Max links:        7                     MEMORY CONFIGURATION MENU
Max connects:     10
LPT buffers:      128  128  128         REDIR:                BASIC
DECnet DOS:       NO
ASYNCH DECnet:    NO

                                              MEMORY CONFIGURATION MENU

                                        LAD:      Do Not Load   RAM    EMS
Destination:      C:                    LAST:                   RAM    EMS
                                        DNP:                    RAM    EMS
                                        REDIR:                  RAM           XMS
                                        LAT:      Do Not Load   RAM    EMS
                                        RCU:      Do Not Load   RAM    EMS
                                        CTERM:    Do Not Load   Load
                                        NML:      Do Not Load   Load
                                        MSCDEX:   Do Not Load   RAM    EMS
                                        LANSESS:  Do Not Load   RAM    EMS
                                        NDDRV:    Do Not Load   Load
                                        NPDRV:    Do Not Load   Load

                                                  ACCEPT CONFIGURATION
```

Upper Memory Allocation

Figure 6–14 identifies the allocation of upper memory in this configuration.

Figure 6–14 Upper Memory Allocation (80286/DECnet/DOS 5.0)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 218 RD
buffers=8
files= 30
stacks=0,0
DEVICE=C:\DOS\HIMEM.SYS
DOS=HIGH
SHELL=C:\DOS\COMMAND.COM C:\DOS\ /e:526 /p
DEVICE=\DECNET\laddrv.sys /D:4
DEVICE=\DECNET\PROTMAN.SYS /I:C:\DECNET
DEVICE=\DECNET\ELNKII.DOS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\dllndis
%BOOT%\decnet\netbind
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
 /W:-1 /a:-1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   524K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            496K
    Expanded memory available       368K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-CFFF  32K RAM
    D000-DBFF  48K RAM
    DC00-EFFF  80K Unknown
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0008      64  MS-DOS       <DATA>
07C9    2368  COMMAND.COM                        22-24 2E
free      64
07C9     528  COMMAND.COM  <ENVIRONMENT>
free     240
0896   32912  Datalink                           02
10A0    1136  PCSA Mark
10E8    6304  Scheduler    /H                    08 0B 67 6C F1 FC
1273    8320  EMS Stub     /rem:2                13 2A 5C 69 6E
147C   34800  REDIR5       /L:10 /P1:128 /P2:12  05 17 2F
free  536624
```

Configuration Notes

- When you specify a controller other than a DEC EtherWORKS model, the Netsetup utility automatically configures the network controller for NDIS operation.
- When DOS is loaded into HMA, the Basic Redirector (REDIR.EXE) must be loaded into conventional memory. The Enhanced Redirector can be loaded into EMS.

TCP/IP Configurations

This section provides examples of 80286 client configurations that use the TCP/IP transport protocol.

IBM PC AT Base Configuration

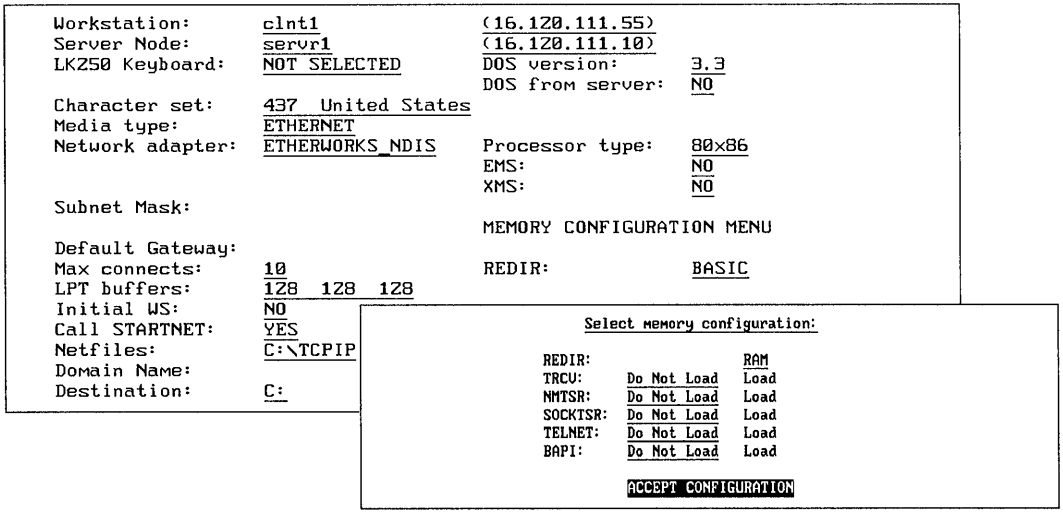
The base configuration for 80286 client configuration examples consists of the following components:

- IBM PC AT with 640 Kbyte conventional memory
- EGA video controller
- EGA video monitor
- DEC EtherWORKS LC network controller

Netsetup Screen

Figure 6–15 shows the Netsetup screen as configured to create a key diskette for this client.

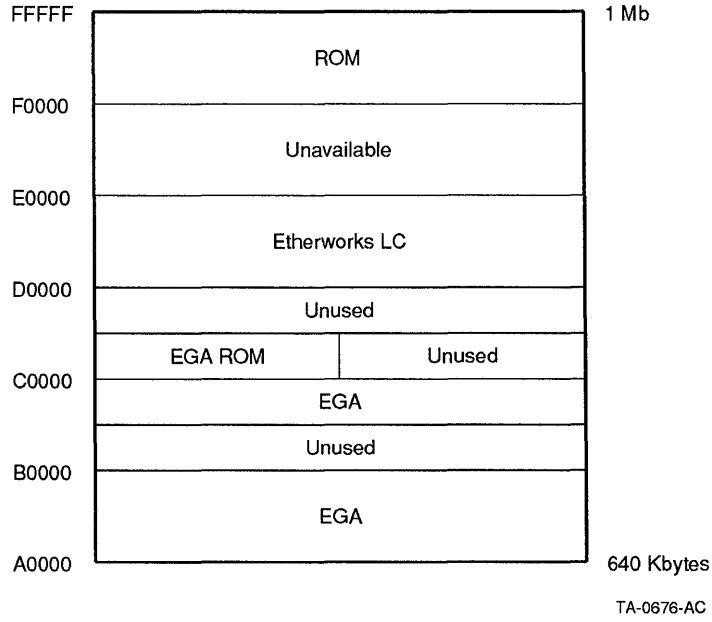
Figure 6–15 Netsetup Screen (80286/TCPIP/Base)



Upper Memory Allocation

Figure 6–16 identifies the allocation of upper memory in this configuration.

Figure 6–16 Upper Memory Allocation (80286/TCPIP/Base)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=20
shell=\command.com /P /E:384
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:C:\tcpip
device=\tcpip\depca.dos
device=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi
%PCSA%\netbind
%PCSA%\tcptsr
%PCSA%\nbdrv
%PCSA%\emsbfr
%PCSA%\save
%PCSA%\minses
%PCSA%\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%PCSA%\setname JOHCOB
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.0.13  PCSA Memory Information Utility
Copyright (C) 1989 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    first fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   394K

    Physical extended memory          0K
    Reported extended memory          0K

    Expanded memory                 not present

    XMS extended memory             not present

System Memory Scan

    0000-A000 640K Conventional
    A000-B7FF  96K Unknown
    B800-BFFF  32K RAM
    C000-C3FF  16K ROM COPYRIGHT PARADISE SYSTEMS, INC. 1986 PEGA BIOS
    C400-CFFF  48K Unknown
    D000-DFFF  64K RAM
    E000-EFFF  64K Free
    F000-FFFF  64K System ROM COPR. IBM 1981, 1985    PARITY CHECK 1
```

