

RABBIT

For the Commodore 64 on Cartridge

"Add High-Speed Load & Save for your CBM 64"

"Don't spend your valuable time waiting on your Cassette Deck"

"Why buy a disk when you can buy the Rabbit for much less"

"Your WishIs My Command"

Load, Save, or Append an
8K program on cassette
in approximately
30 seconds !

Try it - your
un-Rabbitized CBM 64
take almost 3 minutes
and the disk almost 22 sec!

Works with the
64's Cassette Deck!



Very Reliable !

Easy to Install !

Similar to the
Famous VIC 20
Rabbit !

Costs much less
than any disk drive
and almost as fast !

NEW FEATURE - Data File handling

Eastern House Software

(We also sell Rabbits for the VIC 20)

Introduction

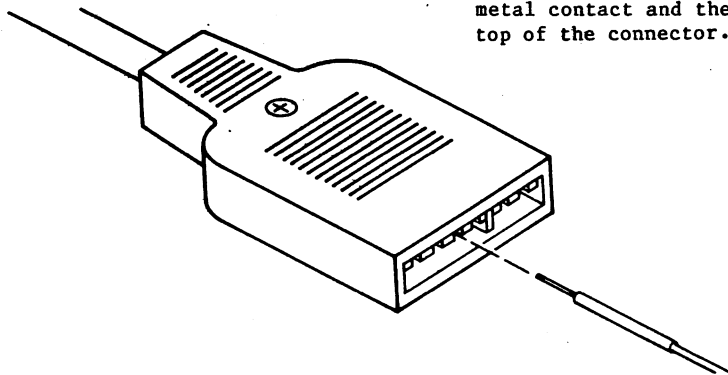
The CBM 64 Rabbit is a cartridge which plugs into the back of the Commodore 64 Computer. No tools are required since it just plugs in. The CBM 64 Rabbit contains software which provides for high-speed LOAD and SAVE on the CBM 64's cassette deck. For example, the CBM 64 cassette deck takes 2 minutes 40 seconds to LOAD/SAVE an 8,000 byte program and the CBM 64 disk drive takes about 22 seconds. The CBM 64 Rabbit requires just 32 seconds! Incredible isn't it - Cassette almost as fast as the disk!!! The Rabbit is very reliable and has been available for the older Commodore computers for over 2 years.

Since the RABBIT is an extension of the operating system, the normal CBM 64 LOAD, SAVE, and VERIFY commands can still be used. Think of Rabbit as providing an additional recording mode - thus you have two LOAD commands (Commodores and Rabbits) and two SAVE commands.

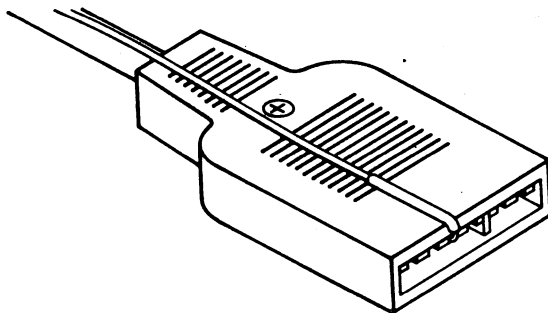
Installation

- 1-) Turn off power to your CBM 64.
- 2-) Insert the CBM 64 Rabbit Cartridge into the back of the CBM 64 at the Cartridge Slot. Note the lettering on the Rabbit Cartridge "This Side Up".
- 3-) Disconnect the cassette deck connector from the CBM 64 computer. Orient the Cassette Deck's Connector so that you are looking into the end of the connector with the metal contacts at the top. Insert the end of the wire from the Rabbit Cartridge into the end of the connector at the third contact from the left as follows:

Note that the wire is inserted between the metal contact and the top of the connector.



Note that the wire is inserted between the metal contact and the top of the cover. The purpose of this is to make electrical contact with the third contact from the left side of the connector. Insert the wire a quarter-inch or more into the connector and then bend over the top of the connector as follows:



Finally, hold the Rabbit wire to the Cassette Connector and plug into the back of the CBM 64 at the Cassette Slot.
(A small rubber band can be used to hold the wire steady.)

