COHERENT Version 2.3.43 Release Notes

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1. Introduction

Congratulations on purchasing the Mark Williams Company COHERENT (tm) operating system for 8086/8088 personal computers. In addition to this document, your installation kit includes the following items.

* Six floppy disks labelled *COHERENT 2.3.43 Volume 1* through *6*. These disks contain the root file system of your COHERENT system.

* One floppy disk labelled *COHERENT 2.3.43 Boot XXX/build*, where *XXX* is the name of your hard disk drive. This is a boot disk configured for your specific type of hard disk.

* A set of COHERENT documentation, including:

Introduction to COHERENT Documentation
Introduction to the COHERENT System
COHERENT Command Manual
COHERENT System Manual
COHERENT Administrator's Guide
COHERENT Assembler Reference Manual
An Introduction To elle
awk User's Manual
bc Calculator Language Tutorial
ed Interactive Editor Tutorial
learn User's Guide
lex Lexical Generator Tutorial
m4 Macro Processor User's Manual
nroff Text Processor Tutorial
sh Shell Command Language Tutorial
Using the Trout Screen Editor
yacc Parser Generator Tutorial

The *Introduction to the COHERENT System* is the manual you should read first. It is a tutorial, with simple step-by-step examples. The *COHERENT Command Manual* describes each command available on the COHERENT system.

The procedure described in the next section installs the COHERENT system on your hard disk. Please take a few minutes to read all the instructions before you start the installation.

The remaining sections of these notes describe normal operating procedures for your COHERENT system; give device-specific information about your COHERENT system, including directions on partitioning the hard disk for use by both MS-DOS and COHERENT; and additional manual pages for PC COHERENT.

2. Installing your COHERENT file system

Before you can install the COHERENT system on your PC with a separate disk, you must connect the hard disk to the PC and turn on the hard disk and the PC. Follow the directions in the documentation provided by the manufacturer of your computer and your hard disk. In general, if your computer and hard disk drive are separate units, you should first power up the hard disk, then the PC.

The following instructions tell you how to install your COHERENT system on your PC. They tell you how to start the boot procedure and the build procedure from a floppy disk; how to partition your hard disk; how to set the root device and the swap device; how to set up additional file systems; and how to deal with problems encountered during the boot and build routines.

Loading COHERENT

The following steps destroy all information on the root partition of your hard disk. If there is information on the hard disk in this partition which you wish to keep, copy it to floppy disks before you continue.

Your PC comes with one or two double-sided double-density floppy disk drives. If you have one floppy disk drive, it is called drive zero. If you have two, the left is drive zero and the right is drive one, or, if they are arranged vertically, the top is drive zero and the bottom is drive one.

The following procedure is called *booting*. Insert the boot disk into drive zero and close the door. *Do not* insert a floppy disk in the drive before you turn on the PC as turning on the disk drive may cause a power surge on some PCs which can harm the disk.

Locate the keys labeled <ctrl> and <Alt> on the left side of your keyboard and the key labeled <Del> at the bottom right of the keyboard. Press all three keys at the same time. The screen will clear and soon the light on the floppy disk drive should come on. After several seconds, the screen says

```
PC boot
?
```

When you see this message, type:

```
fdcoherent
```

(in lower case letters) followed by the <RETURN> key. If you make a mistake, just hit the <RETURN> key and re-enter

fdcoherent. The **<backspace>** key will not work during the booting procedure. If you want to start again from the beginning, just type **<ctrl-Alt-Del>** again.

The computer now reads COHERENT from the boot disk and loads it into memory.

Building the system

Next, you will get the message

```
Coherent (180K, 7452) Version 2.3.43
(c) 1982 - 1985 Mark Williams Company, Chicago
#
```

The numbers in parentheses may differ on your system. The "#" is a *prompt*, which means that the system is ready to accept commands. Now type:

```
build
```

The select light on the floppy disk drive will come on again as the system begins the **build** procedure. **build** will now ask you a series of questions about the configuration of your system.

First, if you have a built-in hard disk, you will be asked which machine you are using. The choices are: **compaq+**, **ibm-xt**, **itt-xtra**, and **ncr model 4**. Respond with the appropriate computer name.

If the internal switches in the PC indicate a 10 megabyte hard disk drive, you will be asked

```
Is hard drive 0 a 10 meg drive?
```

If your answer is no, you will be given a list of possible choices, and you should respond with the appropriate selection for your system.

You will now be asked if you have a second hard disk drive. If you have only one hard disk, answer **n**. If you do have a second drive, you will be asked about it in the same way you were asked about the first one.

Disk partitions

Disk partitioning divides your hard disk into sections that can be used for system files, swapping, user files, and different operating systems.

You may define a total of eight partitions on your hard disk(s). These partions are called **/dev/hd0** through **/dev/hd7**, where

dev is short for **device** and **hd** means **hard disk.**

You will first be told that the default partitions (for PCs with built-in hard disks) are:

```
Current Partitioning:
Partition       Drive   Base    Size
hd0             0       0       1
hd1             0       1       5184
hd2             0       5185    5185
hd3             0       10370   10370
hd4             0       20740   10370
hd5             0       31110   10370
hd6             0       41480   9384
hd7             0       0       0
Do you wish to modify this configuration?
```

Systems with external hard disks may have different partitions.

This partitioning will support hard disks of 10, 15, or 20 megabytes. If you have a 10 megabyte disk, only the first four partitions are operational; the rest must be ignored, since they point to areas that do not exist, and attempting to read or write them will generate errors. For more information see the manual page **xt** in section 7 of this document.

While this configuration is usable, you may want to change it. For instance, you may want to put everything into one big partition. Since partitions may not be split across different devices, if you have two hard disks, you must have at least two partitions. YOU MAY NOT HAVE OVERLAPPING PARTITIONS.

/dev/hd0 is a special block used by the system. If you want to be able to write this block from Coherent, create a single-block partition based at block zero, as in the default configuration. In any case, you should not include this block in a partition that will contain files, as it would soon be overwritten.

