SOTA Memory/16i Memory Enhancement System

Installation Guide
and User's Manual

SOTA™

STATE OF THE ART TECHNOLOGY™

HARDWARE INSTALLATION

Prior to beginning installation refer to the Hardware Installation section of the SOTA 286i or 386si Installation Guide and User's Manual to refresh your memory on proper cover removal, 286i or 386si installation, etc..

You will want to disconnect the ribbon cable from the 286i or 386si and remove the screw from the retaining bracket that secures the 286i or 386si to the computer frame. Grasp the 286i or 386si firmly and gently pull upward until the board is released from the expansion slot.

The Memory/16i is not a stand alone memory expansion board. It is actually a daughter card that piggy-backs onto the 286i or 386si. **Figure 1.1** indicates the positioning of the 16 bit expansion plug-connectors on the 286i or 386si. The Memory/16i will attach to the 286i or 386si at these points.

IMPORTANT: Refer to Appendix B - Jumper Settings before you proceed any further. It is important that the jumpers on the Memory/16i are configured for your system before it is attached to the 286i or 386si.

NOTE: If you own our Floppy I/O PLUS disk controller board and it is presently attached to your 286i or 386si then it must be removed. The Memory/16i requires the use of **both** 16-bit plug-connectors located on the 286i or 386si. You will have to use another available expansion slot in your PC for the Floppy I/O PLUS from now on.

The next step is to attach the Memory/16i to the 286i or 386si. Figure 1.2 indicates the location of the pin-connectors that will attach the Memory/16i to the 286i or 386si at the points refered to in figure 1.1.

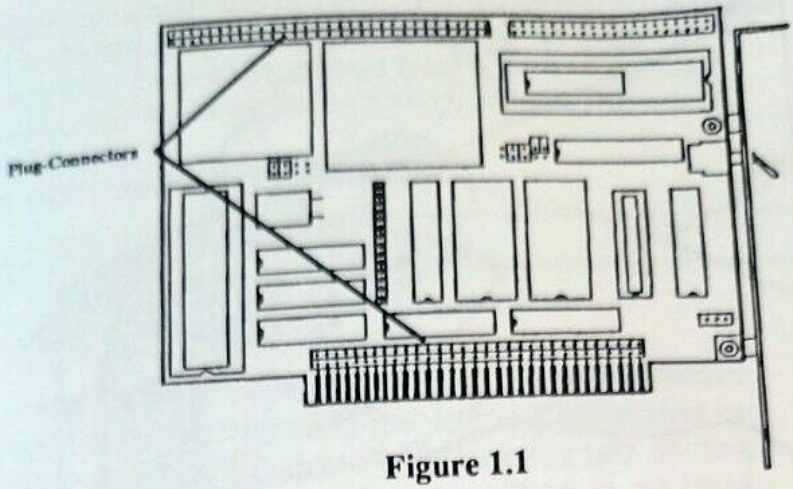


Figure 1.1

It is important to take your time at this point. Refer to figure 1.3 on page 5 as you read this installation description. Grasp the Memory/16i and 286i or 386si firmly with the pin-connectors on the Memory/16i aligned with the plug-connectors on the 286i or 386si. You want to align all the 62 pins of the upper and lower pin-connectors on the Memory/16i with the corresponding plug-connectors on the 286i or 386si. Be careful not to bend the pins or the boards will not come together.

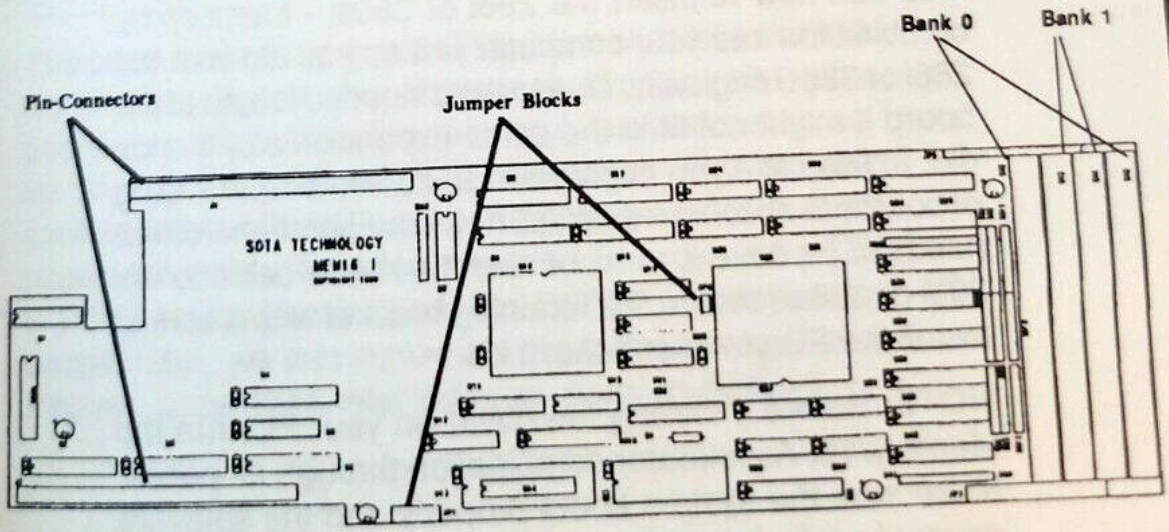


Figure 1.2

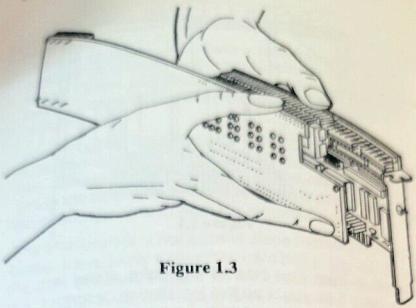


Figure 1.3

Once your sure that the pins are aligned with the holes in the plug-connectors start to push the boards together with as even a pressure as possible. Once all the pins are partially inserted apply somewhat firmer pressure until the pin-connectors are fully inserted into the plug-connectors.

You can now re-insert the 286i or 386si - Memory/16i combination into your computer just as you did with the 286i or 386si originally. Due to the extended length of the board it might not fit in the same expansion slot it once did. In this case you might need to do some rearranging of boards to accommodate this new configuration. All that needs to be done is to reconnect the ribbon cable to the 286i or 386si, secure the retaining bracket with a screw, install the PC cover and that's it!

NOTE: Before installing the cover on your PC, run the Memory/16i-Accelerator combination through its paces. Make sure the system boots properly and the software drivers install and configure properly *. Once the system

is booted, go ahead and run your favorite software. If you have software that can utilize extended or expanded memory then it would be a good idea to verify it's proper function on the Memory/16i right away. A good test would be SOTADISK.
*SEE SOFTWARE INSTALLATION.

THEORY OF OPERATION

Page/Interleave controller

The heart of the Memory/16i is a Page/Interleave Memory Controller. Normally the memory controlled by this page/interleave system is connected to the 80286/80386SX local bus. The exception is all DMA accesses are still accessed via the 8-bit PC connector. Refresh, floppy disk and hard disk transfers all are accomplished using DMA.

The AT BIOS, Real Time Clock and the Memory/16i Control Ports are all connected to the 8-bit bus. They are all accessed by direct decoding of the PC bus address lines and read/write signals. These circuits are completely independent to all memory operations.

