

Getting Started With NitrOS-9

The NitrOS-9 Project
<http://www.nitros9.org>

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Table Of Contents

Getting Started With NitrOS-9	1
Chapter 1. What is an Operating System?	6
Instructing Your Operating System.....	6
Using Applications and Computer Languages	7
Using Peripherals	8
Why Use NitrOS-9?	9
How Much Do I Need to Know About NitrOS-9?.....	10
Chapter 2. How to Start and Exit Your System.....	12
Booting NitrOS-9.....	12
Rebooting NitrOS-9	14
Exiting NitrOS-9	14
Upper- and Lowercase Characters	15
NitrOS-9 Error Messages	16
Chapter 3. What You Need to Know To Use Floppy Drives.....	18
Disk Drive Names	20
Making Copies of Diskettes	20
Formatting With One Disk Drive	20
Formatting With Two Disk Drives	21
Using the Backup Command.....	22
Making Copies With One Disk Drive.....	23
Making Copies With Two Disk Drives.....	25
Chapter 4. Files and Directories	28
About Files	28
About Directories	28
Multiple Directories.....	30
About File and Directory Names.....	31
Examples of Filenames	31
About Pathlists.....	32
Anonymous Directory Names	32
About Device Names	33
Chapter 5. Commands and Keys.....	34
Typing Commands.....	34
Editing Commands	34
Command Parameters.....	35
Using Options.....	36

Using Commands	36
Accessing Commands	37
Commands from Disk	38
Changing the Execution Directory	39
Changing the Data Directory	39
Changing System Diskettes	40
Video Display and Keyboard Functions	40
Special Keys	41
Chapter 6. The NitrOS-9 Toolkit.....	46
Viewing Directories	46
Creating Directories	46
Deleting Directories	47
Displaying Current Directories	48
Copying Files	48
Deleting Files	49
Renaming Files	50
Looking Inside Files	50
Loading Command Modules into Memory.....	51
Listing the Command Modules in Memory	51
Deleting Modules from Memory.....	51
Using Other Commands	52
Chapter 7. The System and Modules Disk Structure.....	54
The System Master Disk.....	54
The Modules Disk	55
The MODULES Directory in Depth.....	56
Chapter 8. Customizing Your System	57
Creating a New System Diskette	57
Step 1: Verify that you are running Shell+	57
Step 2: Select the proper disk.....	58
Step 3: Locate the scripts directory	58
Step 4: Run the script.....	58
Customizing Your Boot	59
Making Your Own Script	60
Monitor Types under Level 2	60
Using Level 2 Windows	61
Establishing a Window	62
Changing Window Colors	64
Eliminating a Window.....	65

Using Startup To Establish A Window66

Chapter 1. What is an Operating System?

NitrOS-9 is a disk *Operating System* (that's what OS stands for). An operating system is a group of programs acting as a message center and an interpreter. Using your instructions, an operating system manages the computer's working circuits.

In fact, thinking of NitrOS-9 as your computer manager is helpful. The boss (that's you) gives orders. NitrOS-9 (the manager) sees that they get done.

To operate NitrOS-9 you need at least one floppy disk drive attached to your computer. NitrOS-9 is originally configured to recognize two floppy disk drives. Later, this handbook describes how to let NitrOS-9 know if you have more than two floppy disk drives, or if you have other hardware (printers, modems, hard disks, and so on) you want it to recognize.

Instructing Your Operating System

You give your commands to NitrOS-9 by typing them. Because NitrOS-9 does exactly (and only) what you tell it, your entries must be precise and have perfect syntax (spelling and form). You must also be sure to give NitrOS-9 every detail it needs to perform a task.

For instance, if you told your office manager to, "Make a phone call," what can the manager do? Obviously, not much that is helpful to you. The manager must know who to call, the phone number, and what to say. NitrOS-9 is the same. It must have all the details before it can carry out your commands properly.

To show you how to instruct your operating system, the handbook asks you to type characters, words, and lines on your keyboard. When you do, you are issuing *commands* to NitrOS-9. Technically, a command is only one word that describes the action you want NitrOS-9 to perform. A *command line* is a command with all of its qualifiers.

In this manual, command lines usually contain words in boxes, such as `ENTER`. These indicate keys that you press.

The manual also asks you to **press** key sequences. For instance, when asked to press `CTRL C`, hold down the key marked CTRL, and while holding down CTRL, press C.

Characters that are not in boxes are typed individually. For instance, if you are asked to type the command line `format /d0` `ENTER`, press each key individually `F` `O` `R` `M` `A` `T` `SPACE` `/` `D` `0` `ENTER`

If you make a mistake while typing, use `←` to move back to the error. Then retype that portion of the line.

Using Applications and Computer Languages

A computer *application* is a program designed to accomplish specific tasks. There are applications to help you write letters or documents (word processors), keep a mailing list (data managers), and keep financial records (accounting packages). There are also applications to help you study for a test, play a game, play music, draw a picture, and much more.

Such applications usually require that you use NitrOS-9 to start your computer. A few applications will let you start directly from the application diskette because the authors obtained permission to include a bootable NitrOS-9 core. In some cases, this application diskette can be used to boot an abbreviated but working version of NitrOS-9. Different programs can require different procedures, and you should check your application program's documentation for specific instructions.

Applications have special screen displays and *menus* to instruct you, or that require you to perform a particular action, such as press a key. When you are operating from an application program, that program passes your instructions to NitrOS-9. NitrOS-9 manages the computer's operations in the background, and its functions are invisible to you.

You can also use computer *languages* to write your own applications. BASIC is a language. If you read the *Color Computer Disk System* manual, you already know a bit about it. There are languages you can purchase to use with NitrOS-9 to create programs, such as assembly language, Pascal, C, and Basic09.

Like applications, each language has its own startup method. The manuals that come with the languages tell you how to get them running on your Color Computer.

Using Peripherals

NitrOS-9 lets you control much more than your computer's operations. It also gives you control over other hardware devices such as disk drives, a printer, modems, windows, other terminals, and so on.

Each device has a "System Name," an abbreviation preceded by a slash (/). NitrOS-9 can only recognize a device if you type its name exactly as shown below. See Chapter 7, "Customizing Your System" for information on how to tell NitrOS-9 what devices you want it to handle.

System Name	Description
/P	A printer connected through your computer's RS-232 port. The RS-232 port is a serial port, and you must have a printer with a serial connection.
/T1	A data terminal or another computer acting as a terminal, connected through the RS-232 port of your computer. If you are using another computer as a terminal, it must run a terminal program that makes it perform as a terminal.
/T2, /T3	Another data terminal or another computer acting as a terminal, connected to the optional RS-232 communications pak in a Multi-Pak Interface. If you are using another computer as a terminal, it must run a terminal program that makes it perform as a terminal.

/M1, /M2	A modem using an optional 300-baud modem pak in the optional Multi-Pak Interface. A modem allows you to communicate with other computers either directly or over phone lines.
/D0, D1, etc.	Floppy disk drives.
/W, /W1, /W2, /W3, /W4, /W5, /W6, /W7, etc.	Windows that you can establish on your NitrOS-9 Level 2 system. You use CLEAR to page among windows you create. See "Using Level 2 Windows" in Chapter 8 and also read the <i>NitrOS-9 Level 2 Windowing System</i> for information on creating windows.

Why Use NitrOS-9?

NitrOS-9 stands out for several reasons. Some of its strong points are:

- *File* managing capabilities.
- *Multi-user* features. With NitrOS-9, more than one person can use the same computer at the same time.
- *Multi-tasking*. NitrOS-9 can handle several jobs at the same time.
- *Window* functions that let you divide your display screens into sections in which you can have one or more operations running, all at the same time.
- *Input/Output* capabilities. NitrOS-9 can communicate with TVs and monitors, disk drives, printers, and other computers.
- A sophisticated repertoire of commands.
- Sophisticated programming languages.

If you are not familiar with such terms as files, multi-user, multitasking, and commands, don't worry. The handbook explains these terms and more.

Programmers like NitrOS-9 because of its powerful features. It lets them show off all of their skills. As a result, another NitrOS-9 feature

is the wide range of excellent programs that you can use with the system.

How Much Do I Need to Know About NitrOS-9?

You might wonder how much you really need to know to start using NitrOS-9. The answer varies with your needs, and with the applications you intend to use.

However, regardless of how you intend to use your computer, there are some NitrOS-9 procedures you must know. For instance, you must know how to load NitrOS-9, how to prepare diskettes to store data, and how to make copies of data or entire diskettes. This part of your handbook makes these jobs easy.

Regardless of how careful you are, there are times when things go wrong. When this happens, NitrOS-9 displays an *error message* on the screen. This part of the handbook also helps you to understand error messages and what to do about them.

Chapter 2. How to Start and Exit Your System

Starting your computer and initializing an operating system is called *booting*. In a sense, the computer is pulling itself up by its bootstraps. To run NitrOS-9, you must have a Color Computer with at least one floppy disk drive.