The example below sets up three partitions. The first partition, **hd1**, is the *root* device with the COHERENT system files and programs. The second partition, **hd2**, is the *user* partition, where you have your files and programs. **hd3**, the third partition, is the *swap* device.

The swap device is an area on the hard disk where processes may be temporarily stored when the system has run short of free internal memory. The swap device should be at the end of a partition because any space between the end of the swap area and the end of its partition is unusable by the system. It must be a contiguous space on the hard disk free from unreadable blocks. A swapped-out process will take up from where it left off when it is swapped back in.

In order to change the configuration, your response to the

question about configuration modification must be **y**. If you do not want to change it, answer **n**, and skip down to the section "Setting the devices" below.

Defining the partitions

You will be asked the following questions if you choose to modify the default configuration. The responses, in **bold**, are those you would give to set up the special 1 block device, a 4499 block root partition, a 1000 block swap device, and a 15240 block user area. The root file system *must* have at least 4300 blocks; 1000 blocks (about 500 kilobytes) is a good size for the swap area, and 15240 blocks fills up the rest of the hard disk. *Do not* put anything in the first block of the hard disk, as the system needs it.

```
Partition 0...
        Drive (0 or 1) 0
        Base block? 0
        Size in blocks? 1
Do you wish to define another partition? y
Partition 1...
        Drive (0 or 1) 0
        Base block? 1
        Size in blocks? 4499
Do you wish to define another partition? y
Partition 2...
        Drive (0 or 1) 0
        Base block? 4500
        Size in blocks? 15240
Do you wish to define another partition? y
Partition 3...
        Drive (0 or 1) 0
        Base block? 19740
        Size in blocks? 1000
Do you wish to define another partition? n
Do you want to zero out the remaining partitions? y
```

You are given the partitions in tabular form again:

```
Here are the partitions you've defined:
Partition       Drive   Base    Size
hd0             0       0       1
hd1             0       1       4499
hd2             0       4500    15240
hd3             0       19740   1000
hd4             0       0       0
hd5             0       0       0
hd6             0       0       0
hd7             0       0       0
Is this the configuration you want?
```

If this is the desired configuration, answer **y**; if not, answer **n** and go through the process again.

Setting the devices

The next question is

> Which partition will be the root device?

to which you should respond **hd1**.

Now, you will be asked

> Which partition will be the swap device?

If you are creating three partitions, with the swap device on its own partition, your response is **hd3**. If you want the swap area to share a partition with a filesystem, you must subtract the size of the swap area from the total number of blocks in the filesystem, and use this smaller number as an argument to the **mkfs** command. (See the section "Creating additional file systems.")

You are next told to

> Enter the (inclusive) lower limit of
> the swap area:

If the swapping space has its own partition, the answer is the first block of that partition--block **0**. If it is sharing a partition, put it at the end of that partition because space between the end of the swap area and the end of the partition cannot be used for files. Thus, if you have only one partition, and you are giving the swapping space the last 1000 blocks of it, enter **19740**.

Now enter

> ... the (exclusive) upper limit:

which should be the size of the swap partition. If there are 1000 blocks, enter **1000**; if there are 20740 blocks, enter **20740**. If, for some reason, you do not want a swap area, enter the same number as your answer to the previous question, setting up a swap area of zero length.

At this point you have the option of checking the swap area for bad blocks. While bad blocks can be mapped out of a filesystem, this cannot be done on the swap area. If your swap area has bad blocks, it must be re-defined to exclude them, or placed on another partition.

Configuring serial ports

The next question is

> To set the com ports, enter "COM1", "COM2", "both", or "none":

This version of Coherent supports up to two asychronous ports, at the standard addresses for COM1 and COM2. If you wish to support both ports, type "both" at this point. If you will never need both, you may save memory by typing "COM1", "COM2", or "none." The serial ports may be set to support the modem control lines. This is a choice you make after building the system, and is explained in the section **Enabling serial ports**.

Configuring the printer

Now, you are asked

> To set the printer port, enter "LPT1" for the address of the monochrome card, "LPT2" for the stand-alone card, or "none":

If you have a printer attached to your PC, it may be at either of two addresses. If you respond **LPT1**, the printer driver will look for the printer at the address for the monochrome display/printer adapter. If you have a color card or a graphics card and a stand-alone printer adapter card, answer **LPT2**. If you do not have a printer, answer **none**.

Building the filesystems

The build procedure will now give you a warning that

> The next step will destroy all data on the root partition you specified. If you need to save files, type ctrl-Alt-Del at this time and boot another diskette. If you are ready to build the root file system, type RETURN.

Assuming that you have nothing on the root partition to save, hit **<RETURN>**.

If you have used the boot disk to build the system previously, you will get the message

> mknod: cannot create node /dev/hd1

This message means that the root node has already been created on **/dev/hd1**; this will not interfere with the build process.

Also, you may get several error messages of the form

```
(11,1): dev: read error, block=number
status=19
```

where *dev* is the hard disk name, such as **xt** for built-in disks or **dv** is a Davong; and *number* is the bad block number. COHERENT is reading all blocks in the partition the root file system will be on so that it does not write anything to unreadable blocks, and these messages tell you about those unreadable blocks. There is nothing that you can do about these bad blocks, short of sending your hard disk out to be repaired or reformatted, so you can ignore these messages.

After the root partition has been checked, you will get the message

```
We will now boot the hard disk system and load
the commands and utilities onto the root
partition. Type RETURN or Ctrl-Alt-Del to reboot,
and type "coherent" in response to the PC boot
prompt...
```

So, you hit the **<RETURN>** key and get the

```
PC boot
?
```

message. Now you must type

```
coherent
```

not **fdcoherent**. **fdcoherent** is used when building the COHERENT system from scratch off the floppy disk, and **coherent** is used when booting system from a hard disk. Now **build** will ask you for the six system floppy disks in order, and return the # prompt after it has read them all. Do not remove the boot floppy disk until you are asked for Volume 1 of the system disks. Reading the six disks will take about 15 minutes. You are now running COHERENT.