```
C:\> MEMMAN

MEMMAN V4.0.13  PCSA Memory Information Utility
Copyright (C) 1989 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0E5A    3376  COMMAND.COM                        22-24 2E
free      48
0E5A     384  COMMAND.COM  <ENVIRONMENT>
free     176
free      32
0F5A  109312  n/a                                08 EF FC-FF
2A0B   43744  n/a                                5C F5
34BA    1136  PCSA Mark
3502    1216  n/a                                21 2A
354F   33312  n/a          /L:10 /P1:128 /P2:12  05 17 2F FB
free  403680
```

Configuration Notes

- You might have to unload TCP/IP components to run very large DOS applications. Refer to Chapter 4 for information on unloading TCP/IP components.
- A mouse is typically not used in a low-memory configuration like this one, so the mouse driver is not loaded to save memory.
- There is not enough memory in this configuration to run PC DECwindows Motif.

With 1-Mbyte Intel Above Board

Refer to Intel Above Board documentation for detailed explanation of the installation and configuration of the memory board.

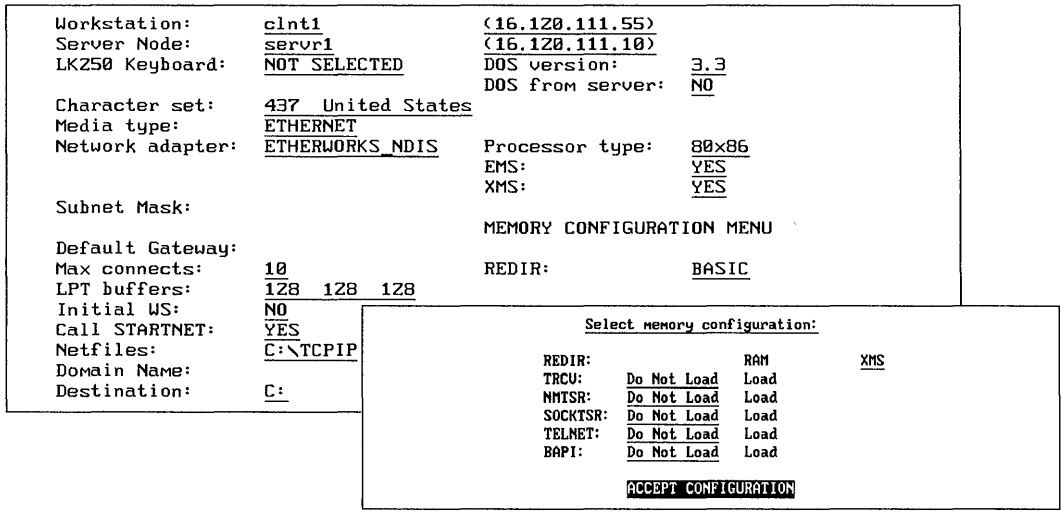
In this example, the following changes are made from the preceding configuration:

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Add 512 Kbytes of extended memory for XMS 2.0 use.
  - Add 512 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.

Netsetup Screen

Figure 6–17 shows the Netsetup screen as configured to create a key diskette for this client.

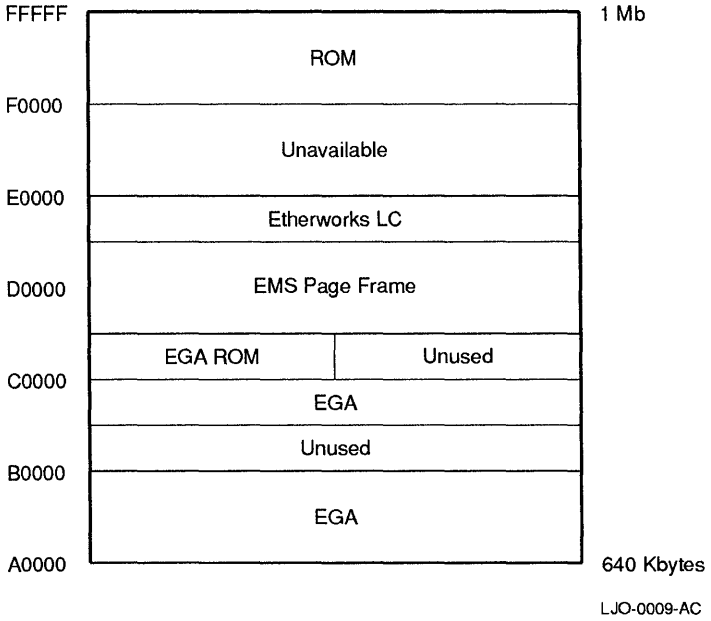
Figure 6–17 Netsetup Screen (80286/TCPIP/Above Board)



Upper Memory Allocation

Figure 6–18 identifies the allocation of upper memory in this configuration.

Figure 6–18 Upper Memory Allocation (80286/TCPIP/Above Board)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 248
buffers=8
files=20
shell=\command.com /P /E:526
device=c:\himem.sys
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:C:\tcpip
device=\tcpip\depca.dos
device=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\TCPIP\setname client1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   509K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       416K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
123A    3376  COMMAND.COM                        22-24 2E
free      48
123A     528  COMMAND.COM  <ENVIRONMENT>
free     176
1341   44192  n/a                                08
1E0C    6128  n/a                                5C
1F8C    1168  n/a
1FD6    1136  PCSA Mark
201E    1504  n/a                                21 2A
207D     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  521392
```

Configuration Notes

- The addition of the memory board and the ability to load components in expanded memory increased available conventional memory by 79 Kbytes.
- The Netsetup utility automatically configures the network controller for NDIS operation when TCP/IP transport protocol is specified.
- You might have to unload TCP/IP components to run very large DOS applications. Refer to Chapter 4 for information on unloading TCP/IP components.
- You must load the SOCKTSR component before you can run PC DECwindows Motif. If you load SOCKTSR in expanded memory, the full 448 Kbytes of XMS extended memory is available to PC DECwindows Motif.
- This configuration is well-suited for a client that uses an equal mix of PC DECwindows Motif and DOS applications. If you use primarily PC DECwindows Motif applications, you should:
  1. Configure the memory board to fill conventional memory to 640 Kbytes.
  2. Configure all remaining memory on the board as extended.
  3. Load REDIR into XMS and specify that there is no EMS available.

With EtherLink II Network Controller

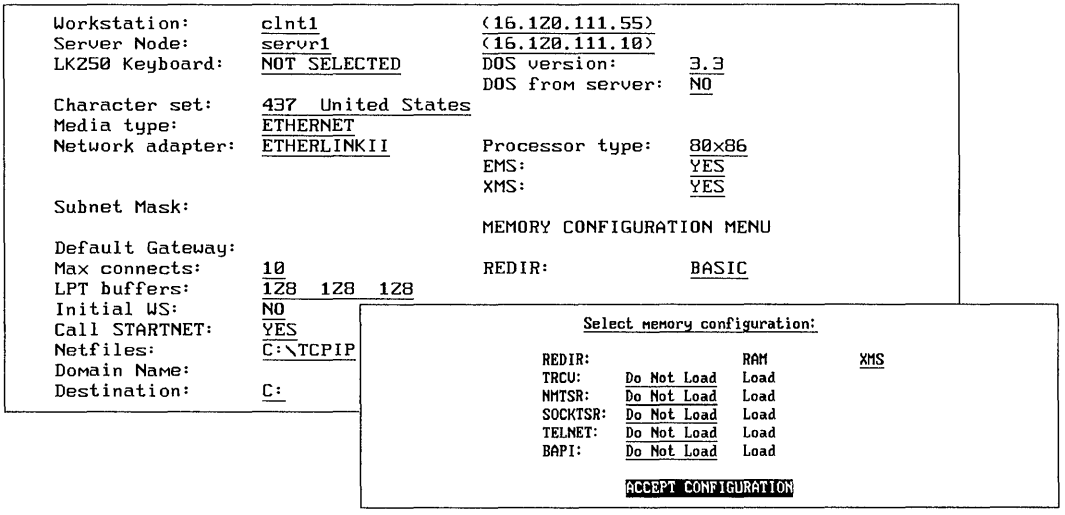
In this example, the following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured as in the previous examples.
- A 3Com EtherLink II network controller

Netsetup Screen

Figure 6–19 shows the Netsetup screen as configured to create a key diskette for this client.

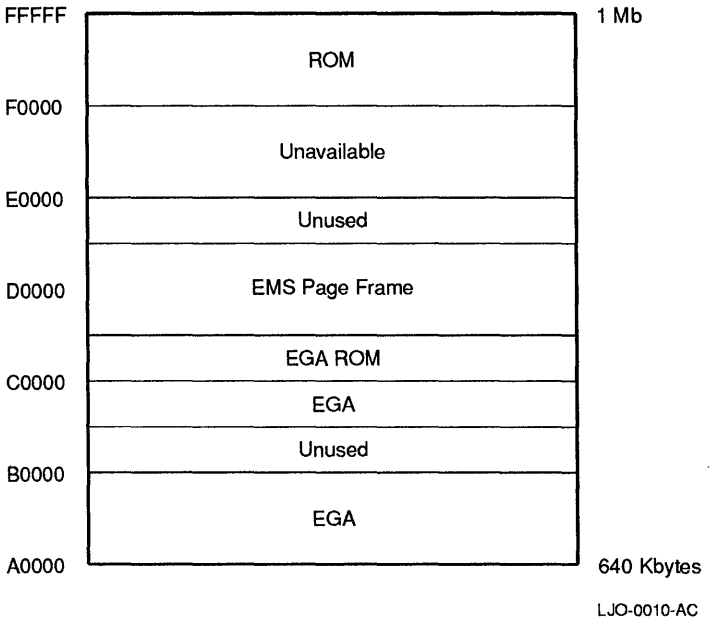
Figure 6–19 Netsetup Screen (80286/TCPIP/EtherLink II)



Upper Memory Allocation

Figure 6–20 identifies the allocation of upper memory in this configuration.

Figure 6–20 Upper Memory Allocation (80286/TCPIP/EtherLink II)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 248
buffers=8
files=20
shell=\command.com /P /E:526
device=c:\himem.sys
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:C:\tcpip
device=\tcpip\ELNKII.SYS
device=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\TCPIP\setname client1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   508K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       416K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-EFFF  96K Unknown
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

    MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
1288    3376  COMMAND.COM                        22-24 2E
free      48
1288     528  COMMAND.COM  <ENVIRONMENT>
free     176
138F   44192  n/a                                08
1E5A    6128  n/a                                5C
1FDA    1168  n/a
2024    1136  PCSA Mark
206C    1504  n/a                                21 2A
20CB     864  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  520144
```

Configuration Notes

- When you specify a controller other than a DEC EtherWORKS model, the Netsetup utility automatically configures the network controller for NDIS operation.
- This configuration is well-suited for a client that uses an equal mix of PC DECwindows Motif and DOS applications. If you use primarily PC DECwindows Motif applications, you should:
  1. Configure all remaining memory on the board as extended.
  2. Load REDIR into XMS and additional network components into conventional memory.

With the Enhanced Redirector

Refer to Intel Above Board documentation for detailed explanation of the installation and configuration of the memory board.

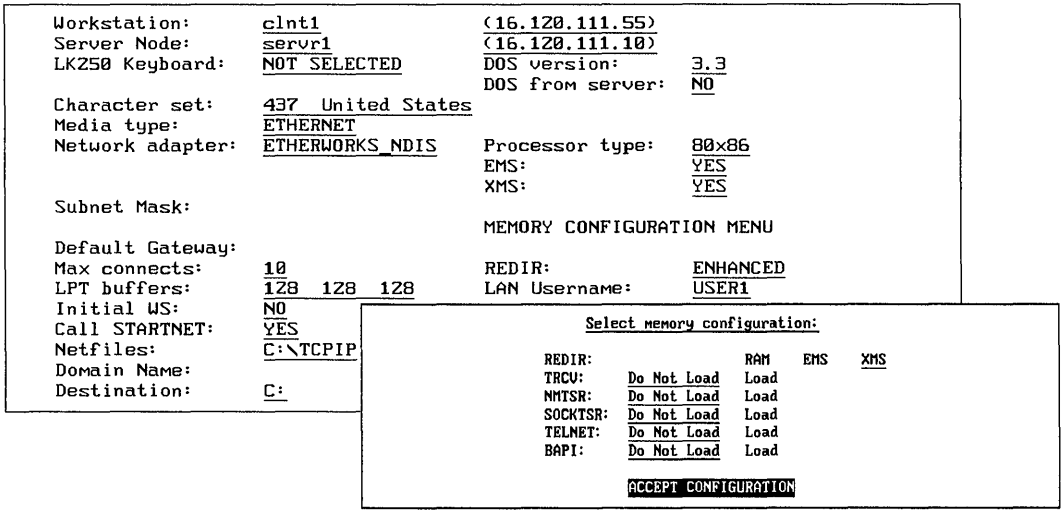
In this example, the following changes are made from the preceding configuration:

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Add 512 Kbytes of extended memory for XMS 2.0 use.
  - Add 512 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.
- With the Enhanced Redirector

Netsetup Screen

Figure 6–21 shows the Netsetup screen as configured to create a key diskette for this client.

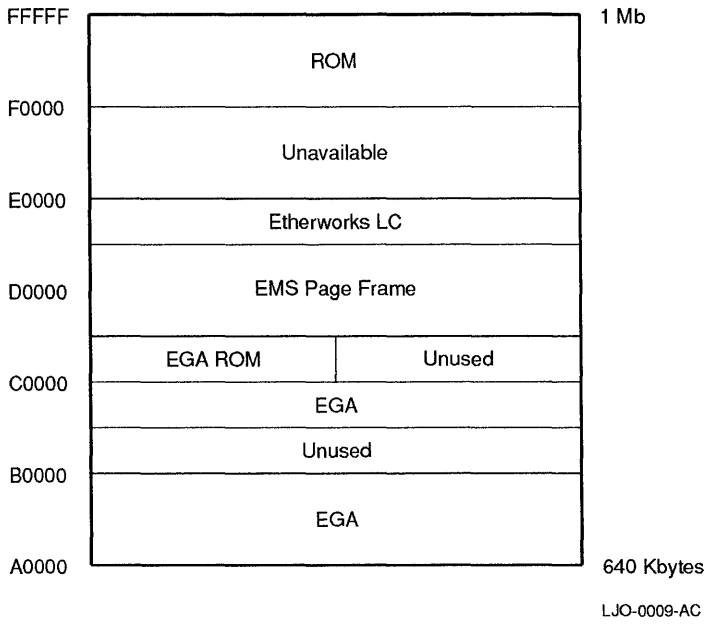
Figure 6–21 Netsetup Screen (80286/TCPIP/Enhanced Redirector)



Upper Memory Allocation

Figure 6–22 identifies the allocation of upper memory in this configuration.

Figure 6–22 Upper Memory Allocation (80286/TCPIP/Enhanced Redirector)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS AT 248
buffers=8
files=20
shell=\command.com /P /E:526
device=c:\himem.sys
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:C:\tcpip
device=\tcpip\depca.dos
device=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\LMDOS\NETPROG\net start wksta /lim:yes /himem:no /lanroot:%erdr%\lmdos
%BOOT%\LMDOS\NETPROG\net logon USER1 *
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Physical conventional memory    640K
    Reported conventional memory    640K
    Available conventional memory   474K

    Physical extended memory        512K
    Reported extended memory          0K

    Expanded memory size            512K
    Expanded memory available       352K

    XMS extended memory available   448K
    Largest available EMB           448K

System Memory Scan

    0000-9FFF 640K Conventional
    A000-B7FF  96K ROM
    B800-BFFF  32K RAM
    C000-C7FF  32K ROM
    C800-D7FF  64K Page Frame
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1984
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
1289    3376  COMMAND.COM                        22-24 2E
free      48
1289     528  COMMAND.COM  <ENVIRONMENT>
free     256
1394   44192  n/a
1E5F    6080  n/a                                5C
1FDC    1168  n/a
2026    1152  PCSA Mark
free    2656
2116    1760  n/a                                21 2A
2185   34624  n/a          %                     08 17 28 2F F0
free  483408
```

Configuration Notes

- The addition of the memory board and the ability to load components in expanded memory increased available conventional memory by 79 Kbytes.
- The Netsetup utility automatically configures the network controller for NDIS operation when TCP/IP transport protocol is specified.
- You might have to unload TCP/IP components to run very large DOS applications. Refer to Chapter 4 for information on unloading TCP/IP components.
- You must load the SOCKTSR component before you can run PC DECwindows Motif. If you load SOCKTSR in expanded memory, the full 448 Kbytes of XMS extended memory is available to PC DECwindows Motif.
- This configuration is well-suited for a client that uses an equal mix of PC DECwindows Motif and DOS applications. If you use primarily PC DECwindows Motif applications, you should:
  1. Configure the memory board to fill conventional memory to 640 Kbytes.
  2. Configure all remaining memory on the board as extended.
  3. Load REDIR into XMS and specify that there is no EMS available.

7

8086/88 Client Configuration Examples

This chapter contains a series of 8086/88 client configuration examples that illustrate how common personal computer (PC) characteristics affect the configuration of a typical 8086/88 PATHWORKS client.

The examples in this section do not apply to all 8086/88 PATHWORKS clients. The configuration that provides the best mix of memory and performance for a client depends on the type of client and the non-PATHWORKS requirements of its user.

Note

Do not rely on any one example as optimal for your client. Use these examples to help you to understand configuration requirements, but use the procedures outlined in Chapter 3 to configure each client.

The 8086/88 configuration examples in this section include:

- DECnet Configurations
  - IBM PC XT base configuration
  - With 1.5 Mbyte Intel Above Board memory board
  - With the Enhanced Redirector
  - In remote boot configuration
  - With EtherLink II network controller
  - IBM PS/2 Model 30

- TCP/IP Configurations
  - IBM PC XT base configuration
  - With 1.5 Mbyte Intel Above Board memory board
  - With EtherLink II network controller

DECnet Configurations

This section provides examples of 8086/88 client configurations that use the DECnet transport protocol.

IBM PC XT Base Configuration

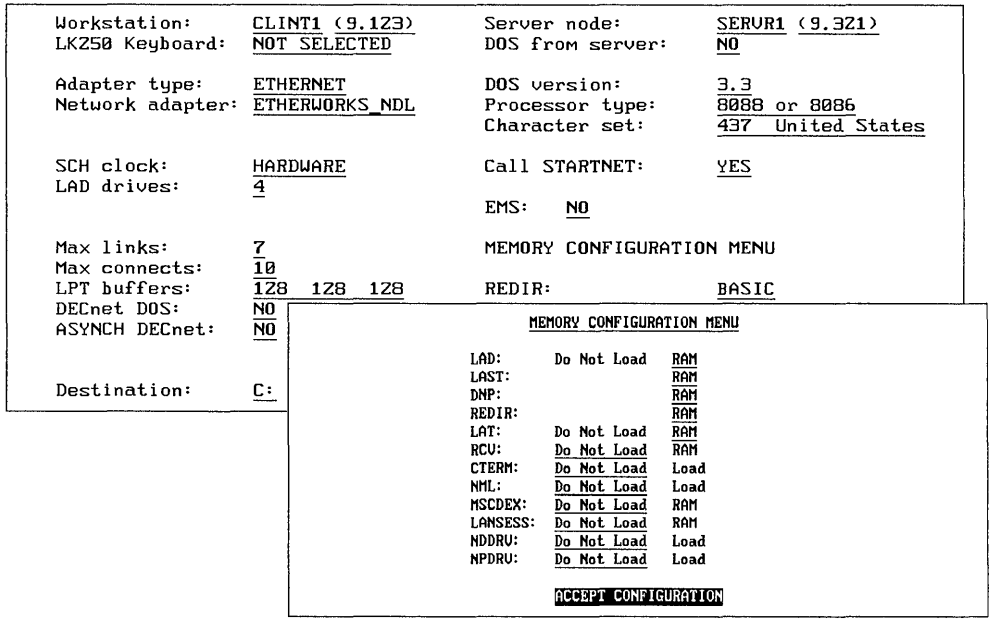
The base configuration for 8086/88 client configuration examples consists of the following components:

- IBM PC XT with 640 Kbyte conventional memory and IBM Monochrome video monitor
- DEC EtherWORKS LC network controller

Netsetup Screen

Figure 7–1 shows the Netsetup screen as configured to create a key diskette for this client.