Your NitrOS-9 system diskette includes modules to support the following TRS-80/Tandy Color Computer hardware:

- Up to 64K RAM for Level 1 on any TRS-80/Radio Shack/Tandy Color Computer, Up to 2MB of RAM for Level 2 on a Tandy Color Computer 3
- The Color Computer Keyboard
- An Alphanumeric Video Display
- A Color Graphics Display
- Floppy Disk Drives (one or two)
- Joysticks (one or two)
- A Serial Printer
- An RS-232C Communications Port
- If you connect a Multi-Pak Interface to your Color Computer, NitrOS-9 can support the following devices:
 - Multiple external RS-232 communications cards and modem paks
 - SCSI and IDE hard drive interfaces

Note: The Multi-Pak Interface has four cartridge slots. A floppy disk controller must be in Slot 4. You can put modem paks, hard disk controllers, or RS-232 paks in Slots 1, 2, or 3. Consult your hardware's manual for more specific information.

Booting NitrOS-9

Use the instructions in the *Color Computer Disk System* manual to turn on your computer system. After you do, the video screen displays a copyright message followed by the letters, OK. This is Disk

Extended Color BASIC's way of telling you that it is ready to get to work. It is waiting for your commands.

To load NitrOS-9, follow these steps:

1. Insert the NitrOS-9 System Master diskette into Drive 0. At the OK prompt, type:

```
DOS 
```

NitrOS-9 starts. If the DOS command returns a syntax error (?SN ERROR), be sure you entered the command correctly. If DOS still returns the error, check to make sure you have installed your disk cartridge properly.

2. After NitrOS-9 displays its startup message, this prompt appears:

```
          yyyy/mm/dd hh:mm:ss  
Time?
```

Type the year, month, date, hours, minutes, and seconds in the format requested; then press . For instance, if the date and time is September 3, 2004, 1:22 p.m., type:

```
2004/09/03 13:22 
```

Note that the time is entered in 24-hour notation and that the seconds (: SS) are optional.

You can bypass this time and date prompt by only pressing . However, if you do, NitrOS-9 cannot provide the correct date when you create and save data on disk. Also, it cannot provide the correct date and time for applications that require them.

3. After you enter the date and time, the NitrOS-9 shell prompt appears and NitrOS-9 is now in control and ready to accept a command.

You should always keep the NitrOS-9 System diskette in Drive 0 (/D0) while running NitrOS-9 unless you have a hard disk containing your system files. A NitrOS-9 System diskette is a backup copy of the NitrOS-9 System Master diskette. The instructions for making copies are in the next chapter.

Rebooting NitrOS-9

If you need to reboot NitrOS-9 after the initial startup, press your computer's reset button (located at the right rear of the computer). Pressing the reset button one time causes the NitrOS-9 boot message to reappear. The system then loads as it did originally. Be sure the System Master diskette is in Drive /D0 when you reboot.

Pressing the reset button twice returns the computer to Disk BASIC.

Exiting NitrOS-9

In the same manner that you use NitrOS-9 to start operations, you should use NitrOS-9 to exit or close operations. For instance, if you are in the middle of a process, it is unwise to suddenly turn off your computer. Doing so can destroy files or garble disks.

You can usually terminate an operation by pressing **BREAK** or **CTRL** **⏏**. In some instances, you must let an operation complete its function before you can regain control of NitrOS-9. If you are using an application program, that program's manual tells you how to exit the program to the NitrOS-9 command level.

You should always be at the NitrOS-9 command level to turn off your computer. Then follow these steps:

1. Be sure the NitrOS-9 system prompt and cursor are displayed. (Note: You can *turn off* the NitrOS-9 cursor. If you or an application program has done so, the cursor does not display at the command level.)

2. Take out any floppy diskettes from the disk drives, put them back in their protective envelopes, and store them in a safe place.
3. Turn off all the equipment attached to your computer such as a printer or disk drive(s); then turn off your TV or monitor. Last of all, turn off your computer and Multi-Pak Interface (if you have one). If you plug your equipment into a power strip, you can use the power strip switch to turn off all equipment at one time.

Upper- and Lowercase Characters

NitrOS-9 can display both upper- and lowercase letters. However, you can tell it you want to use only uppercase. To do this, type:

```
tmode upc=1 ENTER
```

If you do this, you cannot type lowercase letters, and the system displays all uppercase letters. To switch back to both uppercase and lowercase, type:

```
tmode upc=0 ENTER
```

Even when you are in the upper-/lowercase mode, you can switch to typing all uppercase by pressing CTRL 0. Everything you type is now uppercase, but the computer can display both upper- and lowercase. Press CTRL 0 to switch back to upper-/lowercase.

If you want to type only one uppercase letter, hold down SHIFT while you press that letter.

It does not matter to NitrOS-9 whether you type in uppercase or lowercase letters, or any combination of upper- and lowercase letters. For instance, instead of typing `TMODE UPC=1`, you can type `tmode upc=1` or `Tmode UPC=1`.

NitrOS-9 Level 1 Users: If you are using NitrOS-9 Level 1 on a Color Computer 3 or a Color Computer 2 with true lowercase, the following

commands will make true lowercase appear on the 32x16 VDG screen:

```
tmode upc=0 par=1
display e
```

If your Color Computer supports true lowercase, then the output of commands will show true lowercase instead of inverse uppercase characters.

NitrOS-9 Error Messages

Everyone makes a mistake now and then when typing commands. If you type something the operating system doesn't recognize, or if you ask it to do something it cannot do, it displays an error message. This message is a number that refers to the type of problem that NitrOS-9 has encountered. For instance, if you type `xxxx` **ENTER** (which is nonsense to NitrOS-9), the system displays:

```
Error #216
```

If you don't know the meaning of the system error number you have two options: (1) you can look up the reference in *NitrOS-9 Commands* under Appendix A, "Error Codes" or, (2) you can type:

```
error 216 ENTER
```

Either method shows you that Error #216 means "Path Name Not Found." NitrOS-9 thought you wanted it to execute a command but it could not find one named `xxxx`.

Other NitrOS-9 error messages tell you if you have used all of a disk's storage space, if the computer's memory is full, if you try to create two files with the same name, and so on.

Chapter 3. What You Need to Know To Use Floppy Drives

Floppy diskettes require careful handling. You might already be familiar with how to take care of diskettes from reading your *Color Computer Disk System* manual. If not, or as a reminder, review the following points:

- Always make copies of important diskettes. The price of a diskette is small compared to the time it can take to replace destroyed data.
- Copy data you are working with regularly. If you experience a power failure while using your computer, the data on any diskettes you have in a drive can be destroyed. Other accidents can happen as well.
- For 5.25" floppies, always keep the protective paper or cardboard envelope on the diskette when it is not in use.
- Your drive accesses a diskette through the oblong slot in the diskette's jacket or covering. Never touch the diskette through this hole. The oil from even the cleanest hand can destroy data, making the diskette useless.
- Do not bend diskettes.
- Store diskettes away from excessive heat, dust, and any magnetic source. Even components in disk drives, video displays, TVs, and electric motors can garble the data on diskettes.
- If you must write on a diskette label after placing it on the diskette, use only a soft felt pen, such as a Sharpie®.

- Do not switch your computer, disk drives, or Multi-Pak interface on or off while you have a diskette in a disk drive.

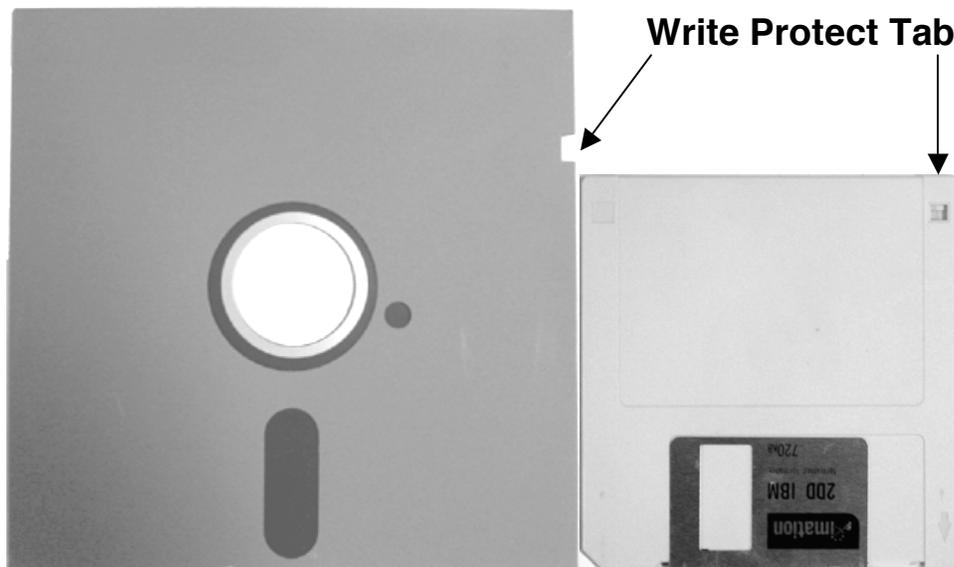


Figure 1 – 5.25” and 3.5” diskettes

One important feature of diskettes that you should be aware of is the write protect tab. The write protect tab denies the disk drive’s ability to write to the disk, thereby preventing inadvertent writes or formats which could modify or erase the contents of a diskette. Usually, the write protect tab is engaged on diskettes where important data is saved.

