CP/M
USER GUIDE

H DRIVE

CORVUS SYSTEMS

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USER GUIDE

CP/M

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Chapter 1
Introduction

The CORVUS SYSTEMS CP/M USER GUIDE provides you with a general introduction to the Corvus hard disk system, the Mirror option for backup of data, the pipes and spooling features for moving files between computers and peripherals, trouble-shooting procedures, and diagnostic programs. Your Corvus hard disk system should already be installed and configured for a single user. Please retain your installation guide for future reference.

The CORVUS SYSTEMS CP/M USER GUIDE is used with the following computers:

—TRS-80™ Model II (under CP/M)
—XEROX 820™
—Zenith Z-89 or Z-90
—Intertec SuperBrain™
—NEC PC-8001, PC-8001A or PC-8800™
—S-100 Bus Systems, for example:

- Cromemco™ (under CP/M)
- CCS (California Computer Systems)
- Dynabyte™
- North Star™
- Vector Graphic™

as well as other systems. Consult with your dealer if you wish information about a specific computer system or a particular model.

This guide and other Corvus manuals do not take the place of the operating system and language manuals provided by the manufacturer of your computer. It is presumed that you have a working knowledge of your computer system hardware and software.

For more detailed information on Corvus software, refer to Appendix F. For information on multi-user configurations, refer to the CORVUS SYSTEMS MULTIPLEXER INSTALLATION GUIDE for your computer.

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Chapter 2
Reviewing Some Basic Points About Your System

Your Corvus hard disk system should be installed and configured at this point, following the directions provided in the installation guide for your computer. The standard configuration makes the Corvus Model 6 and 11 drives appear as two extra-large floppy drives to your computer system (Drives C and D) and a Corvus Model 20 drive appear as a three extra-large floppies (C, D and E). These pseudo floppies are called virtual drives. The entire Corvus disk is called a physical drive. If your system only has a single floppy diskette drive, you should have this single physical drive appear as two virtual drives (for example, the TRS-80 Model II has a program called ONEDRIVE to do this).

Start-Up of Your Computer System

Insert the CP/M boot diskette into Drive A:. The screen displays the initial boot instructions and information on the CP/M version (you should have version 2.2 or later), and then a prompt, similar to:

```
CP/M VER. 2.2  COPYRIGHT DIGITAL RESEARCH
CORP.

A>  _
```

Insert a CORVUS UTILITIES VOL. 1 diskette into Drive B:.

Type **B:** and press < **RETURN** >. The screen displays:

```
B>  _
```

Type the appropriate CLINK program, for example: **CLINK2TN** and press < **RETURN** >. The screen displays:

```
--- CORVUS LINK INSTALLED ---

B>
```

Remember, you must run the correct CLINK program before you can use your Corvus drive.

How to List a Directory

To list a directory for the one of the virtual drives on the Corvus, follow the same procedure you use for a floppy drive. For example, type D:DIR and press <RETURN>. The screen displays the directory in a manner similar to:

```
D : INDEX    DOC : CERROR   DOC : PUTGET   COM : CLINK2FV COM
D : CLINK2TN COM : CLINK2TW COM : CLINK7FV  COM : CLINK7TN COM
D : CLINK7TW COM : CDIAGNOS COM : CDIAGNOS DOC : CORVB173 CLR
D : MIRROR   COM : SEMA4    COM :

B>
```

How to Run a Program

Files that have a "DOC" extension are text files, rather than programs. To examine the contents of a DOC file named INDEX.DOC on Drive C: of the Corvus disk, type **D:TYPE INDEX.DOC** and press <**RETURN**>. The contents of the file will scroll up the screen. To stop at any point, hold the control key down and press S (<**CNTL**>**S**). To restart, hold the control key down and press Q (<**CNTL**>**Q**). If you wish to return to the main CP/M program, hold down the control key and press C (<**CNTL**>**C**).

CP/M finds files by filename. Each file also has a three-letter extension. For example, "COM" indicates that the file is a command program (also known as a "system program") that you can run. See Appendix A of this guide for a list of the different types of extensions. It is not necessary to type the extension for COM files.

Your Corvus drive should already be configured and linked. To run the program TANGENT (as an example) on Drive D of the Corvus disk drive, type **D:TANGENT** and press <**RETURN**>. The computer goes to Drive D:, finds TANGENT, and runs the program.

How to Save a File

Once a Corvus drive has been linked to your computer system with one of the CLINK programs, it works just like a giant floppy disk drive, and CP/M programs work in the usual manner. Save files on a Corvus drive just as you would on a floppy, specifying the drive and file name, plus the extension (optional).

How to Copy a File

Files are copied from one drive (either physical or virtual) to another drive, using the PIP program in CP/M. Since one physical Corvus drive is made to look like either two or three floppy drives (virtual drives), you can have duplicate files on the Corvus, or transfer material from the floppy drives to the Corvus and vice-versa. To move the TEXT.TXT file (as an example) from Drive C: on the Corvus disk to Drive B: on the floppy drive, first make sure the CP/M boot diskette is in Drive A:. Type **A:PIP** and press <**RETURN**>. This loads the PIP program. The screen displays:

Type **B:=C:TEST.TXT** and press <**RETURN**>. The screen displays:

Type <**CNTL**>**C** to exit the PIP program and return to the main CP/M program. You have now copied the TEST.TXT file from the Corvus hard disk to a floppy diskette.

Chapter 3
Backing Up Your Drive with the Mirror

This chapter is for those users who have a Corvus Mirror (either built-in or add-on) with their Corvus Disk System.

Description of the Corvus Mirror

Corvus Systems has developed a unique system for providing effective, low-cost backup for its hard disk drive, known as the Corvus Mirror, using a video cassette recorder (VCR) and video cassettes. The Mirror creates an "image", or copy, of either virtual drives or the entire physical drive on the video cassette. The Corvus drive is configured to appear as several (either two or three, depending on size) virtual drives to your computer.

The Mirror hardware can be ordered built into Corvus Disk Systems, or it can be purchased as an add-on option. Mirror software is included on the CORVUS UTILITIES diskettes which accompany the Corvus disk drive.

General Tips

Use the same VCR whenever possible for backing up your Corvus drive. The VCR should be set at the standard play speed, and the highest quality tape should be used to prevent errors. It is recommended that VCRs without the color enhancement feature be used, or that this feature be disabled when using the VCR with a Mirror.

See Appendix E for the capacity of different-sized cassettes and the time required to backup Model 6, 11 and 20 drives. You should be familiar with the operation of your VCR before using it with the Mirror.

Hardware Installation of the Corvus Mirror

Your drive must already be configured for the number of virtual drives before using the Mirror. Turn off all power before making any connections.

If you have a drive with a Mirror already installed, the serial number and the drive size should both end with an "M". Insert one end of the phono connector cable into the VIDEO out jack on the VCR, and the

other end into the VIDEO IN jack on the back panel of the Corvus drive. Connect one end of the other phono connector cable into the VIDEO IN jack on the VCR and the other end into the VIDEO OUT jack of the Corvus drive.

If you have an add-on Mirror, see the CORVUS SYSTEMS MIRROR INSTALLATION GUIDE supplied with the add-on Mirror for instructions on hardware set-up.

The Mirror Menu

```
L  : LIST THIS MENU
H  : LIST HELP DATA
B  : BACKUP
V  : VERIFY
I  : IDENTIFY
R  : RESTORE

TASK (L TO LIST) : _
```

This is the Mirror menu, which allows you to pick which sub-program of the Mirror program you wish. Simply press the letter for the option you wish.

L: LIST THIS MENU—Pressing **L** for this option allows you to see a display of the Mirror menu, as shown above.

H: LIST HELP DATA—If you press **H** for this option, HELP DATA will display a brief description of the BACKUP, IDENTIFY and RESTORE options, in addition to a brief overall description of the Mirror utility program running under CP/M.

B: BACKUP—Pressing **B** for the BACKUP option starts the Mirror option for recording an image (a copy of all or part of the Corvus hard disk) on the VCR. See below in this chapter.

V: VERIFY—Pressing **V** for the VERIFY option makes the Mirror read a video tape image to check if the image has been properly recorded. A search is made for hard and soft recording errors and a status report is displayed on the screen. If a different VCR machine will be used for the RESTORE option than for the original BACKUP recording, you can perform a verify pass to check the head alignment on the VCR.

