Eventide
the next step

16 K ( )
24 K ( )
32 K ( )

Memory Board

THE MEMORY BOARD IS DESIGNED SPECIFICALLY TO FIT INTO THE COMMODORE PET COMPUTER. ALL HARDWARE REQUIRED IS FURNISHED WITH THE BOARD. ABSOLUTELY NO ELECTRICAL MODIFICATIONS TO THE PET ARE REQUIRED. THE MEMORY DERIVES ITS POWER FROM THE PET TRANSFORMER BUT NOT FROM ITS REGULATORS. THE 24 K BOARD ALLOWS YOU TO WRITE PROGRAMS TO THE TOTAL CAPACITY OF THE PET. THE 32 K BOARD ALLOWS STORAGE OF PROTECTED MACHINE LANGUAGE PROGRAMS.

* * * LIMITED WARRANTY * * *

The memory expansion board is warranted against defects in material and workmanship for a period of six months from date of purchase from an authorized dealer.

In case of difficulty, return the circuit board and jumper cable (the hardware is optional) to EVENTIDE CLOCKWORKS INC. The board must be wrapped in aluminum foil to prevent static damage, and a complete and detailed trouble report must accompany the return. For warranty repairs, please return a copy of your sales receipt showing date of purchase.

This warranty does not cover shipping damage, damage caused by improper installation, damage caused by unauthorized modification, or damage caused by physical or electrical abuse. Determination of the cause of damage is the sole province of the manufacturer. The sole liability is for repair or replacement of any defective components, and neither the manufacturer nor his agents will be held liable for consequential damage.

EVENTIDE CLOCKWORKS, INC. • 265 WEST 54TH STREET • NEW YORK, N.Y. 10019 • 212-581-9290

WARRANTY REGISTRATION FORM

Note: Your warranty becomes effective upon purchase, as described in the warranty in the Instruction Manual. Sending in this form enables us to send you additional information, including updates and change information, and new product announcements, and to keep in touch. It also allows us to improve our product by receiving your comments.

NAME_____ DATE PURCHASED_____

ADDRESS_____

_____

DEALER FROM WHOM PURCHASED_____

DEALER ADDRESS/LOCATION_____

What configuration is your board 16 K ( ) 24 K ( ) 32 K ( )

What configuration was your PET (before board installation)

4 K ( ) 8 K ( )

Were the installation instructions clear and unambiguous? YES ( ) NO ( )

Were they accurate for your PET? YES ( ) NO ( )

If NO, please tell us of any differences or ambiguities_____

_____

Did the board work immediately after installation, or was some adjustment required? WORKED ( ) ADJUSTMENT NEEDED ( )

How did you learn of this product?_____

Do you have any comments or queries regarding this unit?

COMMENT SPACE

Thank you for taking the time to fill in this form. Please return to:

EVENTIDE CLOCKWORKS INC., 265 West 54th Street, New York NY 10019, USA

MEMORY BOARD PHYSICAL INSTALLATION INSTRUCTIONS

This sheet covers the PHYSICAL INSTALLATION of your memory board in the PET computer. It is assumed that the board is properly configured with respect to memory boundaries. UNPLUG THE PET BEFORE BEGINNING!

1: Remove the four large screws that attach the PET cabinet to the metal base tray.

2: Lift the cabinet and lower the metal prop and place it in either of the holes on the left side of the tray. If necessary, remove the cassette cable from its connector.

3: Four metal spacers are furnished with your memory board. Select the short one and screw it down on the 6-32 screw protruding from the frontmost voltage regulator. Do not remove any of the regulator hardware.

4: Remove the left and right rearmost screws which hold the PET main circuit board to the bottom tray. Screw two of the remaining spacers into the holes vacated by these screws.

5: Remove the right-hand screw near the center of the board and screw the remaining spacer in the vacated hole.

There should now be four spacers sticking up in locations corresponding to the four corners of the memory board. If there are not, you have either done something unthinkable, or perhaps you have a nonstandard or prototype PET. We have not encountered any such, but that doesn't mean that they don't exist. If you do experience any mechanical difficulties, please note them on the warranty card so that we may drill additional holes in our boards to accommodate all versions. Thank you.

6: Remove the 5 pin Molex connector which connects the PET to its power supply, and screw the board to the spacers with the 6/32 screws provided.

7: Attach the connector just removed to the rear male Molex connector on the memory board.