Most 5.25” diskettes have a square notch cut from one corner, which can be covered with an adhesive label (usually supplied with the diskette).

For 3.5” diskettes, there is a slider tab at the upper right hand corner that can be moved into an open or closed position. If the hole is closed, then the diskette is write protected; if the hole is exposed, the disk is not write protected, and can be written or formatted.

If you attempt to write or format a write protected diskette, NitrOS-9 will return an error 242 - E\$WP (Write Protected).

Disk Drive Names

NitrOS-9 has its own method of referring to your disk drives. What your Color Computer Disk System manual calls Drive 0, NitrOS-9 calls Drive /D0. This is your first drive if you have more than one floppy disk drive connected to your system. Subsequent drives are named /D1, /D2, and so on.

If you have a hard disk attached to your system, NitrOS-9 refers to it as Drive /H0. A second hard disk drive is named /H1.

Making Copies of Diskettes

Before you can store information on a diskette, you must format it. Formatting is the process of magnetically arranging a disk's surface so that NitrOS-9 can store and locate information. The following steps tell you how to format a diskette. Format at least two diskettes at this time to use in making backups (copies) of your two NitrOS-9 system diskettes. If you have other important diskettes to backup, format as many diskettes as you require.

Formatting With One Disk Drive

If you have not already done so, place a write-protect tab on your System Master diskette. Then, turn on and boot your computer as described in Chapter 2.

With the NitrOS-9 System Master diskette in your drive, type:

```
load format ENTER
```

Select a diskette that does not contain data or that contains data you do not want to keep. Make sure it does not have a foil tab covering the write-protect notch. Put it in your disk drive (Drive /D0) in place of your NitrOS-9 System Master diskette and type:

```
format /d0 ENTER
```

Format outputs information about the diskette, and the final prompt appears:

Ready?

Press **Y** to begin formatting. NitrOS-9 asks you for a `Disk Name: .` Type any name, using a maximum of 32 characters. For example, you can type `s` **ENTER** to name the diskette "s."

Next NitrOS-9 verifies that the diskette is formatted properly. The screen shows each track number in hexadecimal notation during verification. A track is a concentric ring around the diskette on which information is stored.

When formatting is complete, NitrOS-9 shows you the `Number of good sectors`. This number depends on the type of disk drive you are using. For a 40 track, double-sided drive, the number should be `$0005A0` (hexadecimal 5A0 sectors). The NitrOS-9 shell prompt and cursor reappear. Remove the newly formatted diskette from the drive, and store it in a safe place until you are ready to use it.

Format as many diskettes as you need by following Steps 3 through 6.

Formatting With Two Disk Drives

If your computer is off, turn it on, and boot NitrOS-9 as outlined in Chapter 2.

At the shell prompt, type: `format /d1` **ENTER**. Format outputs information about the diskette, and the final prompt appears:

Ready?

Insert a blank disk, or one which does not contain data you want to keep, into Drive /D1, and close the latch. Be sure the diskette does not have a foil tab covering the write-protect notch. Press **Y**.

NitrOS-9 formats the diskette; then asks you for a `Disk Name: .` Type any name, using a maximum of 32 characters. For example, you can type `s` `ENTER` to name the diskette "s."

Next NitrOS-9 verifies that the diskette is formatted properly. The screen shows each track number in hexadecimal notation during verification. A track is a concentric ring around the diskette on which information is stored.

When formatting finishes, NitrOS-9 shows you the `Number of good sectors`. This number depends on the type of disk drive you are using. For a 40-track, double-sided drive, the number should be `$0005A0` (hexadecimal 5A0 sectors). The shell prompt and cursor reappear. Remove the newly formatted diskette from the drive, and store it in a safe place until you are ready to use it.

Format as many diskettes as you need by following the same procedure.

Using the Backup Command

BACKUP is one NitrOS-9 command that you can expect to use frequently. It is the command you use to make copies of your diskettes. **We strongly recommend that you now use the following instructions to make copies of your NitrOS-9 system diskettes.** You can only copy diskettes that are created in the same type of disk drive you are using. Your NitrOS-9 system diskettes are 40 track, double sided for 5.25" drives, and 80 track, double sided for 3.5" drives.

BACKUP uses two terms you need to understand. They are *source* and *destination*. A source diskette is the diskette that contains the program, file or data that you want to backup. The destination diskette is the blank formatted diskette you prepared to receive the copied data.

Note: Some applications you buy do not let you make copies of their diskettes. Check the program manual for information on protecting the data on these diskettes.

Making Copies With One Disk Drive

If your computer is off, turn it on, NitrOS-9 as outlined at the beginning of Chapter 2.

At the shell prompt, type:

```
backup /d0 #16K 
```

This tells NitrOS-9 to make a backup of the diskette in Drive /D0. The screen displays the following prompt:

```
Ready to backup from /d0 to /d0  
?:
```

Leave the System Master diskette in Drive /D0 to make a backup of it. To back up one of your other diskettes, for example the Modules diskette, remove the System Master diskette and replace it with the diskette you want to copy.

Press when you are ready to continue. The screen displays:

```
Ready destination, hit a key
```

Replace the source diskette with the destination diskette. Then, press the space bar to continue BACKUP. When you back up one diskette to another, any data previously existing on the destination diskette is overwritten (destroyed). NitrOS-9 gives you a chance to make sure you have inserted the proper destination diskette by displaying the message:

```
DISK NAME  
  is being scratched  
Ok ?:
```

"Scratched" means that NitrOS-9 is going to replace any data on the diskette with new data from the source diskette. BACKUP also gives

the destination diskette the same name as the source diskette-the destination becomes a duplicate of the source.

Press **Y** to keep going. The screen asks you to:

```
Ready Source, hit a key:
```

Remove the formatted diskette from Drive /D0, and replace it with the source diskette that contains the data you want to copy. Press the space bar.

In a moment, a prompt asks you to:

```
Ready Destination, hit a key:
```

Remove the source diskette and replace it with the destination diskette. Press the space bar.

Continue switching diskettes as the screen instructs you until you see:

```
Sectors copied: $0276  
Verify pass
```

Followed in a moment by:

```
Sectors verified: $0276
```

The diskette now in your drive, the destination diskette, is a duplicate of the source diskette. If you copied the System Master or the Modules diskette, store it in a safe place, and use the copy as your working diskette. Reserve the original diskette for making future backups.

Note: For a Color Computer 3 running NitrOS-9 Level 2 with 512K of memory, you can backup your diskette faster if you replace #16K in the instructions above with #56K.

Making Copies With Two Disk Drives

If your computer is off, turn it on, and boot NitrOS-9 as outlined at the beginning of Chapter 2.

At the system prompt, type:

```
backup /d0 /d1 #16K 
```

This tells NitrOS-9 to make a backup of the diskette in Drive /D0. The screen displays the following prompt:

```
Ready to backup from /d0 to /d1
```

Leave the System Master diskette in Drive /D0 to make a backup of it. To back up one of your other diskettes, for example the Modules diskette, remove the System Master diskette and replace it with the diskette you want to copy.

Press when you are ready to continue.

When you back up one diskette to another, the process overwrites or destroys any data previously existing on the destination diskette. NitrOS-9 gives you a chance to make sure you have inserted the proper destination diskette by displaying the message:

```
DISK NAME  
  is being scratched  
Ok ?:
```

"Scratched" means that NitrOS-9 replaces any data on the destination diskette with new data from the source diskette. As well, BACKUP gives the destination diskette the same name as the source diskette -- the destination becomes an exact duplicate of the source.

Press to keep going. Copying continues. When the procedure ends, you see:

Sectors copied: \$0276
Verify pass

Followed in a moment by:

Sectors verified: \$0276

The diskette in Drive /D1 is now a duplicate of the source diskette. If you copied the System Master or the Modules diskette, store it in a safe place, and use the copy as your working diskette. Reserve the original diskette for making future backups.

Note: For a Color Computer 3 running NitrOS-9 Level 2 with 512K of memory, you can backup your diskette faster if you replace #16K in the instructions above with #56K.

Chapter 4. Files and Directories

Before you can use NitrOS-9 extensively, you need to know how the system organizes and stores data on disk. The information in this section is true for both floppy diskettes and hard disks. However, because of the greater storage capacity of a hard disk, it is of particular importance to hard disk users.

About Files

Consider the information stored on disks to be of two basic types, programs and data. A program is *code* that causes your computer to execute a task. Data is information that a program uses or that a program creates.