I: IDENTIFY—Pressing **I** for the IDENTIFY option tells the Mirror to read the initial header block which is created at the beginning of each image. This header block has the date, time, a name, a comment, and format information, which helps you locate images on the video tape if you have several images on the same tape. The Mirror program displays an error message on your CRT if the initial header block cannot be found in about 1 minute on the video cassette.

R: RESTORE—Pressing **R** for the RESTORE option copies a video cassette image back onto the Corvus disk. This image may be stored in a different disk location than the original data copied by the Mirror.

The RETRY Function

The RETRY function is part of the VERIFY and RESTORE options of the Mirror. If you need to use this function after performing either a VERIFY or a RESTORE, a screen message is displayed that alerts you to the number of blocks that need to be retried. With the RETRY function, the Mirror program attempts to reconstruct data from blocks with errors to create a block without errors.

Exiting the Mirror Program

You can exit from the Mirror program back to the CP/M prompt by pressing <**CNTL**>**C**, except in the middle of actual Mirror operations.

Using the Mirror to Backup Your Entire Corvus Disk

1. First, make sure the Corvus Mirror and the VCR are properly connected. Boot your computer system with the CP/M boot diskette. Run the correct CLINK program.

2. Load the Mirror program from the CORVUS UTILITIES VOL. 1 diskette in Drive B: by typing **MIRROR** and pressing <**RETURN**>. The screen displays the Mirror menu:

```
L  : LIST THIS MENU
H  : LIST HELP DATA
B  : BACKUP
V  : VERIFY
I  : IDENTIFY
R  : RESTORE

TASK (L TO LIST) : _
```

3. Press **B** for Backup. The screen displays:

```
BACKUP ENTIRE CORVUS DISK (Y/N) ? _
```

4. Press **Y** for Yes. The screen displays:

```
CORVUS DRIVE # (1-4) ? _
```

5. Press **1** (unless you have added on another Corvus physical drive). The screen displays:

```
--- ENTER TAPE FILE HEADER INFORMATION ---
DATE _
```

6. It is strongly recommended that you complete the tape header information. The tape header is information that is written at the beginning of the backup image to help you identify the image. Here is a sample tape file header. Type **MAY 9, 1982** and press <**RETURN**>. The screen displays:

```
TIME _
```

7. Type **12:00 A.M.** and press <**RETURN**>. The screen displays:

```
NAME _
```

8. Enter the name you wish to use on your tape header. Type **TEST ONE** and press <**RETURN**>. The screen displays:

```
COMMENT _
```

9. Type **COMMENT COMPLETED** and press <**RETURN**>. The comment is optional. If you do not want a comment, just press <**RETURN**>. The screen displays:

```
NORMAL OR FAST FORMAT (N/F) ?
```

10. Press **N** for Normal. The screen then displays:

```
START UP RECORDER AND PRESS RETURN
```

11. Make sure the VCR is on, and the video cassette is loaded properly. Write down the VCR counter number on a piece of paper and save it. Start the VCR recording (on most recorders you will have to press both the play and record buttons). Press <**RETURN**>. The screen displays:

```
WAITING FOR RECORDER TO SPEED UP...
```

After about half a minute, the screen displays:

```
>>BACKUP HAS STARTED<<
```

12. When the backup is finished (about 11 minutes for the 6 MB drive, 17 minutes for the 10 MB drive and 35 minutes for the 20 MB drive), the screen displays:

```
BACKUP DONE --- NO DISK ERRORS
TASK (L TO LIST) ? _
```

13. Stop the VCR. It is strongly recommended that you copy down the VCR counter number, so you will know the approximate starting and ending locations of the image on the video cassette.

It is a good idea to record just one entire drive on each cassette, and to use a double back-up system—keeping the current backup and one copy of the next previous backup on another cassette.

How to Backup Single Virtual Drives on the Corvus Disk

1. Boot your computer system with the CP/M diskette, and then run the correct CLINK program.
2. Load the Mirror program on the **CORVUS UTILITIES VOL. 1** diskette in Drive B: by typing **MIRROR** and pressing <**RETURN**>. The screen displays the Mirror menu:

```
L  : LIST THIS MENU
H  : LIST HELP DATA
B  : BACKUP
V  : VERIFY
I  : IDENTIFY
R  : RESTORE

TASK (L TO LIST) : _
```

3. Press **B** for Backup. The screen displays:

```
BACKUP ENTIRE CORVUS DISK (Y/N) ? _
```

4. Press **N** for No. The screen now displays:

```
STARTING DISK BLOCK # ? _
```

5. This starting disk block number is for an internal address of the Corvus drive, which is calculated in terms of 512-byte sectors (four 128-byte sectors). See Table 1 below for the correct starting disk block number. For example, on a Model 20 drive, the starting disk block number for Drive D is 12345.

TABLE 1—REFERENCE TABLE FOR BLOCK NUMBER/ LENGTH

Model 6 Drive with CLINK2 Program

Drive	Starting Disk Block #	Number of Blocks in Drive
C:	**580**	**5472**
D:	**6068**	**5472**

Model 11 Drive with CLINK2 Program

Drive	Starting Disk Block #	number of Blocks in Drive
C:	**580**	**11552**
D:	**12148**	**11552**

Model 20 Drive with CLINK2 Program

Drive	Starting Disk Block #	Number of Blocks in Drive
C:	**580**	**11749**
D:	**12345**	**11749**
E:	**24110**	**11749**

Type **12345** and press <**RETURN**>. The screen displays:

```
NUMBER OF BLOCKS ?
```

6. Table 1 shows that for a Model 20 drive (CLINK2) the number of blocks in a virtual drive is 11749.
   Type **11749** and press <**RETURN**>.

7. The Mirror now requests the information for the header block. The screen displays:

```
--- ENTER TAPE FILE HEADER INFORMATION ---
DATE:
```

8. Type **4/18/82** and press <**RETURN**>. The screen displays:

```
TIME:
```

9. Type **2:30 p.m.** and press <**RETURN**>. The screen displays:

```
NAME:
```

10. The name cannot be more than 16 characters long. Type **TEST FILE** and press <**RETURN**>. The screen displays:

```
COMMENT:
```

11. Type **COMMENT FINISHED** and press <**RETURN**>, or just press <**RETURN**> if you have no comment. The screen displays:

```
NORMAL OR FAST FORMAT (N/F) ?
```

12. Press **N** for Normal. The screen displays:

```
START UP RECORDER AND PRESS RETURN
```

13. Make sure the VCR is on, and the video cassette is loaded properly. Write down the VCR counter number on a piece of paper and save it. Start the VCR recording (on most recorders you will have to press both the play and record buttons). Press <**RETURN**>. The screen displays:

```
WAITING FOR RECORDER TO SPEED UP...
```

After about a half a minute, the screen displays:

```
BACKUP HAS STARTED
```

14. When Backup is finished, the screen displays:

```
BACKUP DONE—NO DISK ERRORS
TASK (L TO LIST) :
```

15. Now stop the VCR and copy down the VCR counter number. If you do record more than one image on a cassette, it is recommended that a gap be left between different virtual drives, so that the initial header blocks can be located easier.

How to Use the Verify Option on the Mirror

1. Rewind the video cassette to the start of the tape, or to the location on the cassette you copied down earlier.
2. Your computer should be operating under CP/M. The Corvus drive should be on and the Corvus link established. The Mirror and VCR hardware should be connected.

3. Load the Mirror program from the CORVUS UTILITIES VOL. 1 diskette in Drive B by typing **MIRROR** and pressing <**RETURN**>. The screen displays:

```
L  : LIST THIS MENU
H  : LIST HELP DATA
B  : BACKUP
V  : VERIFY
I  : IDENTIFY
R  : RESTORE

TASK (L TO LIST) :
```

4. Press **V** for Verify option. The screen displays:

```
START RECORDER AT BEGINNING IF IMAGE
VERIFY IN PROGRESS
```

5. Start the VCR playing (not recording). When the Verify procedure is finished, the screen displays (for example):

```
--- ERROR STATISTICS ---

# SOFT ERRORS : 3
# DISK ERRORS : 0
# OF BLOCKS NEEDING RETRYS : 0

ALL DATA RECEIVED
```

Sometimes soft errors will appear. However, this is no problem since all data is recorded four times.