8: Connect the jumper cable provided from the front male 5-pin Molex on the board to the connector on the PET board from which the original cable was removed.

CAUTION: Commodore has cleverly arranged this cable to be non-polarized, so that it may be installed backwards without damage. HOWEVER, some PET's have showed up with slightly mangled connectors which were made by melting the ends off longer ones. It is physically possible to replace a connector with a one pin offset, and doing so WILL SERIOUSLY DAMAGE THE PET, its POWER SUPPLY, or BOTH! Be absolutely certain when installing the power connectors that all pins are properly mated!

9: Connect the flat ribbon connector cable from the memory board to the PET memory port connector. The cable should not be twisted, and it fits between the outside of the bottom tray and the cabinet shroud.

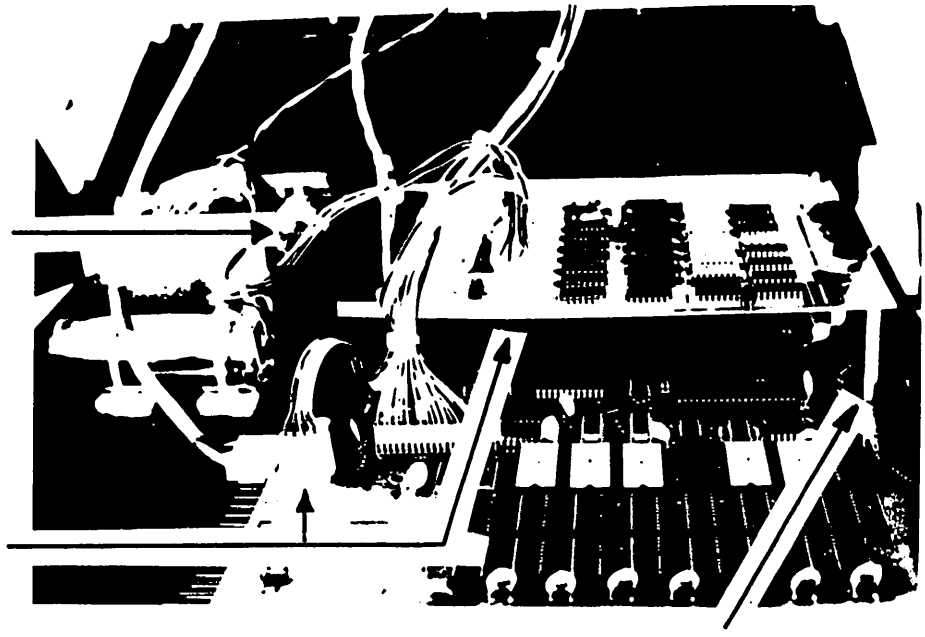
This completes the installation of the memory board. We recommend that you save the original hardware in a plastic bag taped inside the PET, in case the memory board has to be removed, or the PET shipped back to the factory.

INSTALLATION OF MEMORY BOARD IN PET COMPUTER

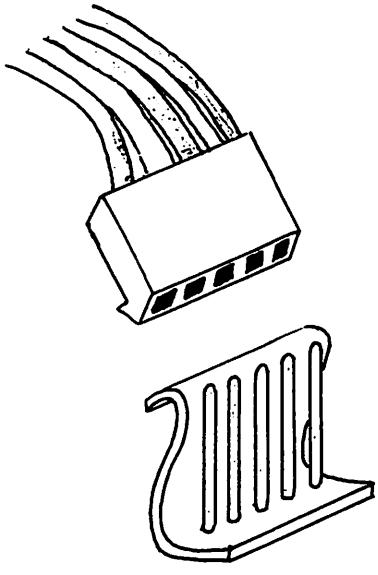
NOTE: The PET computer MUST be unplugged before commencing installation.

Detach the cable coming from the transformer from the PET board, and connect to the rear Molex on the memory board

Connect jumper from PET board to the front Molex on the memory board



Mount the memory board on the standoffs provided



JUMPER

5-pin Molex connector

After installation of the memory board, the PET, when switched on, should read:

8 K PET + 24 K or 32 K memory board	'31743 BYTES FREE'
8 K PET + 16 K memory board	'23551 BYTES FREE'

If you do not get these exact readings, and you are sure that you have installed the memory board correctly, try adjusting the blue pot a turn or so in either direction. We have not found this to be necessary on any of our PET's, but you can never tell.