Creating additional file systems

The **build** procedure will create only the root file system on its partition. If you have additional partitions, you must make a file system on each of them. You build the file systems by using the **mkfs** command. First, create a *proto* file called **p1**. Assuming that you have created the partition **/dev/hd2** with 15240 blocks in it, enter the following:

```
ed p1
a
/dev/null
15240 2400
.
wq
```

The first entry is a boot block. We're using /dev/null because this is not a bootable filesystem. **15240** is the number of blocks on the device, and **2400** is the number of i-nodes, or files. As a rule of thumb, the number of i-nodes should be about one-seventh the number of blocks. Thus, if you have a partition with 5184 blocks on it, 648 is a good number for the i-nodes. The number of i-nodes is the largest number of files and directories that can be created on the partition. If you have placed the swap device on a partition that is shared with space for files, subtract the size of the swap area from the partition size, and use the difference as the number of blocks. This will insure that blocks in the swap area do not get used in the filesystem and overwritten by the swapper.

Now enter the command

```
mkproto /dev/hd2 <p1 >p2
```

This tells the system to read each block on the partition and maintain a list of blocks that caused read errors. These bad blocks are mapped out of the filesystem, and will never be used.

Now enter the command

```
/etc/mkfs /dev/hd2 p2
```

to create the file system on the partition.

Repeat this process for each of the partitions.

Changing the configuration

These steps load the COHERENT system onto your hard disk and need to be performed only once. However, if you want to change the configuration at sometime in the future, follow these steps:

1) Insert the boot disk in drive 0 and type
   ```
   /etc/mount /dev/fd0 /f0
   ```
2) Type the command
   ```
   /f0/config/setsys
   ```

This will begin an interactive process similar to the build procedure. It will make changes to the **coherent** image on the floppy disk, but will not alter the hard disk. You can use this command to change the partitioning of the hard disk, add COM ports, or change the address of the printer port. However, if

you want to change the base or size of the root partition, you must follow the instructions for building a new system; the root partition must be reconstructed.

What went wrong?

If your installation of COHERENT does not succeed, either your hardware is not configured correctly or the software supplied on floppy disks is unreadable or inappropriate for your system. Reread the installation instructions carefully, then repeat the installation procedure. If you still cannot install COHERENT, make sure the problem is not with your hardware.

Note that your PC system must include at least 256K of memory and that the memory boards must be correctly installed to indicate the location of the memory. Your system must have a dual density, double-sided floppy disk drive as drive 0. It must include a hard disk with a capacity of at least 5 megabytes and the hard disk must be formatted in 512-byte blocks. The switches which control the PC and hard disk configuration must be set correctly.

The COHERENT installation kit must include the correct boot floppy disk for your hard disk. Information displayed during the installation procedure identifies the target hard disk; if it disagrees with the label on the floppy disk, the label is wrong. If you received the wrong boot floppy disk or are unable to read a floppy disk from the installation kit, return the entire kit to your supplier with a description of your problem, or call the Mark Williams support hotline at 312-472-6659.

3. Booting COHERENT

Once the COHERENT system is installed on your machine, you must boot COHERENT whenever you restart the system.

Start-up

Type <Ctrl-Alt-Del>. Power up the computer, then insert the boot diskette in floppy drive 0 (the righthand drawer). Wait for the machine to complete it's diagnostics (about 45 seconds); it will then read the floppy and print

```
PC boot
?
```

on the console screen. Now type

```
coherent
```

The boot strap program will now read the COHERENT image into memory. The lines

```
Coherent (180K, 7452) Version 2.3.43
(c) 1982 - 1985 Mark Williams Company, Chicago
```

followed by the '#' prompt, indicate that the system is running. (The pair of numbers in the first line will vary with the available memory on your machine.) On booting, the system is in single-user mode, and commands are executed with the permissions of the superuser, or root. The prompt '#' is used to indicate these permissions; it also occurs in multiuser mode when 'root' is logged in, as well as for users who use the 'su' command to run with superuser permissions.

Whenever you reboot COHERENT, you should check the filesystems on your hard disk and set the date.

Checking the file system

To protect your files and the COHERENT commands from potential loss or damage, you should check the file systems on your hard disk whenever you reboot the system. Suppose you have three filesystem partitions: /dev/hd1, /dev/hd2 and /dev/hd3, and that the root device is /dev/hd1. The command

```
check -s /dev/hd3 /dev/hd2 /dev/hd1
```

will tell the system to check the consistency of the your files. It will let you know if anything is out of order, and attempt to reconcile any problems it finds (this is the meaning of the '-s'

flag). The following must be followed whenever this check command is invoked:

1) If you are checking the root device, make sure it is the last partition listed in the command line.
2) If errors are found on the root device, immediately reboot the system, without typing **sync**. When the system is running again in single-user mode, re-issue the check command for each partition that was found to be in error, listing the root device last on the command line.
3) If there are errors non-root partitions but not root, you may re-issue the check command without re-booting, listing each device that had errors.
4) If there are still errors after a second check, the filesystem will have to be fixed by hand with other filesystem utilities in command directory /bin.

You need to check only those partitions which contain files. If you have set the swap device to be a separate partition, do not use that device name in a check command. Situation 2) is the only case when you should reboot without typing **sync**. Normally, the **sync** command should be issued, so that the filesystem is sure to be up to date before you bring the system down.

In case of severe damage to the root file system, you may need to re-install the COHERENT system from the distribution kit.

For more information about fixing filesystems, see the COHERENT Administrator's Guide.

Setting the date

Whenever you boot the COHERENT system, you should set the current date and time. The system keeps track of the date and time for each file you create or modify. If the date and time are not accurate, some commands such as **make** and **at** may not function properly. If you type

```
date
```

you see the system's current date and time. If you have not set the timezone to your local time zone, the time is displayed in GMT (Greenwich Mean Time), which is five hours ahead of Eastern Standard Time. The section "Changing the time zone" below describes how to change the time zone.

If you have already set the time zone, set the date and time with the **date** command. Type:

```
date 8410271317.56
```

to set the date to October 27, 1984 and the time to 1:17:56 PM.