All the information that NitrOS-9 stores on disks, whether program or data, is stored in units called *files*. Whenever a program creates a file, NitrOS-9 defines a portion of your disk to store it. It keeps the location of the file in a special list (called a directory), also located on the disk, so that it knows where to find your program or data the next time you want it.

About Directories

A directory is a storage space for filenames, other directory names, or both.

After you format a disk, it contains one directory called the ROOT directory. However, a disk can have many directories. For instance, besides the ROOT directory, your System Master diskette contains the CMDS and SYS directories. The ROOT and CMDS directories are especially important to you.

When you boot NitrOS-9, you automatically begin operation from these two directories. The ROOT directory becomes your current *data directory* and the CMDS directory becomes your current *execution directory*.

Whenever you ask NitrOS-9 to store a file on a diskette, it automatically stores it in the current data directory (the ROOT directory), unless you tell it otherwise. If you ask NitrOS-9 to execute a command or program, it automatically looks for that command or program in the execution directory (the CMDS directory), unless you tell it otherwise.

Every NitrOS-9 directory can also contain other directories, called *subdirectories*. For instance, SYS, and CMDS are established as subdirectories of the ROOT directory. Put in chart form, your ROOT directory with its subdirectories looks like this:



Figure 2

But there are also files in the ROOT directory, OS9Boot and Startup are two. The full ROOT directory might look like this:



Figure 3

You can create another subdirectory of the ROOT directory if you want. For instance, if you created a directory named FAMILY, the chart of the ROOT directory looks like this:



Figure 4

After you create the FAMILY directory, you can also create other directories in it. Suppose you create two subdirectories named PLEASURE and WORK. The chart organization is as follows:



Figure 5

The directories you create also can hold files. If you created three files each in the PLEASURE and WORK directories, the chart might look like this:

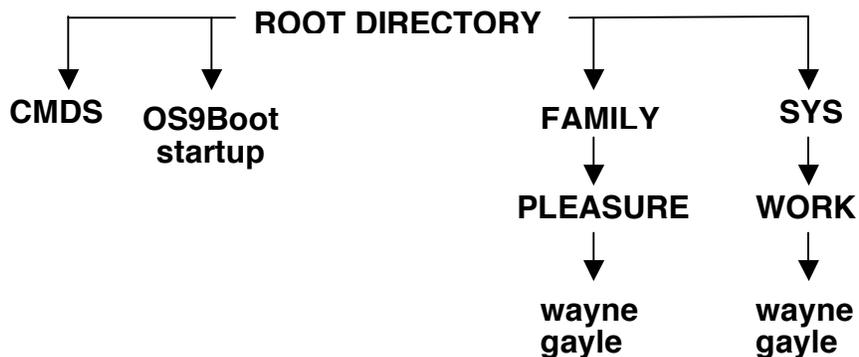


Figure 6

You can continue to create files and subdirectories in any or all of your disk's directories until you fill the disk's storage space.

Multiple Directories

There is nothing wrong with storing all your files in the ROOT directory. Doing so makes it easy to access them because they are always in your data directory.

However, creating multiple directories makes it easy to keep your data organized when you have many files, or if more than one person is using the same disk. Such a multiple-directory organization is especially helpful when using hard disks, which can store hundreds of individual files.

Also, when you have multiple directories, you can store files having the same name in different directories without conflict, such as in the PLEASURE and the WORK directories of Figure 5.

About File and Directory Names

The file and directory names shown so far consist only of letters of the alphabet, but you can use other characters and symbols in a file or directory name as long as each name begins with a letter. The following is a complete list of acceptable characters:

- Uppercase letters: (A-Z)
- Lowercase letters: (a-z)
- Decimal digits: (0-9)
- The underscore character (-) and the period (.)

You can include as many as 29 characters in a file or directory name.

Examples of Filenames

The following are samples of filenames that NitrOS-9 can recognize:

mydata	samfile
mydata1	Dollar-gifts
records.srt	help.file
XXX.xx	file#1.txt
prog1.bas	program.sourcecode
prog2.bas	program.opcode

Examples of invalid filenames are:

`his*hers` because * is not a valid character for filenames

`.DATA` because the name begins with a dot

COST+INT because + is not a valid character for names

About Pathlists

Because you can organize NitrOS-9 disks into multiple levels, you need a way to tell the system where to find directories and files. The directions you give are called pathlists.

A pathlist is exactly what its name implies a path (or route) to the device, directory, or file you want to access. For instance, if you are in the ROOT directory and want to look at the contents of a file in the WORK directory, you must tell NitrOS-9 how to get there. The pathlist from the ROOT directory to the `wayne` file is `family/work/wayne`. NitrOS-9 expects you to separate the junctions of pathlists with slashes. To look at the contents of `wayne`, you type:

```
list family/work/wayne ENTER
```

Because you are accessing a file on the current disk, you do not need to specify a drive name. Because every disk contains a ROOT directory, and all other directories and files branch from it, ROOT is always implied in a pathlist. If Figure 3 represented the diskette in Drive /D1, the pathname to the `wayne` file would be `/dl/family/work/wayne`.

Depending on the location of the directory or file you want to access, a full pathlist need not contain any more than the name of a drive, the name of a directory, or the name of a file. For instance, the complete pathlist from the ROOT directory of the above example to the Startup file is `startup`. To look at the contents of `startup`, type:

```
list startup ENTER
```

Anonymous Directory Names

To save time, or if you do not know a full pathlist, you can refer to the current directory, or to a higher-level directory, using an anonymous name, or name substitute, as follows:

- One period (.) refers to the current directory
- Two periods (..) refer to the parent of the current directory (the next highest-level directory).
- Three periods (...) refer to the directory two levels up, and so on.

You can use an anonymous directory name in place of a pathlist or as the first name in a pathlist. Some examples are:

<code>dir ..</code>	<code>[ENTER]</code> lists names in the current data directory's parent directory.
<code>del ../temp</code>	<code>[ENTER]</code> deletes the file called Temp from the current data directory's parent directory.

Anonymous names can refer to either execution or data directories, depending on the context in which you use them.

About Device Names

In the same manner that NitrOS-9 has names for its commands, it also has names for its devices. These names are abbreviations of actual device names. For instance, instead of typing Disk Drive 0 to refer to your first disk drive, you only need to type `/D0`. To refer to your printer, type `/P`. NitrOS-9 Level 2 windows are named `/W` through `/W7`.

All of NitOS-9's device names are preceded by a slash this is how NitrOS-9 can tell you are referring to a device rather than a directory or file. The NitrOS-9 System Master diskette is configured to recognize two disk drives, a printer, and one terminal port. For information on how to configure your system to recognize other devices, see Chapter 7.

Chapter 5. Commands and Keys

You already put NitrOS-9 to work with commands such as FORMAT and BACKUP. In these cases the manual told you exactly what to do to accomplish a very specific task. If you want to strike out on your own, you should know some additional background information.

Typing Commands

As explained earlier, some NitrOS-9 files are programs. You tell NitrOS-9 to execute these programs by typing the program (file) name and pressing **ENTER**. You are then issuing a command to NitrOS-9. That's all a command is, the name of a program for the system to execute. The following are some rules about commands: You can enter a command whenever the screen displays the shell prompt.

A command consists of one word, the command name. A *command line* consists of one or more command names and their associated *parameters* and *modifiers*. Parameters and modifiers are special information you include with a command that provide necessary data for the command to operate, or that affect the command's operation. A command line can have a maximum of 198 characters including any combination of upper- or lowercase letters. To execute a command, press **ENTER**. For example, to clear the screen, type:

```
display 0c ENTER
```

Editing Commands

NitrOS-9 is very particular about the commands you type. If you make any mistake, NitrOS-9 either does not understand (and tells you so with an error message) or does the wrong thing.

If you see that you made a mistake before you press **ENTER**, you have two choices: (1) use **←** or **CTRL H** to move the cursor to the

mistake, and retype that portion of the line, or (2) press **CTRL** **X** or **SHIFT** **←** to erase the line you are typing, and start over.

Command Parameters

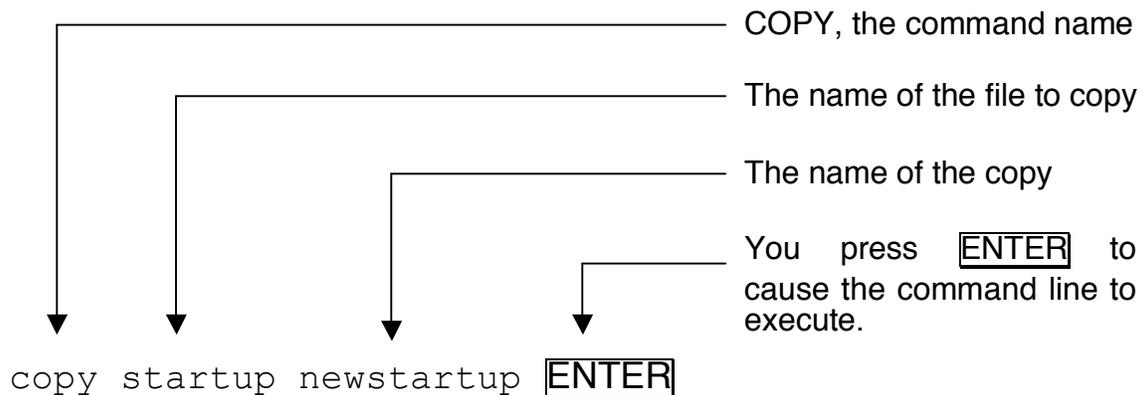
You can follow a command name with one or more parameters that give NitrOS-9 more specific instructions. For example, in the command line:

```
list file1 ENTER
```

LIST is the name of the command that displays the contents of a text file. *file1*, the specified parameter, is the name of the file that you want displayed.

