DeadTest-781220 FOM’26

Diagnostics-586220 FOM’26

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Revision 1

Table of Contents

Introduction

After working on DesTest series of memory diagnostics I wondered if I might be able to apply some of the lessons I learned to the original Commodore DeadTest-781220 and Diagnostics-586220 cartridges:

- DesTestMAX is able to display a screen of information directly from ROM and requiring absolutely no RAM. DeadTest usually displays a black screen for nine long seconds before seemingly coming to life – perhaps we can use the same trick to display something useful during that time.
- The DesTest products all intentionally introduce slight-interference (flickering or sparkles) into the border to give the user reassurance that the program is still running. This could be very useful for both DeadTest and Diagnostics too.

So I found my disassembler and got to work.

My intention was to increase the utility of the original Commodore diagnostic offerings – not to change them beyond recognition. For better or for worse I did not change the underlying methodology of the diagnostics themselves. Good tests remain good. Bad tests remain bad.

Adding cool visual effects to DeadTest and Diagnostics is all very well and good but only if I could verify I haven't broken anything. To help here I enlisted the help of my C64 with socketed RAM and my specially broken version of VICE that can emulate bad RAM. I put the original programs through their paces with a perfectly functional C64 (real and emulated) and then moved on to seeing what happened with emulated and real memory faults. Oh dear. Oh dear oh dear. I quickly added fixing bugs to my list of things to address.

First, the bugs...

I classify bugs here as things that crash or clearly don't do what they should. Questionable design choices aren't bugs. I will write a separate document on how these tests work, what they're checking for and some of the limitations.

There are several variants of the FOM'26 DeadTest and Diagnostics supplied in the archive file. While these variants have slightly different features, all of them have the bug-fixes below.

DeadTest Bugs

- The initial tests (the 9 second black-screen pause) runs 2 extra useless passes due to bad mathematics.
- The flash-codes can be just plain wrong.
- Error-bits detected during the main ZERO PAGE, STACK PAGE, SCREEN RAM, COLOR RAM and RAM TEST tests are displayed incorrectly.

Note: If an error or errors are found during the main set of tests the error is reported and the program immediately stops without any fanfare. This is definitely intentional and is not considered a bug.

Diagnostics Bugs

- If errors are detected during the ZERO PAGE, STACK PAGE, SCREEN RAM, RAM TEST2 or COLOUR RAM tests the diagnostics will crash. Chips identified as BAD will likely be incorrect, and the test will not be noted as “BAD”.

Enhancements

While all variants of DeadTest and Diagnostics binaries come with the bugs fixed, different build variants are offered that include different enhancements. See the Binaries section for a discussion of which binaries include what.

‘Screen’: DeadTest only

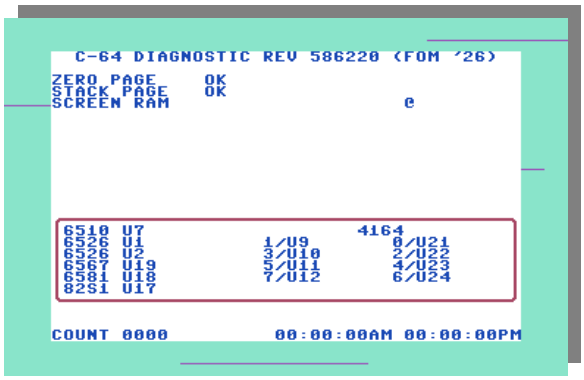
The Screen enhancement displays a static ROM-based display during what would otherwise be the 9 second black-screen period. This screen includes a table that maps the number of screen-flashes to the data-bit number and the RAM IC identifier for most C64s and C128s.

Additionally, this enhancement fetches the character-definitions from the ROM rather than copying them to RAM and fetching them from there. This means the unlike the original DeadTest, the characters-on-screen don’t slowly disappear during the RAM TEST.

‘Sparkle’: DeadTest and Diagnostics

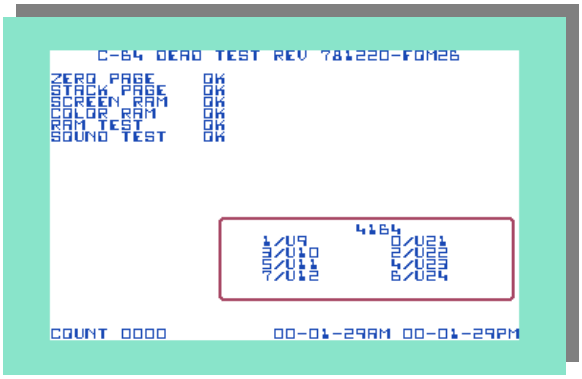
The Sparkle enhancement simply adds sparkles (interference) to the border during any of the memory tests. This effect is intended to let the user know that the tests are still running and that the computer hasn’t crashed.