Note: After you have bent the wire, try to avoid unbending it. This will prevent metal fatigue which could eventually break the wire. It should be very easy to remove the cassette deck connector and extract the wire without unbending.

- 4-) Turn on power to your CBM 64.
- 5-) Type: SYS 9*4096 and then press the RETURN key. This will cause the Rabbit software commands described in the manual to be made available for use.
- 6-) Refer to the following for a description of the use of the Rabbit commands.

RABBIT ASTERISK COMMANDS:

The Rabbit provides not only high-speed LOAD/SAVE but other useful functions. When the Rabbit Cartridge is installed, the number of free bytes drops by 4,096 to 34,815. This is required so that the Rabbit can occupy memory address space. Because of the way the CBM 64 was designed, the Rabbit software will blank the screen when using the Load, Save, Verify, Execute, and Append commands. Rabbit cannot load programs saved in the regular Commodore tape format. These programs must be loaded using the LOAD command and then re-saved using the Rabbits high-speed save command. The Rabbit commands are as follows:

*SL "name",device,start,end

or

*S "name",device,start,end

Save a program in RABBIT format with a long leader.

Examples:

*SL "STARTREK"	< Save Basic program STARTREK
*S "STARTREK",1,800,FFF	< Save Machine Language program in memory range \$0800-\$0FFF

*SS "name",device,start,end

Save a program in RABBIT format with a short leader. This is the same as *S or *SL except that a shorter leader tone is recorded.

Example:

*SS "MOUSETRAP"

NOTE: You should always use *S or *SL when saving at the start of a tape. This is because most cassettes have plastic leader material at the beginning that must be moved passed before recording data.

*L "name",device,load address

Load specified program in RABBIT format. When a program is loaded or passed over, a status message will be output (see RABBIT Note 4).

Examples:

*L	< Load next program from tape
*L "MAZE"	< Load program named MAZE
*L "TEST",1,F00	< Load machine language program but store at location \$0F00

NOTE: Normally a program is loaded in memory at the same location where it was previously saved. If you entered *L "TEST",1,FOO , then the program would be stored at \$0FOO no matter where it was previously saved.

*A "name",device

Load and append the specified program (in RABBIT format) to the end of the Basic program currently in memory. When a program is loaded or passed over, a status message will be output (see Note 4). Examples:

*A < Append next program from tape

*A "PRINT USING" < Append program PRINT USING at end of program currently in memory

The Append command does not renumber line numbers - so watch out for appends which result in a duplication of line numbers.

*V "name",device

Verify a program to insure that a good recording was made. (See Rabbit Note 4). Examples:

*V < Verify next program

*V "PAC MANN" < Verify program named PAC MANN

If the recording was OK then the name of the program will be displayed in reverse format. If the recording was bad, then the message CASSETTE ERROR will be displayed.

The Rabbits verify command operates differently from the CBM 64s VERIFY command. The VERIFY command compares the data on the tape with that in memory, while the *V command reads the tape and just tests if the program can be read without errors. Even with no program in the CBM 64, the *V command can still verify that a program can be later read by checking that no recording errors occurred.

*E "name",device

Execute. This command is the same as the *L command except that it performs a load from tape followed with an automatic run.

Example:

*E "STARTREK" See RABBIT Note 4.

*H XXXX

Convert the hex number xxxx to decimal..

Example:

*H FFO

< You type

=04080

< and RABBIT responds

*D XXXXXX

Convert decimal number xxxxx to hex.

Example:

***D 4080**

< You type

=OFFO

< and RABBIT responds

***T test, start, end**

Perform RAM memory test on memory range "start" thru "end".

"Start" and "End" should be entered as hexadecimal numbers.