EMS 4.0 Mapper

The other main component of the Memory/16i is an EMS 4.0 Mapper chip. If this Mapper is enabled, all logical addresses are mapped to their physical addresses according to the LIM 4.0 EMS standard. The mapper creates 2 sets of 1 MB blocks in 64 page windows. Each page within this window consists of 16K-bytes (64 x 16K = 1MB). In conjunction with the SOTAEMS driver discussed later, we can implement the technique known as ***Paging***, sometimes referred to as ***Bank switching***.

Paging or Bank Switching

Paging consists of redirecting data from one memory location to another. In other words the SOTAEMS driver communicates with the mapper chip to convert a **Physical Page** address (memory between 0 and 1MB) within the page window into a **Logical Page** address in expanded memory. This is accomplished by the SOTAEMS driver assigning a mapping register to each of the 64 16K-byte pages in the 0 to 1MB range. When an application program (that supports EMS) accesses a physical page in the page frame the SOTAEMS driver translates this access by enabling the corresponding mapping register onto the address bus. The memory mapping portion of the chip contains two banks of 64 mapping registers. Each bank is refered to as a **Context Set**. These context sets (tasks) can be selected independently by the SOTAEMS driver thereby allowing high speed swicthing between tasks. In multitasking environments such as Windows 286/386, Desqview and Omniview this task switching could be done by one single **context set** switch. As mentioned previously this can also be refered to as ***Bank Switching.***

MEMORY SPECIFICATIONS

Memory Banks

There are several different memory configurations that are supported by the Memory/16i. Each DRAM bank consists of two (2) SIMMS. A minimum of 1 megabyte of DRAM is required on the Memory/16i.

NOTE: the software can automatically distinguish which configuration is in use by a series of tests run during a cold boot.

IMPORTANT: the first 640K of the Total Memory column of Table A-2 is reserved for DOS. In other words the first

640K of memory present on the Memory/16i replaces the 640K on your motherboard.

Memory Speeds

Table A-1 below indicates the various memory speeds required depending on the processor speed of your 286i or 386si. In most cases these chip speeds will allow virtually zero wait state performance using page mode access.

TABLE A-1

CPU (PROCESSOR)	MEMORY SPEED
12.5MHz	150ns or faster*
16MHz	100ns or faster
16MHz	150ns (1 wait state) or faster

*** If 80ns chips are installed on a 12.5MHz 286i then true zero wait state operation can be realized.**

Table A-2 below indicates valid memory configurations. Banks 0 and 1 refer to the 4 SIMM sockets located on the Memory/16i board. Refer to Figure 1.2 on page 4 for proper location of the DRAM banks.

TABLE A-2

TOTAL MEMORY	EMS RANGE	DRAM BANK			
		BANK 0		BANK 1	
1MB	320K	256K	256K	256K	256K
2MB	1MB	1MB	1MB	0K	0K
4MB	3MB	1MB	1MB	1MB	1MB

NOTE: Be aware that Bank 0 refers to the 2 outside SIMM sockets and Bank 1 refers to the 2 inside sockets. In other words from left to right the physical SIMM sockets 1 and 4 are Bank 0 and the physical SIMM sockets 2 and 3 are Bank 1. See Figure 1.2 on page 4.

Expanded Memory

Expanded memory is defined as all memory above the 640K limit that is used by an expanded memory management (EMM) software driver - in this case the SOTAEMS driver. The Lotus/Intel/Microsoft expanded memory specification (LIM 4.0) will be supported in hardware. The Memory/16i contains an EMS Mapper chip that will provide 128 EMS pages. No wait state overhead will be added for EMS thereby allowing virtually zero wait state performance.

Extended Memory

All memory above 1 megabyte that is not allocated as expanded memory (EMS) will automatically be configured as extended memory. This means if the

SOTAEMS driver, dicussed in the next chapter, is not installed then all memory above 1MB will be configured as extended memory.

SOFTWARE INSTALLATION

The Memory/16i affords you various types of memory configuration. The 640K memory (or less depending on your system) on your motherboard will no longer be required once the installation of the Memory/16i has been accomplished. The first 640K on the Memory/16i will be reserved for DOS and to run applications. Your software will perform more efficiently by accessing the much faster 16-bit memory on the Memory/16i. The memory above 640K on the Memory/16i can be configured as expanded memory. This expanded memory will conform to the Lotus/Intel/Microsoft (LIM 4.0) expanded memory specification. Memory hungry applications like Windows, Xerox Ventura Publisher and LOTUS 1-2-3 can now take advantage of this additional memory thereby instantly providing you with increased productivity.

AT BIOS Extension

SOTA16i.SYS

The SOTA16i.SYS driver provides your system with full AT compatibility. What this driver does is add all the functions of an AT BIOS to your system's existing XT BIOS. We provide this software solution due to the many and varied clones on the market today. It would be difficult to provide a hardware solution that would guarantee compatibility in every environment. If all clones and compatibles were indeed 100% compatible, then we could provide an actual AT prom on the Memory/16i itself.

Simply edit your current 286i or 386si driver line (**Device=[path]\SOTA286I.SYS or \386sI.SYS**) to be the following:

Device = [path]\SOTA16I.SYS /[Options]

NOTE: This driver replaces either the SOTA286i.SYS or 386si.SYS driver you presently employ. We have included options in order to test the memory, determine page or non-page mode and wait states on the Memory/16i. If you include the **/MEMTEST** option then all the memory on the Memory/16i will be tested, otherwise no memory will be tested. You should run this test periodically to verify the proper functioning of the memory on the 16i or when you encounter difficulties that might be attributed to faulty RAM.

For example:

One of your programs that requires large amounts of memory will not load even though you know enough memory exists on the Memory/16i.

The following indicates some of the operating options available with the Memory/16I:

- **/ZWAIT** allows for zero wait state performance in non page mode which provides the best performance. **It requires that the Memory/16i be populated with 80nanosecond DRAM.**
- **/ZWAIT /PMODE** allows for zero wait state performance in page mode. **This configuration would be beneficial only if the Memory/16i is populated with 4 megabytes of DRAM.**
- **If no parameters are used then the SOTA16I.SYS driver defaults to 1 wait state performance in non-page mode.**

WHAT IS PAGE MODE?

Page mode is a high speed method of accessing a portion (page) of DRAM. Directly after a normal access of DRAM, it is possible to hold certain signals on the DRAM to "keep the RAM on" so to speak. It is when the RAM is in this **ON** state that any locations in that particular page can be accessed in roughly half the time of normal page mode. Thus, a 150ns DRAM can be accessed in about 75ns while in the page mode. If an access of memory occurrs outside this particular page then the DRAM must exit page mode and the process starts all over again.

EMS Driver

SOTAEMS.SYS

Memory Configurations

Included with the Memory/16i is an EMS software driver with the name SOTAEMS.SYS.

Device = [path]\SOTAEMS.SYS

The SOTAEMS.SYS driver must be installed after the SOTA16i.SYS driver discussed above. Place this driver as the second line in the config.sys file.

NOTE: If you own a Floppy I/O PLUS, then the SOTA16i.SYS and SOTAEMS.SYS drivers will follow the FLOPPYIO.SYS driver in the config.sys file - this should be the only exception.

The memory between 640K and 1 megabyte can be configured as expanded only. Memory above 1 megabyte can be configured as extended or expanded memory. In order to run extended memory it will be necessary to alter the configuration of the SOTAEMS driver. This is possible by selecting the options the driver

uses to accomplish this and include them in the config.sys file.

OPTION SETTINGS

- **/X[TEND] = nnnn**
  This option will reserve **nnnn** Kbytes of memory as extended memory. The rest will be reserved as expanded memory.

