Final Expansion 3 User Guide

Version 1.0

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Version Information

Version	Date	Changes
1.0	2017-02-08	Initial draft

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Final Expansion 3 User Guide

Introduction

This guide describes the features of the Final Expansion 3 cartridge for the VIC-20 and how to use them. It also includes reference material for programmers to write software that uses the advanced capabilities of the cartridge.

The information given in this guide is believed to be accurate, however because there are many hardware and software variations the authors cannot guarantee that a specific system will function exactly as described.

The authors would be grateful to hear from you if you find a mistake or omission in this guide.

Where to Get Help

As there are several versions of the cartridge produced by different manufacturers the best source of information specific to yours is wherever you purchased it from.

The on-line forum Denial, http://sleepingelephant.com/denial/, is a community of VIC-20 users. They may be able to provide information and suggestions but cannot be expected to resolve your specific problems.

Cartridge Overview

The Final Expansion 3 (FE3) cartridge expands the VIC-20 with:

- 512KB of Random Access Memory (RAM)

- 512KB of Electrically Erasable Read Only Memory (EEPROM)

- storage to Secure Digital cards emulating a disk drive (SD2IEC)

The memory expansion is highly configurable, both from an interactive menu and by commands contained in user-created files. Virtually any type of memory map can be set up to allow all manner of programs to be run.

Additional commands are available to make disk devices easier to use, these are provided using a software wedge (which can be disabled) similar to those that work with physical disk drives such as the 1541.

Loading and saving to IEC bus devices is accelerated if they contain support for JiffyDOS, this includes the integrated SD2IEC device.
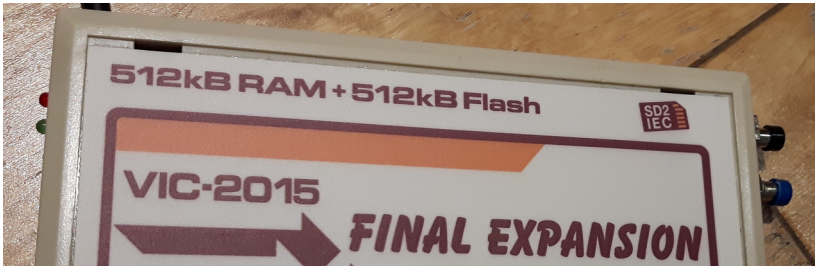
The two indicators which are located on the left of the cartridge relate to the SD2IEC device

- error (top, red) – flashes when an error message is present on the command channel

- activity (bottom, green) – lit when a file is open on the device

The two push buttons on the right of the cartridge provide different forms of system reset

- VIC-20 system reset (top) – system resets but memory configurations etc are retained

- VIC-20 and Final Expansion 3 reset (bottom) – system resets with defaults identical to those at power on.

Quick Start

*** text here ***

Start Up Menus

Main Menu

When the VIC-20 is powered on a menu with the following options is presented

- Select common memory configurations

- Load programs from SD2IEC

- Load programs from flash

- Store programs to flash

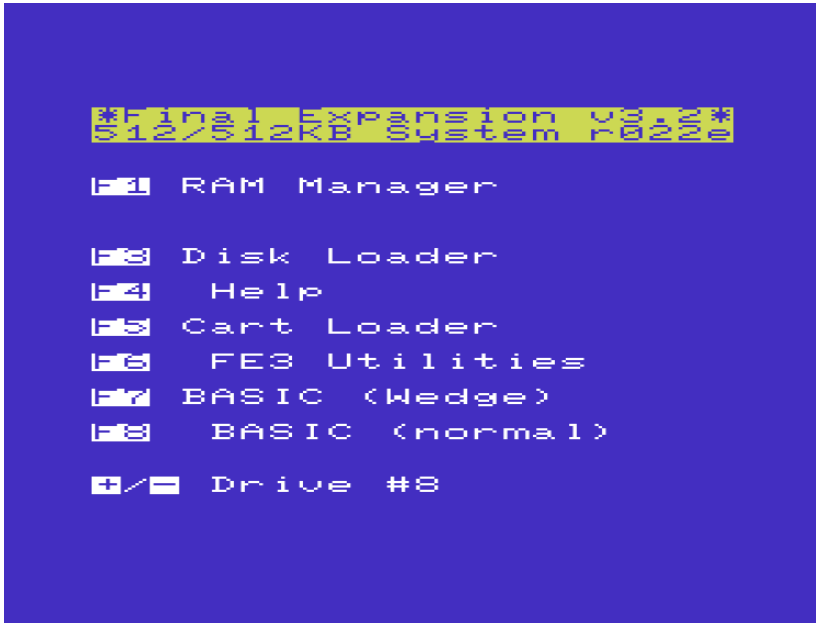- Change the SD2IEC device number

Options are selected by pressing the function keys (along with the Shift key if necessary).

Pressing the 'F8' key returns from any submenu.

Bypassing the start up menus can achieved by holding down one of the following keys during power on:

- Shift – wedge enabled, no additional memory

- C= – wedge disabled, no additional memory

The common configuration of all memory blocks being filled is available by pressing 'F7' (with the command wedge) or 'F8' (without the command wedge).

The device number used by the SD2IEC device can be changed by pressing the '+ and '-' keys. Values between 8 and 15 are supported.

