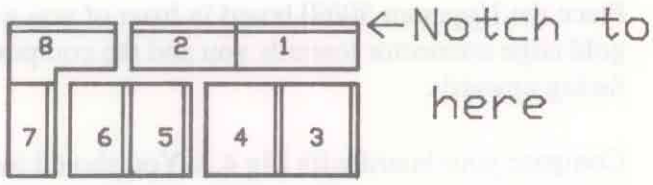
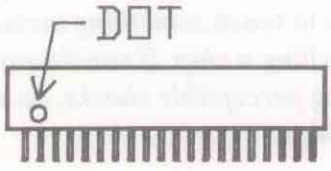


Figure 4.3



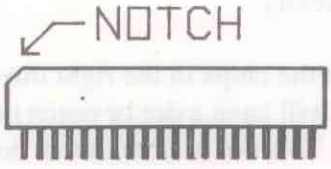


Figure 4.4

Step 5
Inserting the chips

Check the orientation, then insert the chip half way into the socket. Check that each of the legs on the chip corresponds correctly with a hole in the socket. Make sure there are no bent or misaligned legs. Now push the chip firmly the rest of the way into the socket. The top of each chip you insert should be level with other chips already in the board. If any chips are not level gently extract them using a small screw driver in a levering action. Check the legs and carefully reinsert.

Step 6
When you have finished inserting all the memory chips in the order indicated by Fig. 4.3, replace the Hyperam 50/60 board in your computer and reboot the machine.

N.B. The board must be placed in the same slot it was originally installed in.

Step 7
Insert the Hyperam 50/60 installation disk in drive A, log over to drive A and key in:

install

N.B. If you do not re-run the installation program, your machine will not acknowledge the new memory you have added.

Step 8
Answer each of the questions in turn, making sure you specify the correct number of banks for the total amount of memory you now have on your Hyperam 50/60 board. Insert the backup of your Reference diskette in drive A when you are prompted to do so.

Step 9
Exit from the install program, power off the machine and reboot with the Reference diskette in drive A. You may now get a ***164*** error. This is not a cause for alarm as you have not yet completed the re-installation procedure.

If you do get a ***164*** error press **<F1>** to continue. You will now be asked:

Automatically configure the system? (Y/N)

Answer **N** to this question. You will then be presented with a main menu.

If you do not get a ***164*** error you will be presented with a Main Menu. Selection option 3:

Set configuration

A second menu will now appear. Select option 2:

Change Configuration

A configuration summary will now be displayed for your machine. Use the **down arrow** key to move to the slot number which contains the Hyperam 50/60 board. Use the **<F5>** and **<F6>** keys to select the correct board number for the slot - this should be board 1 unless you have installed more than one Hyperam 50/60 board.

Now use the **<F10>** key to save your new configuration and exit from the menu.

Step 10

Place the backup copy of the Hyperam 50/60 installation disk in drive A, log over to drive A, and key in:

install2

A program will now be run which correctly configures the extended memory in your machine.

You will now be prompted to insert the Reference disk in drive A. Insert your copy of the Reference disk when prompted and press **<Enter>**.

You will now be prompted to reinsert your Hyperam50/60 install disk in drive A. Insert the disk when prompted and press **<Enter>**.

The following question will now be displayed:

Do you want to install the EXPanded memory driver and/or other utilities?

You should only answer **Yes** to this question if you have allocated some or all of the memory on the Hyperam50/60 card to expanded memory and you wish to alter your expanded memory software configuration.

If you answer **Yes** you will be presented with the Software installation menu. Make your new software selections as directed by the install program.

If you answer **No** to the question the installation is now complete.

MULTIPLE BOARDS

If you are installing 2 or more Hyperam 50/60 boards at the same time or are adding another Hyperam 50/60 board to your computer's configuration you must read this chapter. The procedure for installing multiple boards or adding extra boards is different from the standard procedure.

If you have not already done so, turn to the ***Installation*** chapter and follow steps **1** through to **8**, then return to this page.

Installing two or more boards at the same time

Step 9
It is important that you insert each of the Hyperam 50/60 boards in the order you used when entering configuration details during the first part of the installation process. That is, you must know which Hyperam 50/60 board equates to the board you configured as board 1, which is board 2 and so on.

