

CBM EXPANSION MEMORY BOARD

USER'S GUIDE

SOFTWARE ADDENDUM

Part Number 324065-01

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B	Assembly listing of Add-on-load
C	Assembly listing of Exp. BASIC
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Chapter IV

64k SYSTEM DISK

INTRODUCTION

By using the 64k Expansion Memory Board you have given your system a soft load capability and also expanded program work space. We have provided a disk with several programs to demonstrate these functions.

```
ADD-ON-LOAD
ADD-ON-LOAD.SRC
ADD-ON-MON
ADD-ON-MON.SRC
BASIC2.0
BASIC4.0/40
BASIC4.0/80
EXPANDED-BASIC
EXP-BASIC.SRC
EXPANDED-DEMO
STTEST
TEST1
TEST2
TEST3
TEST4
```

For your convenience we have recorded these programs in 8050 format on one diskette surface and in 4040 format on the flip side. Use the corresponding side for your system and make a back-up copy before use.

ADD-ON-LOAD

This program is a special loader which loads one of three special versions of BASIC, which we have provided on the disk, and jumps to the proper entry to execute them. These versions of BASIC reprogram the CRT controller of your 8032 to become a 40-column display. With this environment, all old 40-column programs in BASIC 2.0 and 4.0 will run on your 8032.

To load and execute a version of BASIC, type the following sequence of commands:

```
DLOAD"ADD-ON-LOAD" <return>
RUN <return>
```

Your CRT should display the following message:

64K ADD-ON-LOADER 2-12-81

SYSTEM NAME?

The cursor will be blinking for you to enter one of the following system names followed by <return>:

BASIC2.0
BASIC4.0/40
BASIC4.0/80

In a few moments your 8032 will print the logon message from the program you selected.

BASIC 2.0

This is the 40-column BASIC found in all the 3016 and 3032 business keyboard machines. It was produced by dumping the ROMs and adding the following patch to re-initialize the CRT controller:

D71A	EA EA
D745	A2 04
D747	BD 5E D7
D74A	BC 59 D7
D74D	8C 80 E8
D750	8D 81 E8
D753	CA
D754	10 F1
D756	4C DE E1
D759	01 02 04 07 09
D75E	14 20 28 21 07
FC05	20 45 D7

figure 4-1

BASIC 4.0/40

This is the 40-column BASIC found in all the 4016 and 4032 business keyboard machines. It was produced by dumping the ROMs and adding the following patch to re-initialize the CRT controller:

FD1B	20	5D	FD	
FD5D	A2	04		
FD5F	BD	76	FD	
FD62	BC	71	FD	
FD65	8C	80	ED	
FD68	8D	81	ED	
FD6B	CA			
FD6C	10	F1		
FD6E	4C	00	E0	
FD71	01	02	04	07 09
FD76	14	20	28	21 07

figure 4-2

BASIC 4.0/80

This version of BASIC is that supplied in the 8032 60hz versions. If you have a 50hz machine you probably do not need this version anyway because it is already in ROM.

Expansion Memory Monitor Program

The expansion memory monitor source program is provided on the diskette supplied with this manual. A listing of the program is provided as an addition to this manual. To run the monitor program:

1. Load the program into the lower 32K of RAM by typing:

```

dload "add-on-mon" <return>

```
2. Type:

```

run <return>

```

The following paragraphs describe the commands used in the expansion monitor program. The commands allow the programmer to examine or alter expansion memory, examine or alter 6502 registers, execute programs, load or save disk files and load the expansion control register.

:

Format: : Address [list of bytes]

Purpose: Alter bytes in memory.

Remarks: This command is automatically printed onto the CRT display preceding the address and data after execution of the display memory (M) command. To alter memory, use the screen editor to change the displayed bytes and press the <RETURN> key. The bytes are altered in the addresses specified by the expansion control register.

;

Format: ;PC,IRQ,SR,AC,SR,YR,SP

Purpose: Loads list into 6502 registers.

Remarks: The list of data following this command is loaded into the 6502 hardware registers when a G command is given. This command is automatically printed on the screen preceding the current list of data when an R command is executed. The list can be edited and re-entered in the same manner as the alter memory command. See the R command for contents of the list.

R

Format: R

Purpose: Displays the 6502 registers.