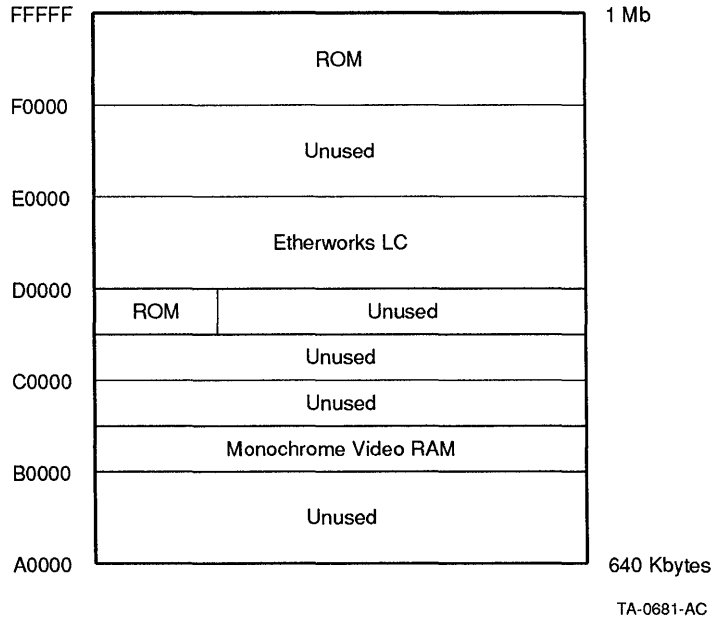
Figure 7–1 Netsetup Screen (8086-88/DECnet/Base)



Upper Memory Allocation

Figure 7–2 identifies the allocation of upper memory in this configuration.

Figure 7–2 Upper Memory Allocation (8086-88/DECnet/Base)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=20
device=\decnet\laddrv.sys /D:4
shell=\command.com /P /e:384
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\decnet\setname % WSNODE%
% SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1 /W:-1 /a:-1
%_SYSD%\DECNET\LAT
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    640K
    Available conventional memory   480K

    Reported extended memory        Not present

    Expanded memory                 Not Present

    XMS extended memory             Not Present

System Memory Scan

    0000-9FFF 640K Conventional
    A000-AFFF  64K ROM
    B000-B7FF  32K RAM
    B800-C7FF  64K ROM
    C800-C9FF   8K ROM (C)COPYRIGHT  IBM 1982+
    CA00-D7FF  56K ROM
    D800-DFFF  32K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1981
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0BBD    3376  COMMAND.COM                        22-24 2E
free      48
0BBD     384  COMMAND.COM  <ENVIRONMENT>
free     256
0CC0    1136  PCSA Mark
0D08    6928  Scheduler    /H                    08 0A 6C F0
0EBA    8160  Datalink                           1C F1-F2
10B9   33120  DNP/NETBIOS  /rem:2                2A 5C 6E
18D0    9904  LAST         /N:CUPPC5 /c:d /M:D   69
1B3C   33968  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free     240
2398    5280  LAD          /R:-1 /W:-1 /A:-1     13
24E3   12400  LAT                                6A
free  491840
```

Configuration Notes

- You might have to unload the network components to run large DOS applications.
- A mouse typically is not used in a low-memory configuration like this one, so the mouse driver is not loaded to save memory.

With 1.5-Mbyte Intel Above Board Memory Board

Refer to Intel Above Board documentation for detailed explanation of the installation and configuration of the memory board.

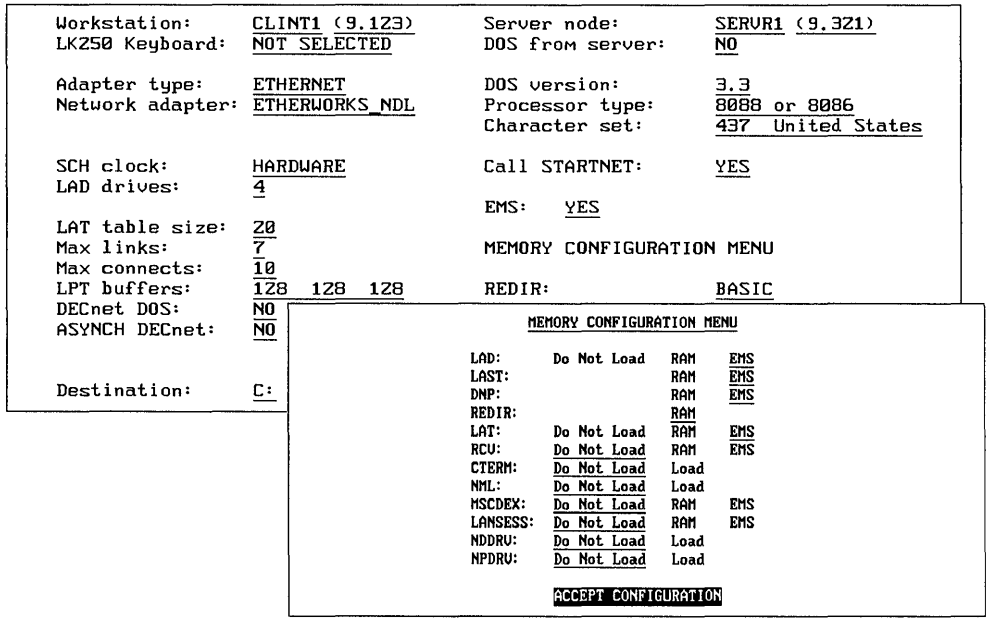
In this example, the following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Fill out conventional memory from 512 to 640 Kbytes.
  - Add 2688 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.

Netsetup Screen

Figure 7–3 shows the Netsetup screen as configured to create a key diskette for this client.

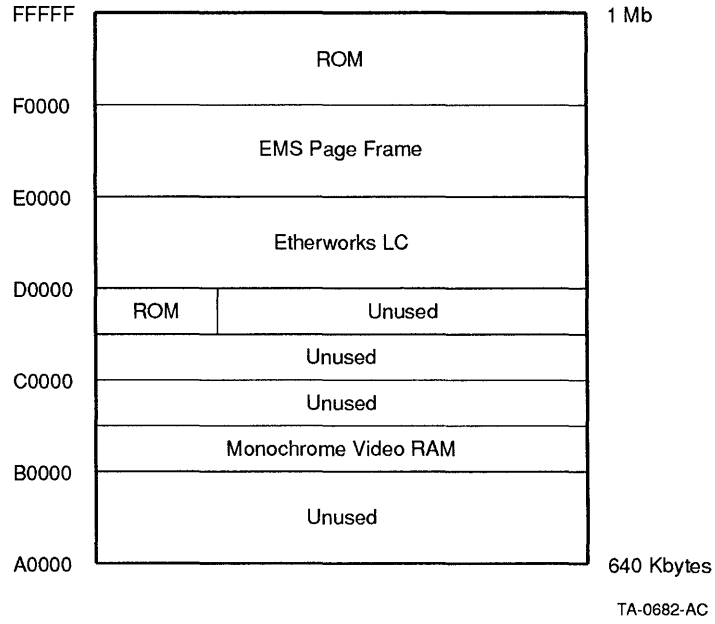
Figure 7–3 Netsetup Screen (8086-88/DECnet/Above Board)



Upper Memory Allocation

Figure 7–4 identifies the allocation of upper memory in this configuration.

Figure 7–4 Upper Memory Allocation (8086-88/DECnet/Above Board)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS PC 258
buffers=8
files=20
device=\decnet\laddrv.sys /D:4
shell=\command.com /P /e:384
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
   /W:-1 /a:-1
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    640K
    Available conventional memory   520K

    Reported extended memory        Not present

    Expanded memory size           2688K
    Expanded memory available      2560K

    XMS extended memory             Not Present

System Memory Scan

    0000-9FFF 640K Conventional
    A000-AFFF  64K ROM
    B000-B7FF  32K RAM
    B800-C7FF  64K ROM
    C800-C9FF   8K ROM (C)COPYRIGHT  IBM 1982+
    CA00-D7FF  56K ROM
    D800-DFFF  32K RAM
    E000-EFFF  64K Page Frame
    F000-FFFF  64K System ROM COPR. IBM 1981
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0ED9    3376  COMMAND.COM                        22-24 2E F1-F2
free      48
0ED9     384  COMMAND.COM  <ENVIRONMENT>
free     256
0FDC    1136  PCSA Mark                          EE
1024    6080  Scheduler    /H                    08 0A 67 6C ED
11A1    8080  Datalink                           02 1C
139B    8208  EMS Stub     /rem:2                13 2A 5C 69-6A 6E
159D   33888  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  532912
```

With the Enhanced Redirector

Refer to Intel Above Board documentation for information about installation and configuration.

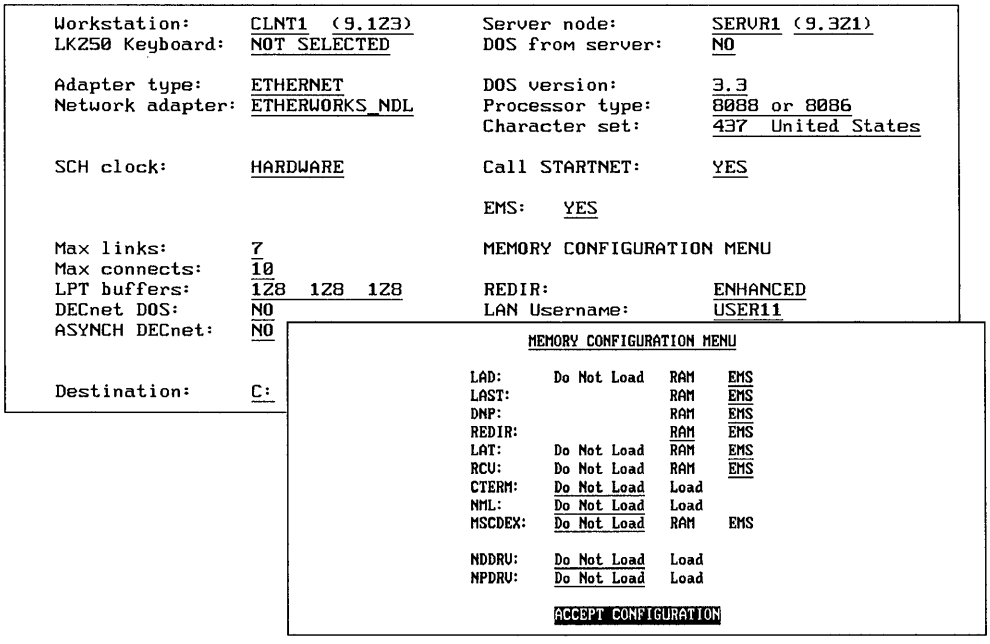
In this example, the following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured as in the previous examples.
- The Enhanced Redirector is used.

