OS9/68000 Information

Version 2.4

System Requirements

- 512K DRAM (1024K or more highly recommended)
- MFM - Hard Disk (May be shared with MS-DOS, REX or SK*DOS)
  or
- IDE - Hard Disk (May Be shared with MS-DOS)
- 1.2M or 1.4M Floppy Drive (PT68K4 Board)
- 80 Track 3.5" or 5-1/4" (720K) Floppy Drive (PT68K2 Board)
- MK48T02 clock chip must be installed
- MC68230 PIA is required to support parallel printer
- Monochrome card, CGA, EGA or VGA with IBM clone keyboard
  or
  RS232 terminal

Note: The parallel printer port on the monochrome card or CGA card is not supported at this time.

Installation of OS9/68000

The EPROMS you receive may also contain HUMBUG or MONK in addition to the OS9 Boot.

1. Remove the existing EPROMS from sockets (PT68K2) U20 and U27
   (PT68K4) U26 and U27

2. Install the new OS9 ROMS in sockets (U20 and U27 for PT68K2) (U26 and U27 for PT68K4). Use caution when installing these EPROMS. If installed backwards, they will be destroyed.

3. **FOR OS9/HUMBUG USERS:** Your computer will start at power-up as before. When you get the HUMBUG prompt you can enter the OS9 boot menu by selecting the 'X1' option on the HUMBUG menu.

4. **For OS9/MONK USERS:** Your computer will start up under the MONK monitor. You may select the OS9 boot menu by selecting option 'O' on the MONK command list.

5. **FOR OS9 WITHOUT HUMBUG or MONK:** Your computer will display the OS9 boot menu automatically on power up.

6. The boot menu will appear simultaneously on a MONO/CGA/EGA/VGA monitor and an RS232 terminal connected to COM Port 1. A sample of the boot menu is shown below.

```
   Peripheral Technology
OS9/68K System Bootstrap V2.4 Rev 0

  1 = Boot from IDE Drive 0
  2 = Boot from IDE Drive 1
  3 = Boot from Floppy (1772)
  4 = Boot from Floppy (37C65)
  5 = Boot from MFM Hard Disk 0
  6 = Boot from MFM Hard Disk 1
  7 = Set Auto Boot
  8 = Drive Set Up
  9 = Set Default RS232 Baud Rate

  Enter choice ?
```

The boot menu will wait for about 20 seconds for you to enter a boot choice. If no choice is made, the computer will attempt to boot from the auto boot device. The auto boot option allows the computer to restart and run a program with no user intervention after a power failure. When the 'Set Auto Boot' selection is made, the choice is stored in battery backed-up RAM.

Choice **"8 = Drive setup"** must be run before booting your computer.
You will be prompted to supply information about the type(s) of floppy drives connected to your computer. This option must be utilized after you first install the OS9 boot EPROMS. After you once run this option your choices will be stored in battery backed-up RAM. It is not necessary to run this option again unless you change the type of drive that is connected to your computer.

Choice **"9 = Set Default RS232 Baud Rate"** allows you to select 1200, 9600 or 19200 baud as the baud rate in the RS232 port on power-up. NOTE: the default baud rate on your OS9 master disks is 9600. If you change the power-up baud rate, it will be necessary for you to modify the appropriate descriptor module and run 'OS9GEN' in order to change the baud rate in OS9 after booting.

Device Drivers

```
sc68681     RS232 device driver
dc68230     Parallel driver
rb1772      Floppy disk driver for WD1772
rb3765      Floppy disk driver for 37C65
rbxt512     Winchester driver for WD-XTGEN controller
rbide       Driver for IDE drives
monokbd     Monochrome card and IBM keyboard driver
vgakbd      CGA,EGA or VGA card and IBM keyboard driver

/term       Terminal descriptor for RS-232 port 1 or monochrome
/t0         Terminal descriptor for RS232 port 1
/t1         Terminal descriptor for RS232 port 2
/t2         Terminal descriptor for RS232 port 3
/t3         Terminal descriptor for RS232 port 4
/p          Parallel printer descriptor port 1 MC68230
/p1         Serial printer descriptor RS232 port 2
/h0         Winchester descriptor (drive 0 )
```

```
/d0         Floppy drive 0
/d1         Floppy drive 1
/dd
```

The /dd descriptor (default disk) may refer to a floppy, a hard disk, or a ram disk depending on the OS9 Boot file. The descriptor will be of the form dd.d0, dd.h0, dd.r0 etc. when located in the CMDS/BOOTOBJS file.

There are versions of OS9 which use the IBM MONOCHROME, CGA, EGA, VGA monitors or RS-232 terminals. The difference between these versions is the assignment of the initial system terminal. Either version may be converted to the other by using the OS9GEN utility to create a new version of OS9. The RS232 system terminal if present should be connected to COM1. The terminal should be configured for 9600 baud and 1 stop bit.