How to Use the Identify Option on the Mirror

1. Rewind the video cassette to the start of the tape, or to the location on the cassette you copied down earlier. Since the Identify option searches for the very first characters of the header block, it is important to rewind the video cassette completely to avoid missing the header.

2. Your computer should be operating under CP/M. The Corvus drive should be on the Corvus link established. The Mirror and VCR hardware should be connected.

3. Load the Mirror program from the CORVUS UTILITIES VOL. 1 diskette in Drive B: by typing **MIRROR** and pressing <**RETURN**>. The screen displays:

```
L  : LIST THIS MENU
H  : LIST HELP DATA
B  : BACKUP
V  : VERIFY
I  : IDENTIFY
R  : RESTORE

TASK (L TO LIST) : _
```

4. Press **I** for the Identify option. The screen displays:

```
POSITION TAPE AND START PLAYBACK
SEARCHING FOR IMAGE HEADER
```

5. Start the VCR playing (not recording). When the image is found, the screen displays (for example):

```
--- IMAGE RECORDED FROM CORVUS DRIVE ---

        IMAGE ID :
    IMAGE LENGTH : 11220 BLOCKS
          SYSTEM : CP/M
            DATE : 4/12/82
            TIME : 2:18 p.m.
            NAME : TEST ONE
         COMMENT : COMMENT FINISHED

TASK (L TO LIST) : _
```

You can use the Identify option to locate different images on the same cassette, or to examine the header blocks of different cassettes, if you are searching for a particular backup.

How to Use the Restore Option on the Mirror

1. Connect the Corvus Mirror and VCR hardware. Boot your computer system with the CP/M diskette, and then run the correct CLINK program.
2. Load in the Mirror program from the CORVUS UTILITIES VOL. 1 diskette in Drive B: by typing **MIRROR** and pressing <**RETURN**>. The screen displays:

```
L  : LIST THIS MENU
H  : LIST HELP DATA
B  : BACKUP
V  : VERIFY
I  : IDENTIFY
R  : RESTORE
TASK (L TO LIST) : _
```

3. Press **R** for Restore. The screen displays:

```
RESTORE ENTIRE DISC (Y/N) ? _
```

4. If you have backed up the entire disk, press **Y** for Yes. If you have backed up only part of the entire physical drive, press **N** for No.
5. If you press **N**, the screen displays:

```
STARTING DISK BLOCK # ? _
```

6. Enter the same starting disk block number that you used in Backup (from Table 1). The screen displays:

```
NUMBER OF BLOCKS ? _
```

7. Enter the same number of blocks that you used for Backup (from Table 1). The screen displays:

```
CORVUS DRIVE # (1-4) ?
```

8. Press **1**. The screen now displays:

```
POSITION TAPE AND START PLAYBACK
RESTORE IN PROGRESS...
```

9. Find the beginning of the image on the video cassette. You may have to use the Identify feature if you have several images on the same cassette. If you use the VCR counter to find the starting position, make sure you get the complete image. When you are finished the Restore procedure, the screen displays (for example):

```
--- ERROR STATISTICS ---
# SOFT ERRORS: 0
# DISC ERRORS: 0
# OF BLOCKS NEEDING RETRYS: 0
ALL DATA RECEIVED
TASK (L TO LIST) :
```

You have now backed up and then restored a Corvus drive. We recommend that you back up data on your Corvus hard disc at least weekly, or more often, depending on computer use. Although hard disk drives offer superior reliability compared to floppy diskette drives, you should take proper care to protect valuable data from unforeseen accidents.

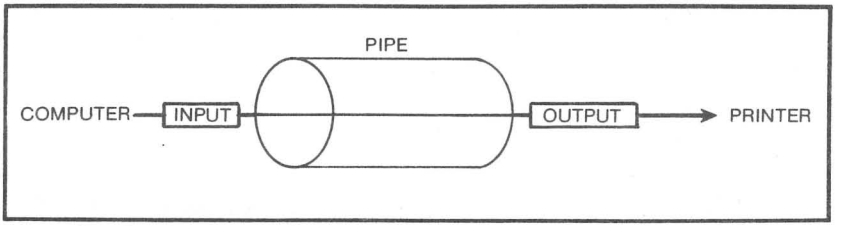
Chapter 4
Printing Multiple Files

It is desirable, in some applications, to print more than one file at a time.

Corvus has implemented this by providing a special area on the disk that you can write files to (spooling) and retrieve files from (despooling). This temporary file area is called the "pipes" area. The reason for this name is that like a pipe, the first thing put into it is the first thing out.

In this section you will find instructions for creating a pipes area, putting files into the pipes area (spooling) and sending files to the printer (despooling).

Although there are many more uses for these techniques, they are reserved for multi-user systems. For a complete explanation, see the Corvus Systems CP/M Multiplexer User Guide.



How to Create a Pipes Area

Although the CLINK program automatically reserves an area of 250K bytes for pipes, it is possible to reserve a larger or smaller area.

NOTE: Do not attempt to recreate a pipes area if you already have data on your Corvus disk. To do so will destroy some of the data.

If the default of 500 blocks is changed, it will be necessary to have CLINK altered by a programmer.

1. Insert the CORVUS UTILITIES VOL. 1 diskette into floppy drive B. Type **PMGR** and press <**RETURN**>. The screen displays:

```
Pmgr [1.1] L)ist P)urge C)lear I)nit Q)uit _
```

2. Press **I** to initialize the pipes area. The screen displays:

```
DEFAULT PARAMETERS
STARTING BLOCK:  64
BLOCK LENGTH:    500
USE DEFAULT PARAMETERS ? (Y/N) _
```

3. Press **N** for NO. The screen displays:

```
STARTING BLOCK:
```

4. Type **64** and press <**RETURN**>. The screen displays:

```
BLOCK LENGTH:
```

5. Type **500** and press <**RETURN**>. The screen displays:

```
INITIALIZE ? (Y/N)
```

6. Press **Y** for YES. The screen displays:

```
INITIALIZING PIPES AREA
Pipes Area Initialized
Pmgr [1.1] L)ist P)urge C)lear I)nit Q)uit
```

7. You have now set up the pipes area. Press **Q** to quit the PMGR program. The screen displays:

```
B
```

How to Send a File to a Pipe

To send a file to a pipe, the file must already exist on your Corvus disk drive, or on the floppy diskettes.

1. Insert the CORVUS UTILITIES VOL. 1 diskette into floppy drive B. Type **SPOOL** and press <**RETURN**>. The screen displays:

```
SPOOLER [2.0]: S(pool D(espool L(ist Q(uit _
```

2. Press **S** for S(pool. The screen displays:

```
SPOOL PARAMETERS

P(ipe name: PRINTER
F(ile name:
M(essage:
T(ype of File: F(ormatted Text
L(inefeeds: TRUE
N(ew pages: FALSE
I(nclude Files: FALSE
  S( P( F( M( T( L( N( I( Q( : _
```

3. Press **F** for F(ile name. The screen displays:

```
F(ile name:
```

4. Type **B:INDEX.DOC** and press <**RETURN**>. The screen displays:

```
SPOOL PARAMETERS

P(ipe name: PRINTER
F(ile name: B:INDEX.DOC
M(essage:
T(ype of File: F(ormatted Text
L(inefeeds: TRUE
N(ew pages: FALSE
I(nclude Files: FALSE
  S( P( F( M( T( L( N( I( Q( : _
```

INDEX.DOC is the name of the file you want to send. B: is the drive it resides on.

5. Press **M** for message. The screen displays:

```
M(essage:
```

6. Type **This is a test file.** and press <**RETURN**>. The screen displays:

```
SPOOL PARAMETERS

P(ipe name: PRINTER
F(ile name: B:INDEX.Doc
M(essage:This is a test file.
T(ype of File: F(ormatted Text
L(inefeeds: TRUE
N(ew pages: FALSE
I(nclude Files: FALSE
  S( P( F( M( T( L( N( I( Q( : _
```

The message option allows you to make comments about a file without having them included in it. When printed, this message will appear on a separate page from the text.

7. Press **S** to send the file. The screen displays:

```
Spooling file to pipe. PRINTER [1] .....
  10 blocks written to pipe PRINTER [1]
```

The number in brackets is the pipe's number. There can be up to 62 pipes named PRINTER.