Netsetup Screen

Figure 7–5 shows the Netsetup screen as configured to create a key diskette for this client.

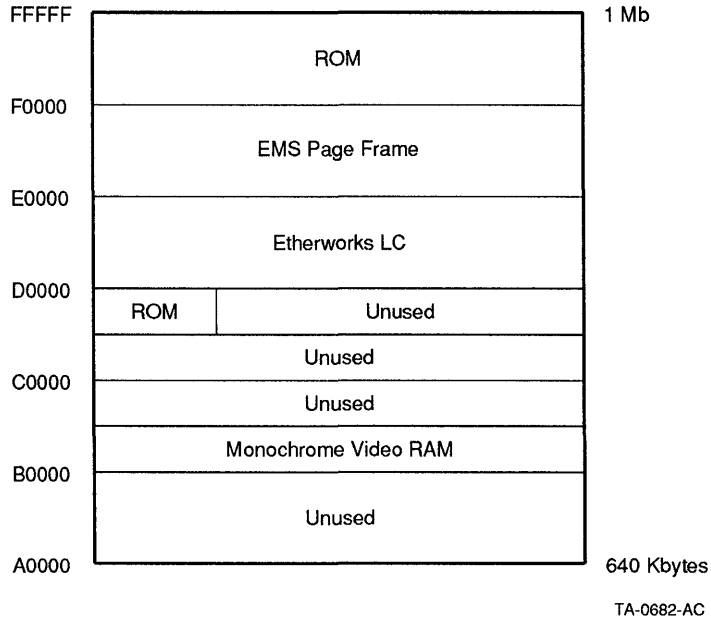
Figure 7–5 Netsetup Screen (8086-88/DECnet/Enhanced Redirector)



Upper Memory Allocation

Figure 7–6 identifies the allocation of upper memory in this configuration.

Figure 7–6 Upper Memory Allocation (8086-88/DECnet/Enhanced Redirector)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS PC 258
buffers=8
files=20
device=\decnet\laddrv.sys /D:4
shell=\command.com /P /e:384
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\dlldepca.exe
%BOOT%\decnet\ emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:% WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
  /W:-1 /a:-1
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\LAT
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\DECNET\rcv /r:2
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\>MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    640K
    Available conventional memory   487K

    Reported extended memory        Not present

    Expanded memory size           2672K
    Expanded memory available      2544K

    XMS extended memory             Not Present

System Memory Scan

    0000-9FFF 640K Conventional
    A000-AFFF  64K ROM
    B000-B7FF  32K RAM
    B800-C7FF  64K ROM
    C800-C9FF   8K ROM (C)COPYRIGHT  IBM 1982+
    CA00-D7FF  56K ROM
    D800-DFFF  32K RAM
    E000-EFFF  64K Page Frame
    F000-FFFF  64K System ROM COPR. IBM 1981
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0BEB    3376  COMMAND.COM                        22-24 2E
free      48
0BEB     384  COMMAND.COM  <ENVIRONMENT>
free     256
0CEE    1136  PCSA Mark
0D36    6304  Scheduler    /H                    0A 67 6C F0
0EC1    8160  Datalink                           1C EE-EF F1-F2
10C0    8320  EMS Stub     /rem:2                02 13 2A 5C 69-6A 6E
free    2592
136C   79104  n/a          %H                    08 17 28 2F
free  496672
```

In Remote Boot Configuration

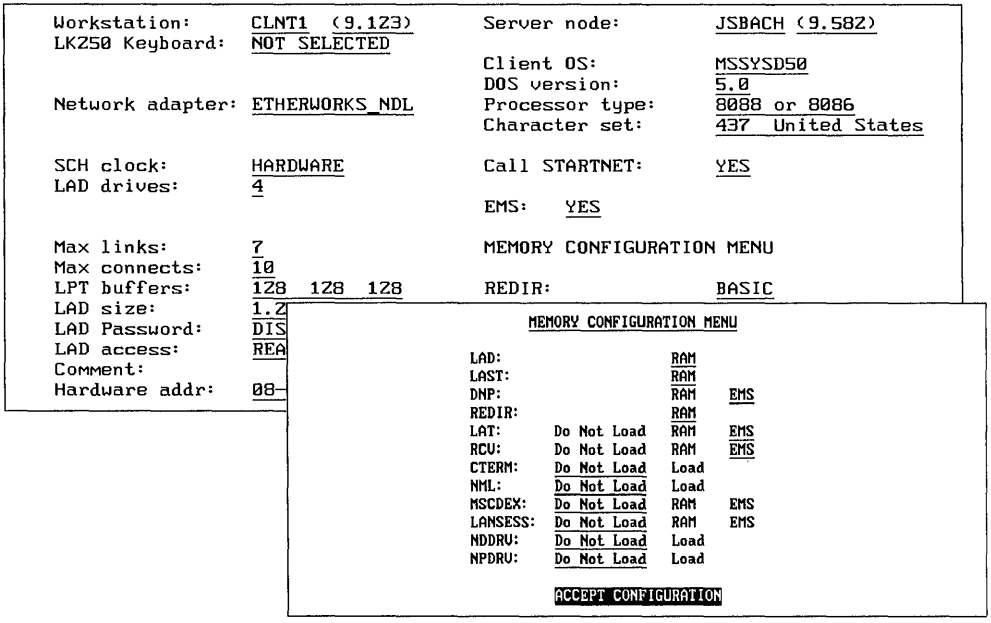
In this example, the base configuration is reconfigured for remote boot operation and the following changes made:

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Fill out conventional memory from 512 to 640 Kbytes.
  - Add 2688 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.

Netsetup Screen

Figure 7–7 shows the Netsetup screen as configured to create a key diskette for this client.

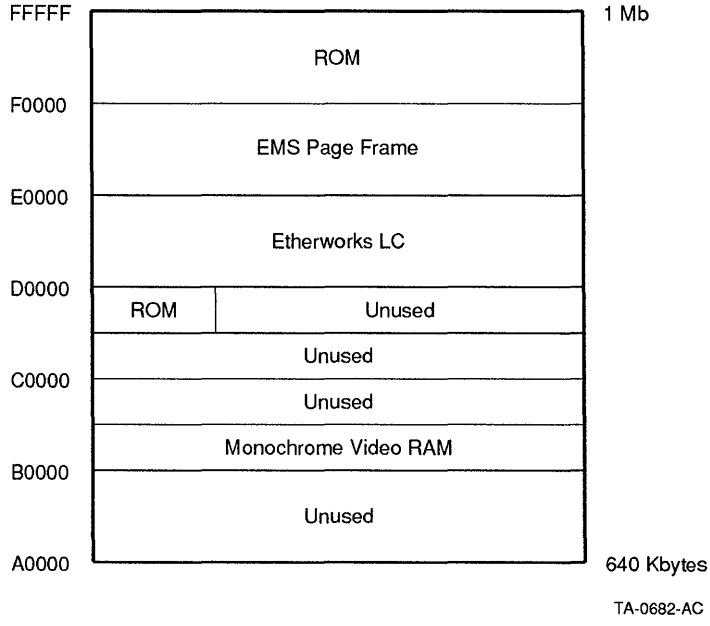
Figure 7–7 Netsetup Screen (8086-88/DECnet/Remote Boot)



Upper Memory Allocation

Figure 7–8 identifies the allocation of upper memory in this configuration.

Figure 7–8 Upper Memory Allocation (8086-88/DECnet/Remote Boot)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
device=C:\EMM.SYS PC 258
buffers=8
files=20
stacks=0,0
device=\decnet\laddrv.sys /D:4
shell=\decnet\bshell.exe /P /E:384
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
% SYSD%\LMDOS\DRIVERS\PCSA\emsload % SYSD%\DECNET\rcv /r:2
%BOOT%\DECNET\emsload %_SYSD%\DECNET\LAT
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    608K
    Available conventional memory   503K

    Reported extended memory        Not present

    Expanded memory size           2688K
    Expanded memory available      2560K

    XMS extended memory             Not Present

System Memory Scan

    0000-97FF 608K Conventional
    9800-9FFF  32K Remote Boot Image
    A000-AFFF  64K ROM
    B000-B7FF  32K RAM
    B800-C7FF  64K ROM
    C800-C9FF   8K ROM (C)COPYRIGHT  IBM 1982+
    CA00-D7FF  56K ROM
    D800-DFFF  32K RAM
    E000-EFFF  64K Page Frame
    F000-FFFF  64K System ROM COPR. IBM 1981
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0EB6     208  n/a          /P /E:384
0EC4    3376  COMMAND.COM                        22-24 2E EE-EF F7
free      48
0EC4     384  COMMAND.COM  <ENVIRONMENT>
free     224
0FC5    8320  EMS Stub     /rem:2                2A 5C 69-6A 6E F3 F8 FC
11CE   33968  n/a          /L:10 /P1:128 /P2:12  02 05 17 2F
free  515664
```

Configuration Notes

- The 32 Kbyte Remote Boot Image shown in the memory map (MEMMAN/S/F) contains the SCH, DLL, LAST, and LAD PATHWORKS components.