New versions of OS9 may be created by using the BOOTFLOP or BOOTWIN files found in the /d0/CMDS/BOOTOBJS directory. These files contain a list of modules that are to be included in a bootfile. These files may be edited and modified as the user requires. A new version of OS9 can be created by using one of the following commands:

```
OS9GEN -z=bootwin -b=128 -e /h0    Put new version of OS9 on Winchester
OS9GEN -z=bootflop -b=128 -e /d1   Put new version on Floppy Drive 1
OS9GEN -z=bootflop -b=128 -e /d0   Put new version on Floppy Drive 0
```

Other options are possible. Consult the OS9 User's Manual for more information on the OS9GEN command.

WINCHESTER INTERFACE

The WD-XTGEN controller is an IBM PC/XT compatible controller that plugs into the PC/XT expansion slots of the PT68K2/K4 computer. This controller works with drives with up to eight heads and 1024 cylinders. Some versions of the XTGEN board will work with up to 16 heads. Connect the 20 and 34 conductor cables as described in the installation sheet which comes packed with the controller. The drive should be configured with hardware select 0.

Software Considerations

OS9/68000 can share a hard disk with MSDOS, REX or SK*DOS. Currently REX and SK*DOS cannot be installed on the same hard disk. Since there are several choices of operating systems, there are some rules to follow when installing multiple operating systems on the same hard disk. The installation of several popular configurations is outlined as follows.

MS-DOS with OS9/68000 and/or REX

MS-DOS requires the installation of the ALT86 board. If you are planning to use the ALT86 it should be installed at this time. The hard drive should be low-level formatted and MS-DOS installed as outlined in the ALT86 manual. MS-DOS must be installed on the first drive and be the first operating system installed. OS9/68000 and/or REX may then be installed in any order. You should carefully consider how much space you want to allocate to each operating system. YOU MAY HAVE TO REFORMAT THE ENTIRE DISK IF YOU CHANGE YOUR MIND. SK*DOS and MS-DOS cannot be installed on the same hard disk. If you wish to have SK*DOS on a hard disk you will need to install a second disk. SK*DOS can be booted from the second hard drive.

OS9/68000 with REX or SK*DOS

REX and SK*DOS should be installed first. Consult the REX or SK*DOS User's Manual for the proper procedure to format the hard disk. If you have a drive with 612 cylinders and you wish to use half of it for REX/SK*DOS, tell the REX/SK*DOS format program that you have 306 cylinders. When setting up OS9/68000 use a cylinder offset of 306 and set the number of cylinders to 306.

IMPORTANT NOTE: You must use the 'HDSETUP' utility before you can use the 'FORMAT' utility supplied with OS9 to format your hard drive.

VERY IMPORTANT NOTE: After using the 'HDFORMAT' program to format your winchester drive you still must modify and assemble the 'h0.a' descriptor. The 'HDSETUP' program modifies the 'h0' descriptor in memory so that the winchester drive may be formatted. You can then copy your OS9 system diskettes to the winchester and modify the 'h0.a' descriptor. It is easier to modify descriptors on hard disk systems when compared to a floppy based system.

IF YOU ARE INSTALLING SK*DOS AND OS9/68000 ON YOUR WINCHESTER DRIVE USE THE FOLLOWING STEPS AS A GUIDE:

1. Decide how many cylinders to allow for SK*DOS. When the SK*DOS format program prompts for the number of cylinders enter the number you wish to use, not the size of the drive. The remaining cylinders will be used for OS9/68000.

2. Boot SK*DOS and format the desired number of cylinders for SK*DOS.

3. Boot OS9/68000 from floppy disk. Use the Utility 'HDFORMAT' to modify the number of heads, cylinder offset, number of cylinders and steprate code to match your drive. The 'HDFORMAT' utility calls OS9's 'FORMAT' utility to format the winchester drive. At the completion of OS9's 'FORMAT' utility a partition table is created by the 'HDFORMAT' utility. Copy your OS9 system diskettes to the winchester. Don't forget that you must modify the 'h0.a' descriptor to match your drive. Set the track offset equal to the number of cylinders formatted for SK*DOS. You will also need to set other parameters in the 'h0.a' file to match your drive. Create a new bootable diskette with the new descriptor for h0. Format the remainder of your hard disk for use with OS9/68000. You must run 'OS9GEN' to make the winchester bootable.

NOTE: If you reformat the SK*DOS part of your drive after making OS9/68000 bootable you will need to boot OS9/68000 from a floppy and execute the following command to make OS9/68000 bootable.

HDFORMAT /h0 also enter drive parameters (-t=612 -h=6) etc.