You must now take care to insert each of the boards in the same order. Board 1 must go in the first available slot - probably slot 1, - board 2 must go in the second and so on. Take a note of which board is in which slot - you will be asked to key in this information later during the IBM configuration process.

Step 10
Tighten the expansion slot screws which you loosened earlier. Replace the cover of your system unit, reconnect all plugs and cables.

Step 11
Place the copy of the Reference diskette, which you used earlier in the installation, in drive A and turn the machine back on.

Step 12
You will see a ***165*** error on the screen. Do not be concerned, the error will no longer appear when the installation is complete. The IBM logo will now appear. Press the **<Enter>** key.

Step 13
An ***Adapter Configuration Error*** message will now appear. Again, this will disappear once the installation is complete.

At the bottom of the screen you will see the following question:

Automatically configure the system? (Y/N)

As you are installing 2 or more Hyperam 50/60 boards you must answer N to this question.

Step 14
You will now be presented with a Main Menu. Select option 3, ***Set Configuration***

Step 15
A second menu will now appear. Select option 2, ***Change Configuration***

Step 16
A configuration summary of your computer will now be displayed. Use the **down arrow** key to move down to the line where the first Hypertec board is described - probably slot 1. Use the **<F5>** and **<F6>** keys to cycle through the available choices for the number of the board installed in that slot and select the appropriate number.

Step 17
Repeat this step for all other Hyperam 50/60 boards you have installed in other slots.

N.B. It is important that you enter the correct board number for each slot - you should have taken a note of these details back at Step 9.

Step 18
When you have finished entering board numbers for each of the slots containing a Hyperam 50/60 board, save your new configuration summary by pressing the **<F10>** key.

Extended memory

If you have used your additional Hyperam board(s) to add extra extended memory, you will get a ***164*** error on the screen (possibly with other error numbers as well) when you start the machine. Do not be concerned. Press **<F1>** to continue. Insert your backup copy of the Hyperam 50/60 installation disk in drive A:, log over to drive A: and key in:

install2

A program will now be run which correctly configures the extended memory in your machine.

You will now be prompted to insert the Reference disk in drive A. Insert the disk when prompted and press **<Enter>**.

You will now be prompted to reinsert the Hyperam50/60 installation disk in drive A. Insert the disk when prompted and press **<Enter>**.

The following question will now be displayed on the screen:

Do you want to install the EXPanded memory driver and/or other utilities?

If you have allocated some or all of the memory on the Hyperam 50/60 boards to *expanded memory* for use by EMS specification software and/or Hypertec print spooling and ram disk, you should answer **Yes** to this question. The Software configuration menu will now appear on the screen. Make your software selections.

If you are not allocating any of the memory on the Hyperam50/60 boards to expanded memory you should answer **No** to the expanded memory question. The installation is now complete.

Adding another Hyperam 50/60 board

If you are adding another Hyperam 50/60 board to your computer you should follow Step **1** through to **8** in the ***Installation*** chapter of this manual. When entering details during the *Hardware configuration* process (Step 4) you must re-enter the configuration information for the Hyperam 50/60 board(s) you already have in your machine.

When you have completed Step **8** of the ***Installation*** chapter, return to this page.

Step 9
Make a note of the slot you have inserted your additional Hyperam 50/60 board in and check the slot number containing the original Hyperam 50/60 board. Note down this information as you will need it later in the installation process.

Step 10

Now refer back to Step **10** in the first half of this chapter and follow each of the steps through to step **18**. Also follow the additional notes about Extended memory and Expanded memory.

HARDWARE REFERENCE

This section is not essential reading. The install program should tell you all you need to know about the Hyperam 50/60 board. If, however, you would like to know in more detail about Hyperam 50/60, read on.

How the memory works

The memory on the Hyperam 50/60 board may be configured as expanded (EMS) memory or as extended memory or as a combination of both. The allocation of memory is done by you during the installation process and can be changed at any time by running the install program again.

Expanded memory is memory outside the 640 Kb limit imposed by DOS and is accessed by an "expanded memory window". Expanded memory can be used by any application programs which run under DOS and understand the expanded memory specification (EMS). Typically, such programs use large spreadsheets or data bases which may not fit into DOS's 640 Kb limit (e.g. Lotus or Framework).

In order to use the Hyperam 50/60 board for expanded memory applications you must install either the Hypertec EMM.SYS driver or the POOL.SYS driver. These drivers use the expanded memory window to control access to the expanded memory by EMS applications.