IBM PS/2 Model 30 and EtherLink II Network Controller

The following components are included in this example:

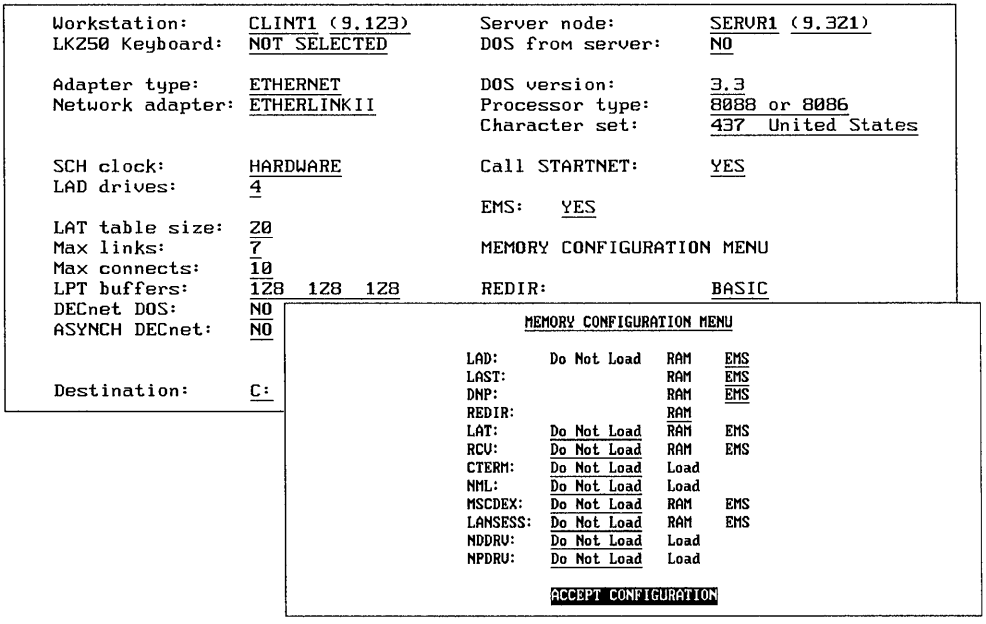
- IBM PS/2 Model 30 PC with 640K memory
- Intel Above Board configured for 2 Mbytes of expanded memory for EMS 4.0 use.
- 3Com EtherLink II network controller

  The controller is automatically configured for NDIS mode operation when you specify a controller other than a DEC EtherWORKS model.

Netsetup Screen

Figure 7–9 shows the Netsetup screen as configured to create a key diskette for this client.

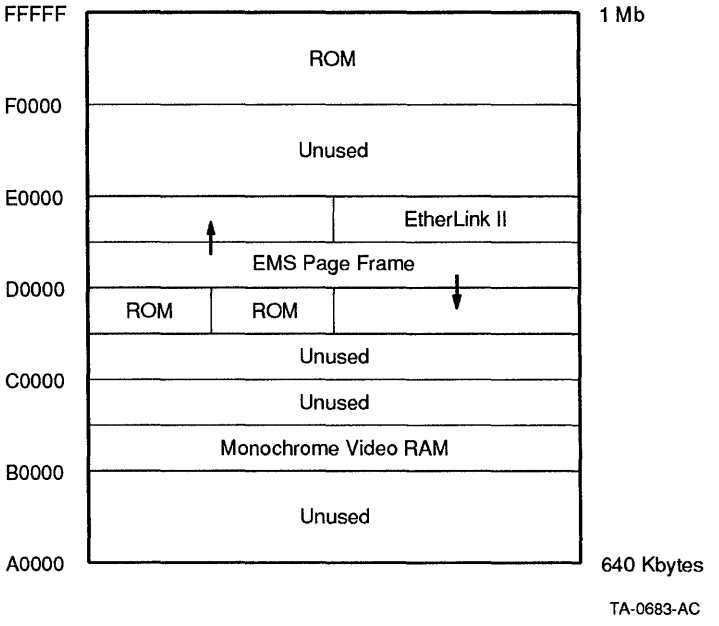
Figure 7–9 Netsetup Screen (8086-88/DECnet/IBM PS/2 Model 30)



Upper Memory Allocation

Figure 7–10 identifies the allocation of upper memory in this configuration.

Figure 7–10 Upper Memory Allocation (8086-88/DECnet/IBM PS/2 Model 30)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=15
files=20
device=\emm.sys mod30 D000 258 ND
shell= \command.com /P /e:526
device=\decnet\laddrv.sys /D:4
device=\decnet\PROTMAN.SYS /I:A:\DECNET
device=\decnet\ELNKII.DOS
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \DECnet directory.

```
%BOOT%\decnet\netenvi 145 48
%BOOT%\decnet\dllndis
%BOOT%\decnet\netbind
%BOOT%\decnet\save
%BOOT%\decnet\sch /H
%BOOT%\decnet\emsload %BOOT%\decnet\dnneth.exe /rem:2
%BOOT%\decnet\emsload %BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\last /N:%_WSNODE% /c:d /M:D /g:-1
%BOOT%\decnet\redir.exe /L:16 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\decnet\setname %_WSNODE%
%_SYSD%\LMDOS\DRIVERS\PCSA\emsload %_SYSD%\LMDOS\DRIVERS\PCSA\lad.exe /R:-1
 /W:-1 /a:-1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    639K
    Available conventional memory   479K

    Reported extended memory        Not present

    Expanded memory size           2048K
    Expanded memory available      1920K

    XMS extended memory             Not Present

System Memory Scan

    0000-9FBF 639K Conventional
    9FC0-9FFF   1K Extended BIOS Area
    A000-AFFF  64K RAM
    B000-B7FF  32K Free
    B800-BFFF  32K RAM
    C000-CFFF  64K Free
    D000-DFFF  64K Page Frame
    E000-EBFF  48K RAM
    EC00-EFFF  16K ROM COPYRIGHT DIGITAL EQUIPMENT CORPORATION 1990
    F000-FFFF  64K System ROM COPR. IBM 1981, 1987
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
1259    3376  COMMAND.COM                        22-24 2E F4
free      48
1259     528  COMMAND.COM  <ENVIRONMENT>
free     224
1363   32896  Datalink                           FE
1B6C    1136  PCSA Mark
1BB4    6256  Scheduler    /H                    08 0B 67 6C
1D3C    8320  EMS Stub     /rem:2                13 2A 5C 69 6E
1F45   35328  n/a          /L:16 /P1:128 /P2:12  05 17 2F F5-F7
free  490896
```

TCP/IP Configurations

This section provides examples of 8086/88 client configurations that use the TCP/IP transport protocol.

IBM PC XT Base Configuration

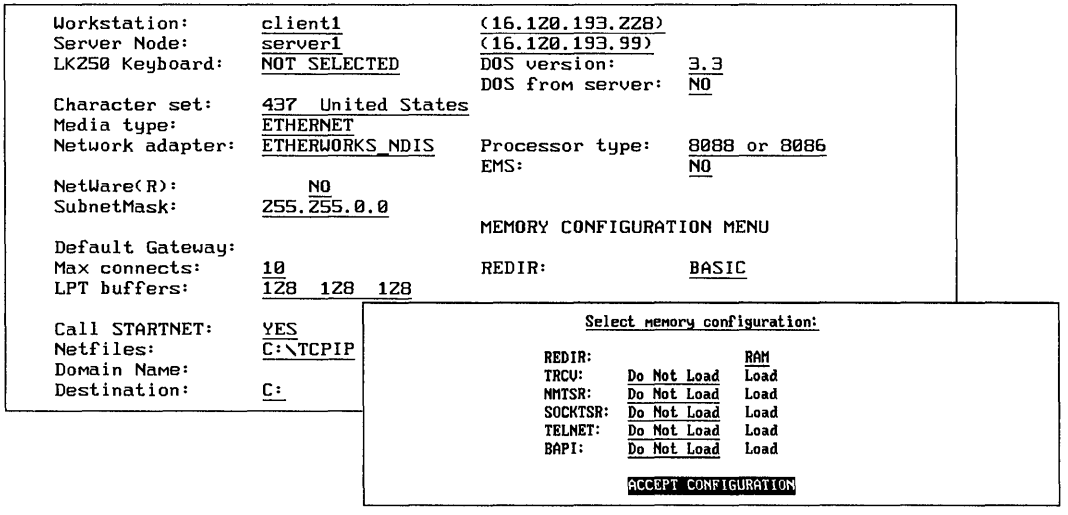
The base configuration for 8086/88 client configuration examples consists of the following components:

- IBM PC XT with 640 Kbyte conventional memory with an IBM monochrome video monitor
- DEC EtherWORKS LC network controller

Netsetup Screen

Figure 7–11 shows the Netsetup screen as configured to create a key diskette for this client.