Two tests can be performed:

Test 1 = Test RAM IC's for storage retention

Test 2 = Test RAM IC's for proper chip select operation

If an error is encountered, it will be output in the following format:

XXXX YY ZZ

Where xxxx is the address of the bad memory cell, yy is the test pattern, and zz is the error pattern. Consult the first issue of COMPUTE magazine (page 32) for more specifics on memory testing.

To test the RAM memory in your CBM 64, enter:

***T 1,0800,9000**

< Tests memory from 0800 to 9000

*T 2,0800,9000

```

< tests memory from 0000 to 500
<  "    "    "    "    "    "

```

If a memory error occurs, it will be displayed in inverse video.

An example error is: 2000 00 FF.

This test takes a lot of time as it performs an exhaustive diagnostic.

You can interrupt the test at any time by pressing the RUN/STOP key.

*G XXXX

Go to machine language program at hex address xxxx.

Example:

***G 1AF3**

*

This is a quick and convenient way to go to the CBM 64 monitor. Simply type * followed with a return. Note: If you do not have a Machine Language Monitor loaded, do not issue this command.

*Z

Toggle lower case versus graphics character set.

*K

Kill the Rabbit. This removes the Rabbit link into Basic.

LOAD, SAVE, and VERIFY Commands

If you enter SYS 9*4096+12, the standard commodore LOAD/SAVE/VERIFY commands will operate in Rabbit tape format. A special case is allowed for the LOAD command in which LOAD "A:name" will cause an appended load like the *A command. LOAD "E:name" is a feature that is not implemented by Rabbit.

If you enter SYS 9*4096+15, the standard LOAD/SAVE/VERIFY commands will revert back to regular Commodore recording mode.

Rabbit Data Files

Data files are those files that are written and read using the PRINT#, INPUT#, and GET# statements. The Rabbit can easily be initialized to generate data files in its high-speed recording mode. In addition to the Commodore tape format, the Rabbit provides high-speed data files in two high-speed modes:

Short Data Files - Data files read and written in Rabbit format using the built-in 192-byte cassette buffer located at \$033C.

Long Data Files - Data files read and written in Rabbit format using 1K of memory allocated at the top of the Basic program space.

Rabbit short data files are about twice as fast as the standard Commodore format. Long data files are even faster.

When you type SYS 9*4096, you set up the Rabbit to recognize only the *L, *S, *V, *E, *A type commands. The LOAD, SAVE, and VERIFY commands remain in the normal Commodore tape mode. If you generate a data file, then it will be in Commodore's tape format.

If you type SYS 9*4096+3, Rabbit will recognize both the *L, *S, etc. type commands and generate data files in its high-speed short data file tape format. To initialize the Rabbit for short data files from within a program, you should type SYS 9*4096+6. The reason is that the 9*4096+3 address prints the Rabbit copyright message that may be undesirable in some applications.

To illustrate the Rabbit data file capability, enter the following example program:

```

10 SYS 9*4096+6      : REM TURN ON RABBIT SHORT DATA FILE
20 PRINT "READ OR WRITE"
30 INPUT RW$
40 IF LEFT$(RW$,1) = "R" THEN 200
50 REM
60 OPEN 2,1,1,"TEST"
70 T$="EASTERN HOUSE"
80 FOR I=1 TO 50
90 R$=STR$(RND(1))
100 PRINT#2, I CHR$(13) T$ CHR$(13) R$ CHR$(13)
110 PRINT I;" ";T$;" ";R$
120 NEXT I
130 PRINT "*** CLOSE WRITE ***"
140 CLOSE 2
150 STOP
200 REM
210 REM
220 OPEN 3,1,0,"TEST"
230 FOR J=1 TO 50
240 INPUT#3,A,B$,R
250 PRINT A;" ";B$;R
260 NEXT J
270 PRINT "*** CLOSE READ ***"
280 CLOSE 3
290 STOP

```

Note that line 10 contains a SYS to instruct the Rabbit to generate short data files. Try running this program if you like but be sure and Write the tape before you try to Read it.

After you create the tape, rewind and type *V. We want to do this in order to take a look at the name of the data file on the tape. Note that

an "SD-" preceeded the data file name. This implies that the file was recorded in Rabbits short data file format. Conversely, a Long Data File will be prefixed with "LD-".