8. Press **Q** to quit. The screen displays:

```
SPOOL PARAMETERS
P(ipe name: PRINTER
F(ile name: B:INDEX.DOC
M(essage: This is a test file.
T(ype of File: F(ormatted Text
L(inefeeds: TRUE
N(ew pages: FALSE
I(nclude Files: FALSE
  S( P( F( M( T( L( N( I( Q( : _
```

The other SPOOL options are:

P(ipe name— Allows you to assign another name to the pipe. For single user applications, leave it set as PRINTER.

T(ype of File— may be changed to U for unformatted text or N for non-text. Non-text may result in an end of file error.

L(inefeed— will allow linefeeds when TRUE and will strip them out if FALSE. If your printed copy seems to double-space, select F for FALSE.

N(ew Pages— if your printed copy does not leave blank lines between the bottom of one page and the top of the next, you should select T for TRUE.

I(nclude Files— is used with word processing packages that allow file linking. If you wish to use this feature, select T for TRUE.

Sending a File From a Pipe to a Printer

If you have not sent a file to the pipes area, go to the previous instructions labelled "How to Send a File to a Pipe."

1. Insert the CORVUS UTILITIES VOL. 1 diskette into floppy drive B:.

Type **SPOOL** and press <**RETURN**>. The screen displays:

```
Spooler [2.0]: S(pool D(espool L(ist Q(uit :
```

2. Press **D** for **D(espool**. The screen displays:

```
DESPOOL PARAMETERS
P)ipe name: PRINTER
W)here: PRINTER
M)ax lines/Page: 0
E)xpand Tabs: 8
L)inefeeds: TRUE
  D) P) W) M) E) L) Q) :
```

3. Say we wish to despool the file INDEX.DOC which was loaded in pipe PRINTER [1].
   Press **P** for P)ipe name:. The screen displays:

```
P)ipe name:
```

4. Type **PRINTER** and press <**RETURN**>. The screen displays:

```
DESPOOL PARAMETERS
P)ipe name: PRINTER
W)here: PRINTER
M)ax Lines/Page: 8
E)xpand Tabs: 8
L)inefeeds: TRUE
  D) P) W) M) E) L) Q) _
```

5. If you wish to change other defaults, follow a similar procedure. When you are finished, press **D** for despool. The file is despooled to the printer, and the computer waits to despool the

next pipe. The screen displays:

```
Pipe Contained 10 Blocks

Waiting to Despool Pipe "PRINTER"

Depress any key to escape...
```

This procedure will print all pipes named PRINTER.

6. When you press any key, the computer returns to the start of the Spool program and the screen displays:

```
Spooler [2.0]: S(pool D(espool L(ist Q(uit :
```

7. Continue despooling files until you are finished. Press **Q** for Q(uit. The screen displays:

```
B
```

How to Clear the Pipes Area

1. Insert the CORVUS UTILITIES VOL. 1 diskette into floppy drive B. Type **PMGR** and press **[RETURN].** The screen displays:

```
Pmgr [1.1] L(ist P(urge C(lear I(nit Q(uit :
```

2. Press **C** for Clear. The screen displays:

```
Clearing Pipes area:
Starting Block: 0
Block Length: 500
Continue? (Y/N) _
```

3. Press **Y.** The screen displays:

```
Pipes Area Cleared
```

You have just cleared the entire pipes area of files.

How to Clear a Single Pipe

1. Insert the CORVUS UTILITIES VOL. 1 diskette into floppy drive B. Type **PMGR** and press **[RETURN]**. The screen displays:

```
Pmgr [1.1] L(ist P(urge C(lear I(nit Q(uit : _
```

2. Press **P** for purge. The screen displays:

```
Purge which pipe (enter pipe number)?
```

3. Type **1** and press **[RETURN]**. The screen displays:

```
PIPE ERROR -12
Pipe does not exist.
```

Pipe number 1 did not have any data in it because the pipes area was already cleared.

What Is In the Pipes?

It is possible to find out what pipes you have spooled to in the following way:

1. Insert the CORVUS UTILITIES VOL. 1 diskette into floppy drive B.

   Type **PMGR** and press **[RETURN]**. The screen displays:

```
Pmgr [1.1] L(ist P(urge C(lear I(nit Q(uit :
```

2. Press **L** for list. The screen displays something like:

```
Active Pipes are:
1.  PENPLOT     Closed      ----   Contains Data
2.  PRINTER     Closed      ----   Contains Data
```

   A pipe is open only while spooling or despooling. If a pipe does not contain data, it will not be listed.

3. **To quit, press Q.** The screen displays:

```
B
```

Chapter 5
Troubleshooting Your Corvus Drive

The Corvus disk system is designed to provide years of problem-free use. At times, however, it may experience a hardware or software problem. If your drive is not performing properly, consult the following table for recommended actions.

Corvus Systems suggests that you take two simple steps when you first set up your system:

- Make copies of the Corvus Utilities Program diskettes.
- Copy down on paper the spared track and virtual drive offset tables. See page 49 of this manual.

PROBLEM	OPERATION TO FIX PROBLEM
A. NO FRONT PANEL INDICATOR LIGHTS ON.	1. Make sure power switch is on. 2. Check power cord connections to drive and wall socket. 3. Inspect fuse—replace with proper fuse if blown (see the Installation Guide for your computer). 4. Check the Voltage Circuit Board for correct voltage and installation (see the Installation Guide for your computer). 5. Listen to the drive and hear if fan is spinning. If fan is not operating, repeat Steps 1–4, then call your Corvus Service Center for further instructions. If fan operating, go Step 7. 6. Toggle Reset Switch (rightmost switch on front panel). If front panel lights remain off (and fan is operating), call your Corvus Service Center for further instructions.

B. FAULT AND BUSY LIGHTS COME ON AFTER POWER UP SEQUENCE. BUSY LIGHT FLASHES FOR A WHILE, THEN BOTH LIGHTS STAY ON.

7. Toggle Reset Switch on front panel.

8. Check all front panel switches for proper position.

9. Check flat interface cable connections.

10. Unplug processor flat cable and video connections (if you are using the Mirror). Toggle Reset Switch. If drive becomes ready, reconnect interface cable (and video connections if using Mirror), and repeat the installation sequence, making sure correct software programs are used. (See the Installation Guide for your computer for instructions).

11. If drive does not become ready after Step 10, turn format switch on and reset drive. If the drive becomes ready, refer to Section 6 of this User Guide. Go to Step 12.

    If your drive still does not become ready, call your Corvus Service Center.

12. You will now update the controller code on the drive (refer to Section 6 of this User Guide). Power drive down. Turn format switch to the right before proceeding. Power drive up. Run the CDIAGNOS program from the floppy drive. Select option #6. Update with controller

code program from directory (see Step 13 above). After updating controller code, turn format switch off (to the left). See Section 6 of this manual for examples of this operation.

Toggle Reset Switch. If drive does not become ready after 1 to 2 minutes, the final step is to reformat the drive (Step #15).

13. First, read the section on reformatting the Corvus drive (refer to Section 6 of this User Guide).

WARNING

REFORMATTING THE DRIVE WILL DESTROY ALL DATA ON DRIVE. BACK UP DATA IF AT ALL POSSIBLE. COPY DOWN SPARE TRACK TABLE AND VIRTUAL DRIVE OFFSET TABLE AS WELL.

Power the Corvus drive down. Flip the Format Switch (second switch from right) to the right. Power drive up.

Run CDIAGNOS program from floppy drive. Select option #6. Type the controller code (CORVXX. XXX) with an .FMT extension, example:

CORVB173.FMT

Answer the questions as they appear on the screen. The busy light will flicker rapidly for about one minute and

then the screen displays a long message indicating formatting is finished, and the new controller code has been written out. You should then restore the old values to the Virtual Drive Offset Table (VDO Table) and spare track table. Turn format switch off and toggle Reset Switch.

Repeat Step 13 to check controller code. If the system does not become ready after toggling reset, call the Service Center for further information.

C. BACKUP OR RESTORE FUNCTION SHOWS DISK ERROR.

14. This is usually caused by bad sectors on the drive. Run CDIAGNOS program and do the Format Check (Option 2). You should back drive up (ignoring disk errors), spare out bad tracks, and then restore data.