MEMORY BOARD CONFIGURATION

The memory board is available in three configurations: 16384 bytes (16K), 24576 Bytes (24K), and 32768 Bytes (32K). The PET computer comes in two configurations, 8192 Bytes (8K), and 4096 Bytes (4K). The 4K version of the PET has, to the best of our knowledge, never been manufactured, but may be at some time, and so provision is made for using the PME1 board with a 4K PET.

The PET memory map, as described in the manual furnished with the computer, permits program memory to be added up to a total of 32K. Since the PET contains 8K already, the largest useful board intended to be used for BASIC storage is the 24K configuration. According to the manual, memory pages 9, A, and B, corresponding to absolute addresses 36864 through 49151, are for "expansion ROM". However, there is no reason why expansion RAM cannot be added to these locations, as long as the user recognizes that this expansion RAM cannot be used for PROGRAM storage. It can be used for machine language routines, text, display data, and any other information that does not have to be accessed by the PET BASIC Operating System. For instance, up to 8 full-screen displays can be loaded into the memory in pages 9 and A and a very short PEEK and POKE routine can be written in basic to transfer these displays to the display memory in page 8. Using PRINT statements, these displays would require just as much BASIC RAM which would then be unavailable for programming.

Another possible application for the 32K RAM is to compensate for PET deficiencies: Sad to say, of the 6 PET computers we have used in testing and developing this memory board, four have had one or more bad memory chips. (One of our favorites has a stuck bit in one precise and invariable location. We use this to check our memory test software!). If you have experienced this problem and have no immediate use for 8K of machine language capability (or, of course if you somehow have obtained a 4K PET), it is possible to strap the board to respond to page 1 instead of page A and remove the PET memory chips. Thus you will have 8 (or 7, or 6, or 5....)spares. This will also save power, as the PET static RAM's require much more power than the dynamic RAM's in the memory board.

Regardless of the configuration of your memory, it is possible to reserve space in RAM for machine language programs. When power is applied, the PET determines how much memory is available to it by writing what Commodore calls a "checkerboard" pattern and then, presumably, reading it back. This should not be considered an exhaustive memory test! It will usually not uncover single bit errors (such as our bad RAM chip mentioned above). It does, however, tell PET how much RAM is installed. This information is stored in memory locations 134 and 135 decimal and may be modified using PEEK and POKE statements. For instance, with the 24K board installed, perform the following command sequence:

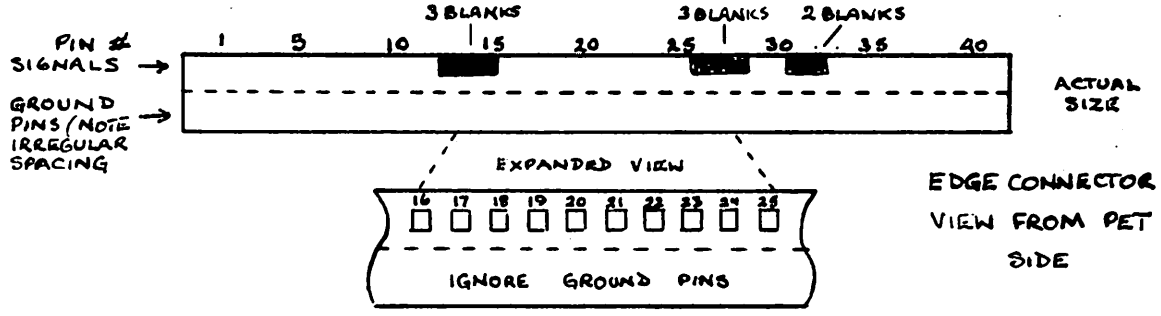
?FRE(0) returns 31740
?PEEK(135) returns 128
POKE135, 64 returns READY, but now
?FRE(0) returns 15356, and memory above page 4 will be untouched by BASIC.

EXPANSION MEMORY STRAPPING

As supplied from the factory, the board responds to addresses as follows:

16 K 8192 to 24576
24 K 8192 to 32767
32 K 8192 to 32767, and 36864 to 45055

It is possible to change the board configuration to function with a 4 K PET, or with an 8 K PET with half its memory removed (see configuration section). Refer to the drawings below to see what board or jumper modifications are required. In each case, performing the modification will subtract 4096 bytes of available memory from the largest number above and cause the memory board to respond to locations 4096 through 8191 (Page 1 as described in the manual for the PET).