Note: In a command line, always use spaces to separate parameters from their command, and from each other. Parameters cannot contain spaces. Chapter 6 discusses parameters for each NitrOS-9 command.

Some commands have more than one parameter. For instance, COPY requires two parameters: the name of the file being copied, and the name of the new file you want COPY to create. If you want to copy a file called Startup, and call the copy Newstartup, your command line reads:



Using Options

Command lines can also contain another type of parameter, called an option. An option changes the way a command performs. For instance, the command DIR, without parameters, shows the name of all files in the current data directory.

However, if you add the -E option as a parameter to the command, like this:

```
dir -e ENTER
```

the output includes not only the names of the files, but also complete statistics about each file—the date and time created, size, security codes, and so forth.

To display complete information about each file in SYS, type:

```
dir sys -e ENTER
```

Using Commands

As described earlier, NitrOS-9 acts in much the same manner as an office manager. It looks after the operation of your computer and equipment. Because NitrOS-9 is only a manager, it expects you to make the necessary decisions.

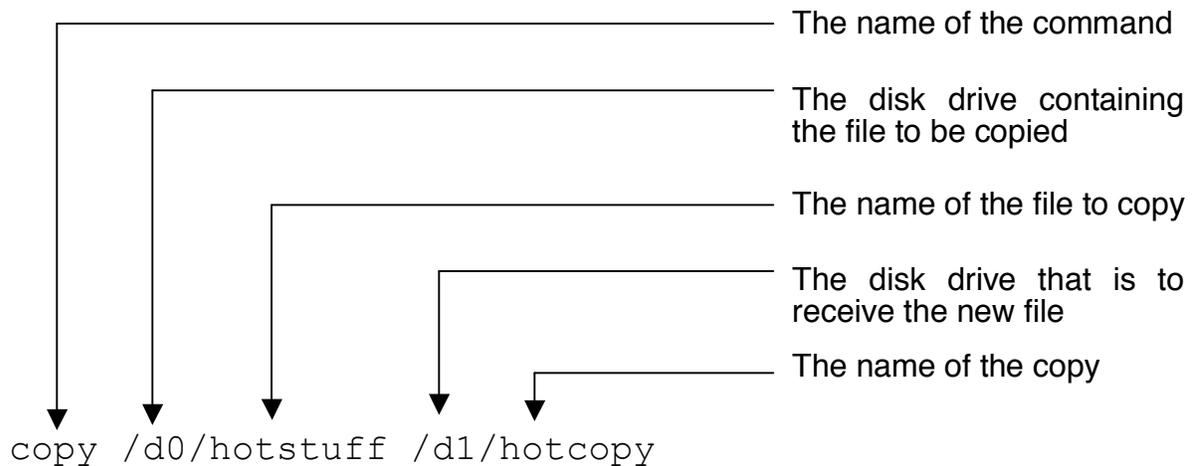
For example, suppose you have an important file named `hotstuff` that you want to copy. Before giving it to your office manager (NitrOS-9), you must make executive decisions, such as:

- Do you want the copy on disk, paper, or the computer screen?
- If you want the copy on disk, which disk?
- If you want the copy on the same disk, what name do you want to give the second copy so NitrOS-9 is not confused?
- If you want the copy on the computer screen, do you want the display to pause when it fills the screen?

You make the decisions, NitrOS-9 manages the job. For instance, if your decision is to copy `hotstuff` from one diskette to another, you might type the following command line:

```
copy /d0/hotstuff /d1/hotcopy ENTER
```

This is how NitrOS-9 sees your command:



This command line tells NitrOS-9 to copy a file named `hotstuff` from your floppy disk Drive `/D0` to a second floppy Drive `/D1`. The file copy is given the new name, `hotcopy`.

You only need to know the name of the file you want to copy, on which disk it is located, and the disk on which you want the new copy. NitrOS-9 manages the operation for you.

Accessing Commands

NitrOS-9 has two ways to access commands. Some commands reside on a disk. When you type the command name and press **ENTER**, NitrOS-9 must look on the disk, load the program into the computer's memory, and then execute it.

Other commands are loaded into your computer's memory at startup, or you can load them into memory later. When you call a command that is in memory, it is executed immediately. There is no delay while NitrOS-9 finds it on disk.

Commands from Disk

When you give NitrOS-9 a command that it cannot find in memory, it looks for the command in the current execution directory. If it cannot find it there, it checks the current data directory. If it still cannot find it, the system issues Error Message #216, Path Name Not Found. If the command you want executed is in a directory other than the current directory, you must tell NitrOS-9 where to find it. Remember, when initialized, NitrOS-9 sets the CMDS directory of the system disk to be the execution directory.

For instance, suppose you booted your system using a diskette configured like the example we used in Chapter 4:

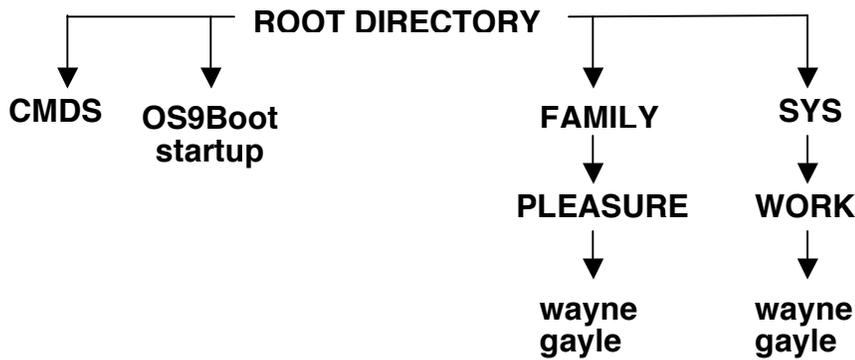


Figure 7

When the system starts, the ROOT directory is the data directory, and the CMDS directory is the execution directory. Now, suppose you had a program named `expenses` in the FAMILY directory:

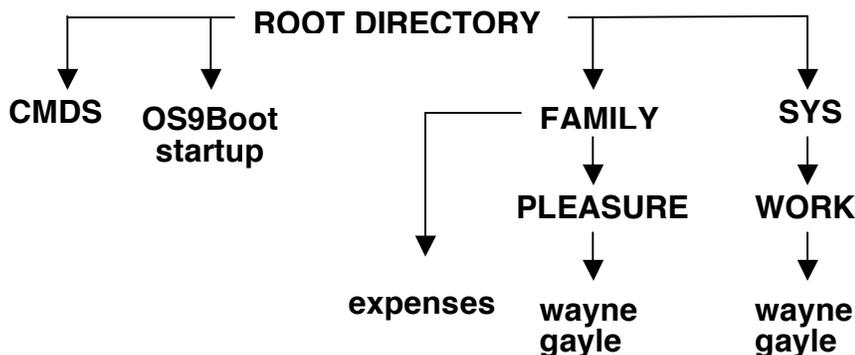


Figure 8

(Remember that a program and a command are really the same thing.)

You can now access (use) the `expenses` program in two ways. One way is to specify a pathlist from the ROOT directory to execute `expenses`, such as:

```
/d0/family/expenses ENTER
```

Another way is to change the execution directory.

Changing the Execution Directory

To change the execution directory to the FAMILY directory, type:

```
chx /d0/family ENTER
```

Or specify a pathlist relative to the current execution directory, such as:

```
chx ../family ENTER
```

To execute the `expenses` program, you now only need to type `expenses` **ENTER**.

However, after you change the execution directory, to use a command in the COMMANDS directory, you must tell NitrOS-9 where to find it. For example, to format a new diskette in Drive /D1, type:

```
/d0/cmds/format /d1
```

Changing the Data Directory

Suppose that the `expenses` program keeps track of work and pleasure expenses for Wayne and Gayle. Unless you tell NitrOS-9 otherwise, it looks for data files in the current data directory, the ROOT directory. To tell NitrOS-9 to look for data files in the PLEASURE directory, type:

```
chd family/pleasure
```

The slash between FAMILY and PLEASURE tells the system that PLEASURE is a branch of FAMILY. Subordinate directories and files are always separated from their parent in this way.

Now, when `expenses` needs data, it knows to look in the PLEASURE directory.