Changing the time zone

If, as is probable, you are not in the Greenwich time zone, you should change the file **/etc/profile** to specify your time zone. **/etc/profile** is a file executed when each user logs on. You must give the names of your standard and daylight savings time zones and the location of your time zone in minutes west of Greenwich. For example, use

```
TIMEZONE=EST:300:EDT
```

if you are in the Eastern time zone, or

```
TIMEZONE=PST:480:PDT
```

if you are in the Pacific time zone.

Going to multi-user mode

After you have set the date, and you have gotten the '#' prompt, hit **<Ctrl-D>** (hold down the **<Ctrl>** key and strike the D key simultaneously) to put the system in multi-user mode. You should do this even if you are the only one who ever uses the system. The advantages of multi-user mode are:

1) The system runs a process that updates the filesystems every 30 seconds. This will largely prevent errors.
2) You may log is as a user other than root, and prevent serious damage to protected files in the event of a typographical or other error in a command line.

If you want to become the superuser, you can use the **su** command to become root. Just type

```
su root
```

and the password (if there is one) to become the superuser. If you are not the only user of this system, you should consider whether or not you want all users to be able to run as the superuser; passwords can be used to control this. For more information, see the *COHERENT Administrator's Guide*.

After you have gone to multi-user mode, the system will first execute the shell command file **/etc/rc**. **etc/rc** is executed when the system goes to multi-user mode. The system will now say:

Coherent Login:

If you want to change this login message, edit the file /etc/logmsg. For example, you could change the login message to read

Joe's Grille and Computer--

Now, you reply with your user name -- which can be any name in the /etc/passwd file, including root.

When you are want to log off, type <Ctrl-D>; and the system will print the login message for the next time you want to use the computer.

4. Tips on using the system

This section gives some more information on how you can use the COHERENT system to its fullest advantage.

Enabling swapping

In order to avoid having your processes run out of space in the computer, you should use swapping. After defining the swap area, you make the node for the swap device. If the swap device is on **/dev/hd2**, you enter

```
mknod /dev/swap b 11 2
```

The number **11** is the **major device number**, in this case, the hard disk, and the **2** is the **minor device number**, for the partition **/dev/hd2**. Keep the major device number the same for your system, but change the minor device number as appropriate for your partition. You only have to make the node this once, when you first build the COHERENT system.

You then can enable swapping with the command

```
/etc/swap &
```

starting the swap process running in the background. Generally, this command is in the file **/etc/rc**, so it will be executed whenever the system goes to multi-user mode. The swapper will have no effect until available memory has been exhausted by active processes.

Enabling cron

cron is a command which will allow you to tell the system to run commands on a regular basis. In order to start **cron** running, you should have

```
/etc/cron &
```

in **/etc/rc**, to run cron automatically in multi-user mode.

Enabling serial ports

The command /bin/enable is provided to prepare a serial port to run a login process, or shell. The usage is

```
enable port
```

where Bport

is the name of the tty device, in the directory /dev
For example, to cause a login process to be spawned on
/dev/tty50, use the command

enable tty50

You should enable a serial port if only if you
want to log on to the local system over that port.
If you plan to use the port to send data or to
log on to another system, it should not be enabled.
To disable the login process on a port, type the
command

disable port

where port
is the name of the tty device in /dev.
The tty devices optionally support the modem control
lines on the port. The node

/dev/tty50

is a remote line, while the node

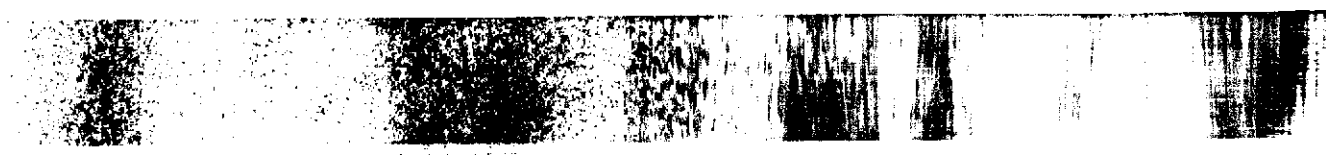
/dev/tty501

is a local line, and does not respond to the modem control
lines. The differences are:

1) /dev/tty50 has minor number 0, while /dev/tty501
has minor number 128, and
2) The second character of the entry in /etc/ttys
is 'r' for tty50, 'l' for tty501.

If a port is set to support modem control, any attempt to open it will wait until the a carrier is detected on the modem. For example, if a modem-control line is enabled, the login process will not be run until someone dials in on that modem.

To summarize, the rules are as follows:



1) If you plan to use a port to dial out and connect to a remote system, the port should be disabled and set up as a local line (no modem control). This will allow you to send commands to the modem.

2) If a port is to be hard-wired to a terminal for the purpose of logging on the the system, it should be enabled and set for no modem control.

3) If you wish to dial in over a port, it should be enabled and set to support modem control. The system will execute a login process as soon as it detects a carrier.

Under no circumstances should both the local and remote versions of the same serial port be enabled at the same time. If you need to use the port without a login process, make sure that both versions (local and remote) are disabled. If one or the other is enabled, the system may try to execute a login process on it, and since it is physically the same device, the result will be extreme confusion.

Using screen editors

To use the **trout** (the command is called **t**) or **elle** screen editors on your COHERENT system, you will need to set the shell variable **TERM**. To set **TERM**, enter:

```
export TERM=CO
```

This will tell the editor about the characteristics of your PC, since different terminals must be handled differently. For convenience, if you plan to use a screen editor, you should add the entry

```
export TERM=CO
```

to your **.profile**.

Adding new users

To add new users **john** and **mary** to your COHERENT system, use the **newusr** command:

```
/etc/newusr john mary
```

newusr will create home directories for **john** and **mary** in the directory **/u**.

If you have a partition for users' directories (**/dev/hd1** in

the example given above), before you use **newusr** for the first time, you should be sure that /u is mounted with the command

```
/etc/mount /dev/hd1 /u
```

This will put the user files into the partition **hd1**. To make sure that /u is mounted whenever you boot the system and go to multi-user mode, put the command to mount it into the file /etc/rc.

newusr also creates a **.profile** file for each new user. When **john's .profile** is created, all it will contain is the line

```
export PATH=:/u/john/bin$PATH
```

see the documents *Introduction to the COHERENT System* and *sh Shell Command Language Tutorial* for further information.