The expanded memory window may be either 64 Kb, 96 Kb or 128 Kb. The larger your window is, the more efficiently your LIM 4.0 EMS software will run. If you are able to use the largest window size (that is, if you do not have other boards in your machine which require the extra addressing space) we suggest you do so. Otherwise use as large a window as your machine configuration will allow.

Use the table below to check window sizes with available address range choices.

Address range	Window size
C000-DFFF	128 Kb
C000-CFFF	64 Kb
C800-D7FF	64 Kb
D000-DFFF	64 Kb
C000-D7FF	96 Kb
C400-DBFF	96 Kb
C800-DFFF	96 Kb

Table 6.1 Window address ranges

A window address range selection is made during the first stage of the Hyperam 50/60 installation. To view the address which has been selected *after* installation, use the ***View Configuration*** option from the IBM Reference Diskette.

Extended memory is linear memory above the 640 Kb limit imposed by DOS. Because of the presence of other kinds of memory (typically video memory) between 640 Kb and 1 Megabyte, extended memory normally begins its address space above 1 Megabyte (at 1024 Kb).

The 80286 processor used in the Model 50 and Model 60 machines can operate in two modes. The first mode, known as *real mode*, can only access memory through DOS and is limited to the 1024 Kb boundary. Additional memory under real mode operation can only be accessed via the expanded memory window described above.

The second mode, called *protected mode*, allows the 80286 processor to directly access up to 16 Mb of memory (limited to 15 Mb in the Model 50 and 60 machines). OS/2 operates in protected mode and therefore has access to a total of 15 Mb of extended memory. Hyperam 50/60 can be configured to supply this extended memory.

EMS Board Address

Hyperam 50/60, like all other extended/expanded memory boards, uses a set of registers to control the hardware. If there are multiple memory boards in the machine, each board must use a different address for its registers. The valid EMS addresses for Hyperam 50/60 are **208, 218, 258** and **268**. The most commonly used address is 258.

To view the chosen register address after installation, select the ***View Configuration*** option from the IBM Reference diskette.

Back Filling System Memory

The latest version of the Lotus/Intel/Microsoft expanded memory specification, Version 4, enables operating systems and special operating environments such as Windows 2.0 to "map" conventional system memory.

When system memory is "mapped" it is accessed in the same way that expanded memory is accessed. However, mappable system memory can only be used by special operating environments such as Windows 2.0. Normal DOS applications and other EMS applications will not benefit from mapping system memory.

If you are running Windows 2.0 and would like to map system memory, the Hyperam 50/60 installation program allows you to do so. You should, however, bear the following points in mind.

(1) The conventional system memory on the motherboard of PS/2 Models 50 and 60 cannot be mapped. It is, however, possible to "switch off" the motherboard memory and replace it with memory from the Hyperam 50/60 board. This replacement memory *can* be mapped.

It should be noted that if you choose to "switch off" system memory you effectively lose the whole 1 Megabyte of memory on your Model 50 or Model 60 motherboard.

This "lost" memory must not be physically removed from the machine as it is required during the boot sequence. It cannot, however, be used for any applications.

The Hyperam 50/60 installation program allows you to "back fill" system memory (i.e. switch "off" motherboard memory and replace it with mappable memory from the Hyperam 50/60 board) if your configuration permits.

Configurations where back filling is not allowed include:

1) Total allocation to expanded memory is only 1 Megabyte or less. Back filling takes 1 Megabyte of your expanded memory allocation. You must, therefore have more than 1 Megabyte allocated to expanded in order to have some expanded memory left over after back filling has been performed.

2) Your machine has more than 1 Megabyte of memory installed prior to the installation of the Hyperam 50/60 board. If you were to back fill you would have to switch "off" and therefore effectively lose all the existing memory in the machine. This would be a high price to pay, particularly if you had a large amount of memory installed.

If your configuration meets either of the above conditions you will not be given the option to back fill system memory.

Remember too, that it is only sensible to back fill system memory if you are using a special operating environment such as Window 2.0 which can use the mapping facility.

This page intentionally blank

SOFTWARE REFERENCE

This section is not essential reading. The install program should tell you all you need to know about the Hyperam 50/60 software. If, however, you would like to know more about the software, read on.

