Resurrecting MZOS on Vector Graphic Computers

Thanks to a hobbyist in Australia, we now have a copy of the version 1.5 MZOS ROM required to support the version 1.5x disks that had been archived in the past. Previously, we only had a copy of the version 1.4 MZOS ROM, but unfortunately, not a version 1.4 disk. While I was able to get MZOS 1.5x running under the 1.4 ROM, it required some patching (see "MZOS 1.5 on ROM 1.4" later in this document).

The MZOS ROM images can be found in the "roms" folder. Manuals for MZOS versions 1.4 and 1.5 can be found in the "manuals" folder.

Running MZOS on a Vector Graphic Computer

MZOS runs under Vector's older, 48K configuration. In this configuration, a version 2.x monitor is at C000 and the Micropolis FDC is at D800. MZOS requires the MZOS ROM at C400 and RAM from DC00-DFFF. This RAM is provided by the VG PROM/RAM board in older systems and by the ZCB CPU board in newer systems.

The 2.x monitor expects RAM at CC00-CFFF or DC00-DFFF depending on how it was assembled. For MZOS compatibility, the monitor must be configured for RAM at DC00-DFFF. The source files for the 2.x monitor ROMs on this website have an equate that allows you to specify the RAM location. The 2.0c monitor uses the Bitstreamer or Bitstreamer II serial port at I/O address 2/3 for console I/O. The 2.0cv monitor uses the same Bitsreamer serial port for keyboard input, but console output is via the Flashwriter or a VDM-1 video board. The 2.x monitors can be found in the "roms" folder.

MZOS Disk 1.5 versus 1.52

The only difference between the version 1.5 and 1.52 disks is the addition of a patch in 1.52 at address 22C3 that jumps to empty space at the end of MZOS (28F6) and fixes a bug in a disk overflow calculation that is present in version 1.5. The patch then jumps back to continue the original code at 22C6.

Creating a Bootable MZOS 1.52 Floppy

To create a bootable MZOS floppy for the Micropolis/Vector MZ configuration, run PC2FLOP to write the "MZOS 1.52.VGI" disk image file to a floppy. You can find PC2FLOP in the "disk_image_transfer" folder and the MZOS disk images in the "disk_images" folder.

PC2FLOP is configured to run on a typical 56K Vector configuration (i.e., Monitor 4.x at E000, Micropolis FDC at F800). Note this is *not* the run-time configuration required for MZOS (see next section).

PC2FLOP can be run under CP/M and still create an MZOS floppy. PC2FLOP can also run stand-alone on a bare machine – see the ReadMe file for PC2FLOP for more information.

MZOS on the SIMH Emulator

Download and extract "MZOS on SIMH.zip" to get the files needed to try MZOS under SIMH. Type "do mzos.txt" at the SIMH prompt to boot the machine into the monitor ROM, then type "E" or "G C400" to boot MZOS.

MZOS 1.5 on ROM 1.4

I obtained a dump of an MZOS ROM that supports version 1.4 of the MZOS disk from Santo Nucifora (snuci on the Vintage Computer forums). I've also obtained MZOS 1.5 and 1.52 disks from Howard Harte which I have archived into .vgi disk image files.

Unfortunately, there are incompatibilities between the MZOS 1.4 ROM and the MZOS 1.5x disks. The following table documents the 1.4 ROM entry points and shows what some of the 1.5 ROM entry points appear to be:

Vector	1.4 ROM	1.5x ROM
C400	Boot	Boot
C402	Disk I/O	Disk I/O
C404	Display "% Syntax Error"	Display disk error
C407	Display "% File Error"	Check for and display disk error if present. Return otherwise.
C40A	Display "% Huh?"	Unknown
C40D	Display "% Write protected"	Unknown
C410	Display "% Disk overflow"	Unknown
C668	Display error message, exit through DF5C	(middle of other code)
C6C3	(middle of other code)	Display error message, exit through DF5C

The primary change from the 1.4 to 1.5 ROM appears to be in the error handling mechanism for the C402 Disk I/O call. The 1.4 ROM prints error messages as disk errors occur and then exits through a vector in RAM at DF5C. The 1.5 ROM gives the caller the option to handle the error by returning with an error code in A' (prime). MZOS does a call to C407 after every call to C402, which appears to check if a disk error is present in A'. If not, control immediately returns to the caller, otherwise, it displays an error message and exits through the DF5C vector.

Since the MZOS 1.5x code always calls C407 after C402, this is basically the same as calling just the C402 entry point in the 1.4 ROM.

MZOS also calls the ROM to display other error messages and then exit through a RAM vector at DF5C. This entry point is in different places in the 1.4 versus 1.5 ROM as shown in the table above.

A bug in the Disk I/O code in MZOS calls the C402 entry point with a "seek" command instead of a "verify" command when doing writes with verify. The command should be patched to 2 instead of 3 as present in the code. This assumes the verify command was not changed to 3 in the 1.5 version of the ROM. The manual for version 1.5 still shows the verify command to be 2, so I'm thinking this is a bug. **UPDATE**: The version 1.5 ROM performs a "verify" with either command 2 or 3, so they did notice this problem and fix it.

Patching MZOS 1.52 to work with ROM version 1.4

The following patches to MZOS 1.52 allow it to work with the version 1.4 ROM. The patched version of the disk image is "MZOS 1.52 on 1.4.VGI"

1) Change 2126 from 3E 03 D9 to C3 0D C4. This is the code to jump to ROM to display the "% Write Protect" error.
2) Change 23FA from CD 07 C4 to 00 00 00. This NOPs out the call to C407 in the new ROM that processes disk errors.
3) Change 240D from CD to C3. This replaces the call to C402 with a jump and therefore bypasses the subsequent call to C407.
4) Change 2748 from C3 to 68. This changes the call to C6C3 to a call to C668, the address of the error message display routine in the ROM.

The final patch is a bug fix, not a ROM version fix. The verify step of a write command issues a "Seek" command (3) instead of a "Verify" command (2).

5) Change 240B from 03 to 02. The "Verify" command is 2, not 3.