Using floppy disks

Because of the flexible COHERENT file system, you can build and use directories directly on floppy disks. For best use of floppy disks, you should understand the following procedures.

The first step is to format each new floppy disk into 512-byte blocks. Using unformatted floppy disks will not work. To format floppy disks, use the **fdformat** command. For example, type

```
/etc/fdformat -v /dev/rfd0
```

to format and verify a double-sided double-density nine sector per track floppy disk in drive 0. The **fd** manual page in below gives information on how to access floppy disks in a variety of other formats.

The second step is to build a file system on each formatted floppy disk before you put files on it. To build a file system on a floppy disk in drive zero, issue the command

```
/etc/mkfs /dev/fd0 720
```

The number 720 is the number of blocks on the floppy disk file system. The default floppy disk is considered to have 9 sectors-per-track, so if you want an eight sector-per-track disk, use the command

```
/etc/mkfs /dev/fdd0 640
```

Either eight or nine sector-per-track floppy disks may be handled by most standard double-density floppy disk drives. Device names containing **f9d** are 9 sector-per-track floppy disks, while device names with **fdd** are 8 sector-per-track floppy disks. The COHERENT system links the devices **fd0** and **fd1** to the **f9d** devices. If you

use 8 sector-per-track floppy disks, you should be sure to link /fdd devices to /dev/fd0 and /dev/fd1.

If you issue an **ls -l /dev** command, you get entries that look like

```
brw-rw-rw- 1 bin 4 1 Fri Oct 5 12:53 fdd0
```

The pair of numbers just before the date are the **major device number** and the **minor device number**. Each of the device numbers is stored as a byte consisting of two hexadecimal digits. Formatting information for **ioctl** is given in the second nibble (half-byte) of the minor device number of the floppy disk drive used for formatting. This number will specify the number of sides (single sided or double sided disks), the track density (single density or double density), and the number of sectors-per-track.

Number	Sides	Tracks	Sectors-per-track
0	1	40	8
1	2	40	8
2	2	80	8
3	1	40	9
4	2	40	9
5	2	80	9

Thus, in the example given above, since **fdd0** has a minor device number of 1, it is a double sided, single density, 8 sector-per-track floppy disk drive.

The third step is to mount a floppy disk containing a file system so you can access it. For example, type

```
/etc/mount /dev/fd0 /f0
```

to mount the floppy disk in drive zero (A) on directory /f0; then you can refer to files on the floppy disk as being in directory /f0. The directories /f0 and /f1 have been provided on the system for you to mount floppy disks. To help you remember which floppy disk is mounted on which directory, always mount the floppy disk in drive zero (A) on directory /f0 and the floppy disk in drive one (B) on directory /f1. The mount command will verify that there is a mountable filesystem on the disk. **mount** will also disallow mounts of more than one device on the same directory. **mount** will check that the mount table /etc/mtab is newer than the file /etc/boottime. /etc/boottime is a dummy file which serves simply to keep the time the system was lasted booted. If /etc/mtab is older than /etc/boottime, the mount table is probably invalid. Thus, if **mount** informs you that

```
mount: /etc/mtab older than /etc/boottime
```

you will probably have to remount your file systems.

The fourth and last step is to unmount a mounted floppy disk when you are finished using it. Type

```
/etc/umount /dev/fd0
```

to unmount the floppy disk in drive zero.

Since COHERENT buffers its disk I/O, if you don't unmount your floppy disk, you may lose data on your disk or on the next disk you put in the drive.

Copying floppy disks

You can use the **dd** command to copy the floppy disks in your COHERENT distribution kit or to copy other floppy disks. Be sure to make a copy of your boot floppy disk and keep the original in a safe place with the other floppy disks from the kit.

Insert the floppy disk you wish to copy in drive zero and type:

```
dd if=/dev/fd0 of=/tmp/disk count=40 bs=18b
```

This copies 720 blocks from the floppy disk in drive zero to the file **/tmp/disk**. Then remove the floppy disk from drive zero and replace it with a formatted floppy disk. Type:

```
dd if=/tmp/disk of=/dev/fd0 count=40 bs=18b
```

This copies the contents of the previous floppy disk to the new floppy disk.

You can make more copies by repeating the second **dd** command with additional formatted floppy disks. When you are finished making copies, type

```
rm /tmp/disk
```

to remove the temporary file.

You can also copy disks with the **fdformat** command. For example,

```
/etc/fdformat -w /tmp/disk /dev/fd0
```

formats the floppy disk in drive 0 and copies the floppy disk in drive 1 to it. This is a faster way of doing a disk-to-disk copy than using **dd**, because it formats the disk as it writes.

Backing up your hard disk

Because your hard disk drive is not removable, and to

protect against accidental damage to the disk, you should periodically copy the information on it to floppy disks. Backup copies are invaluable if your hard disk malfunctions or if you erase files inadvertently.

You can copy information to floppy disks by mounting each floppy disk (as described in "Using floppy disks" above) and using the **cp** or **cpdir** command to copy specific files or directories. However, the **dump** command provides a more convenient method of backing up your file systems.

dump works with PC COHERENT to dump to floppy disks rather than to magnetic tape. The **S** option specifies the size of a floppy disk in blocks. To do a full (level 0) dump of the root file system on **/dev/hd1** to a nine sector-per-track floppy disk in drive zero, type the command

```
dump 0fS /dev/fd0 720 /dev/hd1
```

For a complete discussion of **dump**, see the *COHERENT Command Manual* and the *COHERENT Administrator's Guide*. You can also dump with the **tar** command.

Normal shutdown

To preserve the integrity of your file system if you reboot the COHERENT system or turn off the PC power for any reason (other than repairing the root file system after performing the **check -s** command), you should always type the command

```
sync
```

before you reboot or power down the system. If you are running multi-user mode, **sync** is automatically executed every 30 seconds.

