MEMORY DUMPERS REVISITED
The Latest Forget-Me-Nots for the C-64
Text and Photos by Morton Kevelson

It has been over a year and a half since we looked at *Memory Dumpers for the C-64* (March 1986 *Ahoy!*), an interval which is normally considered as half a lifetime for a computer. We are pleased to note that substantial improvements have been made for this type of utility. The latest memory dumpers provide many features in addition to the basic task of snaring the current contents of memory and storing it onto disk.

We suggest that you take a look at the memory dumper reviews in the March 1986 issue, along with the *Isepic* review in the October 1985 issue. The information presented there, along with the current material, will provide an overview of memory dumpers for the C-64 as they have evolved in this country.

THE FINAL CARTRIDGE
Home & Personal Computers of America
Commodore 64
Price: $44.95

Many sophisticated Commodore products seem to be originating overseas. *The Final Cartridge*, which originates in Holland, is another example of what is being done by the international Commodore community. H & P computers have packed a complete C-64 utility package, in addition to the subject memory dumper, into a standard size C-64 cartridge.

Externally, the presence of paired pushbuttons distinguishes *The Final Cartridge* from the run of the mill program pack. Inside we found a 16 kilobyte PROM and a modest collection of logic and control chips.

The right hand pushbutton simply grounds the C-64's reset line when de-
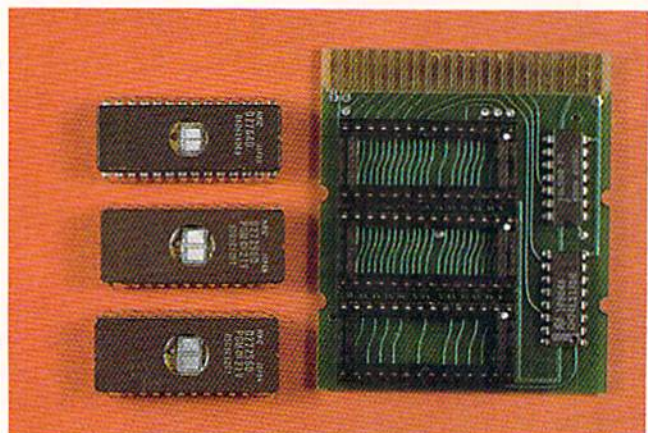

Top: **The Final Cartridge,** *with 16K ROM and twin push-buttons.* READER SERVICE NO. 142

Bottom: **CPR-3 board and its three PROMS** READER SERVICE NO. 143

pressed. This action, sometimes referred to as a cold reset or a hard reset, restores the C-64 to power up conditions. The Reset button comes in handy when the computer crashes for some reason, or if you wish to quickly break out of a program. The primary difference between the Reset button and turning off the computer is that the contents of memory remain for the most part intact. It will generally be possible to retrieve any programs and data which were in memory prior to

the reset, if you have the proper tools and skills. *The Final Cartridge* makes it easy to recover BASIC programs by adding an OLD command to the C-64's repertoire.

The left hand pushbutton interrupts the currently running program and accesses the first of several menus which initiate the various functions provided in *The Final Cartridge.* All menu options are selected via the function keys. Two of the selections on the first menu dump the current contents of memory

With 8K RAM (top) and 32K ROM (bottom), Super Snapshot has more of its own memory than any other dumper. Below: utility menu, offering supplementary features.
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to disk or tape. The form of the dump is such as to allow the currently running program to be reloaded and restarted at the point of interruption. This of course will get around many forms of copy protection. The presence of complete tape support in *The Final Cartridge* is an indication of its overseas origins. Across the Atlantic, tape is still a major form of mass storage.

Among the options available from Menu.2 is the ability to kill sprite-to-sprite or sprite-to-background detection. Both sprite collision detectors can be disabled, but it will take two cycles through the Freeze menus to do so. Killing collision detection may let you rack up some phenomenal scores with some games, as your playing piece is made immune to enemy fire. It may also immunize the enemy to your own missiles, resulting in a stalemate. Games which do not use sprites will not be affected by this function.

The Run selection on Menu.2 lets you restart a program which was inter-rupted by the Freeze button. This is the only time and place from which an interrupted program may be restarted after pressing the Freeze button. The Reset selection drops you into the next menu.

The Reset menu lets you restart the computer with *The Final Cartridge* enabled or disabled. There is also an option to jump into a user-defined reset sequence. The built-in machine language monitor may also be entered from the reset menu.