Changing System Diskettes

Although it is preferable to leave the system diskette in place while the system is running, particularly with multiuser systems, there might be times when you need to use another diskette. Only remove the current diskette when the screen displays the shell prompt, followed by the cursor. If you do remove the system diskette and begin to use another one, use the CHD and CHX commands to tell NitrOS-9 where you want to be located on the new diskette. (For directions, see Chapters 2 and 6.) Those commands set both directory pointers, data and execution, for the new diskette.

While using a program or command, do not remove a diskette and insert another unless the program or command asks you to. You can lose data, or entire files, if you do.

Video Display and Keyboard Functions

NitrOS-9 has many features that expand the capability of the Color Computer's video display and keyboard.

The video display has upper-/lowercase, screen pause, graphics functions, and under NitrOS-9 Level 2 for the Color Computer 3, 80 column displays if you have a monitor connected.

The **ALT** key on the Color Computer 3 keyboard (or the **@** key on Color Computer 1/2 keyboard) provides an alternate key function. Holding down this key while pressing another key sets the high order bit of the character pressed. That is, it adds 128 to the normal ASCII value produced by that key. Holding down **ALT/@** while pressing any other key produces a graphics character on the standard VDG

screen. If you are using NitrOS-9 Level 2 windows, **ALT** lets you produce international characters. (See *The NitrOS-9 Level 2 Windowing System* for more information).

The keyboard has an auto-repeat function. Holding down a key causes the character to repeat until you release the key. This function operates properly only when the disk drives are not in use by a program.

You can deal with the video display and keyboard together as though they are a file. You can receive input from the keyboard and send output to the video screen using the device name `/TERM`.

Special Keys

The following keys and key sequences have special significance to NitrOS-9. NitrOS-9 Level 1 users: replace **ALT** with **@** and **CTRL** with **CLEAR**.

ALT	Produces graphic characters on a standard VDG screen or international characters with windows. Press ALT <i>char</i> where <i>char</i> is a keyboard character.
CTRL	A control key.
BREAK or CTRL E	Stops the current program execution.
← or CTRL H	Moves the cursor to the left one space.
CTRL _	Generates an underscore character. The underscore displays as a left arrow on VDG screens.
CTRL {	Generates a left brace ({).
CTRL }	Generates a right brace (}).

CTRL 3	Generates a tilde (~).
CTRL /	Generates a backslash (\).
CTRL BREAK CTRL C	or Performs an ESCAPE function, and sends an end-of-file message to a program receiving keyboard input. To be recognized, CTRL BREAK must be the first thing typed on a line.
SHIFT BREAK	Performs a CONTROL C function by interrupting the video display of a program. The program runs as a background task.
CLEAR	Selects the next video window (NitrOS-9 Level 2 only).
SHIFT CLEAR	Selects the previous video window (NitrOS-9 Level 2 only).
CTRL CLEAR	Toggles the <i>keyboard mouse</i> on and off. The keyboard mouse uses the arrow keys and the two function keys (F1 and F2) to simulate an external mouse. When keyboard mouse is on, the normal functions for the arrow and function keys are suspended (NitrOS-9 Level 2 only).
SHIFT  or CTRL X	Deletes the current line.
CTRL 0	Activates or deactivates the SHIFT lock function.
CTRL 1	Generates a vertical bar ().
CTRL 7	Generates a caret (^).

CTRL 8	Generates a left bracket ([).
CTRL 9	Generates a right bracket (]).
CTRL A (Level 1) or SHIFT ← (Level 2)	Redisplays the last line you typed and positions the cursor at the end of the line, but does not process the line. Press ENTER to process the line, or edit the line by backspacing. If you edit, press the key combination again to display the edited line.
CTRL D	Redisplays the current command line.
CTRL W	Temporarily halts video output. Press any key to resume output.
ENTER	Performs a carriage return or executes the current command line.

Chapter 6. The NitrOS-9 Toolkit

You now know about a number of NitrOS-9 commands that can help you set up and use your computer system. There are many more commands available. This chapter contains information about a few of the most helpful commands. Becoming acquainted with these makes it easy for you to use other commands and functions. *NitrOS-9 Commands Reference* contains more information and a complete reference to all NitrOS-9 commands (including those we have already discussed).

Viewing Directories

To look at your disk directories use the DIR command. For example, to view the contents of the current data directory, type:

```
dir ENTER
```

If your data directory contains more filenames than can display on the screen at one time, the display pauses. Press the space bar to cause additional files to scroll onto the screen.

You can also view your execution directory in a similar manner. This time you must include the command option, -x. Type:

```
dir -x ENTER
```

If you want to look at a directory on a disk drive other than the current drive, specify a complete path for NitrOS-9 to follow, including the disk drive name. For example:

```
dir /d0/FAMILY/WORK
```

Creating Directories

Before you can store data in a directory other than the ROOT directory, you must create that directory with MAKDIR. For instance, to create a FAMILY directory on your Drive- /D0 diskette, type:

```
mkdir /d0/FAMILY 
```

Deleting Directories

You can also delete directories you create. **When you delete a directory you also delete any files or subdirectories it contains; so use this command with caution.** To delete a directory, follow these steps.

1. Use DIR to view the contents of the target directory and any of its subdirectories.
2. Copy any files you want to keep into a directory outside of the directory you want to delete. Type:

```
delmdir dirname 
```

where *dirname* is the name of the directory you want to delete.

The screen shows:

```
Deleting directory file.  
List directory, delete directory, or quit ?  
(l/d/q)
```

You now have three options:

1. To again confirm the contents of the directory before you delete it, press .
2. To initiate the deletion process, press .
3. To quit the process and leave the directory intact, press .

If you try to delete directories other than the ones you create, NitrOS-9 might display Error #214, No Permission (you do not *own* the directory or have write permission for it): For information on handling such directories, see the ATTR command in *NitrOS-9 Commands Reference*.

Displaying Current Directories

There are times when you need to know the names of your current data and execution directories. The PWD and PXD commands make this possible. To determine your current data directory, type:

```
pwd ENTER
```

The command displays the path from the ROOT directory to the current data directory. For instance, using an earlier example, if your current data directory is PLEASURE the display is:

```
/D0/FAMILY/PLEASURE
```

To discover your current execution directory, type:

```
pxd ENTER
```

The screen might display:

```
/D0/CMDS
```

A standard convention of NitrOS-9 is to capitalize directory names. If you follow this convention when creating directories, you can always tell which files are directories at a glance.

Copying Files

COPY, like BACKUP, provides file security. If something happens to one file, you can use a copy. Also, you might want to copy a command or program to use in more than one directory, or you might want to use the same data on more than one computer.

Continuing with the earlier example, suppose you are in the PLEASURE directory of the diskette. Your execution directory is the FAMILY directory, where you are using the Expenses program. Because the FAMILY directory does not contain any NitrOS-9 commands, you have to change the execution directories whenever you want to use them.

You can make your work easier by copying the `expenses` program to the CMDS directory. To do this, first make the CMDS directory your data directory by typing:

```
chd /d0/CMDS ENTER
```

Then copy the Expenses file to the CMDS directory by typing:

```
copy /d0/FAMILY/expenses expenses ENTER
```

Now, `expenses` is in the CMDS directory, and you do not need to change the execution directory to FAMILY to use it.

Likewise, if the ROOT directory is your data directory, and you want to copy the `gayle` file from the WORK directory to the ROOT directory, type:

```
copy family/work/gayle gayle ENTER
```

You can copy any file between directories and between disks. To do so, you must provide the COPY command with a pathlist for the location of the original file and for the destination of its copy.

Deleting Files

You can delete files in any directory using the DEL command, such as:

```
del myfile ENTER
```

You can delete a file in the current execution directory by using the `-x` parameter. For instance, to delete `myprogram` from the current execution directory, type:

```
del -x myprogram ENTER
```

If the file you want to delete is in a directory other than the current data directory or the current execution directory, you must specify the full pathlist to the file. For instance, suppose you are in the ROOT directory of a diskette configured as Figure 3. To delete the Wayne file in the WORK directory, type:

```
del family/work/wayne ENTER
```

If the file you want to delete is on a drive other than your current drive, include the drive name in your pathlist, such as:

```
del /d1/family/work/wayne ENTER
```

If you attempt to delete a file you did not create, NitrOS-9 might display Error #214, No Permission. For information on deleting such files see the `ATTR` command in *NitrOS-9 Commands*.

Renaming Files

NitrOS-9 lets you change the names of files. Suppose Wayne leaves home, and you now want to keep track of expenses for Pat. To change the name of the Wayne file to Pat, type:

```
rename family/pleasure/wayne pat ENTER
```

Looking Inside Files

`LIST` is a command that lets you examine files that consist of text characters. For instance, to view the `gayle` file from the WORK directory, you might type:

```
list family/work/gayle ENTER
```

The contents of the file appears on the screen.

If you use LIST to display a file that is not a text file, it produces a meaningless display.

Loading Command Modules into Memory

When using NitrOS-9, you might notice that some commands begin execution immediately, while others require access to the disk drive before they execute. The NitrOS-9 commands you need most often load into memory at startup, so they are available for immediate use. If you plan to frequently use a command that is not in memory, you can *load* it.