Remarks: This command displays the contents of a list loaded into the 6502 hardware registers when execution is transferred from the monitor. A sample display follows:

R <RETURN>

PC IRQ SR AC XR YR SP

;0400 E262 01 00 FF FF FE

The abbreviations are defined as follows:

PC = program counter
IRQ = interrupt vector
SR = status register
AC = accumulator
XR = X-index register
YR = Y-index register
SP = stack pointer

M

Format: M Address [Address]

Purpose: Displays bytes from memory

Remarks: Bytes are displayed from the addresses specified by the expansion control register. If one address is specified, 8 bytes are read and displayed on the screen, starting at that address. For more than one address, a range of bytes is displayed, but always the next even multiple of 8 bytes from the first. The STOP key stops the listing.

```
M 0400 <RETURN>
```

```
: 0400 00 00 00 AA AA AA AA AA
```

G

Format: G [Address]

Purpose: Start execution.

Remarks: If an address is not specified, the monitor dispatches to the location contained in the PC of the register display. If an address is specified, execution dispatches to that address. If a BRK (00) has been inserted in the user code, execution will return to the monitor and a register display given with the message "BREAK". On dispatch, the registers are loaded with the contents of the register display.

L

Format: L "name", Device

Purpose: Load memory

Remarks: Device number must be 4 or greater for CBM disks. The starting load address is implicit in the program load file. The STOP key will break a program LOAD.

S

Format: S "name", Device, Address, Address

Purpose: Save memory

Remarks: A file name must be specified in quotation marks followed by a device number, a starting save address and an ending save address. The STOP key will break a memory save.

@

Format: @ [disk command]

Purpose: Displays disk status buffer

Remarks: The command immediately followed by <RETURN> will read the disk status buffer and print its contents on the screen. The device is set at 8 and the command channel is 15.

@ <RETURN>

00,ok,00,00

If a string follows the @, then that string is transmitted to device 8 channel 15 as a command.

@ INITIALIZE @

name

Format: name

Purpose: Load and execute file from disk

Remarks: When a command cannot be matched to the list of known commands, an attempt is successful, the monitor jumps to execute it.

*

Format: * byte

Purpose: Load expansion memory control register (mapper).

Remarks: Puts the byte value following the command into the expansion control register. When a byte value is not specified, a zero is stored. This value restores the machine to ROM operation.

EXPANDED-BASIC

This program is a pseud-cache memory system for use with the 8032 and the 64k add-on memory board only. It is loaded into high memory, (\$7800-\$7BE0):

DLOAD"EXPANDED-BASIC"

It is activated by:

SYS 30720

This routine works nearly the same as the DOS-support program

provided with some Commodore disk systems. It moves the top of memory for BASIC down to \$7800 and resets all the variables. Its commands are implemented by using an escape character sequence detected by a tap into the CHRGET routine in BASIC's zero page.

The EXPANDED-BASIC program is completely protected from normal BASIC programs--however it is vulnerable to POKE and machine code programs.

Because the 8032 ROM code is not modified, it is not possible to add space directly to a BASIC program. The EXPANDED-BASIC program allows a user to store or "cache" programs and data in the expansion RAM for ultra high-speed access in overlaying programs.

The following commands are available:

RECALL

Format: !R,0:"filename",s(u)(p),[device]

Purpose: Cache a file from disk.

Remarks: The file can be USR, SEQ, or PRG. The device number defaults to 8. The ST variable is set in the same manner as a file OPEN for read.

LOAD

Format: !L,"program name"

Purpose: Move data from add-on to BASIC text area.

Remarks: This command clears the current program and loads the named program. Will not work from a program--only direct.

OVERLAY

Format: !O,"program name"

Purpose: Move data from add-on to BASIC text area.

Remarks: This command overlays the current program. Variables and data are preserved.

EXECUTE

Format: !E,"program name"

Purpose: Move data from add-on to BASIC text area.

Remarks: This command clears the variables and data and loads in a new program. It is callable by a program.

QUIT

Format: !Q

Purpose: Turn off the expanded Basic functions.

Remarks: None

The programs and files are placed in the expansion memory in a contiguous manner. If a wrap-around occurs the data will not fit in the first 32k bank, it will continue over into the second bank. There are a maximum of 10 file control blocks so there is a maximum of 10 files that can be stored.

The expanded-BASIC program maintains the file name, start location, end location, and data pointer. The system does not know the difference between file types, so all operations can be performed on all types of files.

The system has the following restrictions: When a command is used in program mode it must be preceded by a colon. This is necessary to insure proper operation within an IF THEN.