The Final Cartridge includes a very powerful machine language monitor (MLM). It is equal to most public domain and commercial machine language monitors, with a similar command format to most of the others. Included is the ability to examine memory in hexadecimal and PETSCII format, a mini assembler and disassembler for writing and examining machine language programs, and the ability to easily direct output to the screen or printer. The memory and disassembly

displays may be scrolled both forward and backward. The usual MLM functions for manipulating the contents of memory by filling, moving, comparing, and hunting are available.

Easy disk access is available while in the monitor via the wedgelike @ command. There is even a simple disk monitor capability where a disk block can be read into the computer's memory, manipulated by the monitor, and written back out. The default disk buffer is the 256 byte block starting at $CF00, but this may be changed.

Additional monitor features include hexadecimal to decimal conversion and the bank switching of the C-64's memory. This last feature let us discover some interesting facts about *The Final Cartridge*. We noticed that when the monitor is active, *The Final Cartridge's* operating system ROM is in the $8000-$BFFF ROM block in the C-64. Thus the BASIC ROM and the 8K of RAM at $8000 are switched out. Using the monitor's bank switching facility we were able to examine the entire contents of RAM in the C-64, including the RAM under the Kernal. However, the ROM structure of *The Final Cartridge* makes it impossible to examine the contents of the BASIC ROM.

We now move back up several paragraphs to the last selection on the first menu. This brings us into the first of two Print menus. The first option lets you manipulate what turns out to be the text and border colors of the text screen. According to the manual, this should have been the foreground and background colors. If a multicolor image is displayed, the border and some of the screen colors may be cycled. If a hi-res image is displayed, color control turns out to be limited to the border and menu text colors while the image colors are not affected. The print menu is left by selecting a normal or reverse screen dump.

The second Print menu lets you reset the printer vectors in case the program has overwritten them, adjust line feed spacing for some IBM compatible printers, and select between a Centronics or Serial port dump. The Serial port dump is for use with a Commodore printer such as the VIC-1515/1525, MPS-801/3, or a dot matrix printer connected via an interface which em-

ulates these Commodore printers. Text screens are dumped as such. Multicolor screens are printed in a pseudo gray scale using printer dot patterns. Hi-res images are sent out as a straight bit map dump. Images are printed in horizontal format. The size of a printout was 8" wide by 5½" high on our Gemini 10X in 1525 mode.

The Final Cartridge will drive a Centronics printer directly. To do so you will have to install a cable between the user port and the printer. H & P will provide a suitable cable for $19.95. We used the cable we described on page 65 in the November 1986 *Ahoy!* We found that the Centronics connection worked just fine with text, but we were unable to get a proper screen dump on our aging but still serviceable Gemini 10X. The Centronics dump on *The Final Cartridge* is intended for an Epson or Epson-compatible printer. We guess that our Gemini 10X just isn't Epson-compatible enough. Since the Centronics dump uses the Epson's double density graphics capability of 960 dots per line, as compared to the MPS-801's maximum of 480 dots per line, we expect the quality of the screen dumps to be somewhat better on the Centronics printers.

When the C-64 is first powered up with *The Final Cartridge* in place, there is no indication as to its presence, as the computer displays the usual opening message. It is only when you start working with the computer that the various enhancements become apparent. To start with, program loading times were from two to four times as fast as with an unadorned 1541 disk drive. Save times were also enhanced by a factor of 3 to 5. Actual improvement seemed to be dependent on file size and disk organization.

The C-64's function keys acquire some useful assignments with *The Final Cartridge*. These are summarized in the following table:

F1	LIST	F5	DLOAD
F2	MONITOR	F6	DSAVE
F3	RUN	F7	DOS"$
F4	OLD	F8	DOS

These commands, which may also be entered directly from the keyboard, are a subset of the programmer's aid

commands included with *The Final Cartridge*. The remainder of these commands are as follows:

AUTO—automatic line numbering
DEL—delete a range of lines
RENUM—renumber the program in memory
FIND—locate a text string or keyword
APPEND—program from tape to program in memory
DAPPEND—ditto from disk
HELP—displays offending line after syntax error
DVERIFY—the disk verify against program in memory
KILL—disables *The Final Cartridge*

The RENUM command will work on APPENDed programs, even with overlapping line numbers. However, the RENUM of branching instructions, such as GOTO or GOSUB, may not be what is expected. Be sure to RENUM your programs to compatible line ranges before using APPEND. The DLOAD command performs a non-re-

locating load to the original address from which the file was saved. As the DLOAD command executes it displays the program's start and end addresses.