For instance the DSAVE command lets you copy an entire directory from one disk to another. To place the DSAVE module into your computer's memory, first be sure your execution directory is the CMDS directory, then type:

```
load dsave 
```

Now you can use DSAVE as many times as you want, without waiting for NitrOS-9 to find it on disk.

Listing the Command Modules in Memory

At startup, NitrOS-9 loads into memory the commands you use most often. If you are not sure whether a command already resides in memory, you can check using the MDIR command. To display a directory of the modules in your computer's memory, type:

```
mdir 
```

A list of all the modules in your computer's memory appear on the screen. The names you see are of modules NitrOS-9 uses to boot and handle system operations and the commands it loads into memory when you boot the system.

Deleting Modules from Memory

After you load a module into memory, you can also delete it. The process is called *unlinking*. To remove the DSAVE command from memory, type:

```
unlink dsave ENTER
```

Do not attempt to unlink modules that you did not install in memory with the LOAD command.

Using Other Commands

NitrOS-9 has numerous commands and functions. This chapter has mentioned only a few. Not only are there other commands available through NitrOS-9, several of the commands presented here have additional options.

The guidelines you learned in this handbook provide the background you need to make use of NitrOS-9's many other capabilities.

By referring to *NitrOS-9 Commands* you can learn how to create *procedure files* to accomplish complicated tasks, send information to your printer, transfer data between devices, execute more than one task at the same time, and much more.

Chapter 7. The System and Modules Disk Structure

NitrOS-9 is distributed on either two 5.25" 360K floppy diskettes or one 3.5" 720K floppy diskette. If you are using two 5.25" diskettes, then the first diskette is the *System Master* and the second diskette is the *Modules* disk. The System Master is the diskette with which you boot NitrOS-9. It also contains all of the standard commands as well as some additional system and definition files.

The Modules disk contains all of the pieces that can be used to build a NitrOS-9 boot disk for various system configurations. It also contains a minimal commands directory that can be used when building a boot disk.

The directory structure on these disks is designed to be highly organizational and to provide consistency between distributions. This chapter explains what to expect when exploring the directories on the distribution diskettes and their purpose.

Because a 3.5" disk can hold twice the information of a 5.25" If you are using NitrOS-9 on a 3.5" 720K floppy diskette, then it contains the contents of both the System Master and the Modules disks. This is because the 3.5" disk can hold twice the amount of the 5.25" diskette.

The System Master Disk

As discussed in a previous chapter, the root directory is the top level directory on a diskette formatted for use under NitrOS-9. The NitrOS-9 System Master diskette contains the following directories:

- CMDS** – contains executable commands and utilities
- SYS** – contains help and error message files as well as the password file. Under NitrOS-9 Level 2, this directory also contains graphic buffer files for fonts, pointers and patterns
- DEFS** – contains the definition files necessary for assembly language development.

The Modules Disk

The Modules disk is organized into various directories and subdirectories. The main directory is NITROS9. It is in this directory that all supported distributions are contained.

Depending upon your distribution, you will see one of three directories:

6809L1 – Files and modules for NitrOS-9/6809 Level 1

6809L2 – Files and modules for NitrOS-9/6809 Level 2

6309L2 – Files and modules for NitrOS-9/6309 Level 2

These are considered *distribution directories*, as their contents reflect files for that particular distribution of NitrOS-9. As other distributions come into existence, additional directories may appear.

An immediate benefit of having separate distribution directories is that on a system with a large capacity disk or hard drive, multiple distributions can reside under the NITROS9 directory without conflicts. Boot disks for those distributions can be easily built, no matter which distribution of NitrOS-9 is actually running. This means that you can build a NitrOS-9/6309 Level 2 boot disk while running NitrOS-9/6809 Level 1, or vice versa.

Underneath each distribution directory is a set of *operational directories* which are the same for all distributions. They are:

CMDS

MODULES

BOOTLISTS

SCRIPTS

The CMDS directory at this level contains commands for creating boot disks. Though all distributions have the same commands, the actual executables may not be the same. For example, the **grfdrv** module in NITROS9/6809L2/CMDS is not the same binary as the module of the same name in NITROS9/6309L2/CMDS. Because of this, you should NEVER mix commands between distributions.

The MODULES directory contains modules for the distribution, and those modules are used for creating boot disks, as we will see shortly.

The BOOTLISTS directory contains one or more text files that end in *.bl*. This is short for *bootlist*. Bootlist files are used by the **os9gen** command when building boot disks, and are part of the automated boot disk creation process discussed in a following chapter.

The SCRIPTS directory contains shell scripts that are used in creating boot disks. The commands in these scripts are executed in series, and rely on the bootlist files in the BOTLISTS directory to complete the creation of a boot disk.

The MODULES Directory in Depth

The MODULES directory contains sub-directories which organize the multitude of module files that compose a potential NitrOS-9 boot disk. They are:

BOOTTRACK – Files and modules which are used to create custom boot tracks

KERNEL – The core kernel files that make up the NitrOS-9 operating system

SYSMODS – Modules that aren't classed in other directories

CLOCKS – All clock modules, both software and real-time clocks

RBF – The disk file manager, drivers and descriptors for a number of different devices

SCF – The character file manager, drivers and descriptors for those devices

PIPE – The pipe file manager and its driver and descriptor

These additional sub-directories provide some order to chaos by allowing modules in related groups to exist in their own directory. This reduces screen clutter and emphasizes their association and place in the NitrOS-9 system.

Chapter 8. Customizing Your System

Your NitrOS-9 operating system is originally configured in a certain way. For instance, it is set up to recognize two floppy disk drives, but no hard drives.

Using scripts located in the NITROS9 directory on the Modules diskette, you can create system diskettes that match the computer system you have. Before proceeding further, be sure you have a working copy of the NitrOS-9 Modules diskette and a blank, formatted diskette. You can use the instructions in “Making Copies of Diskettes” in Chapter 3 to create a working copy of the NitrOS-9 Modules diskette and to create a blank, formatted diskette.

Creating a New System Diskette

The following instructions will assist you in creating a new system diskette. **You will need a two-drive system in order to follow these steps.** To create your new system diskette, make sure you have a newly formatted diskette on hand, then follow these steps:

Step 1: Verify that you are running Shell+

NitrOS-9 Level 2 users already have Shell+ as their default shell. NitrOS-9 Level 1 users, however, do not. In order to run the boot creation script, Shell+ must be used.

NitrOS-9 Level 1 users: insert your NitrOS-9 system diskette into drive 0 and boot up to the shell, then type the following commands:

```
rename cmds/shell shellorg ENTER  
rename cmds/shellplus shell ENTER
```

Once the commands have completed, press RESET on your Color Computer to reboot into NitrOS-9. Shell+ will now be your default shell

Step 2: Select the proper disk

The NitrOS-9 Modules diskette is required to create a system diskette. If you are using 3.5" 720K system disks, then simply boot into NitrOS-9 and go to the next step.

If you are using the 5.25" NitrOS-9 diskettes, use the NitrOS-9 System Disk to boot into the operating system, then insert the NitrOS-9 Modules diskette into drive 0, and type:

```
chx /d0/cmds ENTER  
chd /d0 ENTER
```

Step 3: Locate the scripts directory

Navigate to the scripts directory by typing:

```
chd /d0/nitros9/680912/scripts ENTER
```

(This example presumes that NitrOS-9/6809 Level 2 is being used. Be sure to substitute the '680912' string if you are using a different distribution).

Use the `dir` command to show the contents of this directory, and you will see a single file: `mb` (short for *make boot*). This is the script file that is used to build a fresh system disk.

Step 4: Run the script

Start the script by typing:

```
mb ENTER
```

The script will prompt you for the destination drive. This contains the disk that you want to make bootable. After supplying the device name, the disk in the device is formatted, and the script will continue to display what it is doing through a series of discrete steps.

If no errors occurred, the script will notify you when it is finished. At that point, you have a newly created boot disk in the destination drive that you can now boot from. You will realize quickly, however, that there are no utilities on the disk. It only contains enough of the operating system to boot up and provide a shell.

Customizing Your Boot

While the above steps allow you to create a bootable disk, it doesn't provide you with the information on how to actually make a custom boot disk. The customization comes in by editing one or more bootlist files, found in the `nitros9/680912/bootlists` directory. A single text file resides there: `standard.bl`.

The file contains a list of all modules necessary to build a bootfile, one per line. Most lines are commented out with an asterisk as the first character, and by default, only the modules absolutely necessary for booting are made available.

Using an editor such as `edit`, you can either uncomment lines for modules that you want to include, or add modules at the end of the file. Either way, editing this file is the key to getting your bootfile customized the way you want to. You will notice that there are a lot of modules in the list covering a number of hardware devices, so be sure to search for your driver or module of choice before adding it.