To reboot or power down a multi-user system, you should log in as root. Ask any other users to log off. Then use the **ps -lax** command to determine the status and owner of each process on the system. When user activity is ended and everyone else is logged off, type

```
kill kill 1
```

to return the system to single-user mode. Then type **sync**. Now you may reboot the system by typing <Ctrl-Alt-Del>, or you may simply turn off the power to your PC. Make sure you remove floppy disks from the floppy disk drives *before* you turn off the power, or at least open the door of the disk drive. This ensures that if there is a power surge when the PC is powered off, it will not harm the data on your floppy disks.

Named pipes

A named pipe, also called a fifo, is a special device file under the user's control which is used to communicate between two processes. To create an named pipe, you enter the command

```
/etc/mknod name p
```

where *name* is the name of the pipe file and the letter p tells mknod that you are making a named pipe. To use a named pipe called **connection** to communicate between two command files called **process1** and **process2**, write

```
process1 >connection; process2 <connection
```

This will behave in the same way as if you had typed

```
process1 | process2
```

The real advantage of using a named pipe is that a named pipe can be shared between processes which do not have the same parent, or are owned by different users. Also, just like the regular pipe, the named pipe will fill up a buffer with the output from **process1** and pass it along to **process2** when the buffer is full. If you were to write the output from **process1** into a regular file and then take **process2**'s input from that file, you would have to wait until **process1** had gone to completion before **process2** started.

Differences from other documentation

The COHERENT system is available on a wide variety of computers. In almost all cases, the operation of a COHERENT command is identical on different machines; the system looks the same to the user, regardless of which processor actually executes commands. However, because of hardware limitations, a few commands do not exist or work differently in the PC version. This section notes commands which are described in the *COHERENT Command Manual* or the *COHERENT Administrator's Guide* but which are not included in the current PC version of COHERENT.

1. The erase character, which erases the last character typed, is <backspace> or <Ctrl-H> by default, rather than '#' as noted in some COHERENT documentation. Similarly, the kill character, which erases an entire line, defaults to <Ctrl-U> rather than '@'.

2. The spelling checkers **spell** and **typo** require large dictionary and data files; there is no room for these files on small disk systems, so they are not provided with this release. They are available as an option at a nominal charge.

3. The manual command **man** is included, but the manual text in

directory /usr/man uses large amounts of disk space and is not sent with the standard release. They will be provided upon request for a nominal charge.

4. The magnetic tape handling program **tp** does not apply to the PC and is not included.

5. The format of the **/etc/ttys** file has been changed. It now has the letter 'r' or 'l' in the second position of each line, signifying if the line is remote (having modem control) or local.

6. The **xmail** command has been eliminated.

7. The **newusr** command described above replaces the **mkusr** command mentioned in the *COHERENT Administrator's Guide*.

Possible problems

COHERENT commands can fail when your COHERENT system runs out of some resource, such as memory or disk space. This section lists a few of the problems which you might see.

One error message is

```
Out of memory
```

which indicates that your COHERENT system did not have enough memory available to execute the command. If you get this error message, check to see whether or you have enabled swapping by entering

```
ps -lax
```

and looking for a line which has **<swap>** as the last item. If you have enabled swapping and still get this error, you may need to make your swap space bigger. It may also mean that you have a program with an infinite loop that keeps writing output.

COHERENT may also tell you

```
Can't find xxx
```

when you run out of memory, where *xxx* is the name of the command you typed. Again, check swapping.

The message

```
Try again!
```

indicates that the system reached its limit on the number of simultaneously active processes and therefore could not execute the command you requested. This also indicates a problem with

swapping.

The message

No space on (*m*, *n*)

indicates that the system ran out of space on the file system for the device with major number *m* and minor number *n*. You can find the major and minor numbers associated with each device by typing

ls -l /dev

You should unmount the file system and **check** it with the **-s** option to assure its integrity after you run out of space. If it is the root device, reboot immediately after running **check**, then **check** again after rebooting.

Many programs increase their data area automatically as needed. If a program grows too large, you may get the error message

Bad system call

This usually indicates that COHERENT could not allocate enough memory for an **exec** system call. Sometimes it indicates that a program detected an irrecoverable error and terminated execution with the **abort** library routine, which deliberately issues a bad system call.

Touring the file system

In the section "PC COHERENT 2.3.43 file system" below, you will find a list of the files on the distribution floppy disks. This section gives a brief description of each directory, as an introduction to the structure of the COHERENT file system.

The directory / is the root directory. All files in every file system are in the root directory or in one of its subdirectories.

Directory **/bin** contains the commands described in the *COHERENT Command Manual*. Some PC-specific commands are described in the *PC Command Manual* pages below.

File **/coherent** contains the COHERENT system which is running on your PC.

Directory **/dev** contains data on devices.

Directory **/drv** contains data for some of the special device drivers.

Directory **/etc** contains files and commands used in system

maintenance. The *COHERENT Command Manual*, *COHERENT System Manual* and *COHERENT Administrator's Guide* describe these files and commands.

Directories **/f0** and **/f1** are empty directories for mounting floppy disks, as described under "Using floppy disks" above.

Directory **/lib** contains the phases of the C compiler and the standard C libraries **libc** and **libm**.

Directory **/mnt** is an empty directory used for mounting additional file systems.

Directory **/tmp** is used for temporary files by many COHERENT commands. The command file **/etc/rc** normally deletes all files in **/tmp** when you bring up the system in multi-user mode.

Directories /u and /v are for user files. **/u** is the default directory used by **newusr** for installing user home directories.

Directory **/usr** contains subdirectories for the users and the systems use. **/usr/adm** contains administrative files. /usr/bin contains the **kermit** and **trout** commands. **/usr/games** contains games. **/usr/include** contains header files included when compiling C programs. **/usr/lib** contains libraries and a few other files. **/usr/man** contains manual pages; because of the size of the *COHERENT Command Manual* and *COHERENT System Manual* files, they are not currently distributed with the system. **/usr/pub** contains an ASCII table. **/usr/spool** contains subdirectories for commands which save information for later execution, such as **lpr** and **mail**.