Pressing the 'F4' key displays a brief description of the commands the wedge provides. See "Wedge Commands" on page 15 for more details.

Pressing the 'C' key displays a list of credits.

RAM Manager

This submenu allows different memory configurations to be set up. After selection the system will enter BASIC as normal.

The configurations available are summarized in the following table:

Key	Memory	Blocks	Wedge?
F1	3K	RAM1,2,3	Yes
F2	8K	BLK1	Yes
F3	16K	BLK1,2	Yes

Key	Memory	Blocks	Wedge?
F4	24K	BLK1,2,3	Yes
F5	3K + 24K	RAM1,2,3 & BLK1,2,3	Yes
F6	-	-	No
F7	3K + 24K+8K	RAM1,2,3 & BLK1,2,3,5	Yes

At the bottom of the menu two checkboxes are shown:

- I/O registers (R) - Allow access to the registers which control the memory configuration of the cartridge

- Command wedge (W) – Enable commands listed on page 15

Pressing the given key toggles each checkbox.

Disk Loader

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```
---- Disk Loader ----
>tank-v-ufo              <
 killer comet
 rocket command
 target
 rainbow passage
 minotaur
 demon driver
 brambles
 simon
 duck shoot
 nibblers
 dragon hunter
 breakout
 tank battle
 fighter raid
 salvage diver
 space runner
F1/F3:PgUp/Dwn F8:Exit
F5/F7:First-/Last Line
```

Cartridge Loader

*** text here ***

Secure Digital Drive

*** text here ***

Wedge Commands

The following commands are available in immediate mode, they cannot be included in BASIC programs. They may also be used in loader programs see "Loader Files" on page 21.

The wedge interpreter usually resides in BLK5, if the "All RAM" option was selected in the "RAM Manager" menu then it will reside in the 3K region within BLK0.

Storage Device Commands

The following commands access files stored on the SD card inserted into the SD2IEC device.

File names may be given in quotes or follow the command immediately (unless otherwise stated).

Load BASIC Program

The '/' command can be used to load a program from the current device

```
/SNAKE
 FROM  $0401  TO  $0F8B
RUN
```

The start and end addresses are displayed in hex.

Load Machine Code Program

The '%' command can be used to load a machine code program into the correct location in memory

```
%MEMSOAK
 FROM  $0400  TO  $0A0B
SYS1024
```

The start and end addresses are displayed in hex, the start address is often used to execute the program.

To load a program at a specific address the file name must be given in quotes followed by the address

```
%SCREEN?$1000
```

Save BASIC or Machine Code Program

The '←' command can be used to save the program in memory to the current device

```
HELLO
 FROM  $1201  TO  $1234
```

The start and end addresses are displayed in hex.

To save a machine code program the file name must be given in quotes followed by the start and end addresses

```
GRAPHICS?$2000,$300
0
 FROM  $2000  TO  $3000
```

If the file already exists on the device the following prompt is displayed

```
63,FILE EXISTS,00,00
```

`BORT  EPLACE  PDATE`

Pressing 'R' deletes the existing file and saves the current program with the file name given

`DELETING FILE ...`

Pressing 'U' renames the existing file with "'" (single quote) character at the beginning then saves the current program with the file name given

`DELETING OLD FILE ...`
`RENAMING FILE ...`

Pressing 'A' cancels the operation.

Verify BASIC Program

The '>' command can be used to verify that the program in memory matches the copy saved to the current device

`>CATACOMBS`
` FROM $0401 TO $12E4`
`OK`

Show & Change Drive

The '#' command can be used to display the current device number

`#`
`DEVICE#8`

To change to another device a number between 8 and 15 may be appended

`#9`
`DEVICE#9`

Memory Block Commands

The following commands control the availability of and access to specific memory blocks.

Block Disable

The 'BLKD' command causes one or more memory blocks to be disabled. The blocks affected are appended to the command, multiple blocks are separated by commas

```
BLKD1,2,3
```

Block Protect

The 'BLKP' command causes one or more memory blocks to become read-only. This can be useful if a program has copy protection to prevent it being run from RAM. The blocks affected are appended to the command, multiple blocks are separated by commas

```
BLKP1,2,3
```

I/O Register Disable

The 'NOIO' command disables the I/O registers used to communicate with the FE3. This can be useful if another cartridge is present that also uses the I/O region used by the FE3.

```
NOIO
```

Miscellaneous Commands

System Reset

The 'RESET' command can be used to restart the VIC-20. If an autostart signature is found at the beginning of BLK5 ($A000) then the cold start routine is called. Otherwise the system enters BASIC.

Wedge Disable

The 'OFF' (or 'KILL') command can be used to remove the wedge from memory. Only the standard BASIC commands will be available after running this command

```
OFF
FE3 WEDGE (OFF)
```

Program Recovery

The 'OLD' (or 'UNNEW') command can be used to restore a BASIC program that was in memory before the 'NEW' command was run or the system was reset.

Number Format

The ',' command can be used to convert numbers between different number bases

```
,35
$23  35  #
%00100011
```

The ',' may be followed by a decimal, hexadecimal (prefixed with '$') or a binary number (prefixed with '%'). An integer or floating point variable may also be given.

Loader Files

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Appendix A – Updating Firmware

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Appendix B – Programmers Reference

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