The following diagram illustrates the arrangement of memory in your computer:

```
┌─────────────────────┐
│                     │    Up to 64MB
│   Extended          │
│   Memory            │
│   (Up to 63MB)      │
│                     │
│                     │
│                     │    1024KB (1MB)
├─────────────────────┤
│ Shadow RAM (384KB)  │
├─────────────────────┤    640KB
│                     │
│   Base RAM          │
│   (640KB)           │
│                     │
│                     │
│                     │
│                     │
│                     │
└─────────────────────┘    0KB
```
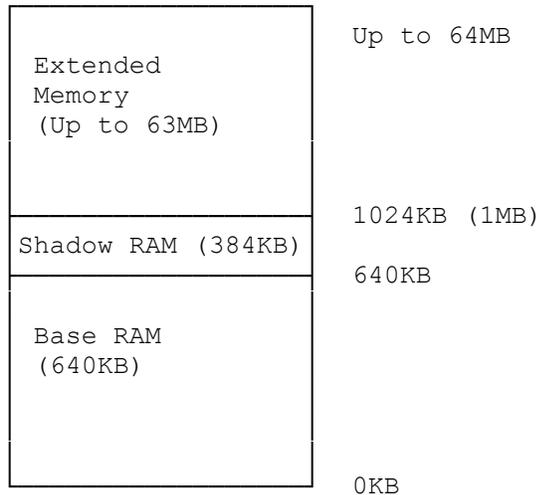
BASE RAM--The memory below 640KB that MS-DOS and all MS-DOS applications use.
Also referred to as conventional memory.

SHADOW RAM--The 384KB of memory from 640KB to 1024KB (1MB); used by the system
BIOS, Video BIOS, and other BIOS extensions.

EXTENDED MEMORY--Continuous memory above 1 MB; can be addressed directly by
80286, 386SX, and i486 microprocessors. Often used for software disk caches,
RAM disks, and software print spoolers. Extended memory can also be directly
used by software like Microsoft Windows or MS-DOS software through the use of
a DOS extender. Other operating systems such as OS/2 or UNIX can also use
extended memory manager called HIMEM.SYS. Refer to MS-DOS 5.0 documentation
for information about HIMEM.SYS.

In addition to the three areas of memory illustrated previously, your computer
supports the creation of expanded memory, or EMS memory, from extended memory
(up to 63MB).

EMS memory increases your system's efficiency by paging large sections of
memory in and out of an area called a page frame. Many of today's application
programs use EMS memory.

Follow this general procedure to create and use EMS memory. Details are
provided in the following sections.

1. Run the setup utility, and specify how much EMS memory to create.

2. Be sure the memory manager, TEMM486.SYS, is on the hard disk. It should
   have been copied to the hard disk when you installed MS-DOS.

3. Install the memory manager on the system startup.

Once the memory manager is loaded, it determines the amount of EMS memory in
the system and performs any required initialization. It uses only extended

memory on the main logic board for EMS memory. For example, if you have 4MB of
memory installed on the main logic board, the memory manager uses as much as
3MB for EMS memory. It does not use any memory that is not on the main logic
board.

NOTE: The memory manager uses any available memory not configured as extended,
system, or shadow, for EMS memory. This includes memory in the segment range
A000h-FFFFh (640KB to 1MB).

NOTE: Refer to MS-DOS documentation if you want to use Microsoft's EMM386.EXE
EMS memory manager instead of TEMM486.

INSTALLING THE MEMORY MANAGER

The memory manager must be the first device driver installed. This positioning
enables other device drivers, such as a RAM disk, to make use of the memory
manager's services.

To install the memory manager, place the following device command before any
others in your CONFIG.SYS file:

    device=\path\temm486.sys cachepresent
    [contexts=nnn][exclude=xxxx-xxxx][frame=xxxx]
    [handles=nnn][include=xxxx-xxxx][nobackfill]
    [noflush][usealternate][fulldisplay][test]
    [showoptions][zero]

Items included in brackets ([]) let you tailor the memory manager to your
system configuration. They are optional.

NOTE: The cachepresent option is required because cache memory is present in
your computer.

Separate command options with spaces.

Specify memory sizes in Kilobytes (number of 1024 bytes).
For example, specify 32,767 bytes as 32.

Each command line option has a default value that is used if the parameter is
not specified in the device statement. Refer to "Memory Manager Options" for
more information.

The command can be abbreviated as follows:

    device=temm486.sys cp [c=nnn][x=xxxx xxxx]
    [s=xxxx][h=nnn][L=xxxx-xxxx][nb][nf][ua][f][t]
    [so][z]

Abbreviations are defined in "Option Abbreviations and Defaults."