Overview

In general, the Hyperam 50/60 software uses a device driver and a control program to perform any function. The device driver must be invoked in CONFIG.SYS; the control program may be invoked at any time after boot. The install package either creates new CONFIG.SYS and AUTOEXEC.BAT files or modifies the ones it finds on your boot disk.

N.B. The Hyperam 50/60 software drivers will operate under DOS but not under OS/2. This means that if you are using both DOS and OS/2 you must boot under DOS each time you wish to use the drivers.

The Hyperam 50/60 EMM driver (Memory manager)

This device driver allows EMS application software to access the expanded memory. If you are only using the Hyperam 50/60 expanded memory for EMS applications you should use this driver.

The Hyperam 50/60 POOL driver

This device driver allows both EMS application software and Hypertec print spooling and ram disks to access the expanded memory. If you wish to use the Hypertec utilities instead of, or as well as EMS applications, you should use this driver.

EMM.SYS

Synopsis

device = emm.sys

This device driver uses no parameters. If loaded, emm.sys will reserve all expanded memory from the Hyperam50/60 board for use by EMS applications such as Lotus, Symphony and Framework.

POOL.SYS

Synopsis

device = pool.sys [q] [r] [eNNN]
q = only display error messages
r = retain the contents of expanded memory across warm reboot if possible
eNNN ='NNN' is the amount of memory (in KB) to retain for expanded memory

The 'r' parameter is optional. If present, it will prevent a clearing of the expanded memory if internal integrity checks are correct. This allows a RAM disk to survive a reboot caused by CONTROL-ALT-DEL.

The 'e' parameter is optional. If present, the number following it is used as the amount of memory to retain for use by application programs which use the Lotus/Intel Expanded Memory Specification; e.g. 1-2-3 and Framework. If this parameter is not present, the Hyperam 50/60 software uses all available expanded memory for itself, leaving none available for use by application software.

Example

device = pool.sys r e256

The above command will install the pool driver and request it to retain RAM drives if possible. 256 Kb of the expanded memory will be reserved for application programs to use.

RAM disks

A ram disk is a block of memory that looks like an ordinary disk to the operating system. However, because a ram disk has no moving parts it works much faster than a conventional disk drive. Programs that read from and write to disk frequently can be sped up significantly if they are run from a ram disk.

N.B. A ram disk is lost as soon as you turn the power off to your machine. You should not use ram disks for storing sensitive information as it may be lost.

A RAM disk is a block storage device like a floppy disk or hard disk and as such is allocated a letter by DOS.

Because DOS learns about floppy disks and most hard disks from a hidden file called IO.SYS, these devices are allocated letters first. RAM disks, which are loadable devices declared in CONFIG.SYS are allocated drive letters after floppy and hard disks.

On a machine with only floppy drives the RAM disks will start with letter C; on a machine with a hard disk they will start at D.

RAMDISK.SYS

Synopsis

device = ramdisk.sys [N]

N = number of RAM disks to be declared (up to 4)

This device driver is used to create RAM disks. It must appear after the POOL.SYS line in the CONFIG.SYS file.

The N parameter is optional. If it is omitted the default number of RAM disks is one.

Example

device = ramdisk.sys 2

This command will install the ram disk device driver and declare 2 disks to DOS.

RAMFMT.EXE

Synopsis

```
   ramfmt [q]  rN/NNN [/f]
  q      = quiet - only print error messages
  rN     = RAM disk number to format
NNN      = size in kilobytes to make the RAM disk
  f      = force format of the RAM disk without questions
```

This command initialises one or more RAM disks. It may also be used to reinitialise an already defined RAM disk, or change its size. If this command is used on an already existing RAM disk, you will be asked if you want to proceed; if you say yes, the previous contents will be completely lost. The 'f' parameter will force the format to be performed without asking you the question; it is for use in batch files.

The maximum number of RAM disks you are allowed to create was defined by you as a parameter to RAMDISK.SYS in your CONFIG.SYS file. If you did not specify a number, you may only have one RAM disk. The maximum size of a RAM disk is limited by the amount of pool memory you have, and how much memory you have allocated to other functions.

Example

ramfmt r1/128 r2/54

This command will format RAM drive 1 with 128 Kb and RAM drive 2 with 54 Kb.

Print spooling and interrupt driving

A print spooler is a block of memory set aside to pretend that it is a fast printer.