- **/I[NCLUDE] = nx00-ny00**
  This option will include additional EMS pages. These pages must be in 16K segments and must have a starting address of either x000, x400, x800 or xC00.

- **Example: /I= B000-B400 /I=B400-B800**
  This would be a valid configuration if your system contains a EGA/VGA display. It would include two more 16K pages for mapping of expanded memory.

- **/E[XCLUDE]= nn00-xx00**
  This option will exclude the pages within the segment address area from nn00 thru xx00.

  - **Example: /E = D000-E000**
    This configuration might be necessary if, for example, a conflict with a Network system occurs. Possibly the network is using the above segment addresses, therefore SOTAPOP must exclude this segment address space in order for the network to function properly.

- **/V[IDEOFILL]**
  This option will forefill the DOS area up to 736K depending on the video display board installed in the system.

NOTE: See TABLE A-3 on the following page for forefill requirements.

TABLE A-3	
VIDEO DISPLAY	MEMORY FILLING
EGA/VGA	640K (No Forefill)
MONCHROME	704K (Forefill)
CGA	736K (Forefill)

- **/F[RAME] = nn00**
  This option allows the user to specify the starting page frame address used for EMS page switching.

- **/F[RAME] = ALL**
  This option reserves all pages except the page frame as high memory address space for loading drivers and TSRs high.

- **/NO[FRAME]= No Page Frame**
  This option reserves the page frame segment as mappable memory or for loading drivers and TSRs high.

- **/R[ESERVE]= nn00-xx00**
  In order to load drivers and TSRs into high memory a segment address space must be reserved for these drivers to occupy.

  - **Example: /R= D000-E000**
    This will reserve the entire D bank. This segment address space will then be used by **LOADDRV.SYS** and **LOADTSR.COM** (See following sections) to store all drivers and TSRs.

- If the SOTAEMS.SYS driver is installed with no parameters then it will default to the following:
  - If an EGA display adapter is detected then the segment area from A000-C000 is automatically excluded.
  - If an CGA display adapter is detected then the segment area from B800-C000 is automatically excluded.
  - If an monochrome display adapter is detected then the segment area from B000-B800 is automatically excluded.

Memory Utilities

LOADDRV.SYS

LOADDRV.SYS provides the capability to load software drivers **(hereafter refered to as a program)** into high memory - memory between the first 640K and 1MB. Oridinarily any drivers present in your config.sys file will occupy low memory, that is to say memory within the first 640K. For instance, your config.sys file might contain a mouse driver, ansi.sys driver, network drivers and any number of other drivers that will occupy memory within the 640K DOS area. This decreases valuable DOS space that could be better used by application programs. LOADDRV.SYS installs in your config.sys file and has the following syntax:

Device=LOADDRV.SYS /[Options] /PROG=[Driver] /[Parameters]

An example of what the above driver line might look like in a real situation is as follows:

Device=LOADDRV.SYS [Options] /PROG=Mouse.sys

The above line will load the mouse driver **mouse.sys** into high memory. This driver line would be repeated for every separate driver you wish to load high.

LOADTSR.COM

LOADTSR.COM , like LOADDRV.SYS is a program that provides the capability of loading high. The main difference is that LOADTSR.COM, like its name implies, loads Terminate and Stay Resident programs **(hereafter refered to as a program) into high memory.** An example of a terminate an stay resident program would be **TURBO SIDEKICK by BORLAND**. LOADTSR.COM installs in your autoexec.bat file or can be run on the command line. The proper syntax for this program is as follows:

LOADTSR /[Options] /PROG=[TSR] /[TSR Parameters]

An example of what the above line might look like in a real situation is as follows:

LOADTSR /[Options] /PROG=SIDEKICK

The above line will load turbo sidekick into high memory. If you have other TSRs to load high you must repeat the above line for each of them.

Several options are available for LOADTSR.COM as well as LOADDRV.SYS that allow you to specify certain conditions when loading programs high. A discussion of these options follows:

OPTIONS SETTINGS

The LOADDRV.SYS and LOADTSR.COM options are included as follows:

Device = LOADDRV.SYS /[Options]
LOADTSR /[Options]

The options available are described below:

- **/A[REA]=n**
  This option allows you to specify which **RESERVED** memory segment address area to load the program to. Refer to the **/R[ESERVED] = nn00-xx00** option in the section on the SOTAEMS.SYS driver. Say that you had two segment addresses reserved as follows:

Device=SOTAEMS.SYS /R=D000-E000 /R=E000-F000

The first reserved memory segment address area (D000-E000) would be **1** and the second reserved area (E000-F000) would be **2** . In this case you could load certain drivers and/or TSRs at AREA 1 and others at AREA 2 as follows:

LOADTSR /A=1 /PROG=SIDEKICK
Device=LOADDRV.SYS /A=2 /PROG= Mouse.sys

The above lines would load SIDEKICK into the D bank and Mouse.sys into the E bank. This, of course, is only applicable if more than one segment address area is reserved. Be advised that you are not limited to one driver per reserved area. AREA 1 above could hold several TSRs as AREA 2 could hold several drivers.

- **/G[ETSIZE]**
  This option will report the memory usage of the program being loaded. It will report two seperate memory usage amounts.
  - The first amount will indicate how much memory was required for loading and initializing the program.
  - The other amount will indicate how much memory this particular program has reserved for its own use.

- **/H[ELP]**
  This option will display a help screen on the options being discussed here.
- **/M[ENU]**
  This option provides the choice to either load the driver or skip over. There might be times when you do not wish to load certain drivers and this is an alternative to editing these drivers out of the config.sys file.
- **/NOL[OW]**
  Oridinarily, if a program cannot fit into high memory then it is automatically loaded into low memory (640K DOS area). This option prevents any program from being loaded in the 640K DOS area when it has been determined that it cannot be loaded high.
- **/NOP[AUSE]**
  This option will prevent pausing on errors.

IMPORTANT

When the GETSIZE option (refered to earlier) is employed it returns the amount of memory necessary in order to load the specific program high as well as the amount of memory required for the program to run. The amount of memory that the program occupies might be significantly different depending on if the program is being executed or not - as with SIDEKICK for example. In order to customize how the memory is allocated you can run LOADDRV.SYS and LOADTSR.COM with the GETSIZE option on all, or some of the programs you wish to load high. The values returned by GETSIZE can then be included with the options outlined below. It would require editing the config.sys file and adding one of the following three options to the appropriate driver line and replacing the n variable with the value returned by GETSIZE.