16 K board Remove pin from 20 and exchange it with pin in 16
24 K board Remove pin from 22 and exchange it with pin in 16
32 K board Remove pin from 24 and exchange it with pin in 16

PIN REMOVAL

The object is to push down the barb while simultaneously pulling on the wire to which the pin is attached. The best tool commonly available is a small, very thin jeweler's screwdriver. Insert it between the top of the pin and the housing. Too much pressure can cause the barb to bend, preventing the pin from re-locking in its new location. If this happens, the barb can be re-bent using the same jeweler's screwdriver.

* * * * IMPORTANT NOTICE * * * *

If your memory board appears "missing", or is inoperative beyond a specific page boundary, the problem is quite probably caused by a dirty PET expansion connector. This is readily cured by cleaning the expansion connector with an ordinary pencil eraser, thereby removing the traces of flux.

If this does not cure your problem, please make sure you include a written trouble report when returning the board to your dealer for service, to help him locate your problem.

TESTING THE MEMORY BOARD

One of the advantages of the PET computer is its completeness. You buy one box and you have a computer. Our market research (read "inspired guess") led us to believe that one of the main reasons for purchasing the PET was the dislike of nests of wiring in the living room (computer shack?). We decided that our product should fit this philosophy: No hardware tinkering, no extra line cords, exposed wiring, etc. This dictated the choice of an internal expansion board, which in turn dictated the use of dynamic rams for their extremely low power consumption. This, combined with the undesirability of requiring PET modifications to initiate wait states dictated some sophisticated design and timing.

Testing complicated memory systems, as semiconductor manufacturers are the first to tell you, isn't easy. To exhaustively test a memory board with all possible data combinations would require many times the estimated age of the universe. This is longer than even unusual delivery delays of computer equipment. The solution is to use data patterns reasonably calculated to find hardware problems such as shorted lands and defective memory chips. Even so, a good memory test program can take a while. Our solution at the factory is to continuously test each board inside a PET for at least 24 hours. We use a machine language memory test which interfaces with BASIC to diagnose problems down to a single defective chip. This program is rather lengthy, and rather than reproduce it here, we have decided to make it available through the dealer from whom you purchased this board. In addition to checking our memory, the program also checks the PET memory chips from about 2K up. If an error in the expansion board is found, the graphic capability of the PET is utilized to draw a picture of the board and indicate which chip appears defective.

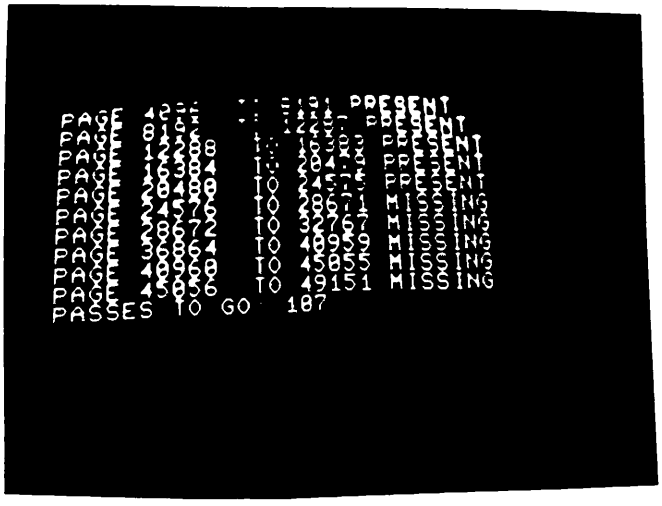
The machine language test is several orders of magnitude faster than the BASIC program presented here, but the BASIC program is quite effective in testing the parameters of consequence.

The program utilizes the RND(0) function of the PET, which generates random numbers in the range from 0 to 1. By initializing the function (RND(-1)), a series of predictable, but statistically uncorrelated, numbers is generated. Multiplying the random number by 255 assures that the result will be in the range from 0 to 255, and taking the integer value allows you to POKE the data thus generated in a specific memory location. This is done successively for all locations of interest. The same random sequence is generated again, and this time compared with data stored in memory. If the comparison fails, the difference between the correct data and the read data implies which chip is defective. The difference will usually be an integer equal to 2 to an integral power (1,2,4,8...128). If it isn't, then it is likely that there is a hardware problem other than a defective memory chip, since it is unlikely that two errors will occur at the same address spontaneously. (If the difference isn't an integer, then there is a problem with the PET quite apart from the memory). The memory chips are all socketed. If one should appear defective, exchange it with another and see if the memory test tracks the bad chip. If so return it for replacement according to the terms of the warranty.