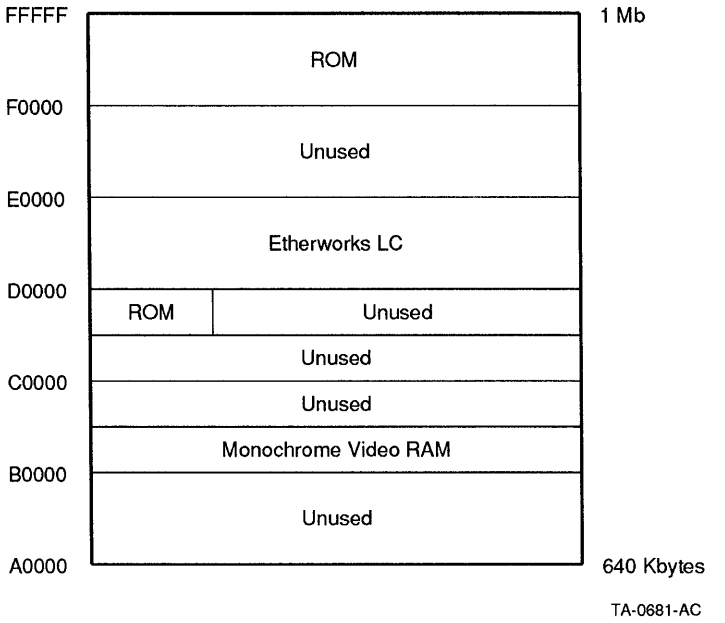
Figure 7–11 Netsetup Screen (8086-88/TCPIP/Base)



Upper Memory Allocation

Figure 7–12 identifies the allocation of upper memory in this configuration.

Figure 7–12 Upper Memory Allocation (8086-88/TCPIP/Base)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
buffers=8
files=20
shell=\command.com /P /e:384
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:C:\tcpip
device=\tcpip\depca.dos
device=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=s
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\TCPIP\setname client1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    640K
    Available conventional memory   428K

    Reported extended memory        Not present

    Expanded memory                 Not Present

    XMS extended memory             Not Present

System Memory Scan

    0000-9FFF 640K Conventional
    A000-AFFF  64K ROM
    B000-B7FF  32K RAM
    B800-C7FF  64K ROM
    C800-C9FF   8K ROM (C)COPYRIGHT  IBM 1982+
    CA00-CFFF  24K ROM
    D000-DFFF  64K RAM
    E000-EFFF  64K ROM
    F000-FFFF  64K System ROM COPR. IBM 1981
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
0D6B    3376  COMMAND.COM                        22-24 2E F0
free      48
0D6B     384  COMMAND.COM  <ENVIRONMENT>
free     192
0E6A   78304  n/a                                08 EE-EF F1-F2
2189   43280  n/a                                5C
2C1B    1136  PCSA Mark
2C63    1504  n/a                                21 2A
2CC2   33888  n/a          /L:10 /P1:128 /P2:12  05 17 2F-30
free  438112
```

Configuration Notes

- You might have to unload the network components to run large DOS applications. Refer to Chapter 4 for procedures on unloading and reloading the network as needed.
- A mouse is typically not used in a low-memory configuration like this one, so the mouse driver is not loaded to save memory.

With 1.5 Mbyte Intel Above Board Memory Board

Refer to Intel Above Board documentation for detailed explanation of the installation and configuration of the memory board.

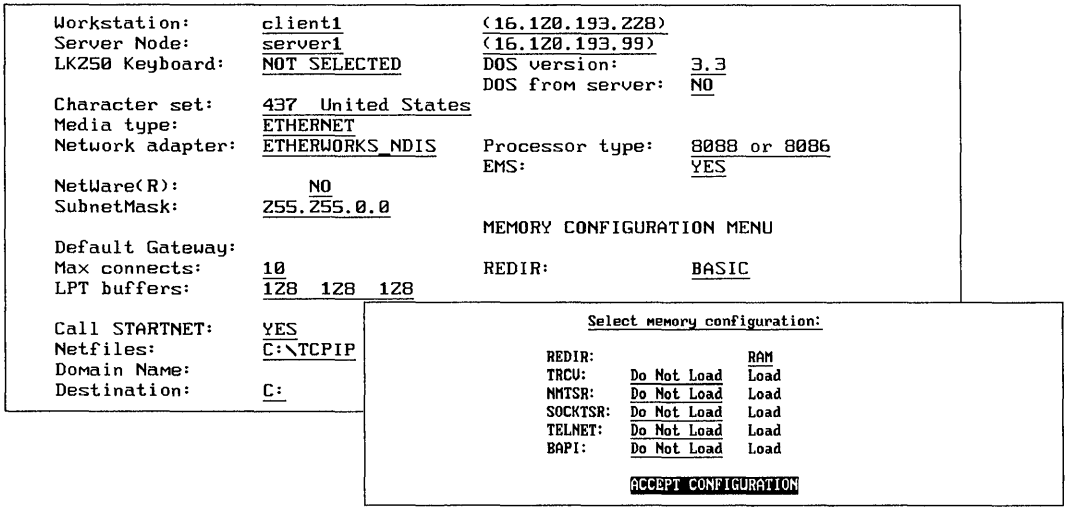
In this example, the following changes are made from the TCP/IP base configuration.

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Fill out conventional memory from 512 to 640 Kbytes.
  - Add 384 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.

Netsetup Screen

Figure 7–13 shows the Netsetup screen as configured to create a key diskette for this client.

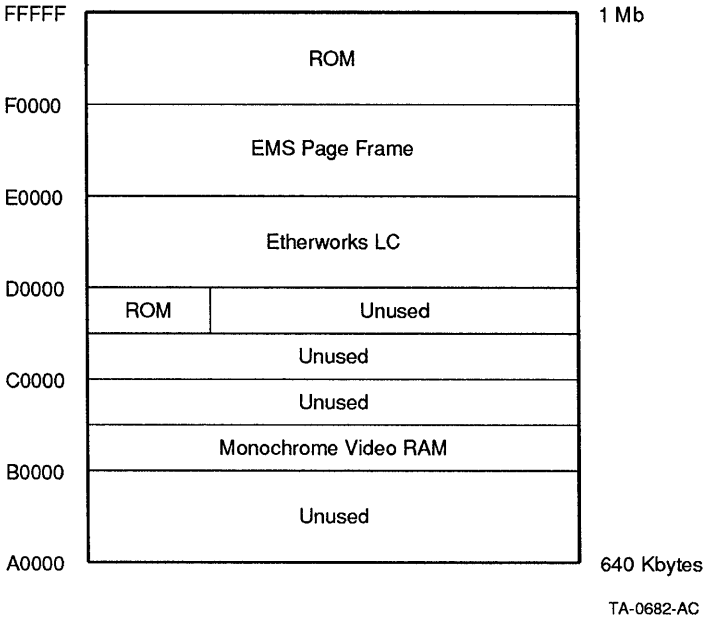
Figure 7–13 Netsetup Screen (8086-88/TCPIP/Above Board)



Upper Memory Allocation

Figure 7–14 identifies the allocation of upper memory in this configuration.

Figure 7–14 Upper Memory Allocation (8086-88/TCPIP/Above Board)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
DEVICE = EMM.SYS PC 258
buffers=8
files=20
shell=\command.com /P /e:384
device=\tcpip\nemm.dos
device=\tcpip\protman.sys /I:C:\tcpip
device=\tcpip\depca.dos
device=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:no
%BOOT%\TCPIP\setname client1
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    640K
    Available conventional memory   483K

    Reported extended memory        Not present

    Expanded memory size           2688K
    Expanded memory available      2592K

    XMS extended memory             Not Present

System Memory Scan

    0000-9FFF 640K Conventional
    A000-AFFF  64K ROM
    B000-B7FF  32K RAM
    B800-C7FF  64K ROM
    C800-C9FF   8K ROM (C)COPYRIGHT  IBM 1982+
    CA00-CFFF  24K ROM
    D000-DFFF  64K RAM
    E000-EFFF  64K Page Frame
    F000-FFFF  64K System ROM COPR. IBM 1981
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
10C0    3376  COMMAND.COM                        22-24 2E
free      48
10C0     384  COMMAND.COM  <ENVIRONMENT>
free     192
11BF   44192  n/a                                02 08
1C8A    6144  n/a                                5C
1E0B    1168  n/a
1E55    1152  PCSA Mark
1E9E    1504  n/a                                21 2A
1EFD   33888  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  494512
```

Configuration Notes

- There might not be enough conventional memory to run large DOS applications. You may want to unload TCP/IP network components to run DOS applications. Refer to Chapter 4 for procedures on loading and unloading TCP/IP components.

With EtherLink II Network Controller

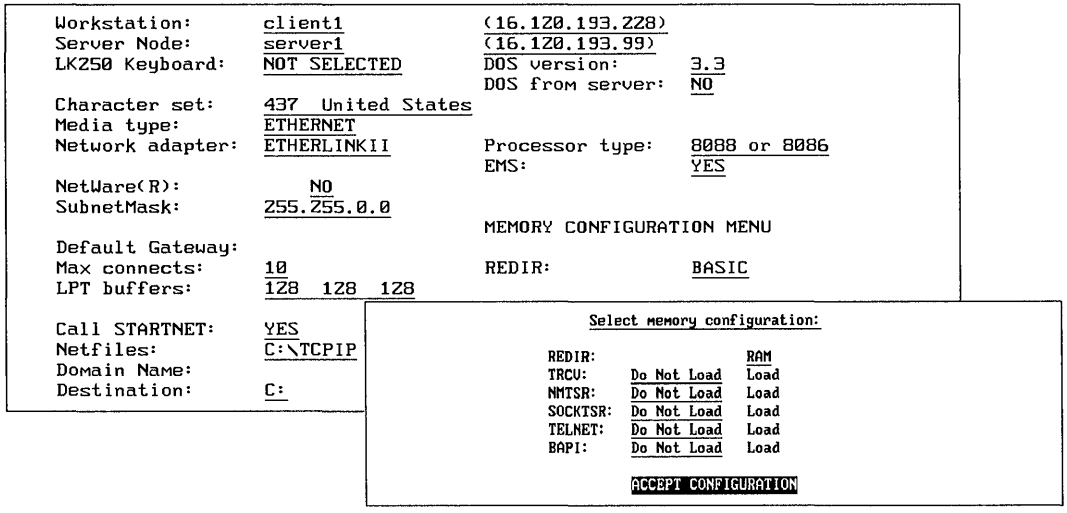
In this example, the following changes are made from the base configuration:

- An Intel Above Board expanded memory board is added to the client and configured to:
  - Fill out conventional memory from 512 to 640 Kbytes.
  - Add 2688 Kbytes of expanded memory for EMS 4.0 use.
- The EMS 4.0 memory driver that comes with the memory board, EMM.SYS, is installed in CONFIG.SYS to manage the allocation of expanded memory.
- The EtherWORKS LC network controller is replaced with a 3Com EtherLink II network controller.