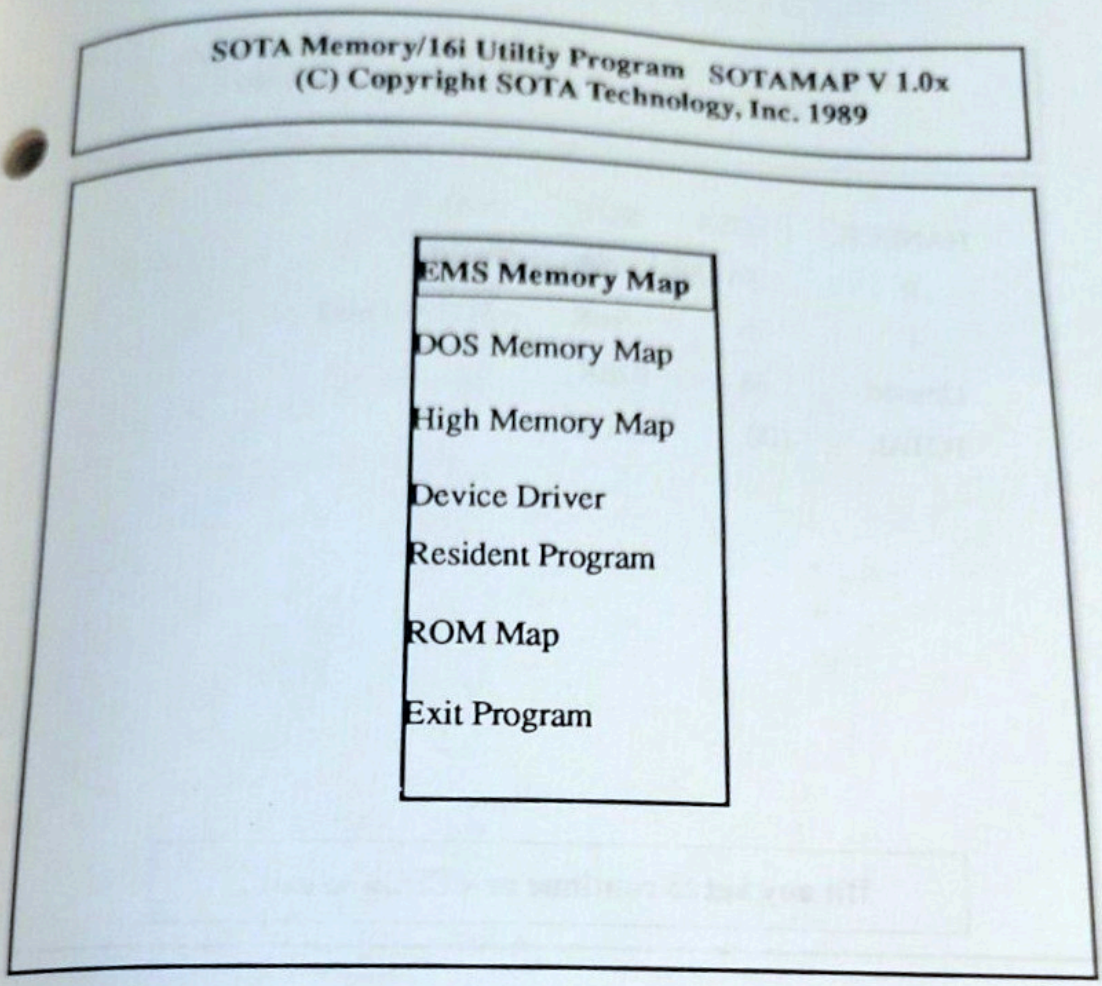
- **/B[YTE]=nnnn**
  This option allows you to specify how many bytes that are necessary to load the program into.
- **/K[B]=nn**
  This option allows you to specify how many kilobytes that are necessary to load the program into.
- **/P[ARA]=nnn**
  This option allows you to specify how many paragraphs (16K byte increments) that are necessary to load the program into.

NOTE: There are other ways to determine the memory requirements of a driver or TSR. This was merely an example approach.

- **/S[AVEHLP]= FILENAME**
  This option will save the **help screen** generated by the **/HELP** option to an ascii file. You can then type the ascii file on screen. This avoids having the /HELP option on the driver line.

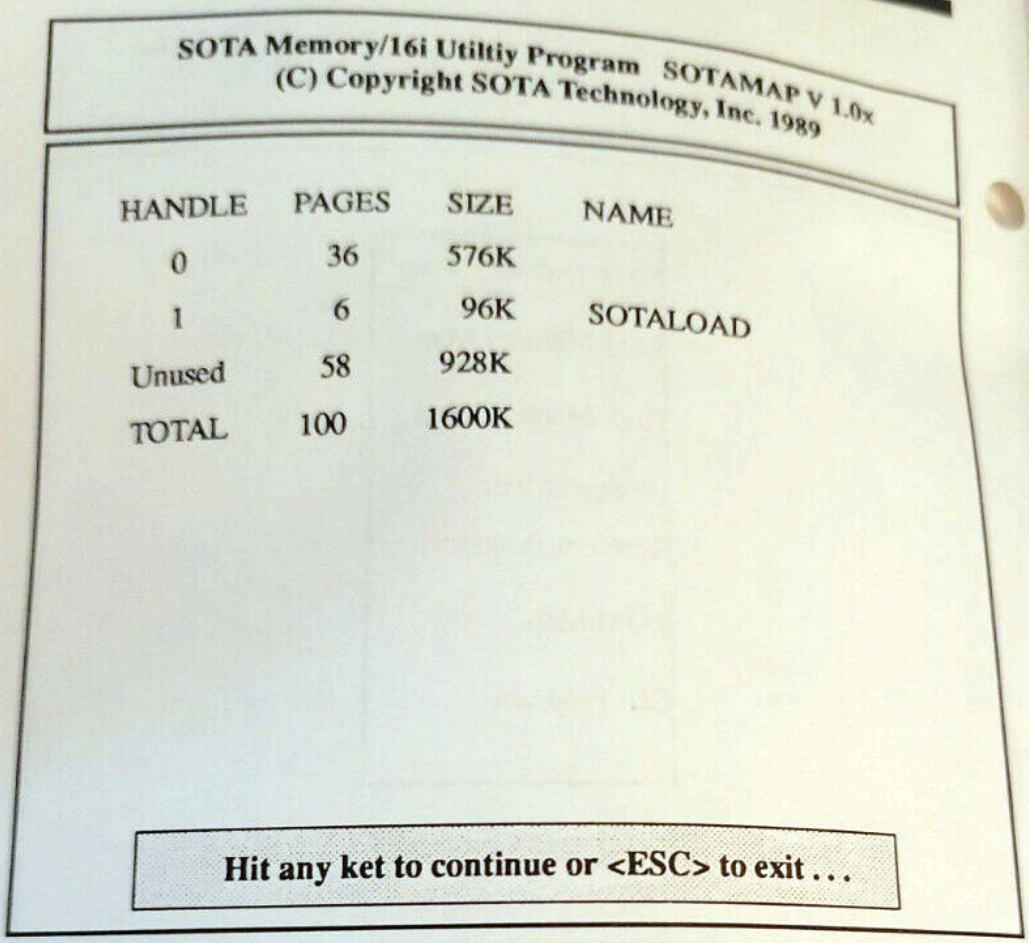
SOTAMAP.EXE

- SOTAMAP.EXE is a utility that displays a detailed description of the current memory configuration you are running under. After SOTAPOP, LOADDRV and LOADTSR have been loaded you can run SOTAMAP to see what the current memory status is. Run SOTAMAP and the menu on the following will appear.



SOTAMAP MAIN MENU

You can see that several choices are given that provide information about EMS memory mapping, high memory mapping, ROM addressing, etc.. Just use the arrow keys on your keyboard to choose a menu item. By pressing <ENTER> the highlighted menu item will be invoked - in this case EMS Memory Map. The following pages provide a brief description of the menu items and what information is made available by each.