Although the program takes quite a while to run, this is an excellent test of the "refresh" circuitry of the RAM board. When you install the board or if you ever are concerned about its performance, just let the test run continuously.

```
 10 REM BASIC PROGRAM FOR TESTING-
 20 REM MEMORY ACCURACY AND RETENTION-
 30 REM RANDOM DATA IS WRITTEN IN EACH-
 40 REM LOCATION AND THEN COMPARED WITH-
 50 REM IDENTICAL RANDOM DATA AT A-
 60 REM LATER TIME-
 70 REM P IS PASS COUNTER-
 100 REM DECIDE MEMORY BOUNDARIES-
 105 PRINT"s"-                                  (clear screen character)
 110 PRINT"INITIAL ADDRESS"-
 120 INPUTI-
 125 IFI<4096THEN110-
 130 PRINT"FINAL ADDRESS"-
 140 INPUTF-
 150 IFF>49151THEN130-
 190 PRINT-
 200 REM INITIALIZE RND AND LOAD-
 205 PRINT"qqPASS     )))))";P;"WRITING"-  (2 up cursors, 5 spaces, 5 back cursors)
 206 PRINT-
 210 A=RND(-1)-
 220 REM FOR EACH PASS USE DIFFERENT-
 230 REM RANDOM SEQUENCE-
 240 FORN=0TOP:A=RND(1):NEXTN-
 300 FORN=ITOF-
 310 POKEN,INT(255*RND(1))-
 320 PRINT"q       ))))))",N-                  (up cursor, 5 spaces, 5 back cursors)
 330 NEXTN-
 400 REM INITIALIZE RND AND READ-
 410 A=RND(-1)-
 440 FORN=0TOP:A=RND(1):NEXTN-
 490 PRINT"qqPASS";P;"READING"-                (2 up cursors)
 495 PRINT-
 500 FORN=I TO F-
 510 A=INT(255*RND(1))-
 520 B=PEEK(N)-
 530 IFA<>BTHEN1000-
 540 PRINT"q       ))))))",N-                  (up cursor, 5 spaces, 5 back cursors)
 550 NEXTN-
 600 P=P+1-
 610 GOTO205-
 1000 PRINT "ERROR FOUND AT ADDRESS:";N-
 1010 PRINT "DATA SHOULD BE";A-
 1020 PRINT "DATA IS       ";B-
 1030 END-
READY.-
```