D. VERIFY FUNCTION INDICATES BLOCK(S) NEEDING RETRY.

15. Possible causes are bad tape, faulty connections, VCR tracking out of adjustment, VCR play speed out of adjustment. If none of the above, you may have hardware problems in the VCR or Mirror.

E. RESTORE FUNCTION INDICATES BLOCK(S) NEEDING RETRY.

16. Probable causes same as #15 above. Do a retry pass. If problem persists, check hardware.

F. WHEN TRYING A RESTORE, ERROR MESSAGE "IMAGE SIZE MISMATCH" OR "MIRROR ERROR 4" DISPLAYS.

17. Probable cause is wrong block size or starting address was used. Use IDENTIFY option of Mirror program to determine correct image size and repeat RESTORE.

G. WHEN TRYING A RESTORE, VERIFY OR IDENTIFY OPTION ON THE MIRROR PROGRAM, THE ERROR MESSAGE "IMAGE NOT FOUND" OR "MIRROR ERROR 7" DISPLAYS.

18. Video cassette not rewound to beginning or VCR conections faulty. First, check video connections and VCR line input/output switches (these switches should be set to either line or VCR, depending on your machine—not TV).

    Rewind video cassette to correct starting position and repeat function.

    If problem persists, call your Corvus Service Center.

H. CORVUS I/O DRIVER OR CORVUS UTILITY PROGRAM ISSUES ERROR MESSAGE IN THE FORM:

    **DISC R/W ERROR #XXH*

22. Look up error code in Appendix B of this guide for an indication of the error type. If it is a bad sector (indicated by error codes AAH, ABH, EBH, or ECH), try to fix it by using Option 2 of the CDIAGNOS Program.

Chapter 6
Diagnostic Utilities for Your Corvus Drive

Corvus Systems has produced a special diagnostics program—CDIAGNOS—to allow you to perform certain hardware and software system checks, and to replace the firmware if necessary. You should read this entire section before using CDIAGNOS, and follow the instructions very carefully.

CDIAGNOS is usually on VOL. 1 of the CORVUS UTILITIES diskettes. It must be run from your floppy drive, rather than the Corvus disk drive.

How to Load the CDIAGNOS Program

1. You should have your hardware (the computer system and the Corvus drive) already connected. The Corvus hard disk should be configured for your system.
2. Boot your computer system with the CP/M boot diskette.
3. Insert the CORVUS UTILITIES VOL. 1 diskette into floppy drive B:.

   Type **CDIAGNOS** and press <**RETURN**>. The screen displays something like this:

```
--- CORVUS DISC DIAGNOSTIC ---
(VERSION 2.55/TT)

--- TEST MENU ---

0. LIST THIS MENU
2. LIST INSTRUCTIONS
1. LIST INSTRUCTIONS
2. DISC FORMAT CHECK
3. READ CONTROLLER CODE VERSION #
4. HEAD SERVO CHECK TEST
5. MANUAL CONTROLLER DIAGNOSTIC
6. UPDATE CONTROLLER CODE
7. LIST/MODIFY DRIVE PARAMETERS
8. LIST/MODIFY CONSTLLATION PARAMETERS
9. EXIT BACK TO CP/M (CTL-C ALSO WORKS)
P—"PARK" REV. H DRIVE HEADS

TASK (Ø TO LIST) : _
```

4. To use CDIAGNOS, press the number for the task and follow the directions. If you wish to exit CDIAGNOS and return to CP/M, press Q when prompted for a task, or hold the control key and press **C** (<**CNTL**> **C**).

A Brief Description of the CDIAGNOS Menu

Ø. LIST THIS MENU

Press **Ø** and the menu displays.

1. LIST INSTRUCTIONS

Press **1** and the screen displays:

```
TO CONSERVE SPACE, THE INSTRUCTIONS HAVE
BEEN REMOVED AND PLACED IN A SEPARATE
FILE: CDIAGNOS.DOC. TO READ THEM JUST TYPE
THE FILE.
```

To see this file, press **9** to exit, and then type **TYPE CDIAGNOS.DOC** and press <**RETURN**>. A summarization of these instructions is also found in Appendix C of this guide.

2. DISK FORMAT CHECK

Press **2** and the screen displays:

```
CORVUS DRIVE # (1-4) ? _
```

Press **1** (unless you have multiple Corvus physical drives). The screen displays:

```
DISK FORMAT CHECK IN PROGRESS...
```

A check of the Corvus disk is performed. After several minutes, the screen displays:

```
NO BAD SECTORS FOUND!!
TASK (0 TO LIST) : _
```

If the Disk Format Check test found any bad sectors, it would display them in this fashion:

```
          -- BAD SECTORS RE-WRITTEN --
SURFACE #   CYLINDER #   SECTOR #   TRACK #
---------   ----------   --------   -------
   XX          XX           XX         XX
LIST DATA AGAIN (Y/N) ? _
```

Copy this table down on a piece of paper. The fourth column, TRACK #, contains the information you will need to spare tracks out, which we will discuss later in this section.

3. READ CONTROLLER CODE VERSION NUMBER

Press **3.** The screen displays:

```
CORVUS DRIVE # (1-4) ? _
```

Press **1** (or the number of the Corvus drive if you have added on more physical Corvus drives). The screen displays:

```
V18.3--CONST II  10/82 REVISION #37
CONTROLLER ROM VERSION #63
TASK (0 TO LIST) : _
```

NOTE: You may have different numbers, but the controller code version should be 18.3 or later.

4. HEAD SERVO CHECK TEST

Press **4** and the screen displays:

```
CORVUS DRIVE # (1-4) ?
```

Press **1** (or the drive number, in case of add-on physical Corvus drives). The read/write heads of the Corvus disk will rapidly move from the outer edge to the center of the disk, producing a whirring sound. This test verifies that the disk reads data and that the disk heads move properly.

NOTE: This test continues indefinitely until stopped by holding down the control key and pressing **C (<CNTL>C).** Approximately one minute of this test should be enough to check the disk.

5. MANUAL CONTROLLER DIAGNOSTIC

Press **5** and the screen displays:

```
                WARNING
     THIS TEST CAN CAUSE LOSS OF USER DATA
           (IF USED IMPROPERLY)

THE COMMAND FORMAT IS:
     R - READ A BYTE FROM THE CONTROLLER
   WXX - WRITE HEX BYTE TO CONTROLLER
     S - READ CONTROLLER STATUS
     E - EXIT TEST
```

NOTE: This test should be performed ONLY under the direction of qualified Corvus Systems Customer Service representatives.

6. UPDATE CONTROLLER CODE

Press **6** and the screen displays:

```
CONTROLLER CODE FILE NAME (COVBXX.CLR) :
```

Type the controller code file name listed in the Directory of the CORVUS UTILITIES diskettes; for example, type **CORVB183.CLR** and press **<RETURN>**. This starts the procedure for updating the controller code on the Corvus drive, which is contained in protected tracks of the hard disk. Normally, this code cannot be written to or read by the user (even accidentally). However, it can be made accessible, for writing, by turning on the format switch. To use this option, follow this procedure:

1. Power the drive up. Turn on the format switch (the second switch from the right under the front bezel of the drive), and depress the reset switch (the first switch from the right).
2. Run the proper CLINK program to establish the Corvus link.
3. Run the CDIAGNOS program from the floppy diskette drive. Select the update option, number 6.
4. Type the controller code file name. For example, type **CORVB183.CLR and press <RETURN>.**
5. Turn off the format switch and reset the drive by either using the reset switch (the rightmost switch under the front bezel of the drive), or by powering the drive down and back up again, and re-running the CLINK program.

7. LIST/MODIFY DRIVE PARAMETERS

Press **7** and the screen displays:

```
CORVUS DRIVE # (1-4) ? _
```

Press **1**. The screen displays (as an example):

```
--- SPARED TRACK TABLE ---

TRACK 16
TRACK 38

PRESS RETURN TO CONTINUE
```

Press <**RETURN**>. The screen displays:

```
SECTOR INTERLEAVING SPEC. = 9
PRESS RETURN TO CONTINUE
```

NOTE: The Sector Interleaving Specification is 9 for all drives. **CORVUS SYSTEMS STRONGLY RECOMMENDS THAT YOU DO NOT CHANGE IT.**

Press <**RETURN**>. The screen displays:

```
        --- VIRTUAL DRIVE TRACK ---
              OFFSET TABLE

DRIVE                TRACK

  1                    0

                  WARNING
CHANGING ANY OF THE FOLLOWING PARAMETERS
CAN MAKE ANY USER DATA STORED ON THE DISC
UNUSABLE

DO YOU WISH TO CONTINUE (Y/N) ?
```

NOTE: Changing these specifications can make your data totally inaccessible, because the directory pointers are changed from the actual disk locations. Before altering drive parameters, you should back up the entire Corvus disk.