Under normal circumstances, when the computer is sending characters to a printer it must wait for the printer to accept each character before sending the next. This means that while printing, the computer is fully occupied, and cannot be used for any other purpose.

When the spooler is in place, the characters are placed in memory before being sent to the printer. As soon as the character is in the spooler, the operating system thinks it has been printed. Control is returned to the application program so that you may proceed with your work. At the same time, a background task takes the characters out of the spooler and sends them to the printer.

N.B. Some application programs already have their own built-in spoolers. Examples include Framework, Multimate and Displaywrite. It is unnecessary to use Hypertec's print spooling with these programs and may even lead to problems.

SPOOL.SYS

This device driver reserves a portion of pool memory for the spool buffer, and declares which devices will be spooled.

Synopsis

device = spool.sys [NNN] parN|comN

NNN = maximum memory in kilobytes

parN = provide for spooling on parallel port N (N between 1 and 4)

comN = provide for spooling on serial port N (N between 1 and 2)

The NNN parameter is optional; it is a decimal number that specifies in kilobytes the maximum amount of pool memory the spooler can use. The default maximum is 8 Kb.

In addition to specifying the amount of memory to reserve for spooling you must specify which ports you wish to spool on by using the parN and comN parameters (where N is the number of the port specified).

SPOOL.EXE

This program activates spooling on the ports specified by SPOOL.SYS.

Synopsis

```
spool [q] parN|comN/b|e|d|p|r
  q     = quiet - only print error messages
parN    = parallel port N (where N is between 1 .. 4)
comN    = serial port N (where N is between 1 .. 2)
  b     = Begin spooling on specified port
  e     = End spooling on specified port
  d     = Discard the spool buffer on specified port
  p     = Pause printing on the specified port
  r     = Resume printing on the specified port
```

When the Begin command is issued, any characters sent to the port will be placed in the spool buffer, and then printed by the background task. When the End command is issued, no further characters will be accepted into the spool buffer; however, the current contents will still be printed. To prevent the contents being printed, you must discard before ending. The Pause command is used to temporarily halt printing on that port; for example, to fix the paper. The spooler will continue to accept characters sent to it by the application program; they will be stored, and printed when you restart the spooler. When the Resume command is issued, printing will commence from where it was paused. The Discard command is used to flush the current contents of any of the buffers.

The Pause and Resume commands may be issued with this program or via the popup menu. If issued via the popup menu, they act on all ports, not just one.

N.B. If you want printing (and spooling) to go to a serial port, you must still use the mode commands in addition to specifying your com port in spool.sys and spool.exe.

Example

```
mode com2:96,n,7,2

mode lpt1:=com2

spool com2/b
```

will initialise the second serial port, redirect standard printing to it and commence spooling on it.

INTRUPT.SYS

Synopsis

device=intrupt.sys

The interrupt driver allows more efficient operation of the print spooler by allowing the background printing task to avoid consuming unnecessary time on your machine.

There are two mechanisms the background task may use to print characters while the computer is performing other operations. The first is called time slicing; there is a timer in the computer which ticks 18 times a second. Once every four ticks the background task takes control of the machine and sends characters to the printer, thus consuming a fixed percentage of computer time. Interrupt driving is a more efficient technique. The hardware port is given a character and told to send it; when it has finished sending, it interrupts the computer and requests another character. While the character is being sent, the computer can proceed with other activities.

Interrupt driving is made optional because there is a possibility of it interfering with communications programs you may be using.

INTRUPT.EXE

Synopsis

intrupt [q] [l] com1|com2| rxon|txon|....

q	= quiet - only report errors
l	= list device status
com1	= serial port one
com2	= serial port two
dcd	= data carrier detect
dsr	= data set ready
cts	= clear to send
rts	= request to send
dts	= data terminal ready
rxon	= xon/xoff for receive
txon	= xon/xoff for transmit
none	= disable all flow control

This program is used to control the method of flow control used by INTRUPT.SYS on serial ports.

Flow control is the process of regulating the flow of characters from the computer to the printer, or from some other device to the computer. The computer can send characters to the printer more quickly than they can be printed. This means that the printer must tell the computer to stop sending for a period, so that it can catch up. Similarly, if another device is sending to the computer, the computer must be able to tell the other device when to stop.