Netsetup Screen

Figure 7–15 shows the Netsetup screen as configured to create a key diskette for this client.

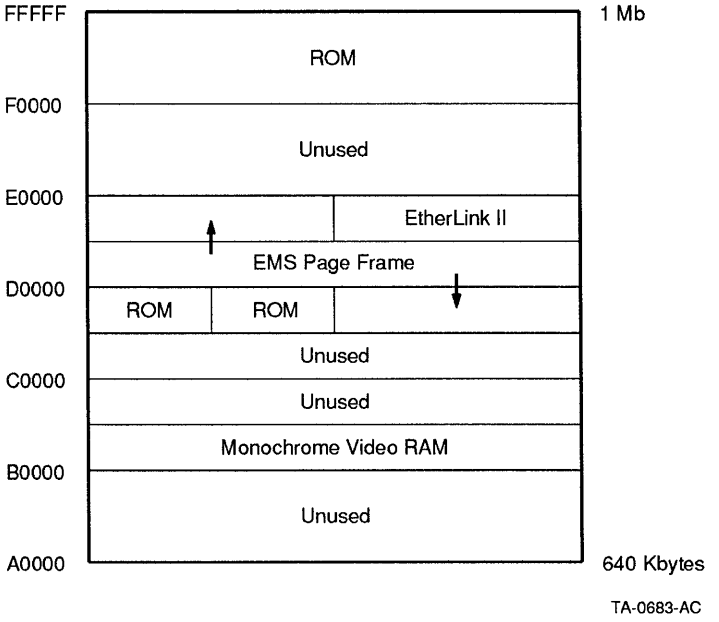
Figure 7–15 Netsetup Screen (8086-88/TCPIP/EtherLink II)



Upper Memory Allocation

Figure 7–16 identifies the allocation of upper memory in this configuration.

Figure 7–16 Upper Memory Allocation (8086-88/TCPIP/EtherLink II)



CONFIG.SYS File

The following example shows the CONFIG.SYS file for this configuration.

```
device=emm.sys pc 258
buffers=8
files=20
shell=\command.com /P /E:384
DEVICE=\tcpip\PROTMAN.SYS /I:C:\TCPIP
DEVICE=\tcpip\nemm.dos
DEVICE=\tcpip\ELNKII.DOS
DEVICE=\tcpip\tcpdrv.dos /I:C:\tcpip
lastdrive=z
```

STARTNET.BAT Load Commands

The following load commands are extracted from the STARTNET.BAT file, located in the \TCPIP directory.

```
%BOOT%\tcpip\netenvi 132 57
%BOOT%\TCPIP\netbind
%BOOT%\TCPIP\tcptsr
%BOOT%\TCPIP\nbdrv
%BOOT%\TCPIP\emsbfr
%BOOT%\TCPIP\save
%BOOT%\TCPIP\minses
%BOOT%\TCPIP\redir.exe /L:10 /P1:128 /P2:128 /P3:128 /himem:yes
%BOOT%\TCPIP\setname client1
%BOOT%\TCPIP\setlogon
```

Memory Maps

Refer to the Client Commands Reference for more detailed information on the Memman utility.

The first Memman command (MEMMAN/S/F) generates information on the memory configuration and a map of upper memory. The second Memman command (MEMMAN) displays a map of conventional memory.

```
C:\> MEMMAN/S/F

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

Memory Usage Summary

    DOS memory allocation scheme    First fit

    Reported conventional memory    640K
    Available conventional memory   477K

    Reported extended memory        Not present

    Expanded memory size           2688K
    Expanded memory available      2592K

    XMS extended memory             Not Present

System Memory Scan

    0000-9FFF 640K Conventional
    A000-AFFF  64K ROM
    B000-B7FF  32K RAM
    B800-C7FF  64K ROM
    C800-C9FF   8K ROM (C)COPYRIGHT  IBM 1982+
    CA00-CBFF   8K ROM
    CC00-DBFF  64K Page Frame
    DC00-EFFF  80K ROM
    F000-FFFF  64K System ROM COPR. IBM 1981
```

```
C:\> MEMMAN

MEMMAN V4.1  Digital Memory Information Utility
Copyright (C) 1988-1991 by Digital Equipment Corporation

PSP    Bytes  Owner        Command Line          Hooked Interrupts
120A    3376  COMMAND.COM                        02 22-24 2E
free      48
120A     384  COMMAND.COM  <ENVIRONMENT>
free     192
1309   44432  n/a                                08
1DE3    6144  n/a                                5C
1F64    1168  n/a
1FAE    1152  PCSA Mark
1FF7    1504  n/a                                21 2A
2056   34384  n/a          /L:10 /P1:128 /P2:12  05 17 2F
free  488496
```

Glossary

386 driver

See *386 memory manager.*

386 memory manager

A software program that manages the allocation of all 80386 memory types. 386 memory managers can convert extended memory into expanded memory and allocate blocks of memory from upper memory. Examples of 386 memory managers are QEMM-386 from Quarterdeck and 386MAX from Qualitas.

conventional memory

That portion of system memory that is available for DOS and DOS application software.

driver

A background software program typically dedicated to the control of a device or resource on a personal computer.

EMB

See *extended memory block.*

EMS

See *Expanded Memory Specification 4.0.*

EMSSPEED

A PCSA utility that measures the speed of an EMS 4.0 memory board in relation to the speed of conventional memory on the personal computer. Also measures page swapping efficiency.

expanded memory

Physical memory completely outside the addressing range of a processor. Portions of expanded memory, called pages, are switched into a designated area of upper memory.

Expanded Memory Specification (EMS) 4.0

A specification of methods for allocating and releasing expanded memory that was developed by Lotus, Intel, and Microsoft (LIM) and sometimes referred to as LIM 4.0.

extended memory

Memory in addresses above one Mbyte. Extended memory cannot be accessed while the processor is in real address mode. A processor must be switched to protected mode to access extended memory addresses.

extended memory block (EMB)

A group of memory addresses that are allocated from extended memory addresses beyond 10FFF.

Extended Memory Specification (XMS) 2.0

A specification for allocating and releasing extended memory, upper memory, and the high memory area (HMA).

fixed mode

One of two modes of EMS memory switching by PATHWORKS network components. Fixed mode switching is more efficient than paged mode switching and is used whenever PATHWORKS components are the only active users of EMS memory on the client. See also *Paged Mode*.

high memory area (HMA)

A 64-Kbyte segment of processor memory that begins at the 1 Mbyte (hexadecimal address 100000) and is addressable in real mode.

memory manager

A software program for 80286 or 80386 PCs that manages the allocation of various memory types.

memory map

A diagram used to indicate the allocation of memory addresses on a personal computer.

page frame

A segment of system memory, usually in upper memory, into which segments of expanded memory are switched by the processor.

paged mode

One of two modes of EMS memory switching by PATHWORKS network components. Paged mode switching, is used whenever PATHWORKS components are not the only active users of EMS memory on the client. See also *Fixed Mode*.

protected virtual address mode

On 80386 and 80386 processors, an operating mode that allows the processor to access addresses in the extended memory range (above one Mbyte).

protected mode

See *protected virtual address mode*.

random-access memory (RAM)

Memory from which can be read information and to which new information can be written.

read-only memory (ROM)

Memory from which can be read information, but to which new information cannot be written. Typically referred to as ROM.

real address mode

A personal computer processor operating mode that is compatible with the operation of the Intel 8088 and 8086 processors. In real mode, the processor recognizes up to one Mbyte of memory addresses.

real mode

See *real address mode*.

ROM

See *read-only memory.*

stub

A small portion of a program left in conventional memory with a pointer to the location outside of conventional memory in which the remainder of the program is stored.

system memory

In a personal computer, the first one Mbyte of memory addresses. The memory that can be recognized by a processsor while in real address mode.

TCP/IP

See *Transmission Control Protocol/Internet Protocol.*

Transmission Control Protocol/Internet Protocol (TCP/IP)

A set of protocols that govern the transport of information between computers and networks of dissimilar types. An alternative to DECnet transport protocols.

UMB

See *upper memory block.*

upper memory

That portion of system memory that is used to store personal computer hardware and startup software. TSRs can sometimes be loaded into upper memory to save conventional memory.

upper memory block (UMB)

A group of memory addresses allocated from the upper memory portion of system memory.

Virtual Control Program Interface (VCPI)

A specification that defines guidelines for compatible operation between programs that use any of the three different 80386 processor modes of operation.

virtual 8086 mode

A mode of operation on 80386 and compatible processors in which the processor emulates the operation of an 8086 processor but, unlike the 8086 processor, allows multiple simultaneous processes

v86 mode

See *virtual 8086 mode.*

XMS 2.0

See *Extended Memory Specification 2.0.*

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