5. Partitioning a disk to use MS-DOS

Note: These instructions apply *only* if you have a PC that runs MS-DOS 2.0 or later.

If you want to have the MS-DOS files on your PC in coexistence with COHERENT, you can set up a partition for them on your hard disk. Because of the way that the hard disk driver in COHERENT handles its devices, it is recommended that the DOS partition be placed at the end of the disk. Any space not used by COHERENT may be used by MS-DOS.

Illustrated below three distinct ways to balance use of the disk between MS-DOS and COHERENT. Those ways are:

COHERENT	MS-DOS
7.5 mb	2.5 mb
5.0 mb	5.0 mb
4.0 mb	6.0 mb

COHERENT will require at least 2.5 megabytes to contain the root file system.

MS-DOS and the hard disk

These directions assume COHERENT has been successfully installed by the **build** procedure, that you are using MS-DOS version 2.0, and that you have a standard 10 megabyte hard disk with:

512 bytes per sector
17 sectors per track
4 platters (heads)
68 sectors per cylinder
305 cylinders

MS-DOS partitions are aligned on cylinder boundaries. There may be only one MS-DOS partition on a hard disk at one time. A partition may be marked as **ACTIVE** or **Not-ACTIVE**, indicating whether or not you can boot the system from that partition or not. There may be at most one ACTIVE partition per hard disk.

Partitions are created, deleted, or made (non)active by the MS-DOS utility **FDISK**. Partitions may not be truncated or moved, only created or deleted. Once created, MS-DOS must be rebooted to recognize the new partition.

The first block (block 0) of the disk contains partition information. The hardware boot ROM looks in this block for the location of the disk partitions, and to see which partition is active.

Once a partition is allocated, it must be formatted with the **FORMAT** utility. The hard disk partition will be named c:. To format the partition, the command is

"format c:/s/v"

The option /s will cause a bootable image of the system to be placed on the hard disk partition. The option /v will cause the partition to be given a volume name.

COHERENT partitions occur at fixed locations on the disk, are not aligned on cylinder boundaries, and may not be changed without reconfiguring the system. The COHERENT hard disk driver does not make use of the data in the partition table in the first block of the hard disk.

COHERENT numbers blocks beginning with zero. Thus the first sector on a cylinder is #0, the first cylinder is #0. The size is in blocks (512-byte sectors). The starting block is an absolute block number on the disk. This location is also given as a pair consisting of a cylinder number, and a sector number within that cylinder.

name	size	start (abs block #)	start cyl	start sector
/dev/hd0	1	0	0	0
/dev/hd1	5184	1	0	1
/dev/hd2	5185	5185	76	17
/dev/hd3	10370	10370	152	34

The first example shows how to allocate half of the space reserved for **/dev/hd3** to a MS-DOS partition. You can restrict the use of **/dev/hd3** to the first half of that device by the way in which you configure **/dev/hd3**.

In this example, you will make the MS-DOS partition 76 cylinders in size, slightly less than 2.5 megabytes, and allocate 7.5 megabytes to COHERENT.

1. Make the partition **/dev/hd3**, but use **5202** instead of **10370** in the initial **build** dialogue. This will allocate to COHERENT all of **/dev/hd3** up to cylinder 229, where the MS-DOS partition will start.

   An alternative is to use **5185** instead of **5202**, which will make **/dev/hd3** identical to **/dev/hd2**. However, this will cause 17 kilobytes of cylinder 228 to be unreachable, since the MS-DOS partition must begin on the next cylinder boundary.

2. Boot MS-DOS from the MS-DOS boot floppy disk. Invoke **FDISK**. Delete any existing partitions with the **FDISK** menu item #3).

Create a partition (**FDISK** menu item #1) with the following parameters:

starting cylinder 229
size of partition 76

If you want to be able to boot MS-DOS off your hard disk partition, you can make this partition active (**FDISK** menu item #2).

3. Reboot MS-DOS from the floppy disk so that it can recognize the hard disk partition **c:**. It is best to format c: with the /s option, and to copy the MS-DOS floppy disk to it immediately.

In the second example, all of the space reserved for **/dev/hd3** (5 megabytes) will be allocated to the MS-DOS partition, and **/dev/hd3** will not be made.

Follow steps 2 and 3 from example 1 above, and omit step 1. In step 2 use the following parameters:

starting cylinder 153
size of partition 152

In the third example, all of the space for **/dev/hd3** will go to the DOS partition, and some of the space from **/dev/hd2** as well. As in example 2, you should not create **/dev/hd3**.

Make the MS-DOS partition 180 cylinders in size, slightly less than 6 megabytes.

1. The number of blocks to use when creating **/dev/hd2** is 3123. Although you can enter a smaller number, doing so will make some blocks on the disk inaccessible. This will give COHERENT all of **/dev/hd2** up to cylinder 125 (about 4 megabytes), after which the MS-DOS partition will start.

2. Follow steps 2 and 3 from example 1 above, except use the following parameters to create the partition:

starting cylinder 125
size of partition 180

The following formulae give the maximum number that may be given to **build** to configure either **/dev/hd2** or **/dev/hd3**, given that a MS-DOS partition is to be *n* cylinders in size.

If **n** is less than or equal to 152, then the MS-DOS partition will fit inside **/dev/hd3**. The largest number of blocks in **/dev/hd3** is given by:

```
(152 - n) * 68 + 34
```

If *n* is greater than 152, then the MS-DOS partition uses all of **/dev/hd3** and part of **/dev/hd2**. When formatting **/dev/hd2** the maximum number of blocks is:

```
(228 - n) * 68 + 51
```

6. PC Coherent 2.3.43 files

This section contains a listing of the files on each of the six system disks for COHERENT 2.3.43.