Since H & P made the point that *The Final Cartridge* "Does NOT use existig memory," we decided to look into the matter. It is true that *The Final Cartridge's* operating system does lie in the external cartridge ROM bank from $8000 to $BFFF. Many of *The Final Cartridge's* operations require the use of system working RAM in page zero or in memory below $400. *The Final Cartridge* does attempt to swap out what it needs and restore what it took out when finished. Since *The Final Cartridge* does not have any onboard RAM, the swap area has to be in free RAM in the computer. Thus, strictly speaking, *The Final Cartridge* must make use of the C-64's existing RAM.

The lack of onboard RAM will limit *The Final Cartridge's* ability to successfully Freeze and save some C-64 programs. All programs are frozen by *The Final Cartridge* with the file names FC

and −FC. These may be renamed with more meaningful titles.

Overall we were quite pleased with the operation of *The Final Cartridge*. We encountered no problems when using a C-64 with a 1541 disk drive. With a C-128 and an SX-64 we occasionally encountered a glitch where we had to hit the Reset button to get back the machine. With the C-128 we found that after several resets right after power up, the problems seemed to go away. We also found that *The Final Cartridge* would not work with our 1571 until we installed the disk drive's upgrade ROM. In fact, *The Final Cartridge* would crash with the 1571 even when we were not performing a disk drive operation. With the SX-64 we used the KILL command, which still left us with access to the Freeze button.

Home & Personal Computers of America, 154 Valley Street, South Orange, NJ 07079 (phone: 201-763-3946).

SUPER SNAPSHOT
Computer Mart
Commodore 64
Price: $54.95

Once again we find ourselves examining an imported product. In this case it had less of a way to go, as it originated just north of the border. *Super Snapshot* is a product of LMS Technologies up in New Brunswick. It is distributed in the USA by Computer Mart. If you saw our original presentation on memory dumpers, you may recall the review of *Snapshot* or *Clonebuster* which was also made by LMS Technologies. Although *Super Snapshot* is based on that earlier release, it has far more features than the original. As a result we feel that it merits a separate review.

Externally *Super Snapshot* looks like any other C-64 game cartridge. Its only distinguising feature, aside from the label, is a flush mounted pushbutton in the upper lefthand corner. Our sample of *Super Snapshot* also included a miniature toggle switch. This $5 option disables *Super Snapshot* for use with the C-128. Of course this switch makes *Super Snapshot* invisible to the C-64 mode as well.

Inside *Super Snapshot* we found a 32 kilobyte PROM, 8 kilobytes of static RAM, and an even half dozen logic and control chips which glue the works together. The 32 kilobyte PROM is socketed for easy replacement by the user. This opens the way for low cost upgrades of *Super Snapshot*. The 8 kilobyte RAM chip is crucial to the operation of *Super Snapshot*. This RAM provides the essential external storage area for critical data which allows *Super Snapshot* to restart virtually any C-64 program after interruption.

Super Snapshot displays its own opening menu when the computer is turned on or reset. This menu may be bypassed by holding down the F7 or F8 key on power up. The former operation brings the computer directly into BASIC with all *Super Snapshot* enhancements in place. The latter operation does the same with *Super Snapshot's* enhancements turned off. Holding down the Commodore key while pressing the *Super Snapshot* button will generate a system reset. The combination of the Control key and the *Super Snapshot* button goes directly to the built-in machine language monitor.
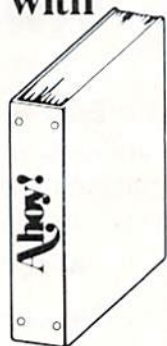
The opening menu provided five options. The first option fills memory with a predetermined pattern and exits to BASIC. The second option is reserved for future expansion. The third option merely displays the *Super Snapshot* version number (2.0 in our sample) and a brief commercial message. The last two options exit to the system with all features on or off. All options are selected via the function keys.

Super Snapshot has three more function screens. The first of these is the Sub-System menu which appears when the Super Snapshot button is pressed. At this point you may toggle subsequent *Super Snapshot* disk operations to device 8 or 9. If you choose to snapshot the program, you will be prompted for a program name and identifier. The name is displayed when the snapshot is reloaded. The identifier is used for the snapshot disk files.