The **EMS Memory Map** item displays, among other things, how much mappable EMS memory is in your system, how many pages (16K increments) of mappable EMS memory are being used and how many pages are free for use. Mappable refers to the amount of memory that can be used in a multitasking environment for task switching. The above example implies that 576K of the DOS area plus a megabyte of expanded memory are available (1024 + 576 = 1600). Actual EMS memory size, in this case, is 1024K plus whatever portions (segment addresses) that can be employed in the 640K to 1MB range (**See the /INCLUDE option on page 20**).

```
SOTA Memory/16i Utiltiy Program  SOTAMAP V 1.0x
(C) Copyright SOTA Technology, Inc. 1989

F000 (960K)  R R R R
E000 (896K)  F F F F
D000 (832K)  H H H H
C000 (768K)  R R H H
B000 (704K)  V V V V
A000 (640K)  V V V V
9000 (576K)  M M M M
8000 (512K)  M M M M
7000 (448K)  M M M M
6000 (384K)  M M M M
5000 (320K)  M M M M
4000 (256K)  M M M M
3000 (192K)  M M M M
2000 (128K)  M M M M
1000 (064K)  M M M M
0000 (  0 K)  D D D D

R: ROM Area          M: Mappable
V: Video Buffer      F: Page Frame
D: DOS Area          H: Reserved High
E: Exclude              Memory
                     I: Include

Command Line Parameters:
    RES=C800-E000

Hit any ket to continue or <ESC> to exit . . .
```

The **DOS Memory Map** item displays information on the first megabyte of memory - that is the 640K DOS area and the high memory area between 640K and 1 Megabyte. The left column indicates the segment address as well as the byte location in which that segment starts. The rows of characters indicate what occupies these specific locations. At the right are the definitions for each character. The letter **R:** stands for ROM Area etc.. In the above example the area between 64K and 640K is mappable memory, A000 through C000 is the video buffer, etc.. The **RESERVE** option used by the SOTAPOP.SYS file, in this example, reserved a 96K block from C800-E000 and is signified with the **H** character.

SOTA Memory/16i Utiltiy Program SOTAMAP V 1.0x
(C) Copyright SOTA Technology, Inc. 1989

AREA	SEGMENT	SIZE (para/byte)	NAME
1	C800	1C8 / 7296	Driver Name
1	C9C9	14E / 5344	"
1	CB18	13C / 5056	"
1	CC55	235 / 9040	"
-	CE8B	173 / 5936	[Hole]
2	CFFF	1000 / 65536	Driver Name
2	E000	7581 / 30080	"
2	E759	8A61 / 35424	[Free]

Hit any ket to continue or <ESC> to exit . . .

The **High Memory Map** item displays the AREA, starting address, size (paragraphs and bytes) and name of all drivers and TSRs presently loaded high. The AREA column refers to the segments reserved with the /RESERVED option of the SOTAEMS.SYS driver. The statement [Hole], under the NAME column, refers to a gap between the reserved segment areas 1 and 2. The statement [Free] simply means that memory is still available in AREA 2 to load more drivers and TSRs - in this case 35,424 bytes.

The **Device Driver** item lists specific information on all the device drivers present in the system. This includes all system devices i.e. COM ports , Parallel Ports, etc.. This item will not be particularly useful to most users, however, it provides useful information for programming at the hardware level. It provides all the device names, the particular device's attribute and type, the segment and offset of each device, its size in bytes and interrupt routine. If you're a low-level programmer then you know what the above items refer to and if you're not don't worry about it!

The **Resident Program** item lists information on ***memory control blocks (MCB).*** These MCB's are at the beginning of every DOS memory block and contain data on the memory block that directly follows in memory. We list the size (in paragraphs and bytes) of the memory block, the **PID** which is a word (2 bytes) that identifies the owner of the memory block, the parent address of the program resident in the memory block, whether it is the environment block or the actual program code and finally, the actual program command line. Again, this is information that will probably be of little use to most users except for those low-level programmers out there.

The **ROM Area** item lists the start and ending segment addresses along with the size in bytes for Video ROM and BIOS ROM.

All the information provided by SOTAMAP is provided for those users who might find it useful. It is quite possible that you will never need to run the program at all. However, it can be educational and we suggest you give it a look at least once. Who knows, you might learn something in the process and it may help you take better advantage of the features provided by the SOTA POP.

RAM DISK

SOTADISK.SYS

The RAM disk driver that was included on your 286i or 386si utility diskette is the same driver we provide with the Memory/16i. The SOTADISK.SYS driver provides the ability to set aside a portion of RAM and treat it as if it were disk space.

When the above driver is installed DOS will recognize a new drive letter one letter higher than previous to installation. If you had drives A-D then your RAM disk would be designated as drive E. This new drive will operate at a much faster rate than your mechanical drives.

NOTE: Any data stored in this RAM drive will be lost upon the turning off or rebooting of your system. It is important to copy all work from drive E in this example to a physical drive - either floppy or hard disk before you turn off or reboot your computer.

The installation is simple and involves a minor edit of your config.sys file. If you plan on running a RAM disk with EMS memory then this driver should be installed after the SOTAEMS driver discussed earlier.

To install SOTADISK, perform the following:

- Copy the file SOTADISK.SYS to the directory of your choice.
- Add the following line to your config.sys file:

  Device = \[path]\SOTADISK.SYS

- Reboot the computer to activate this new configuration.

DEFAULT:

If no option is specified, SOTADISK will use half of the EMS memory available as a RAM disk. If no EMS mem

ory is available then it will use 64K of DOS memory as a RAM disk.

OPTIONS:

To alter the default configuration we provide some parameters that allow you to specify what memory type and amount to allocate as a RAM disk.

To install SOTADISK's optional parameters, perform the following:

- Use a text editor e.g. edlin, to edit your config.sys file.
- On the line Device = \[path]\SOTADISK add one of the following:

/EMS= nnn Set amount of LIM expanded memory to use as RAM disk.
/DOS=nnn Set amount of DOS memory to use as a RAM disk.

- ☐ nnn specifies the amount of memory, in kilobytes, to be allocated as a RAM disk and is rounded up to the nearest 16K increment. If the optional parameters are used then the total amounts specified by nnn determines the RAM disk size.

EXAMPLE:

Device = \[path]\SOTADISK.SYS /DOS=64 /EMS=128

The above line will install a total of 192K of memory as a RAM disk of which 64K is DOS and 128K is EMS.

DISKCACHE

SOTACACH.COM

Similar to the RAM disk driver, the disk caching utility helps to speed up programs which use the disk often.

Unlike the RAM disk, it is completely transparent to the user, and does not lose data when the computer is turned off, rebooted or you suffer a power failure. In fact, the only disadvantage it has compared to the RAM disk driver is that it uses the mechanical disk when it needs to.

You can run the disk caching program, SOTACACH.COM, from either the DOS command line or your AUTOEXEC.BAT file. Do not put it in your CONFIG.SYS file since it is not a DOS device driver.

SOTACACH supports both conventional and expanded memory. To use expanded memory, you must have the SOTA Memory/16i software driver installed. To install SOTACACH, do the following:

If you want to use EMS memory, make sure that an EMS driver is installed in your CONFIG.SYS file.

Copy SOTACACH.COM to the directory of your choice.

Make sure that you add the directory where SOTACACH.COM is located to your system path before trying to run SOTACACH.Examine the options below and determine what options you want to use when installing the cache.

Add the following line to your AUTOEXEC.BAT file:

SOTACACH [*options*]

This command and its corresponding options may be entered in your AUTOEXEC.BAT or just by typing them in at the DOS prompt.

DISK CACHE OPTIONS:

To alter the configuration of the SOTACACH you may select the parameters it uses by adding the following options to the AUTOEXEC.BAT or just by typing them in when you enter the command:

/HARD= n n n n ON

Activate caching on the specified hard disk. The disk is specified as a physical number. ie: 1 is the first hard disk, 2 is the second hard disk.
NOTE: This option is only necessary if you desire to cache specific hard disks. If you want to cache all hard disks then the following is sufficient:

SOTACACH /DOS= nnnn

/HARD= n n n n OFF

Deactivate caching on the specified hard disk. The disk is specified as a physical number. ie: 1 is the first hard disk, 2 is the second hard disk. If no disk is specified then all hard disks are affected.