Long data files can be incorporated by issuing a SYS to a different address. Long data files use a 1K buffer rather than the built-in 192 byte buffer used by short data files and the regular Commodore format. Using a longer buffer results in a significant time savings since the number of reads and writes to tape are reduced by a factor of over 5. For example, 1K of data would require 6 writes to tape of 192 bytes each along with each write operations associated wait for the tape motor to come up to speed, wait for the write of each records record start sequence, and wait at the end of the record for the write of a trailing sequence.

To use Rabbits long data files, you must provide 1K of memory for the data file buffer. This is done by issuing the command SYS 9*4096+30. This command moves Basics "top of memory" pointer down 1K providing 1024 bytes (i.e. 1K = 1,024) for use by the Rabbit. After issuing this command, you should observe that the amount of free memory has been decreased by 1,024 bytes. This command should be issued only once. Each additional SYS to this location moves the "top of memory" pointer down by 1K again which results in an unnecessary waste of memory. If you continually SYS to this location, RABBIT will drop the memory by 1K each time until Basic has just 1K left. Then the Rabbit will output a "?" letting you know you have no more memory. Of course, when you cycle power on your computer, all available memory will return. To illustrate this, try the following:

- 1-) NEW
- 2-) PRINT FRE(0)
The amount of free memory is displayed
- 3-) SYS 9*4096+30
- 4-) PRINT FRE(0)
The amount of free memory is again displayed but
should be 1,024 bytes less. Rabbit now has this
1K of memory for long data file use.

Now that 1K has been allocated, enter SYS 9*4096+33 to instruct Rabbit to read and write data files in long data file format. For example, lets modify the example program for long data files as follows. Remember, issue the SYS 9*4096+30 to obtain 1K of program space once and only once. It is best to issue this command in direct mode so it won't get executed each time we run the program. Lets go ahead and allocate the 1K buffer before we run the program. Type: SYS 9*4096+30.

Next, change line 10 of the example program to: 10 SYS 9*4096+33 in order to instruct Rabbit to process PRINT#, INPUT#, and GET# as long data file operations. Run the program and observe how much faster long data files are over short data files.

There are a number of other SYS points in the Rabbit. They are:

SYS	PURPOSE
9*4096	Provide Rabbit *L, *S, etc. commands.
9*4096+3	Provide Rabbit *L, *S, etc. commands and also short data files.
9*4096+6	Turn on Rabbit mode short data files.
9*4096+9	Turn off Rabbit mode short data files.
9*4096+12	Turn on Rabbit mode for LOAD/SAVE/VERIFY commands.
9*4096+15	Turn off Rabbit Mode for LOAD/SAVE/VERIFY commands. This causes these commands to be in the default Commodore recording mode.
9*4096+18	Turn on Rabbit mode for just the SAVE command. The LOAD and VERIFY are left in their previous mode.
9*4096+21	Turn off Rabbit mode for just the SAVE ommand. This makes the SAVE command save in regular Commodore mode.
9*4096+24	Turn on NMI Intercept so that pressing RUN/STOP and RESTORE keys do not alter vectors in page 3. (See Note 7.) This is automatically performed for every SYS that turns on a feature.
9*4096+27	Turn off NMI intercept so that pressing RUN/STOP and RESTORE keys causes the vectors in page 3 to be restored to their default values. (See Note 7.) This is automatically performed for every SYS that turns off a feature.
9*4096+30	Move Basics "top of memory" pointer down by 1K (1,024 bytes) in order to provide a buffer for use by Rabbit for long data files.
9*4096+33	Turn on Rabbit mode for Long Data Files.
9*4096+36	Turn off Rabbit mode for Long Data Files.

RABBIT NOTES:

- 1) A tape mark can be recorded via
*SS "\$",1,0,0
Any filename beginning with \$ will be interpreted by the RABBIT software as a tape mark. In the above example, 0,0 was tacked on the end so the recorded file will be as short as possible.