System disk 1

/bin/banner
/bin/basename
/bin/check
/bin/col
/bin/diff3
/bin/du
/bin/false
/bin/from
/bin/ln
/bin/lpskip
/bin/man
/bin/mesg
/bin/mkdir
/bin/rev
/bin/setclock
/bin/size
/bin/sleep
/bin/sum
/bin/sync
/bin/touch
/bin/true
/bin/tty
/bin/yes
/dev
/dev/al0
/dev/all
/dev/console
/dev/dump
/dev/f9d0
/dev/f9d1
/dev/f9s0
/dev/f9s1
/dev/fd0
/dev/fd1
/dev/fdd0
/dev/fdd1
/dev/fds0
/dev/fds1
/dev/kmem
/dev/lp
/dev/mem
/dev/null
/dev/rf9d0
/dev/rf9d1
/dev/rf9s0
/dev/rf9s1
/dev/rfd0
/dev/rfd1
/dev/rfdd0
/dev/rfdd1
/dev/rfds0
/dev/rfds1
/dev/tty
/dev/tty20
/dev/tty50
/dev/tty60
/f0
/f1
/mnt
/tmp
/u
/usr/adm
/usr/bin
/usr/bin/kermit
/usr/bin/t
/usr/etc
/usr/games
/usr/games/chase
/usr/games/fortune
/usr/games/lib/fortunes
/usr/games/lib/rubik.m4
/usr/games/rubik
/usr/include/access.h
/usr/include/acct.h
/usr/include/action.
/usr/include/ar.h
/usr/include/assert.h
/usr/include/canon.h
/usr/include/chars.h
/usr/include/const.h
/usr/include/ctype.h
/usr/include/dir.h
/usr/include/errno.h
/usr/include/fblk.h
/usr/include/fdioctl.h
/usr/include/filsys.h
/usr/include/fperr.h
/usr/include/grp.h
/usr/include/ino.h
/usr/include/inode.h
/usr/include/l.out.h
/usr/include/math.h
/usr/include/mdata.h
/usr/include/mnttab.h
/usr/include/mon.h
/usr/include/mprec.h
/usr/include/msig.h
/usr/include/mtab.h
/usr/include/mtype.h
/usr/include/pwd.h
/usr/include/setjmp.h
/usr/include/sgtty.h
/usr/include/signal.h
/usr/include/stat.h
/usr/include/stdio.h
/usr/include/sys
/usr/include/sys.s
/usr/include/sys/const
/usr/include/sys/fblk.
/usr/include/sys/filsy
/usr/include/sys/ino.h
/usr/include/sys/inode
/usr/include/sys/stat.
/usr/include/sys/timeb
/usr/include/sys/times
/usr/include/sys/tty.h
/usr/include/sys/types

/usr/include/sys/uproc.h
/usr/include/time.h
/usr/include/timeb.h
/usr/include/times.h
/usr/include/tty.h
/usr/include/types.h
/usr/include/uproc.h
/usr/include/utmp.h
/usr/lib/atrun
/usr/lib/binunits
/usr/lib/crontab
/usr/lib/diff3
/usr/lib/diffh
/usr/lib/lib.b
/usr/lib/libl.a
/usr/lib/libmp.a
/usr/lib/liby.a
/usr/lib/lpd
/usr/lib/makeactions
/usr/lib/makemacros
/usr/lib/tmac.an
/usr/lib/tmac.s
/usr/lib/units
/usr/pub/ascii
/usr/spool
/usr/spool/at
/usr/spool/lpd
/usr/spool/mail
/usr/spool/pubkey

System disk 2

/bin/cat
/bin/chgrp
/bin/chmod
/bin/chown
/bin/cmp
/bin/comm
/bin/conv
/bin/df
/bin/disable
/bin/epson
/bin/expr
/bin/file
/bin/funkeys
/bin/kill
/bin/lc
/bin/rmdir
/bin/split
/bin/strip
/bin/time
/bin/tr
/bin/tsort
/bin/ttystat
/bin/uniq
/etc/.profile
/etc/accton
/etc/boottime
/etc/clri
/etc/cron
/etc/ddate
/etc/fderror
/etc/fdformat
/etc/getty
/etc/group
/etc/helpfile
/etc/helpindex
/etc/init
/etc/load
/etc/logmsg
/etc/mkfs
/etc/mknod
/etc/mkproto
/etc/mnttab
/etc/motd
/etc/mount
/etc/mtab
/etc/newusr
/etc/passwd
/etc/profile
/etc/rc
/etc/reboot
/etc/termcap
/etc/ttys
/etc/uload
/etc/umount
/etc/update
/etc/utmp
/etc/wall

System disk 3

/bin/cp
/bin/deroff
/bin/dumpdate
/bin/dumpdir
/bin/help
/bin/join
/bin/l
/bin/look
/bin/mv
/bin/nm
/bin/prep
/bin/pwd
/bin/ranlib
/bin/scat
/bin/stty
/bin/tee
/bin/wc
/lib
/lib/cc0
/lib/cc1
/lib/cc2
/lib/cc3
/lib/cpp
/lib/crts0.o
/lib/dtoa.o
/lib/libc.a
/lib/libm.a
/lib/mcrts0.o
/lib/yyparse.c

System disk 4

/bin/[
/bin/ac
/bin/at
/bin/bad
/bin/c
/bin/cal
/bin/cc
/bin/crypt
/bin/date
/bin/dcheck
/bin/dd
/bin/diff
/bin/echo
/bin/egrep
/bin/enable
/bin/find
/bin/grep
/bin/icheck
/bin/lpr
/bin/ls
/bin/make
/bin/msg
/bin/ncheck
/bin/newgrp
/bin/od
/bin/pr
/bin/prof
/bin/ps
/bin/quot
/bin/rm
/bin/sa
/bin/sort
/bin/tail
/bin/test
/bin/units
/bin/write
/bin/xdecode

System disk 5

/bin/ar
/bin/awk
/bin/bc
/bin/cpdir
/bin/dc
/bin/dos
/bin/dump
/bin/enroll
/bin/ld
/bin/learn
/bin/lex
/bin/login
/bin/m4
/bin/mail
/bin/passwd
/bin/restor
/bin/sed
/bin/su
/bin/tar
/bin/xencode
/bin/yacc

System disk 6

/.profile
/bin/as
/bin/db
/bin/elle
/bin/nroff
/bin/who