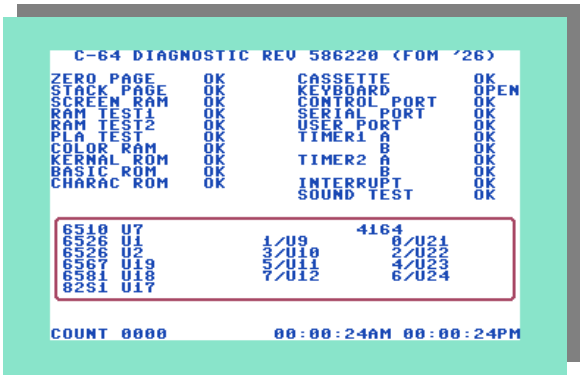
In DeadTest, this effect also occurs during the initial 9-second black screen period and is quite reassuring that the computer is indeed doing something.



‘Bit numbers’: DeadTest and Diagnostics

To make the “bad chip” display (bottom right hand part of the screen) just a little more useful the data-bit numbers have been added. This enhancement is included if either ‘screen’ or ‘sparkle’ enhancements are included in a given binary.





The ‘Switch variants

It doesn’t take much of a mental-leap to wonder if DeadTest and Diagnostics can be combined and used in a DesTestMAX-Switch cartridge. With just a little modification to each not only is it possible but it works very nicely indeed.

The modification to DeadTest is to get it to perform the switch to Diagnostics once it has run all its tests successfully.

The modification to Diagnostics allows it to work properly if no kernal-ROM is installed. A normal Diagnostics ROM will usually only run if the kernal-ROM is present (since it is the kernal that transfers control to Diagnostics). The ‘Switch does not require the kernal-ROM (or the BASIC-ROM for that matter) since MAX-mode DeadTest doesn’t need the kernal at all. Once completed, DeadTest passes control to Diagnostics – no kernal required. This works very well except that Diagnostics does use the kernal interrupt handling routines during the INTERRUPT test. The modifications made to Diagnostics simply allow it to perform the INTERRUPT tests without needing the kernal.

Note: The modification to allow Diagnostics to run without requiring the kernal is present in the stand-alone variants of Diagnostics-586220 FOM’26 too but is of limited use since they require a kernal to even start.

The ‘Switch cartridge has jumpers (marked A15 and A14) that can select between multiple 16K ‘Switch images. Using such jumpers you may install two ‘Switch images on a 27256 PROM or four on a 27512 PROM.

File Manifest

Here is a brief description of the files you’ll find in the dead-diag-fom-2026*.zip distribution archive:

Filename	Description
`manifest.txt`	This list of files.
`deadtest-diagnostics-fom-2026.pdf`	This documentation file
`deadtest-fixed.rom`	DeadTest (no enhancements).
`deadtest-screen.rom`	DeadTest (plus ‘Screen’ enhancement).
`deadtest-sparkle.rom`	DeadTest (plus ‘Sparkle’ enhancement).
`deadtest-screen-sparkle.rom`	DeadTest (plus ‘Screen’ and ‘Sparkle’ enhancements).
`diagnostics-fixed.rom`	Diagnostics (no enhancements).
`diagnostics-sparkle.rom`	Diagnostics (plus ‘Sparkle’ enhancement).
`dead-diags-switch.rom`	DeadTest (no enhancements) & Diagnostics (no enhancements).
`dead-diags-screen-switch.rom`	DeadTest (‘Screen’ enhancement) & Diagnostics (no enhancements)
`dead-diags-sparkle-switch.rom`	DeadTest & Diagnostics (both with‘Sparklee’ enhancement)
`dead-diags-screen-sparkle-switch.rom`	DeadTest (‘Screen’ and ‘Sparkle’ enhancement) & Diagnostics (‘Sparkle’ enhancement).

Note: All binaries have at least the Bug-Fixed variants of DeadTest-781220 FOM'26 and/or Diagnostics-586220 FOM'26. Enhancements are included as noted.

Observations

Under very rare circumstances and depending on exactly is wrong with it, DeadTest 'Screen' might not be able to produce any output on certain malfunctioning C64s. In this case DeadTest 'Sparkle' or the plain fixed version may be able to display flash-codes. I'd love to hear your experiences.

Comments/Questions

- I have not incorporated Jani's extended ROM checksum code in Diagnostics. It isn't my code (heck, none of this my code) and I don't want to tread on toes. Is this or something similar you'd like me to investigate adding?
- I also didn't implement a way of skipping the memory tests in Diagnostics. After spending time and effort getting them to not crash and report correct results I didn't feel like it.
- I kind of super-hate the DeadTest font (FIGHT?). Would you prefer a different one? Which? Commodore-64, Amiga Topaz-8, DesTestMAX, PET or VIC20 maybe?
- Anything else specific to these tests that's bugging you?
- If you include any of these images in your cartridges or collections or whatevers could you at least give me a shout-out? Agreed it's almost entirely not my code but I believe I have added some value worthy of a mention.