Once you have edited `standard.bl` to your liking, save it and return to the `nitros9/680912/scripts` directory. Once there, re-run the `mb` script. If the modules you selected are indeed available, your new bootfile will contain them. Please be aware that typos or references to missing modules in the `standard.bl` file can cause the script process to prematurely abort and you will not have a bootable disk.

Making Your Own Script

If you find the script a bit limiting, you may want to edit it or use it as a template for a new script. With a new script you can reference another bootlist file instead of `standard.bl`, format the disk to a different capacity, build a different kernel track, etc. It's a flexible way to set up a customized boot disk with all the utilities and modules you want.

The remaining sections in this chapter deal with NitrOS-9 Level 2 for the Tandy Color Computer 3. If you are running NitrOS-9 Level 1, you can skip the remainder of this chapter.

Monitor Types under Level 2

NitrOS-9 Level 2 lets you set your Color Computer 3 for different monitor types. The monitor options are for an RGB color monitor, a composite color monitor or TV, or a monochrome monitor or TV. To set your system for a particular monitor type, enter one of the following commands, or add it to your system's `startup` file:

Monitor Type	Command
RGB	<code>montype r</code>
Composite	<code>montype c</code>
Monochrome	<code>montype m</code>

Therefore, to set your system for a composite monitor, type:

```
montype c ENTER
```

To save typing the command each time you start NitrOS-9, put it in the `startup` file in the ROOT directory of your system diskette.

If your system disk does not have an existing `startup` file:

Create one by typing:

```
build startup ENTER  
? montype r ENTER
```

? **ENTER**

If your system disk already has a startup file:

First, rename the `startup` file by typing:

```
rename startup oldstart ENTER
```

Then create a file that contains the new command, such as:

```
build newstart ENTER  
? montype r ENTER  
? ENTER
```

Now, combine the two files into a new `startup` file:

```
merge oldstart newstart >startup ENTER
```

Use **DEL** to delete `oldstart`, `newstart`, or both, or leave them on your disk for future use.

Using Level 2 Windows

If the window descriptors (`W`, `W1`, `W2`, `W3`, `W4`, `W5`, `W6`, `W7`) and the graphics interface and driver, `GrfInt/WindInt` and `GrfDrv`, are in memory, NitrOS-9 lets you set up windows on your display screen.

Note: `GrfInt/WindInt` and the window descriptors must be loaded as part of the boot operation. Your System Master diskette does this.

Once you have initialized windows, you can then move among them, initiating different tasks in each. You can even have different processes showing on different portions of your display screen at the same time.

Another advantage of using windows is that you can choose windows that give you displays of 40 or 80 columns across the screen.

However, unless you have a monitor connected to your computer, rather than a television, you might be unable to read the screen.

Establishing a Window

You can establish one or more windows after booting NitrOS-9, or you can include the window creation process in NitrOS-9's `startup` file. `startup` is a file containing commands you want your system to execute during startup.

To establish a window from the shell prompt, type:

```
iniz wnumber ENTER  
shell i=wnumber& ENTER
```

In this example, `number` represents the window number to initialize. After you type these commands, you can select the window by pressing **CLEAR**. To return to the original screen, press **CLEAR** again.

The default values for the window descriptors `/W1` through `/W7` are:

Window device name	Text size in columns	Window start:	Window size:
<code>/W1</code>	40	0,0	27,11
<code>/W2</code>	40	28,0	12,11
<code>/W3</code>	40	0,12	40,12
<code>/W4</code>	80	0,0	60,11
<code>/W5</code>	80	60,0	19,11
<code>/W6</code>	80	80,0	80,12
<code>/W7</code>	80	0,0	80,24

Note: To initialize Windows `/W2` and `/W3`, you must be operating from Window `/W 1`. To create Windows `/W5` and `/W6`, you must be operating from Window `/W4`.

The "Window start" column, indicates the position on the screen of the top left corner of the window. On the screen grid, coordinates 0,0 are located at the top left corner.

The "Window size:" column indicates the number of characters across each window and the number of character lines in each window.

Therefore, Window 1 displays 40 column text, begins in the top left corner of the screen, extends right for 27 characters and down for 11 lines. Window 5 displays 80 column text, begins at the top of the screen, 60 columns from the left, extends 19 columns to the right and 11 lines down.

Note that the coordinates for each window are based on the text size of the screen. Therefore, Window 1 (based on 40 column text) ends at column 27, while Window 5 (based on 80 column text) begins at column 60.

Using the information in the previous chart, you can now establish any, or all, of the seven windows.

Note: You cannot establish all of the windows unless your computer has 512 kilobytes of memory.

For instance, to set up a full screen, 80-column window, type:

```
shell i=/w7& ENTER
```

After a short pause, the screen displays a message, such as:

```
&004
```

This means that NitrOS-9 has opened a path to your new window and started a shell on the window with the process identifier of 004. To move to the window, press CLEAR. Your 32-column screen vanishes and you are now in Window 7. You can type commands or run programs from here in the same manner as before.

To set up three windows on the same screen, type these commands, then use **CLEAR** to move among the windows:

```
iniz w1 w2 w3 ENTER
shell i=/w1& ENTER
shell i=/w2& ENTER
shell i=/w3& ENTER
```

If you want, and your computer has enough memory, you can run different processes in all of the windows.

Changing Window Colors

Perhaps you don't like the color of the screen in one or more of your windows. You can change it using the display command. The following charts show you all of the colors available for the screen background, text, and border.

00 or 08	White
01 or 09	Blue
02 or 0A	Black
03 or 0B	Green
04 or 0C	Red
05 or 0D	Yellow
06 or 0E	Magenta
07 or 0F	Cyan
10 or greater	Black

Table 1 - Color Codes

To change a color, type `display lb`, followed by the background, text, border, or foreground code followed by a color code. Then, press **ENTER**.

For instance, if you are in Window 7, you can change the background color to red, by typing:

```
display 1b 33 04 ENTER
```

Change the text color to black by typing:

```
display 1b 32 02 ENTER
```

To put a white border around the screen, type:

```
display 1b 34 00 ENTER
```

You can also type all the codes on one line, like this:

```
display 1b 33 04 1b 32 00 1b 34 00 ENTER
```

Pick the colors you want for each window, and change them using DISPLAY.

Eliminating a Window

In the command to establish windows (`shell i=/wnumber&`), "i" tells SHELL that the process being created is *immortal*. This means that you can only terminate it from the window in which it resides.

To kill a window in which you have established a shell, press **CLEAR** until the window you want appears on the screen. Type:

```
ex ENTER
```

Now press **CLEAR** to move to another window in which a shell is running. Then use DEINIZ to deinitialize that window. For instance, if the window you want to eliminate is Window 1, type:

```
deiniz w1 ENTER
```

Using Startup To Establish A Window

If you intend to use a window whenever you start NitrOS-9, for instance if you want to use an 80 column screen; put the appropriate commands in the `startup` file. This file must be located in the ROOT directory of your system disk.

If your system diskette already has a `startup` file:

First rename the existing `startup` file, such as:

```
rename startup oldstart 
```

Then put your new commands into a temporary file. To initialize window Number 7 (80 columns, full screen) with white text on a black background, type:

```
build tempstart   
? iniz w7   
? display 1b 32 00 1b 33 02 1b 34 02 0c>/w7  
  
? shell i=/w7&   
? 
```

Now combine your new commands with the original `startup` file by typing:

```
merge oldstart tempstart >startup 
```

You can remove the `tempstart` file by typing `del tempstart` , or you can leave it in your ROOT directory for future use.

If `startup` does not already exist:

Create it by typing:

```
build startup   
? iniz w7 
```

```
? display 1b 32 00 1b 33 02 1b 34 02 0c >/w7
ENTER
? shell i=/w7& ENTER
? ENTER
```

Now, after you boot NitrOS-9, press **CLEAR** to operate in an 80 column, black and white screen.

Index

Backup, 22
BASIC, 8, 13, 14
Basic09, 8
build, 58, 59, 64
C, 7, 8, 42
chd, 40, 47, 56
copy, 14, 22, 23, 24, 25, 26, 35,
36, 37, 46, 47, 49, 55
del, 33, 47, 48, 64
display, 9, 14, 15, 34, 36, 43,
44, 46, 48, 49, 59, 62, 63, 64,
65
format, 7, 13, 19, 20, 21, 28, 39
Formatting, 20, 21
Grflnt, 59
iniz, 60, 62, 64
international characters, 41
modifiers, 34
montype, 58, 59
Multi-Pak, 8, 9, 12, 15, 19
Multi-tasking, 9
parameters, 34, 35, 36
Pascal, 8
Pathlists, 32
printer, 8, 15, 33, 50
RS-232, 8, 12
shell, 14, 21, 22, 23, 34, 40, 60,
61, 62, 63, 64, 65
startup, 8, 13, 14, 32, 35, 37,
49, 58, 59, 60, 64
subdirectories, 29, 30, 45
tmode, 15. *See* tmode. *See*
tmode
video display, 40, 41, 42
Windlnt, 59
write protect, 19