MEMORY MANAGER OPTIONS

Following is a description of each of the memory manager's parameters.

Cachepresent

The cp option informs the memory manager that a hardware cache is present in

your computer. This parameter has no effect on the cache flush operation. (The nf option affects cache flush.) The memory manager does not try to use the C000h-C7FFh segment for the page frame. The memory manager cannot detect the presence of a cache, and will probably show a series of errors if you omit cp from the command.

Contexts=nn

C=nn specifies the number of contexts (3 to 255) for windows 0 to 3 that can be saved by processes using EMS memory. The default number of contexts is equal to the number of handles that are allocated.

Exclude=xxxx-xxxx

X=xxxx-xxxx specifies a range of addresses not to be used as EMS page frame windows. The page frame will, in general, reside in a 64KB block between C000h and EFFFh.

By default, the memory manager excludes areas known to be used by ROMs or video RAM. The parameter enables you to exclude other areas, such as those that might be used by another device such as a network adapter's RAM buffer. You can specify multiple exclude ranges as necessary, and these can overlap. Use hexadecimal addresses.

Frame=xxxx

S=xxxx specifies the starting address for the standard 64KB EMS window frame. In general, the window frame is located in the C000h-EFFFh segment range. By default, the start of the EMS window frame is selected by the memory manager software. The s=xxxx parameter enables you to choose the address explicitly. The number specified should be a hexadecimal segment address on a 16KB boundary where no ROM, shadowed ROM, or off-board RAM (in an ISA slot) resides.

For systems with monochrome display adapters, the default page frame starts at segment C000h.

For systems with EGA, VGA, or similar display adapters, the default page frame starts at C800h.

Handles=nnn

H=nnn specifies the number of handles (3 to 255) that will be available for programs that use EMS memory. The default number of handles is 255.

Include=xxxx-xxxx

L=xxxx-xxxx specifies a range of addresses that should always be used as EMS page frame windows. By default, the memory manager excludes areas known to be used by ROMs or video RAM. The L=xxxx-xxxx parameter lets you include other addresses. Use hexadecimal segment addresses. You can specify as many include ranges as necessary, and these can overlap.

Test and Zero

Test (t) and Zero (z) are related. Do not use both parameters at the same time.

Test (t) causes memory to be tested on both soft and hard resets. Without the t option, memory is tested only on hard resets, reducing the startup time.

Zero (z) specifies that memory should not be tested on hard or soft resets. The use of the z option causes memory to always be zeroed and never tested. This, the z option decreases the startup time of a hard reset, but at the expense of testing the EMS memory.

Fulldisplay

The f option causes the memory manager to display additional information about the EMS configuration after its sign-on. The default is not to display additional information.

Showoptions

The so option causes the memory manager to show its command line options after its sign-on. The default is not to show options.

Nobackfill

The nb option disables the backfill memory feature. Backfill is an EMS feature provided by the TOPCAT chip set to enable operating system software to use advanced feature of LIM 4.0. Essentially, the memory from 4000h to 9FFFh (256KB to 640KB) becomes part of EMS memory. Normally, this memory is used as conventional memory. The EMS drive enables backfill functions by default. The nb option overrides and prevents remapping this conventional memory as EMS memory.

NOTE: Some network adapters use memory segment range 880h-9FFFh (544KB to 640KB) or 9000h-9FFFh (576KB to 640KB) to address their adapters in the slot bus. Therefore, these adapters will require the nobackfill option.

Usealternate

The ua option enables the use of the alternate register set. By default, the memory manager uses only the standard register set. Most systems will activate that ua option.

Noflush

The nf option disables the cache flush operation. The cache flush operation is performed unless this parameter is present. Using nf in non-cached systems increases performance slightly.

OPTION ABBREVIATIONS AND DEFAULTS

OPTION	ABBREVIATION	DEFAULT VALUE
contexts=nnn	c=nnn	255
exclude=xxxx-xxxx	x=xxxx-xxxx	Include all available RAM not used by shadowing the ROMs or as specified by BIOS setup.
frame=xxxx	s=xxxx	C000h for monochrome monitor,

		C800h for EGA or VGA monitor.
handles=nnn	h=nnn	255
include=xxxx-xxxx	L=xxxx-xxxx	All available RAM (C000h-EFFFh or C800h-EFFFh, depending on the type of monitor).
nobackfill	nb	Backfill enabled.
noflush	nf	Cache flush enabled; performance of EMS driver slowed.
usealternate	ua	TOPCAT EMS hardware Alternate Register Set no used by EMS driver.
fulldisplay	f	Only sign-on message displayed when EMS driver is installed.
test	t	Memory tested only on hard reset.
showoptions	so	Command line options not displayed during installation.
zero	z	Memory cleared only on soft resets