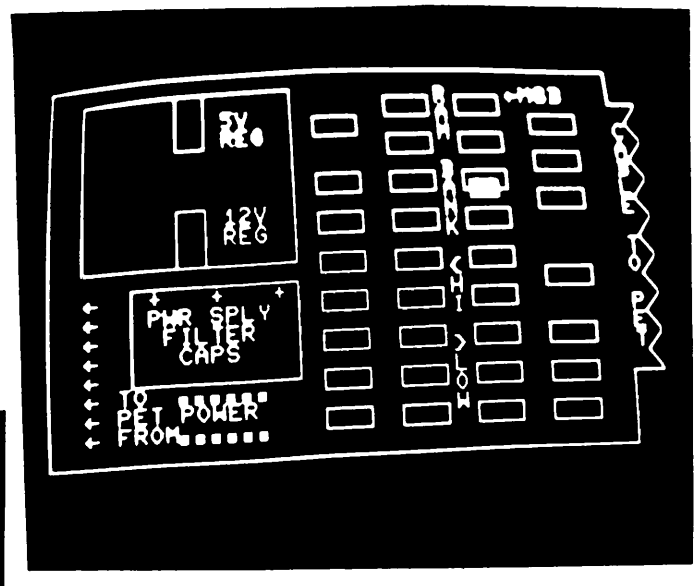
OPTIONAL MEMORY TEST PROGRAM

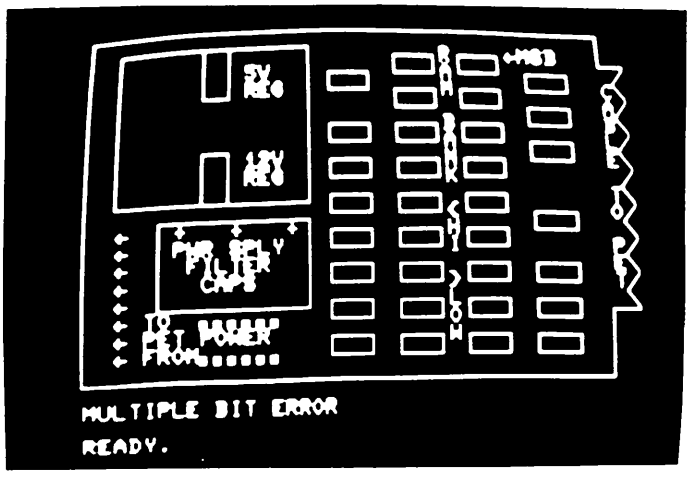


This unusually complete memory test program can be used to check out thoroughly both the memory of the PET and of the expansion memory board. First, a machine language program is loaded as a USR function, then BASIC programs access the USR function between defined boundaries. The PET display and program memory is tested, then another program is loaded to check the expansion board.

This program first tests the board to see how it is configured (see display at left). It then continuously reads and writes test patterns into the memory present. These patterns are designed to uncover both single bit errors and addressing problems.

If an error is found at any address, the program displays a schematic outline of the memory board on the PET screen and, if the error can be diagnosed as a single bad bit, the defective chip is indicated by a flashing "XX" at its position on the PET screen. (See white rectangle on the third chip down). This indicates that the third MSB between 8 K and 24 K is bad.