Press **Y** for Yes (if you wish to continue). The screen displays:

```
                DRIVE PARAM MENU

S : CHANGE SPARED TRACK TABLE
I : CHANGE SECTOR INTERLEAVING
V : CHANGE VIRTUAL DRIVE OFFSETS
E : EXIT BACK TO MAIN MENU

TASK ?
```

Press **S** if you wish to change the spared track table. Spared tracks are tracks automatically skipped by the drive—any data on them is lost if not backed up first; and other data may be disturbed. Add or delete tracks by typing the track numbers, and then press <**RETURN**>.

It is not recommended that you change the sector interleaving spec or the virtual drive offsets.

8. LIST/MODIFY CONSTELLATION PARAMETERS

This option allows one to examine and/or modify the:

A. Master Multiplexer Connection Table
   This table is usually set to assume all the slots have a mux on them.

B. Constellation Polling Constants
   These numbers determine certain aspects of the Constellation polling environment.

The main menu displays:

---CONSTELLATION PARAM. MENU---
M : LIST/EDIT MUX TABLE
P : LIST/EDIT POLLING PARAMETERS
E : EXIT

TASK? M

---MASTER MUX CONFIGURATION---

```
M                       M
M                       M
M                       M
M                       M
        =       =
        =       =
```

DO YOU WANT TO CHANGE THIS (Y/N)?

Press **Y**

```
5                       4
6                       3
7                       2
8                       1
        =       =
        =       =
```

IN THE FOLLOWING, SPECIFY WHAT IS CONNECTED TO EACH SLOT IN THE MASTER MUX. THE SLOTS ARE NUMBERED IN THE PICTURE ABOVE. LEGAL RESPONSES ARE:

<RET> — NO CHANGE
M — MUX **--NOTHING**
L — LSI-11 **C — COMPUTER**

SLOT 1(-,M,C,L):
SLOT 2(-,M,C,L):
SLOT 3(-,M,C,L):
SLOT 4(-,M,C,L):
SLOT 5(-,M,C,L):
SLOT 6(-,M,C,L):
SLOT 7(-,M,C,L):
SLOT 8(-,M,C,L):

Goes Back to Main Menu

For CP/M systems all slots must specify a Master Multiplexer regardless of the device connected to each slot.

Press **P**

---POLLING PARAMETERS---

180	52
26	
32	32
0	0

DO YOU WISH TO CHANGE THE POLLING PARAMETERS (NOT RECOMMENDED) (Y/N) ?

Press **N**

Return to menu

Press **E**
WRITE CHANGES BACK TO DISC (Y/N)?

Press **N**

Returns to Test Menu

9. EXIT BACK TO CP/M (CTL-C ALSO WORKS)

If you wish to return to the main menu, press option 9.

P—"PARK" REV. H DRIVE HEADS

The PARK option will move the disk read/write heads to a safe area on the disk. The heads should be placed in PARK for shipment or long term storage. Powering on the drive will automatically remove the heads from PARK.

Appendix A. List of Common CP/M Extensions

Extension	Explanation
.ASM	**Ass**embly language source file
.BAK	**Back**up file
.BAS	**BAS**IC program source file
.DAT	**Dat**a file
.DOC	Text (**Doc**ument) file
.FOR	Microsoft **FOR**TRAN source file
.HEX	Intel **HEX** format object code file
.LIB	Extension for a **Lib**rary file
MAC	Source code for some Microsoft **MAC**RO assemblers.
.OBJ	Machine code (**Obj**ect code)
.PAS	**Pas**cal source file
.PCO	Sorcin Pascal run-tim module
.REL	**Rel**ocatable machine code program
.SRC	**Sour**ce file for CP/M User's Group
.SUB	Command file for a **sub**mit run
.TXT	**Text** file
.$$$	Temporary file or an improperly saved, unusable file

Appendix B. Corvus Disk Error Codes (text of CERROR.DOC file from CORVUS UTILITIES DISKETTE VOL. 1)

Corvus Disk Error Codes

The Corvus controller has a number of error codes that may be issued if either an illegal command is given, or the controller is out of synchronization, or there is a hardware malfunction. A number of the utilities and disk interface programs can list these error codes (in hex) if such an error occurs. For example, PUTGET.COM may list the code as:

**** DISK R/W ERROR # XXH ****

where XX is the error code. You can demonstrate this by trying to read a sector (with PUTGET) from drive 4 (unless you have four drivers). This will give error code A7H. The upper 3 bits of the error code have the following significance:

BIT 5 Set if there was a recoverable error (as in a re-try or read or write).

BIT 6 Set if an error occurred on a re-read (verification) following a disk write.

BIT 7 Set if any fatal error has occurred.
NOTE: Most of the programs will not list the error unless bit 7 is set.

The lower 5 bits have the following significance:

BITS 0–4	MEANING
0	Disk Header Fault
1	Seek Timeout
2	Seek Fault
3	Seek Error
4	Header CRC Error
5	Re-zero (Head) Fault
6	Re-zero Timeout
7	Drive Not On Line
8	Write Fault

9	------
A	Read Data Fault
B	Data CRC Error
C	Sector Locate Error
D	Write Protected
E	Illegal Sector Address
F	Illegal Command
10	Drive Not Acknowledged
11	Acknowledge Stuck Active
12	Timeout
13	Fault
14	CRC
15	Seek
16	Verification
17	Drive Speed Error
18	Drive Illegal Address Error
19	Drive R/W Fault Error
1A	Drive Servo Error
1B	Drive Guard Band
1C	Drive PLO (Phase Lockout) Error
1D	Drive R/W Unsafe

Appendix C
Description of CDIAGNOS Program

CDIAGNOS.DOC

The CP/M version of the Corvus Disk Diagnostic (CDIAGNOS.COM) provides some relatively "safe" disk tests along with the ability to list and/or change some parameters within the controller code.

For the latest documentation, see the text in the CP/M Utilities diskette with the file name CDIAGNOS.DOC.

Appendix D
Description of Corvus Utilities Programs

1. INDEX.DOC — This is the disk index document file.

2. CERROR.DOC — This is a short document file listing the controller error codes.

3. PUTGET.COM — This is a disk utility that can be used under CP/M to read and write from memory to the Corvus drive as well as fill various sections of the disk with data. The routine has its own disk drivers and is mainly useful as a SYSGEN routine to write a configured CP/M 2.X system out to the drive, and to initialize a drive directory.

4. CLINK2FV.COM
   CLINK2TN.COM
   CLINK2TW.COM
   CLINK7FV.COM
   CLINK7TN.COM
   CLINK7TW.COM
   — These are several versions of the Corvus link program. You should choose the one that best meets your needs, and ignore the others. Consult the CORVUS SYSTEMS CP/M USERS GUIDE for descriptions of each program. This program contains the Corvus disk drivers that are linked into CP/M. These programs will only work with CP/M version 2.0 or later.

5. CDIAGNOS.COM
   CDIAGNOS.DOC
   — A disk diagnostic that can be used to verify correct drive operation as well as to update the controller code and change other drive parameters.

6. CORVB183.CLR — This is a controller code file for use with CDIAGNOS.COM. This is a copy of version 18.3 of the controller code for the REV H controller.

7. MIRROR.COM — This program is the control program for the Corvus Mirror disk backup system.

8. SEMA4.COM — This is an example program designed to illustrate how to access the semaphores supported on the Corvus drive.

9. PMGR.COM — This is a program that allows the user to manage the pipes area of the drive. It allows the user to initialize the pipes and clear the pipes area, purge as pipe, and list the current pipes and their status.

10. SPOOL.COM — This is a program that use the pipes facilities on the Corvus drive. It transfers files to and from an area of the drive that is accessible by any user and/or system through pipe commands. Examples of its usage are: (1) Send text files to a shared printer; and (2) Transfer files between different systems (CPM <--> APPLE).