/FLUSH= n n n n

Flush data from cache for the specified hard disk. If no disk is specified then all hard disks are affected. If you have the removeable hard disk such as Bernolli Box you should flush the disk cache everytime you change the cartrige.

/FLOPPY= n n n n ON

Activate caching on the specified floppy drive. The drive is specified as a physical number. ie: 1 is the first floppy drive, 2 is the second floppy drive. If no drive is specified then all floppy drives are affected.

/FLOPPY= n n n n OFF

Deactivate caching on the specified floppy drive. The drive is specified as a physical number. ie: 1 is the first floppy drive, 2 is the second floppy drive. If no drive is specified then all floppy drives are affected.

/EMS= nnnn

Set the amount of LIM Expanded Memory to use. nnnn specifies the number of KB to use.

/DOS= nnn

Set the amount of DOS memory to use. nnn specifies the number of KB to use.

/TIMEOUT= nnn

Usage: SOTACACH /TIMEOUT= nnn
☐ where nnn is 55 msec increments.

Example: SOTACACH /TIMEOUT= 36

sets timeout to approximately 2 seconds (DEFAULT).

The /TIMEOUT option controls when floppy disk caching buffers are cleared. This option is usually used for systems that do not have hard disk drives, and must use floppy disk drives to run application software. Most accesses of the floppy disk drive occur within 2 seconds of each other in a given task, so the default value of 2 seconds is adequate in most instances. It also takes at least 2 seconds to change a floppy diskette, so the default value automatically flushes the the floppy cache before another diskette can be accessed.

If disk intensive applications are being run and the diskette is never changed, you may use a /TIMEOUT value of "0".

Then the floppy cache will never flush and RAM speeds can be approached on disk accesses.

The floppy disk cache (if set) must be flushed whenever the diskettes are changed. Anytime the floppy disk drive is accessed the drive mechanism is turned on, which is rather slow, so instead of checking the physical device for media (diskette) changes, automatic cache flushing is employed.

EXAMPLE:

SOTACACH /DOS=16 /EMS=112

The above line will install SOTACACH with 16K bytes to DOS memory, 112K bytes allocated to EMS memory. All hard disks will be cached and no floppy drives will be cached.

NOTE: You can set these SOTACACH options in the autoexec.bat file or from the command line, but remember that once the /DOS and /EMS options are set you can not re-initialize them without re-booting the system. All other parameters can be re-initialized without a re-boot.

PRINT SPOOLER

SOTASPL.COM

No matter how fast your computer runs, it often has to slow down to print. Since the printer can only print at its rated speed, the computer spends a lot of its time waiting for the printer to accept the next character. With the SOTA print spooling program, you can send data to a RAM buffer very quickly, then return to work while the spooler feeds data to the printer for it to print at its maximum speed.

You can run the print spooling program, SOTASPL.COM, from either the DOS command line or your AUTOEXEC.BAT file. As with the disk caching program, it will not operate properly if installed in the CONFIG.SYS file.

SOTASPL.COM supports both conventional and expanded memory. To use expanded memory, you must have the SOTA Memory/16i option and its software driver installed. To install SOTASPL.COM, do the following:

If you want to use EMS memory, make sure that an EMS driver is installed in your CONFIG.SYS file.

Copy SOTASPL.COM to the directory of your choice.

Make sure that you add the directory where SOTASPL.COM is located to your system path before trying to run SOTASPL.

Examine the options below and determine what options you want to use when installing the cache.

Add the following line to your AUTOEXEC.BAT file:

SOTASPL [*options*]

PRINT SPOOLER OPTIONS:

To alter the configuration of SOTASPL.COM, you may select the options available by adding the following parameters to the AUTOEXEC.BAT or just by typing them in when you run SOTASPL.COM.

/LP= n	n is the printer number to specify (1 or 2)
/DOS=nnn	nnn is the number, in K-bytes, of DOS
/EMS=nnnn	nnnn is the number, in K-bytes, of EMS memory to use.
/TAB=nnn	nnn is the number of the column position of each tab.
/LEFT=nnn	nnn is the column position of the left margin.
/RIGHT=nnn	nnn is the number of columns in a line.
/PAGE=nnn	The number of lines on a printed page.
/BREAK=nn	nnn is the column where the lines end on a page.
/NOINT	specifies the printer hardware interrupt.
/INT=nnn	nnn is a specific IRQ line to use with the printer.

By default, LPT1: is spooled using both the printer and timer interrupts. For example:

SOTASPL /DOS=16

The above line will install SOTASPL with 16k bytes of DOS memory allocated. The parallel printer will be spooled.

Real - Time Clock

SOTACLK.EXE

The Memory/16i would not be complete without a clock feature, therefore, we have included a real-time clock which will keep track of the time and date even after you turn your system off. If you are running DOS version 3.0 or later it will recognize the real-time clock's presence and update its internal time automatically. If you are using DOS 3.3 it will set the real-time clock when using the DOS TIME and DATE commands. Therefore, it is unnecessary to install the clock program if you run under DOS 3.0 or later. However, if you are still using DOS 2.x, then the real-time clock will not be automatically recognized. It is for this situation that we supply the real-time clock utility called SOTACLK. This utility can update the DOS TIME and DATE or you can set the real-time clock yourself. Follow the instructions below for installing SOTACLK:

- Copy the file SOTACLK.EXE to the directory of your choice.
- To set the clock manually run the following command:
  - SOTACLK /I
- The /I parameter option will prompt you for the present date and time. It will then update the real-time clock and DOS from the values you enter.

- Add the following line to your Autoexec.bat file
  - SOTACLK /R
- The /R parameter option will cause SOTACLK to read the real-time clock and update the DOS TIME and DATE.

Software Theory of Operation

In addition to the high performance hardware, each SOTA Memory/16i includes SOTA Productivity software which takes advantage of its unique features. The following productivity software comes standard with the SOTA Memory/16i package:

- *Ram Disk*
- *Disk Cache*
- *Print Spooler*

To familiarize you with how each program works we will cover the theory of operation in the next few pages.

RAM DISK

RAM DISK is also called VIRTUAL DISK or DISK EMULATION. The RAM Disk software that comes with your SOTA 386si lets you use some memory (RAM) as though it were a disk drive. Unlike an ordinary disk drive, a RAM Disk has no mechanical parts, so it works much faster. As a result, it speeds up the access of your data.

Once the RAM disk has been created, you can COPY to it, COPY from it, ERASE files from it or run any other DOS commands with it. However, because RAM disk is a device driver, it must be setup in your CONFIG.SYS file, and all the data will disappear when ever you reboot or turn off the computer.

A RAM disk is especially useful with application programs that frequently access overlays, libraries or

temporary files. You can tell how often a program accesses a disk drive by watching the drive lights go on and off. When a disk drive's lights come on, the computer is accessing (reading from or writing to) the disk.

When running a program, if you notice the disk drive light flashing often, you could probably speed up that program by using a RAM disk to replace the conventional drive. If you write new data files on a RAM disk, realize that the files could be destroyed if a power failure occurs. So, you should copy your new data files from the RAM disk to your hard disk or floppy diskette FREQUENTLY, and you should not write any important data files to the RAM disk.

If you keep the differences between RAM disk and magnetic disk in mind, you can safely use a RAM disk to speed up your application programs.