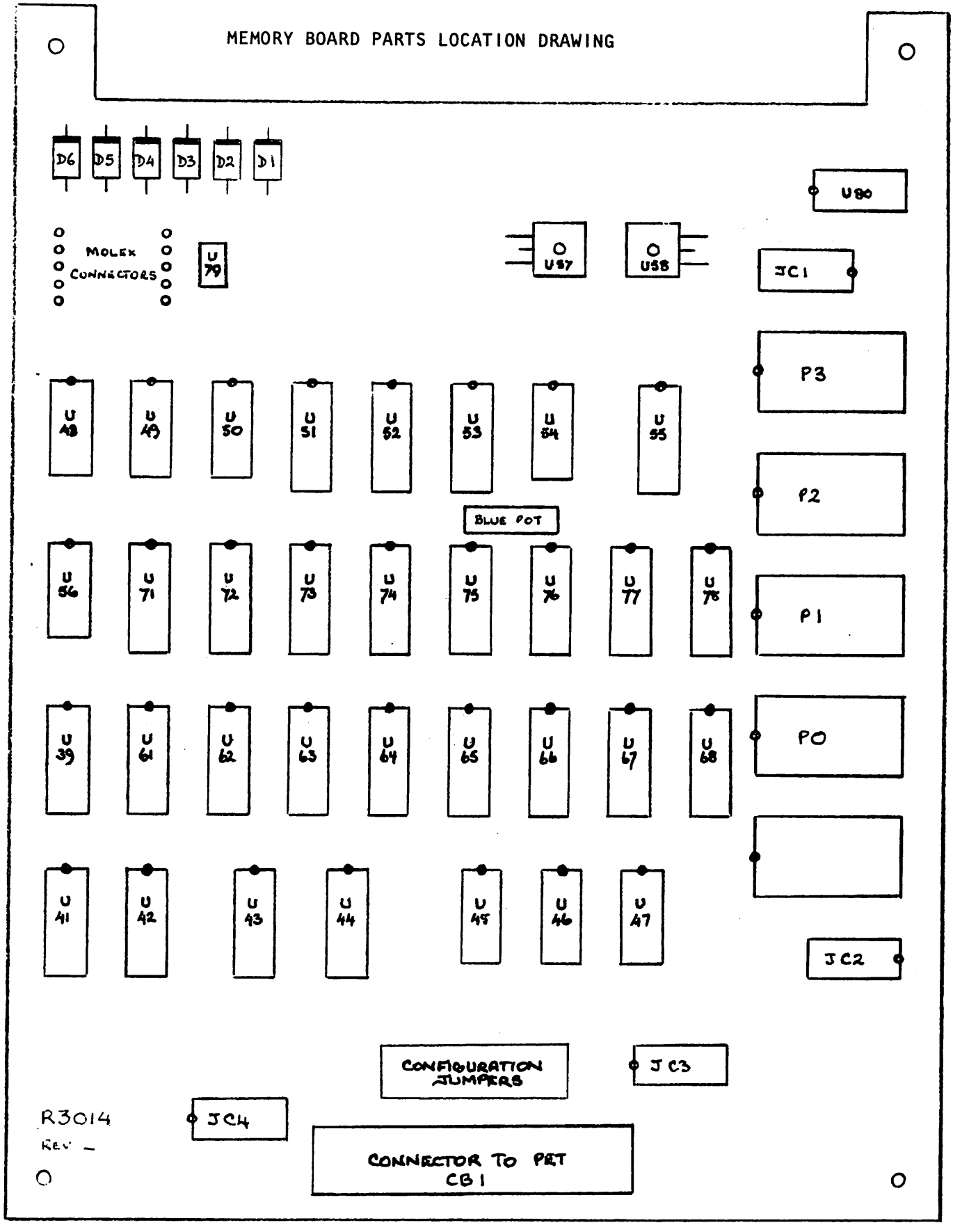


If an error which involves several bits occurs, the program displays "MULTIPLE BIT ERROR" and stops. One is then free to interrogate the variables to determine the address(es) of the error, what the data were, and what the data should have been.

Documentation furnished includes the BASIC listing and instructions which allow the program to be modified if desired. As this program tests the PET, as well as the expansion board, it is particularly useful in checking the memory chips in the PET. These have a tendency to have single stuck bits at one address, and can very easily cause system crashes under mysterious and sometimes unrepeatable circumstances.

Because the memory test in is machine language, it runs much faster than the BASIC program shown elsewhere in this manual. The program, with documentation and a tape cassette, can be purchased from your usual dealer, or from

EVENTIDE CLOCKWORKS INC., 265 WEST 54TH STREET, NEW YORK NY 10019.


MEMORY BOARD PARTS LOCATION DRAWING
D6
D5
D4
D3
D2
D1
U80
MOLEX CONNECTORS
U79
U57
U58
JC1
P3
U48
U49
U50
U51
U52
U53
U54
U55
P2
BLUE POT
U56
U71
U72
U73
U74
U75
U76
U77
U78
P1
U39
U61
U62
U63
U64
U65
U66
U67
U68
P0
U41
U42
U43
U44
U45
U46
U47
JC2
CONFIGURATION JUMPERS
JC3
R3014
REV –
JC4
CONNECTOR TO PET CB1

MEMORY BOARD REPLACEABLE PARTS LIST

Various revisions of the R3014 board exist. This list gives information on parts which were changed in those revisions..

DESIGNATION	COMMERCIAL PART #	COMMENTS
U41	MC14040B	Replace with Motorola part only
U42	80C97	* Revision A boards only
U42	74LS365	May be replaced with 74LS366
U43	74LS257	
U44	74LS258	May be replaced with 74LS258
U45	74C30	May be replaced with 74LS30
U46, U47	74C20	May be replaced with 74LS20
U61 - U68	various	16 K RAM, low addresses (32 K board)
U71 - U78	various	16 K RAM, high addresses (32 K board)
U71 - U78	various	8 K RAM, high addresses (24 K board)
U71 - U78	NONE	Empty board positions (16 K board)
U48	74LS00	
U49	74C73	May be replaced with 74LS73
U50	74LS73	
U51	74LS174	
U52	NONE	Timing ROM (see note below)
U53	74LS193	
U54	74LS86	
U55	NE564	
U56	74LS10	
U57	78M12	12 V positive regulator
U58	78M05	5 V positive regulator
U39	74LS365	* Revisions B & C may be replaced with 74LS366
U39	74LS367	* Revision D boards
U79	various	5 V negative regulator, present in some Revision D boards, where it replaced diodes D1 and D2
U80	NONE	* Some Revision D boards. Chip Select ROM (see note below)
JC1 - JC4	NONE	Jumper cable sockets - Revision D boards only
P0 - P3	NONE	* Revision D boards only - sockets for ROM's
D1	1N749	4.5 V zener diode (Revision D boards - will be missing if U79 is present)
D2	1N4148	Silicon diode (Revision D boards - will be missing if U79 is present)
D3 - D6	1N4001	Rectifier diodes, 50 PIV or greater
CB1	NONE	Cable assembly, memory board to PET

