CBM EXPANSION MEMORY BOARD

USER'S GUIDE

SOFTWARE ADDENDUM

Part Number 324065-01

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WARRANTY DISCLAIMER

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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
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    STTEST
    TEST1
    TEST2
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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:

4-1

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
FCD5    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 editior 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 editied
           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.

           @ INITALIZE @

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 neccessary to insure proper operation within an IF THEN.