The second choice on the Sub-System menu leads to the Screen-Copy menu. The screen which was displayed at the time when the Super Snapshot button was pressed may be now be sent to the printer, and in the case of bit map screens it may also be saved to disk as a *Koala* or *DOODLE!* format file. We

are especially pleased to see the bit map file save option as it was included at our suggestion. Once saved as a *Koala* or *DOODLE!* file, the image may be converted or manipulated by any of several programs or utilities.

The Screen-Copy menu offers a choice of three printers: the 1525, 1526, or Epson-compatible. The 1525 and Epson dumps are vertically oriented, which allows for a larger dump and better defined dot patterns for a higher contrast gray scale. We did not try the 1526 dump. Selecting the 1526 generates a warning message which includes the length of time it will take to do the dump. This could be as long as 35 minutes. For the C-128 you have the option of running the dump in 2.0 MHz mode, which may speed things up a bit for all printers. Three dump sizes are provided. All graphics are printed in gray scale except for the small size hi-res dump which uses a straight bit map representation.

The medium and large sized dumps in 1525 mode were the same width but of different lengths. The proportion of the dump will depend on the printer you are using. On a 1525 the medium sized dump was nearly square, while the large sized dump was properly proportioned. On the Gemini 10X in 1525 mode, the medium sized dump was properly proportioned and the large sized dump was elongated.

Using the Gemini 10X as an Epson compatible, we were able to generate small and medium sized dumps. The large size dump apparently used the Epson's high density print codes which did not work with our Gemini 10X. Size of the multicolor bit map dumps are approximately 4.5 by 3.25", 6.75 by 6.75", and 8.75 by 7.5" for the small, medium, and large on an Epson-compatible printer. The hi-res dumps were about the same for the small size and 9 by 6.75" for the medium size.

Getting back to the Sub-System menu, you may enter the Utility menu. At this point you may set up for a new snapshot or selectively enable or disable the three categories of *Super Snapshot* features. These consist of the Wedge, Turbo DOS, and Function Keys as described below. The Utility Menu also lets you view the disk directory and issue commands to the disk drive.

The built-in machine language monitor is accessed via the Sub-System menu. All standard MLM functions are supported, including alternate output to the screen or printer. Leading zeros may be omitted from all parameters. The only noticeable shortcoming is the lack of scrolling via the cursor keys. A rudimentary track and sector editor is included by reading a single block into RAM which may be modified and written back to the disk. Direct access to the I/O registers is also provided.

The MLM does an excellent job of manipulating the C-64's layered memory. It is possible to examine all of RAM including that under the BASIC ROM, the Kernal ROM, and the Character Generator, as well as under the I/O section. Bank switching is accomplished by manually changing the values in the lower three bits of the C-64's memory address 1. This address is actually an I/O port built into the 6510 microprocessor which is used to control the C-64's memory configuration.

Interestingly enough, we were not able to locate any of the *Super Snapshot's* operating code in the C-64's memory map. We suspect that *Super Snapshot* uses some snappy memory bank and data swapping between the C-64's RAM and its own 8 kilobytes. We found some evidence of this in a very noticeable screen flicker when examining some parts of RAM. This type of flicker is indicative of extensive use of interrupts and bank switching on the C-64.

The last option on the Sub-System menu lets you resume execution of the interrupted program. This is a very powerful tool, as it allows for the examination and manipulation of the computer's memory and the testing of the results. This option is always available following any of *Super Snapshot's* operations, as all the menus exit to the Sub-System menu. We tried the resume option on numerous programs without any problems.

Super Snapshot provides a full-featured DOS wedge which includes commands for toggling Turbo DOS, displaying the function keys, and toggling the function keys. Turbo DOS does a fast load at about five times the speed of a 1541. *Super Snapshot* checks the disk drive and turns off Turbo DOS

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if it is not compatible. There is also a built-in fast format which prepares a disk in about 30 seconds. The function keys contain the following commands on power up:

F1—loads first program on disk
F2—displays current function keys
F3—disk directory
F4—selective directory
F5—RUN
F6—SAVE
F7—LIST
F8—enter the monitor

The contents of the function keys may be changed at any time.

Not all programs are amenable to the *Super Snapshot* process. For example, software which uses specialized disk drive routines cannot be Snapshot. To get around this problem *Super Snapshot* includes a disk with 40 parameters. These are a sampling of the most popular parameters from the hundreds on the *Kracker Jax* utility disks distributed by Computer Mart.