DISK CACHE

Disk cache is a program that essentially speeds up disk activities (floppy & hard disk). Disk cache is similar to RAM disk in many ways. They are similar in that they both speed up disk access, but disk cache is more advanced than RAM disk because it speeds up your program automatically without user intervention.

Disk cache reserves RAM (conventional or EMS) as buffers to hold copies of data from the disk. Every time an application reads the disk, the cache program first looks in the buffer to see if it already has the requested data. If it does, then it eliminates the disk read which makes your application run faster. Each time there is a disk read that is not in the buffer, a disk access occurs and the buffer is gradually filled. When the buffer is full and a disk read is required that is not in the buffer, it discards the least recently used data to make room for the new data.

The copies of the sectors are held in sequence according to frequency of usage. Every time a sector is read, it is placed at the top of the list. As a result, heavily used sectors such as the directories, indices to a random file or your word processor's overlays are automatically held in memory, providing dynamic optimization that is independent of the application. In conclusion, disk access time is cut dramatically without any user intervention.

PRINT SPOOLER

The print spooler is a piece of software that lets you print a document without tying up your computer. While your documents print, you can continue working.

When you work at your computer, it can be annoying to stop, send a document to the printer, then wait for the printer to finish before you go back to what you were doing. Though most programs are capable of transfering documents very quickly, most printers receive data slowly.

A print spooler solves this problem by turning some of your computer memory into a data buffer. Data pours in from the application program to the memory, stands in memory until the printer is ready for it, then flows to the printer at a rate the printer can handle.

Your application programs can work faster when they send data to memory because the memory, unlike the printer, can accept data rapidly. With a print spooler, your computer is free for other work as soon as the printer buffer (memory) has been filled. While you go on working, the data waits in memory until the printer is ready for it. The print spooler never interferes with you or your program.

ADDITIONAL UTILITIES

For DESQview Users:

In order that XDV.COM works with QEXT.SYS to gain the largest partition size for DESQVIEW, two programs named QEXTON.COM and QEXTOF.COM are included on the SOTA Memory/16i utility diskette. These programs are run from a batch file called SOTAXDV.BAT. The batch file is listed below. Run this program in lieu of DESQview's xdv.com

```
SOTAXDV.BAT : echo off
              qexton
              xdv /L
              qextof
```

For MS/Windows 286 Users:

In order for Windows to gain extra memory to use in high memory, SOTA has written its own version of HIMEM.SYS and included it on the SOTA Memory/16i Utility diskette.

Typical usage in the CONFIG.SYS file might be :

```
DEVICE = [path] SOTA16I.SYS
DEVICE = [path] HIMEM.SYS
DEVICE = [path] SOTAEMS.SYS
```

(SOTAEMS.SYS will detect HIMEM.SYS and reserve the lowest 64K of extended memory, i.e. the 64K right above 1MB)

or

```
DEVICE = [path] SOTA16I.SYS
DEVICE = [path] SOTAEMS.SYS /XTEND=64
DEVICE = [path] HIMEM.SYS
```

APPENDICES

APPENDIX A - JUMPER SETTINGS

Figure 1.4 below indicates the jumper locations on the Memory/16i. We will refer to the jumper settings as either **open** or **closed**. Closed indicates that the jumper covers both pins while open implies that no jumper is present.

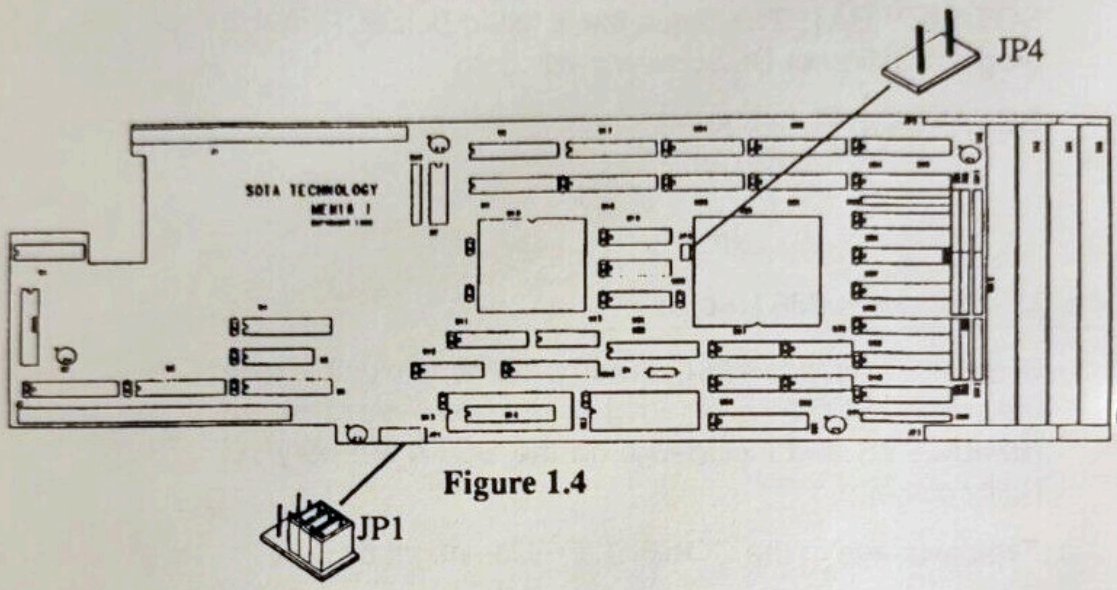


Figure 1.4

Figure 1.5 indicates the default jumper settings for the jumper block JP1 noted above. JP1 consists of 5 sets of pins that we will refer to as jumper sets 1 through 5 going from left to right. The jumper sets signify the following:

Jumper Set 1

This jumper controls whether or not **parity errors** on any memory controlled by the Memory/16i are reported. The default setting is open which means parity is disabled.

Jumper Set 2

This jumper sets the real time clock to interrupt line IRQ7. This setting requires that jumper set 2 be closed.

Jumper Set 3

This jumper sets the real time clock to interrupt line IRQ2. This is the default setting (closed) and in most cases you should not need to change this interrupt line.

Jumper Set 4

This jumper set controls I/O addressing and can be selected as either (170 to 18F) or (270 to 28F). The default setting is closed and indicates 170 to 18F addressing.

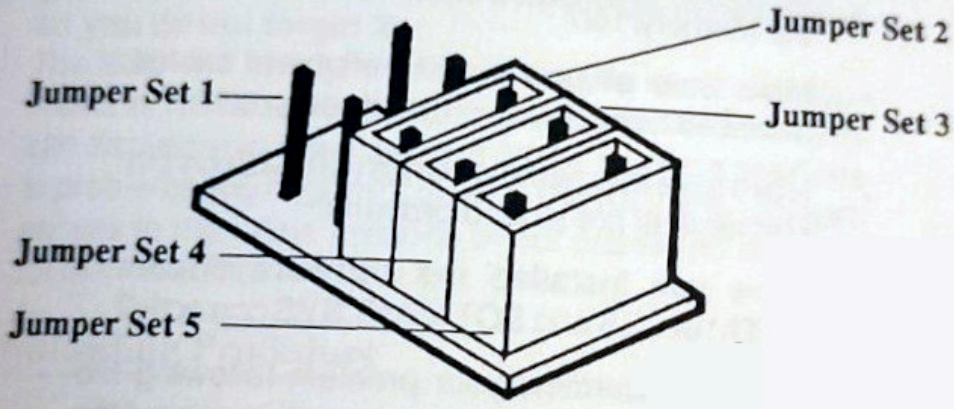


Figure 1.5

Jumper Set 5

This jumper set selects which memory bank the AT BIOS will reside in. The default is closed and indicates the E bank (E000:0000), however by removing the jumper the AT BIOS will reside in the D bank (D000:0000).