When the HDFORMAT calls the OS9 FORMAT program enter 'N' so that you do not format the hard drive. You may then re-enter the partition table data since the SK*DOS format will erase the partition table.

Example Format Session

Assume that you have a 20MEG drive which has 612 cylinders and four heads. Also assume that you want to split the drive using half of the drive for REX and the other half for OS9/68000.

Parameters for REX:

306 cylinders
Refer to SK*DOS manual for instructions on formatting.
('HDFORMAT' command)

Parameters for OS9:

```
    cylinder offset = 306
number of cylinders = 306
    number of heads = 4
    steprate code   = 5
```

First use the HDFORMAT utility to set the cylinder offset and the number of heads. The steprate code defaults to '5' and should not need to be changed unless you are using a very old drive.

NOTE: User input is underlined.

```
HDFORMAT -h=4 -o=306 -t=306        note: (1) -? will display options
                                         (2) HDSETUP with no options
Winchester Setup Utility V2.0              will display parameters.
-----Descriptor /h0 Data-----

Hardware select      : 0
Number of heads      : 4
Steprate code        : 5
Number of cylinders : 306
Cylinder offset      : 306
```

Winchester Partition Table

No	System	Beg	End
1		0	0
2		0	0
3		0	0
4		0	0

Change partition data ? (Y or N) Y

Beginning cylinder ? 306

Ending cylinder ? 612

Is partition table OK ? (Y or N) Y

```
                Disk Formatter
OS-9/68000 V2.4  PT68K4 - 68000
------------- Format Data ------------

Fixed values:
                Disk type: hard
            Sectors/track: 17
 Minimum sect allocation: 32

Variables:
     Number of cylinders: 306
      Number of Surfaces: 4
Sector interleave offset: 3

Formatting device:  /h0
proceed? y
```

Initial OS9 Loading

After formatting your hard disk it is necessary to copy the OS9 system diskettes to the hard disk. Follow the steps listed below.

The first diskette should be in the floppy drive (Disk 1 of x).

Enter the following OS9 commands:

```
chd /d0
dsave -b=100 -v -e /h0
```

When the copy operation is finished place the second diskette in the floppy drive and enter these commands:

```
chx /h0/cmds
dsave -b=100 -v -e -m /h0
```

If you have additional diskettes, insert each diskette and enter the commands listed below until all of the diskettes have been copied.

```
chd /d0
dsave -b=100 -v -e -m /h0
```

The default descriptor for the hard disk may not match your drive. You will need to modify the descriptor and create a new one before you can boot the hard disk. Edit the file 'h0.a' in the /h0/IO directory to match the drive you are using. To create a new descriptor use the following command.

```
make h0
```

NOTE: the 'h0' MUST be in lower case. The make utility will assemble and link the descriptor. It should be noted that the make utility actually creates two descriptors 'h0' and 'dd.h0' The dd.h0 descriptor is the one that the system uses when booting from the hard disk.

When this is completed, execute the following commands to make the hard disk bootable:

```
chd /h0/cmds/bootobjs
os9gen -z=bootwin /h0 -b=128 -e
```

Booting from hard disk upon power-up is now possible. If you desire to customize OS9, you may proceed from this point.

General Notes and Information

The OS9 format program uses a fast verify on formatting. If your drive has bad sectors you should format using the -nf option or the bad sectors will not be mapped out. The HDFORMAT utility will prompt for use of fast verify.

How do I get umacs to work? I keep getting an error message 'Environment variable TERM net defined'.

You must set the environment variable. If you use a password to log-on you may set the environment variable automatically at log-on. If you are starting with the release disks it is necessary to enter the following command before using umacs.

setenv TERM V1 - the **TERM** and **V1** must be in upper case.

The V1 will work with MONO, CGA, EGA or VGA terminals. If you are using an RS232 terminal you must create a termcap file to match you terminal. NOTE: there are several terminal types supplied with OS9, and one of the types may match your terminal. See the umacs manual for more information.

I have modified the h0.a descriptor to match my drive and made a new 'OS9Boot' using OS9Gen. I still can't get OS9 to boot from the hard disk.

You probably manually assembled and linked the h0.a descriptor. You should use the 'MAKE' utilility. A sample line is shown below. OS9 uses dd.h0 for the winchester description. If you manually assemble and link h0.a you did not get the dd.h0 file that is required by OS9. The Make utility creates 'h0' and 'dd.h0' and places them in the /h0/CMDS/BOOTOBJS directory.

make h0 - Note the 'h0' must be entered in lower case.

If you are using an RS232 terminal you may need to delete the .UMACSAR file. This file is located in the SYS directory and redefines some of the keys for use with the IBM style keyboard. Files which begin with '.' are hidden. The dir command with the '-a' option will display hidden files.