11. DRIVEL.COM — This is a program that helps you configure your Corvus drive, if you choose not to use one of the default CLINK.COM's provided. Based on your input, it creates a file containing the equates that need to be changed in the CLINK2.ASM program to set up your drive. Also in this file is the start and directory addresses for the pseudo drives being set up. These addresses are used with the PUTGET and MIRROR programs.

12. LINKASM.COM
LINKASM.DOC — This is an assembler that uses the standard Intel mnemonics and is upward compatible with the assembler supplied by Digital Research (but unfortunately not also provided by XEROX with their version of CP/M). This program was written by Ward Christensen and was extracted from CP/M Users Group disk #36. If necessary, you can use this assembler to assemble any of the .ASM files on these disks. NOTE: This assembler is only supplied for the XEROX 820 or Vector Graphics computers.

The following source programs are provided for those of you who wish to modify the Corvus interface or utility programs:

13. CLINK2.ASM — Source for the Corvus link program which may be modified if the default versions do

not meet your needs. Consult Appendix F for instructions on how to modify CLINK2.ASM.

14. SEMA4.ASM
SPOOLGEN.SUB
SPOOL.SRC
SPOOL.DEF
SPOOL.PAS
SPOOLM.PAS
PIPEGEN.SUB
PIPES.SRC
PIPED.PAS
PIPEC.PAS
PIPES.PAS
CPMIO.MAC

Sources for the SEMA4 and SPOOL programs. These sources are provided as examples of how to use the Semaphore and pipe features of the Corvus drive.

NOTE: The spool program is written in Pascal, and requires you to have PASCAL/MT and the M80 Assembler in order to modify it.

15. CLOADR.ASM

This is a short boot loader program to be used with CP/M 2.X. It can be used under a floppy-based CP/M to boot in CP/M from the hard-disk once it is put there, or it can be used to make a ROM-based loader.

16. CBOOT.ASM

This is a cold boot loader for CP/M 2.X. It is brought in by CLOADER. CBOOT then brings in the CP/M system.

17. BIOSC.ASM
BIOSCT.ASM

One of these two files should be on your set of diskettes. Both of these files contain the source for the Corvus Basic I/O System (BIOS) to configure the Corvus drive into one to seven pseudo drives, as well as allow for the control of two floppy drives. The BIOSC.ASM file contains dummy floppy and console I/O drivers. These dummy drivers should be replaced with the floppy and console should be replaced with the floppy and console I/O drivers for your computer. The BIOSCT.ASM file contains floppy and console I/O drivers for a typical S-100 system using a single density floppy diskette drive controller.

NOTE 1: Source for the programs PUTGET, CDIAGNOS, and MIRROR is available by special order.

NOTE 2: All of the disk utilities contain their own Corvus disk drivers. They can be run from floppy-based CP/M systems that are not yet linked to the Corvus drive.

NOTE 3: Support for pre-2.0 versions of CP/M has been discontinued. The last release of pre-2.0 software, dated 7-May-81, is available by special order.

Appendix E
Supplemental VCR Information

Corvus Systems recommends that you purchase a VHS-type video cassette recorder (VCR). The following VCR models have been used with the Corvus Mirror:

Grundig VCR 4000 (PAL Format)

Hitachi VT 5000 (PAL Format)

National NV 7000

Panasonic VHS 1000
Panasonic VHS 1500
Panasonic NV 3810
Panasonic NV 8200
Panasonic NV 1200

RCA VDP 150
RCA VET 180
RCA VCT 201
RCA VET 250
RCA VDT 350
RCA VDT 501

Sony Betamax SL 5600 (Beta Format)

Technicolor 212 (limited to 30 minute cassette)

Zenith VL 9700 (Beta Format)

When used in the normal quad recording format of the Corvus Mirror, video cassettes have the storage capacities listed below:

30 minute cassette—18 MB maximum storage capacity
60 minute cassette—36 MB maximum storage capacity
90 minute cassette—55 MB maximum storage capacity
120 minute cassette—73 MB maximum storage capacity

Appendix F
CP/M User Guide

Introduction

This document has been provided to assist users in making changes to the CLINK2 program. The assembly language source code for CLINK2, CLINK2.ASM, is usually provided by Corvus Systems as part of the standard CP/M interface software. That source program, which contains commentary, should be sufficient to enable a knowledgeable person to make any required modifications in the way the CLINK2 program works.

WARNING

We assume that the reader has some familiarity with CP/M assembly language programming.

The standard configuration for a Corvus disk drive is detailed in the CORVUS SYSTEMS CP/M USER GUIDE. You may wish to configure your Corvus drive differently; for example, you may wish to have two volumes of unequal size, or seven volumes on one drive. In some cases you will have to alter the CLINK2.ASM program, make a copy of the altered version, and run it every time you bring a new copy of CP/M into memory (a "cold boot"). You may wish to use the program auto load feature if your CP/M system supports it. See your CP/M operating system manual for more information.

You may remember that the Corvus drive is divided into multiple space areas called volumes, each of which appears to your computer as a floppy diskette. You must decide where you want each volume to start, and how long you want it to be, and then configure the CLINK program appropriately. The CLINK2 program then sets up the volume configuration on the Corvus disk.

Four points are important here:

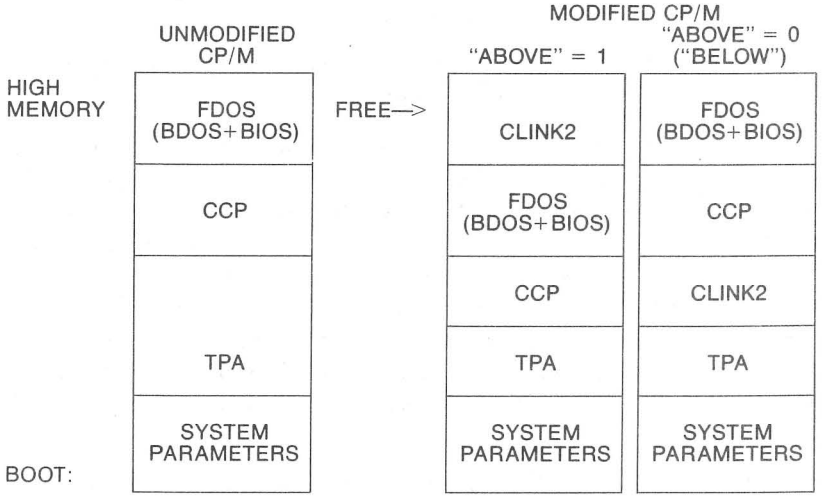
1. The size of your version of CP/M (i.e., 48K, 63K, 56K, etc.), and whether you can put the Corvus link "above" CP/M.
2. The model of your Corvus drive (6, 11 or 20).
3. The number of volumes desired (1 to 7).
4. The use of the pipes and spooling feature.

1: Size of CP/M

The Corvus disk drivers require about 1K of memory to run. This 1K is taken away from the running CP/M, so the Transient Program Area will be 1K smaller. The best method for obtaining this 1K is to reconfigure your version of CP/M, using MOVCPM or the equivalent program, to be 1K smaller. We refer to this method as locating the link "above" CP/M. For example, if you have a 48K version of CP/M, you must use MOVCPM to create a 47K version of CP/M.

DIAGRAM 1

Unmodified and Modified CP/M Programs with the Corvus CLINK2 Program Above and Below CP/M.



Unfortunately, it is not always possible to put the CLINK program above CP/M. This is the case with the SuperBrain, some S-100 Bus systems, and some other computers. In this case, you must locate the CLINK program "below" CP/M. Putting the link below CP/M means (1) it requires more memory, thus shrinking the Transient Program Area of CP/M even more, and (2) some programs may not work properly. In particular, the auto density select feature (in multi-density CP/M floppy implementations) may not work with the CLINK program installed below CP/M. The density may be "frozen" at the particular densities that exist when the link was installed.

Find the CLINK2.ASM program, and notice that it has a list of user-defined equates. You will have to change certain values for some of these equates. After you have finished making the changes, you will have to re-assemble the CLINK2.ASM program, link it, and then run the program.

The first change is for the equate ABOVE.

ABOVE = 1 if CLINK program is located above CP/M.

ABOVE = 0 if CLINK program is located below CP/M.