Figure 1.4 indicates jumper block JP4 which controls DMA wait states. This is not intended as a user selectable option. You should leave this jumper in its default setting (open) as shown in figure 1.4.

APPENDIX B - TECHNICAL SUPPORT

Before calling SOTA for technical assistance please read the following suggestions of things you yourself can look for in determining your problem. This will save you the time and expense involved in a long distance call to our technical support department.

- Are you sure that you have attached the 286i or 386si to the Memory/16i properly? Make sure all the pins are inserted and none are bent or broken.
- Have you checked Appendix A in this manual to verify that the jumper settings are correct on the Memory/16i?
- Make sure all power and peripheral cables have been reinstalled on your computer.
- Make sure the memory banks (SIMMS) on the Memory/16i are seated properly.
- Have you installed the software drivers SOTA16i.SYS and SOTAEMS.SYS correctly?

If you could not determine your problem following the above suggestions or if you still have questions about the SOTA Memory/16i please contact SOTA Technology Inc. and ask for the technical support department. Please have the following information available before calling :

- The make and model of the computer being used.
- Do you own a 386si or 286i.
- A detailed description of the problem.

Our technical support department will answer your questions Monday through Friday between 8:00 AM and 5:00 PM (PST) at (408) 745-1111.

APPENDIX C - SOTA BULLETIN BOARD

If you own a modem feel free to take advantage of our BULLETIN BOARD SYSTEM (BBS). You can reach our BBS 24 hours a day at (408) 745-0326. The BBS accepts BAUD rates of 300,1200, and 2400 using the parameters N,8,1(no parity, 8 bit word, 1 stop bit).

When you first logon to the BBS it will asked you to enter some information for our records i.e. your name, city&state, phone number(home/office),SOTA product you own, as well as a password of your choice. Once you have entered a password the BBS will ask for verification and from then on you will need to enter this password to gain access to the BBS. **Make a note of your password so you do not forget it.**
The BBS will help you keep up on the latest developments at SOTA as well as provide a forum in which you can discuss with other users of SOTA products solutions to problems you might encounter. The BBS also provides access to the latest versions of our product(s) software for downloading.

Downloading Procedure

- At the **Main Board Command** enter **F** (for file directories) and then <Return>.
    - A list of product directories i.e. 286i, 386i etc. will be displayed numbered 1 to n (n being the current number of products available).
- Choose the product directory of your choice.
    - All the file names (utilities and drivers) for the given product will display.
- At the prompt enter **D** for download.
- It will then ask what file you want to download. Enter the file name you want to download and the press <Return>.

- The BBS will then prepare for downloading and will display some information similar to the following.
  - The file to be downloaded.
  - How many bytes the file is.
  - Estimated time to download.
  - Number of blocks to download.
- At this point it will be necessary for you to initiate the downloading procedure of your particular communications package.
  The following example is for users of **PROCOMM:**
  - When the above information is displayed it is time for you to initiate download.
  - Press the <Pg Dn> key on your keyboard.
  - Choose number **(1) Xmodem** protocol option.
  - It will then prompt you for a file name to download to your system. Choose any file name or simply keep the same name we have given the file. Press <Return>.

The file should then begin to download onto your system. When the download is complete press <Return> and continue on with your BBS session.

NOTE: Most communication packages will have a similar download procedure.

APPENDIX D - OTHER SOTA PRODUCTS

SOTA FLOPPY I/O PLUS

The **Floppy I/O Plus** is a floppy controller card for PC/XT's which comes standard with the following:

Support for up to 4 floppy drives.

Will support any combination of 360K,720K,1.2MB and 1.44MB floppy drives and tape drives.

Comes standard with 1 serial and 1 parallel port. (second serial port is optional)

Attaches directly to the 286i or 386si (if the Memory/16i is not installed on the 386si or 286i) or can be installed in any standard expansion slot on the motherboard.

SOTA VGA/16+

The **SOTA VGA/16+**is a state-of-the-art video adapter that offers features and functionality equal to and beyond any other in the VGA class of graphics boards. The **SOTA VGA/16 + features are as follows:**

System level compatibility with the IBM VGA Adapter.

Register-level compatibility with existing EGA/ CGA/MDA and Hercules graphics stadards.

Graphics resolution modes providing 640x480, 800x600, and 1024x768 High Resolution when used with the appropriate monitor *(A monitor that supports High Resolutions modes).*

Text modes providing 132x25, 132x28,132x44, 100x40, and 80x60 resolutions.

Running extended text modes in Lotus 1-2-3 and Symphony; and extended graphics mode drivers for AutoCAD, Digital Research GEM, Microsoft Windows, Ventura Publisher, WordPerfect 5.0 and Framework II.

able DOS memory for use by large applications such as Ventura Publisher and LOTUS 3.0. By providing full implementation of the LIM EMS 4.0 specification, SOTA POP can support multitasking programs like DESQview, Windows 286, Omniview and Software Carousel. Imagine working in Ventura Publisher while your LOTUS 3.0 spreadsheet recalculates in the background!

APPENDIX E - TROUBLE SHOOTING GUIDE

Symptom: The clock on the Memory/16i will not keep the correct time and date.
Action: Make sure that **jumper set 2 or 3** on the JP1 jumper block is closed (see APPENDIX A). Run the SOTACLK program. First run SOATCLK /I to set the time and date and also put the line SOTACLK /R in your autoexec.bat file.

Symptom: I can not access my network after installing the Memory/16i.
Action: Determine the segment address area your network resides in and exclude this area via the SOTAEMS driver.

☐ **Example:** Assume your network is occupying the D bank segment area then **Device = SOTA16i.SYS** /E=D000-E000 will exclude the entire D bank.

Symptom: My computer hangs while counting the extended memory on the Memory/16i. It might appear something like the following:

Testing Low Memory 1024K Passed
Testing Extended Memory 0000K_

Action: This is mostly likely due to improper installation of the SOTA16i driver. For instance, the Memory/16i might be populated with 100 or 150nanosecond DRAM and your driver line in the config.sys file looks like so:

Device = SOTA16I.SYS /ZWAIT

The /ZWAIT parameter is only valid if the Memory/16i is populated with 80nanosecond DRAM. Either remove the /ZWAIT parameter or add the parameter /PMODE to the above driver line if your board has 4 megs. If you have a 2 meg board then do not use any parameters.Refer to page 12 for more details.

ADDENDUM

386si and Memory/16i

IMPORTANT

If you own a 386si then read the following information concerning the SOTA16i.SYS driver parameters.

DO NOT use the /ZWAIT parameter under any circumstances.

If your memory/16i is populated with 4 MB of DRAM then use the /PMODE parameter for increased performance.

IMPORTANT

You must remove the first jumper of the JP5 jumper block of the 386si board in order for the Memory/16i and 386si combination to function normally. See page 43 of your 386si manual. Figures 3 and 4 refer to the necessary adjustments for IBM PC originals - follow these guidelines.

386si or 286i and Memory/16i

IMPORTANT

Due to the many and varied hard disk controllers on the market SOTA suggests that prior to installing the Memory/16i in your system that you perform a backup of your hard disk. This is merely a precaution that all hard disk users should employ to eliminate any unnecessary loss of data.

Loading high

Type loadtsr /? for options menu that will indicate options valid for both the loaddrv.sys and loadtsr.com utilities.