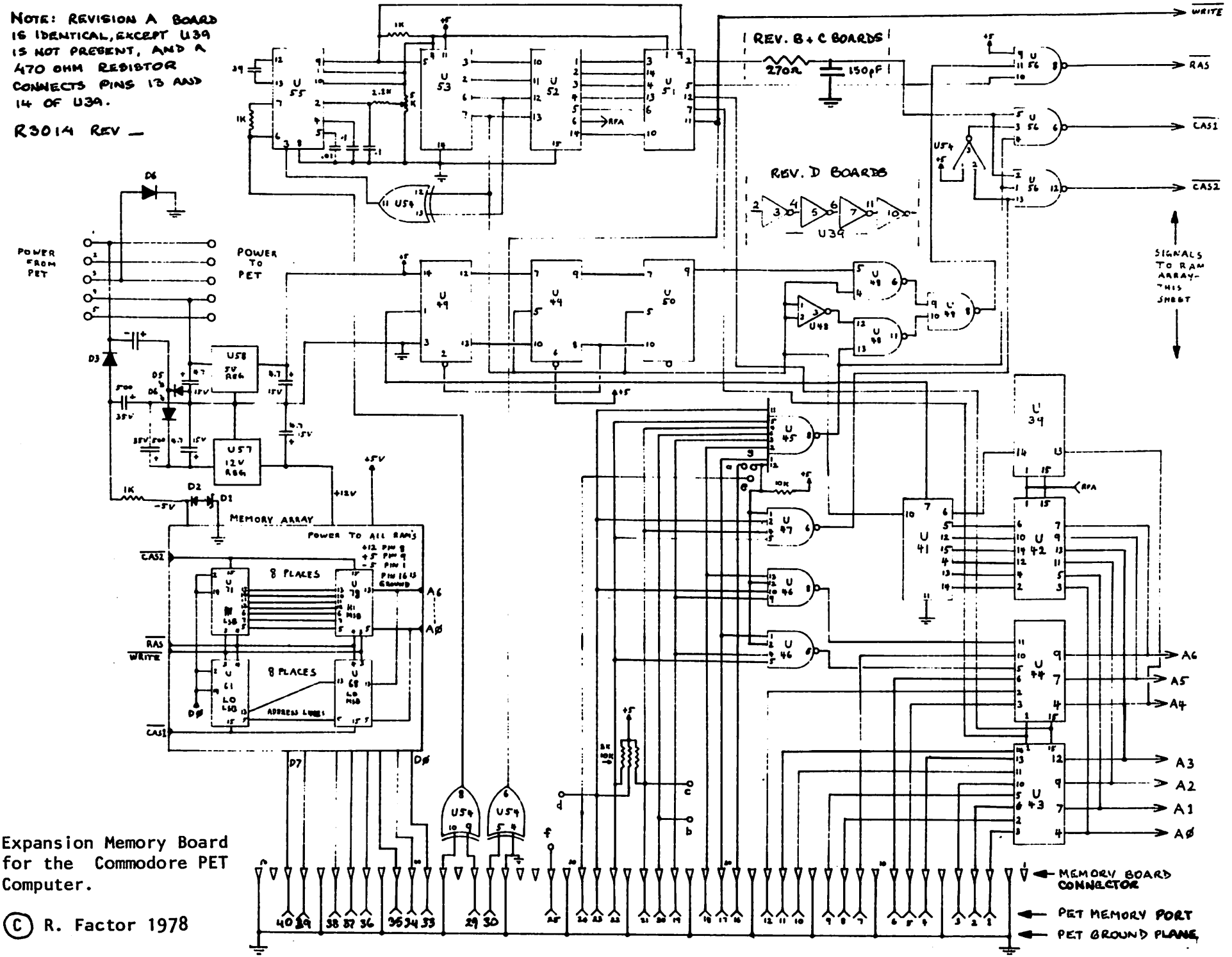
All other parts which can be replaced are common passive components, whose values can be obtained by inspection. If a passive component should become defective, whether in or out of warranty, we recommend that as a matter of convenience you obtain the part locally.

NOTE:
The CB1 cable assembly, and ROM's U52 (timing) and U80 (Chip Select) must be obtained from your dealer or from Eventide Clockworks, as these are custom components.

WHEN RETURNING THE MEMORY BOARD FOR REPAIR please wrap the board in aluminum foil to prevent static damage, and enclose a full report of the problems experienced.

NOTE: REVISION A BOARD IS IDENTICAL, EXCEPT U39 IS NOT PRESENT, AND A 470 OHM RESISTOR CONNECTS PINS 13 AND 14 OF U39.

R3014 REV —



Expansion Memory Board for the Commodore PET Computer.

Eventide
the next step

digital delay lines
instant flangers
omnipressors
harmonizers
monstermats

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