Tape marks are useful. If encountered, the RABBIT software will halt its search for a file. A tape mark should be recorded at the logical end of tape.
- 2) If you want to abort a tape load or save operation, press STOP on the cassette deck, and the message CASSETTE ERROR will appear. Sometimes you may have to press PLAY then STOP several times before the message will appear.
- 3) Programs saved using the Rabbit *S command cannot be loaded by the CBM 64 Basic LOAD command. Conversely, programs saved by the CBM 64's SAVE command cannot be loaded by the RABBIT's *L command.
- 4) Whenever RABBIT loads a program or passes over a program on tape, a status message will be output consisting of the length of the program, the address range where loaded, and the program name. This status message will be displayed in reverse video format. The numbers are in hexadecimal form.
- 5) The screen will go blank when loading or saving in Rabbit the same as the regular Commodore tape load/save does. Rabbit, though, does not require you to press the Commodore key as is required when saving using the regular Commodore format.
- 6) If you have trouble loading tapes using the standard /CBM 64 LOAD/SAVE commands, try reorienting the tape deck away from the TV set. CBM 64's have been known to be notorious for having loading problems when placed close to the TV set.
- 7) Whenever you press RUN/STOP and RESTORE keys to recover from a crash or for whatever reason, your computer performs a jump to the NMI intercept vector in page 3. Normally pressing RUN/STOP and RESTORE keys causes certain vectors in page 3 to be restored to their default values.

If these values are restored, the Rabbit will be disabled. Fortunately, whenever you turn on a Rabbit feature, such as data files, the Rabbit will intercept the NMI vector and prevent your computer from disabling the Rabbit. Whenever you turn off a feature, the Rabbit will let the RUN/STOP and RESTORE feature perform its normal function. The only time this could be a problem is illustrated in the following example:

- 1-) SYS 9*4096+6
- 2-) SYS 9*4096+12

Note that #1 above turns on data files and #2 above turns on Rabbit mode for LOAD/SAVE/VERIFY commands.

If you later enter SYS 9*4096+15 to turn off Rabbit for LOAD/SAVE/VERIFY commands and then press RUN/STOP and RESTORE keys, you will cause data files to be disabled. But, if you SYS to 9*4096+24 after you turn a feature off, this will cause the Rabbit to intercept and prevent it from being disabled.

- 8) If you have a problem with your Rabbit in which the Rabbits high-speed load and save do not seem to function, it is likely due to a malfunctioning cassette deck. Before returning it to us, try cleaning and demagnetizing the tape heads. After doing this and the Rabbit still does not work, the problem is likely to be caused by a misaligned tape head. Try another cassette deck or borrow one from a friend to determine if your tape deck is the problem. If you find that another tape deck works and yours does not, you should have the heads aligned by your Commodore dealer. The vast majority of Commodore tape decks are properly aligned and work properly with the Rabbit. The few Rabbit owners who have had problems were due to tape deck problems. If none of the Rabbit commands work including the *H, *D, etc., then the problem is likely to be with either your computer or the Rabbit. For this case, we recommend that you return the Rabbit to us and we will test it and make any necessary repairs.

WARRANTY

The Rabbit Cartridge is warranted against defects in material and workmanship for a period of 60 days from date of purchase. If a defect is discovered during the 60 day period, and you have registered this warranty, Eastern House will replace or repair the cartridge - provided the cartridge and proof of purchase is mailed (postage prepaid) to Eastern House.

If the defect (in the judgement of Eastern House) resulted from accident, abuse, or misapplication of the cartridge, Eastern House shall have no responsibility to replace or repair the cartridge under the terms of this warranty. After the 60 day warranty, Eastern House will repair the cartridge for the cost of parts and shipping.

Be sure and return the enclosed Product Registration card WITHIN 10 DAYS OF PURCHASE. Completion of the registration card not only protects you, but also entitles you to RECEIVE INFORMATION ON OTHER CBM 64 RELATED PRODUCTS THAT WE SELL.

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Load and Save!"



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