LMS Technologies has certainly packed a lot into *Super Snapshot*. They appear to be quite serious about supporting their product. The 32K ROM is presently little more than half full and they are planning to install additional functions in the available space. Owners of *Super Snapshot* V1.0 may upgrade their 16 kilobyte ROM by returning the cartridge with a $15 service fee. Future ROM upgrades should cost even less.

Overall we were very pleased with *Super Snapshot*. Its memory dumper function is probably the most advanced on the market at this time.

Computer Mart, 2700 NE Andresen Rd., Vancouver, WA 98661 (phone: 206-695-1393).

CAPTURE
Jason-Ranheim
Commodore 64
Price: $39.95

We would be remiss in our duties if we did not mention *Capture* as one of the currently available memory dumpers for the C-64. If nothing else, *Capture* is the only native-born memory grabber at this time. We will be brief as a detailed review was presented in the March 1986 *Ahoy!*

Capture is a no-frills memory grabber. It does not contain a machine language monitor or any extensions to BASIC. *Capture's* primary purpose is to interrupt a currently running program and save it to disk, something which it does very well, as it does have its own 8 kilobytes of static RAM as well as an 8 kilobyte operating system on ROM.

A *Captured* program is saved to disk as a series of 2 kilobyte program segments with a separate segment for the I/O section. Each segment is neatly labeled so you can examine the files to find out what is going on. The program disk also contains disk also contains a built-in fast loader for the 1541 disk drive. The fast loader is automatically bypassed on other drives. A supplementary utility is available which combines the files into one for a slightly improved loading time. The *Capture* cartridge works well on both the C-64 and the C-128. The problems we experienced with the earlier samples on the C-128 have been cleared up. *Capture* is normally invisible to the computer until its button is pressed, at which time it takes control of the machine. This means that *Capture* will not force the C-128 to boot up into C-64 mode.

Capture does have a unique option: the ability to create an autostart cartridge from a *Captured* program. This feature, which was not yet implemented for our last review, is now fully operational. As an example we have used it to place version 1.2 of GEOS into an autostart cartridge. The program is now available less than two seconds after power on. The most recent versions of GEOS are not amenable to memory grabbers, as they download code to the disk drives. Disk drive code cannot be preserved in a restartable fashion by the memory grabber cartridges at this time. However, *Capture* does provide the option to save the contents of the disk drive's RAM to a disk file for subsequent analysis.

To create an autostart cartridge you will need Jason-Ranheim's Promenade C1 ($99.95) and one or more CPR3 ($29.95) cartridge kits. Jason-Ranheim offers reduced priced sets consisting of *Capture*, Promenade, and CPR3 for $149.95 and an additional CPR3 with a model DR EPROM eraser for $199.95. The Promenade C1 is a versatile PROM programmer which can handle a wide range of PROM types and capacities, including chips as large as 512 kilobits (64 kilobytes). A detailed review of Promenade along with a feature on PROM programming was presented in the July 1985 *Ahoy!*

The CPR3 cartridge kit consists of a standard-sized C-64 cartridge circuit board and a companion plastic case. The board contains three sockets which accept a 2764 (8 kilobyte) core EPROM and two 27256 (32 kilobyte) data EPROMs. Two additional logic chips complete the control circuitry. A set of three EPROMs is also supplied with the CPR3.

Creating a cartridge is not a difficult process. *Capture* and the Promenade should be installed before powering up. Press the Capture button and preconfigure memory before loading and running the application program in the usual fashion. At the appropriate time press the Capture button to interrupt the program and select option 4 on the Capture menu. *Capture* will then prompt you to insert the PROMs in sequence and will proceed to automatically program them. You will have to supply *Capture* with the appropriate control words for your EPROMs. This information is supplied with the CPR-3 kit. The 2764 core EPROM and one of the 27256 data EPROMs will always be required. The second data EPROM will only be used for larger programs.

Since the CPR-3 circuit board is fitted with sockets, it is possible to program additional chip sets and swap them when desired. However, integrated circuit sockets are not really designed for the repeated insertion and removal of the chips. The CPR-B circuit board (a CPR-3 without the chips) is available for $12.95. Keep in mind that PROMs may be damaged by the discharge of static electricity and should be handled accordingly.

We have been keeping an eye on Jason-Ranheim for more than two years, and we are pleased to see a company which has been actively supporting and developing their products. The Promenade and its related applications are a unique and useful series of products.

Jason-Ranheim, 1805 Industrial Drive, Auburn, CA 95603 (phone: 800-421-7731; in CA 800-421-7748; tech support 916-823-3284).