

# Vector Graphic CP/M 2.2 on 8 inch Controller

## Distribution Disk Content (Mixed Mode)

```
Mon> BOOT DUALSTOR
VECTOR GRAPHIC 56K CP/M - VERSION 2.20 MD

A>DIR
A: MOVCPM/M COM | MOVCPM/D COM | MOVCPM/S COM | SYSGEN COM
A: SUBMIT COM | XSUB COM | MBASIC4 COM | MBASIC5 COM
A: SC COM | ZSM COM | RAID COM | DDT COM
A: LOAD COM | DUMP COM | STAT COM | PIP COM
A: FORMAT/8 COM | FORMAT COM | BACKUP/8 COM | BACKUP COM
A: CONFIG/8 COM | MAP COM | WORM COM | FLASH10 COM
A: MDIAG COM | USERAREA ASM | USERCUST ASM | DUMP ASM
A: DUMP HEX | DUMP PRN
A>STAT DSK:

    A: Drive Characteristics
    7904: 128 Byte Record Capacity
    988: Kilobyte Drive Capacity
    128: 32 Byte Directory Entries
    128: Checked Directory Entries
    512: Records/ Extent
    32: Records/ Block
    52: Sectors/ Track
    2: Reserved Tracks
```

MOVCPM/S creates CP/M that works only with single density disks.

MOVCPM/D creates CP/M that works only with double density disks.

MOVCPM/M creates CP/M that works with double density, single density, and Micropolis disks. Double density drives are physical drives 0-3 as A-D. Single density drives are physical drives 0-3 once again, but as drives E-H. Drives I-L are Micropolis drives 0-3 attached to a Micropolis controller that can be in the system at the same time as the 8 inch controller.

## Boot Tracks

Both single and double density disks use the same format for system tracks 0 and 1 (bottom surface). Track 0 is single density (26 sectors, 128 bytes per sector) and track 1 is double density (26 sectors, 256 bytes per sector). The boot loader is on track zero sectors 1 and 6 (see the “Boot-ing” section, following). The remaining sectors on track 0 and 1 contain the CP/M boot image.

## Single Density Disks

On a single density disk, tracks 2-76 are organized as 26 sectors of 128 bytes using the standard IBM interleave of six sectors. The disk is single sided. This matches the IBM SSSD standard and can interchange data with other SSSD CP/M systems. Note that track 1 on this disk is double density (26 sectors of 256 bytes), but this track is only used to boot CP/M and is therefore only accessed on this particular Vector Graphic system. When formatting a SSSD disk with the Vec-

tor Graphic FORMAT/8 utility, the format utility takes care of formatting track 1 as double density.

## Double Density Disks

A double density disk uses tracks 2-76 on the bottom and tracks 0-76 on the top with 6556 bytes per track. Data on these tracks is organized as 26 sectors of 256 bytes. Logical track 76 is the innermost track on the bottom surface and logical track 77 is the outermost track on the top surface. The CP/M BIOS implements a physical interleave of five 256 byte sectors. This interleave is at the lowest level and has nothing to do with the BIOS SECTTRAN call, which in this BIOS, simply returns the same sector as passed in (i.e., no sector translation).

## Booting

The boot PROM loads sectors 1 and 6 from track zero (128 byte sectors, single density) into memory starting at 300h. Control is passed to this code which then loads the CP/M image. The image is stored with an interleave factor of five. The CP/M image starts on track 0 sector 11. Reading from sector 11 with interleave reads the remaining 24 sectors on track zero before wrapping back to sector 1. The remainder of the CP/M image is on track 1 (always double density) and is also stored with an interleave factor of five.

The BootA PROM at E800 contains boot code for a several drives including the 8 inch floppy controller. The "V" command in the monitor jumps to E800 in the BootA PROM to boot the 8 inch floppy drive. The boot code checks a couple of locations the monitor PROM to determine whether the 4.1, 4.2, or 4.3 monitor is in use. Prior versions of the monitor are not expected. The boot fails, for example, if the 4.0c serial console monitor is in use. To use the 4.0c monitor with the BootA PROM, modify the 4.0c monitor to include a zero byte at location E00Fh. This passes the "4.3" test and the boot proceeds normally.

## Removing synchronization errors from MOVCPM/x.COM

To run one of these versions of MOVCPM under a differ version of CP/M:

Change offset 162h (262h in memory) from C2 80 02 to 00 00 00

Change offset 1E9h (2E9h in memory) from C2 80 02 to 00 00 00

## Notes about SYSGEN

SYSGEN for the 8 inch controller is substantially different than the generic SYSGEN. Several O/S validation checks are done when the program starts. The first two bytes of the six digit serial number preceding the BDOS entry point are checked for 1Fh followed by 16h. If you patch these locations in the CP/M image, you must also patch the 2nd copy of the serial number at offset 305h, 306h in the CCP (look for strings "DIR ", "ERA ", "TYPE", etc., the 2nd serial number copy is just past this command list.) Otherwise, CP/M halts the machine whenever a user command (.com file) is run.

SYSGEN also looks for a disk density indicator at offset 86h in the CCP (just past the CCP input buffer). The byte must be 42h, 43h or 44h for single, double, or mixed density versions of CP/M respectively.

Even if these tests are passed, SYSGEN fails to actually write to the selected output disk when run under a version of CP/M other than the Vector Graphic 8 inch CP/M. Disassembly shows that SYSGEN calls a custom entry vector in BIOS past the last CP/M BIOS vector (SECTRAN). This entry is used to restore the interrupt status of the machine. Other versions of CP/M do not have a subroutine at this address, so SYSGEN does not operate properly.

Instead of patching SYSGEN to create a bootable Vector Graphic CP/M disk (without having one to boot from), I chose to manually load an image of Vector Graphic 8 in CP/M into RAM and then run SYSGEN. To do this, run MOVCPM/D to put a 56K CP/M image in memory at A00h. Reset the computer and use the monitor "M"ove command to move 0A00h-2B00h to BE00h. BE00 is the start of CP/M (the CCP) in a 56K system. After the move, jump to the BIOS cold start entry point at D400. The computer is now running the VG version of CP/M and displays its A> prompt. Immediately run SYSGEN and press return at its first prompt to use the system image already in memory.

## **Formatting Disks**

Disks formatted on other systems – especially a SSSD disk, may not work as expected unless formatted using the FORMAT/8 utility while running under 8 inch Vector Graphic CP/M. Recall that VG CP/M requires a SSSD disk to be formatted with a double-density track 1 in order to accept the CP/M image written by SYSGEN. Across different computer platforms, DSDD formats are not as consistent as the SSSD format, so other machines may not layout a DSDD disk the same as VG CP/M expects.

If trying to get Vector Graphic CP/M running on a “cold” machine, you may need to format a disk using FORMAT/8 under a manually loaded VG CP/M image as outlined previously for SYSGEN.