Next is the equate for MSIZE (Maximum memory size available to CP/M). This is the nominal size of your CP/M program (do not subtract the 1K for the Corvus link, since CLINK will do this automatically). For example, if you have a 64K CP/M system, the CLINK2.ASM program should read:

```
MSIZE   EQU   64    ; MAX MEMORY SIZE AVAILABLE TO CP/M
```

The next equate, CLK2SZ, is set at 400H (approximately 1K). Unless you change the size of the program itself, you should not have to change this figure.

The value for the equate FREE is automatically calculated from the values for MSIZE and CLK2SZ. You should not have to change the equates for DELTA, BIAS, and CCP. DELTA compensates for the difference between what the CP/M signon message may say the CP/M size is, and what the true CP/M memory size is. BIAS calculates the shift in location using DELTA, and CCP allocates an area for part of the CP/M program based on BIAS.

2: Size of Your Corvus Drive

Corvus drives come in three sizes: the Model 6, the Model 11, and Model 20. You must use 1 as the value for the variable which matches your drive size, and 0 for the other two.

MODEL 6		MODEL 11		MODEL 20	
SIXMB	EQU 1	SIXMB	EQU 0	SIXMB	EQU 0
ELVNMB	EQU 0	ELVNMB	EQU 1	ELVNMB	EQU 0
TWNTYMB	EQU 0	TWNTYMB	EQU 0	TWNTYMB	EQU 1

3: Number of Volumes

CP/M allows a maximum of 8 megabytes per volume (65536 128-byte sectors). Corvus drives have the following sizes:

Total Size	MODEL 6	MODEL 11	MODEL 20
(128-byte sectors)	46160	94800	143436

The table below gives the size for each volume (assuming equal sized volumes) for 1 to 7 volume configurations:

FIGURE 2—TABLE OF CP/M VOLUME SIZES

Number of Volumes	MODEL 6	MODEL 11	MODEL 20
1	43840	—	—
2	21888	46208	—
3	14528	30784	46996
4	10880	23040	35200
5	8704	18432	28160
6	7232	15360	23424
7	6208	13120	20096

If you decide not to have pipes (though we recommend that you reserve the area), each volume will be slightly larger.

Now, set the value for the variable NPSUDO to the number of volumes you wish to configure on the Corvus drive.

4: Pipes and Spooling

The CLINK program will reserve a 500 block area if the variable PIPES is set to 1. This size is sufficient for most applications. If you do not reserve the space when you first configure your drive, you will have to reconfigure your system when you do start using pipes, and the reconfiguration process will be more difficult and complicated.

FIGURE 3—SAMPLE CLINK2.ASM LISTING SHOWING EQUATES

```
——— CORVUS DRIVER EQUATES (USER SETTABLE)
ABOVE     EQU  0                          ; SET TO 1 IF LINKAGE CODE IS
                                          ; TO BE PUT 'ABOVE' CP/M AND
                                          ; 0 IF 'BELOW'.

MSIZE     EQU  64                         ; MAX MEMORY SIZE AVAILABLE
                                          ; TO CP/M

CLK2SZ    EQU  400H                       ; MAX ALLOWABLE CLINK2 SIZE

          IF ABOVE
FREE      EQU  (MSIZE*1024)-CLK2SZ        ; FREE AREA FOR THE
                                          ; LINKAGE CODE
          ENDIF
          IF NOT(ABOVE)
DELTA     EQU  1000H                      ; OFFSET OF CCP FROM BEGIN OF
                                          ; STANDARD CP/M CCP
BIAS      EQU  (MSIZE-20)*1024-DELTA      ;
CCP       EQU  3400H++BIAS
FREE      EQU  CCP-CLK2SZ                 ; PUT CLINK2 HERE IF NOT ABOVE
          ENDIF
;
;$I CRVDRV.EQU                            ; DRIVE SIZE EQUATES
;
SIXMB     EQU  0                          ; ONLY 1 OF THESE DRIVE
ELVNMB    EQU  1                          ; DESIGNATORS MAY BE SET TO 1
TWNTYMB   EQU  0                          ;

NPSUDO    EQU  2                          ; # OF PSEUDO DRIVES TO DIVIDE
                                          DISK INTO (1-7)

PIPES     EQU  1                          ; SET TO 1 IF A PIPES AREA IS
                                          ; RESERVED

BLKSZ     EQ   8                          ; ALLOCATION BLOCK SIZE
                                          ; (DEFAULT ?K)
```

Modifying Defaults in CLINK2.ASM

For most applications, it will not be necessary to modify default settings in the CLINK2.ASM program. Corvus has improved the CLINK2.ASM program to automatically set most values internally. You will only need to refer to this section if you wish to do one (or more) of the following:

1. Configure a multi-drive system.

2. Configure a drive with volumes that do not all have the same disk block parameters (i.e., one volume has 2000 sectors and another volume has 4000 sectors).
3. Update an existing system to add pipes (when the original configuration did not have the space reserved).

There are five types of tables which are used by the CLINK2.ASM program. Each of these types is identified by a label in the source code. The labels are:

1. The pseudo drive (volume) labels
2. The disk parameter header labels
3. The disk parameter block labels
4. The checksum vector labels
5. The allocation vector labels.

The disk parameter header labels, the disk parameter block labels, the checksum vector labels and the allocation vector labels correspond to the disk parameter tables of CP/M, which are discussed in detail in Chapter 10 of the CP/M 2.0 ALTERATION GUIDE, available from Digital Research (you may have received a copy with your CP/M system).

There is one pseudo drive label (PDRVn) in the CLINK2.ASM program for each volume defined. Each of these labels denotes the start of a 4-byte entry. The first 2 bytes are a word value containing the lower 16 bits of the sector address. The third byte contains the upper 4 bits of the sector address. The last byte contains the Corvus drive number (1 to 4).

There is also one disk parameter header label (DPEn) for each volume (each PDRV has a DPE). Each label denotes the start of an entry containing the label of a disk parameter block (DPBCx), and an allocation vector (ALVn). Several entries can share the same DPBCx label, but each entry must have unique CSVn and ALVn labels. The other values in this entry should not be changed.

There is also a disk parameter block label in CLINK2.ASM. If you are configuring volumes of unequal sizes, you will have to create a DPBCx for each volume size. For example, if you want to create a DPBCx with 4 volumes, 2 of which are each 1000 sectors in length, and 2 of which are 2000 sectors in length, you will need to define 2 different disk parameter blocks. DPBCA contains the disk parameters for the 1000-sector volumes, and DPBCB contains the disk parameters for the 2000-sector volumes. The disk parameter block contains 10 values (15 bytes). A typical table looks like:

```
DPBC :  DW  SPT     ; # SECTORS/TRACK
        DB  BSH     ; BLOCK SHIFT FACTOR
        DB  BLM     ; BLOCK MASK
        DB  EXM     ; EXTENT MASK
        DW  DSM     ; DISK SIZE—1
        DW  DRM     ; DIRECTORY MAX—1
        DB  ALQ     ; RESERVE DIRECTORY
        DB  AL1     ;         BLOCKS
        DW  CKS     ; CHECK SIZE
        DW  OFF     ; TRACK OFFSET
```

The table items are defined as follows:

SPT The number of sectors per track on the disc (volume), set when the disk is initially formatted. This number is set arbitrarily for routines in BIOSC.ASM or CLINK2.ASM to a value less than 256. SPT is set to be large enough to store a SYSGEN image of a configured CP/M on one track. Also, SPT should be divisible by 4 if the track offset word (OFF) is non-zero. This allows the Corvus Mirror to back whole volumes separately. For historical reasons, Corvus typically has SPT = 64.

BSM This number is used internally by CP/M. It depends completely on the block size (see Table B below). BSM can also be hand-calculated because it is the base 2 logarithm of the number of 128-byte sectors in a block.

BLM This number is one less than the number of 128-byte sectors in a block (BLM=2^BSH-1). The relationship between block size, BSH and BLM can be seen in the table below:

TABLE B—BLOCK SIZE, BSH AND BLM RELATIONSHIPS

BLOCK SIZE	BSH	BLM
1K	3	7
2K	4	15
4K	5	31
8K	6	63
16K	7	127

The block and directory size are among the most important variables that affect the way information is stored and retrieved under CP/M. They have a direct impact on the file access speed, disk storage efficiency, and size of the CP/M disk interface software (in the computer memory).

A block is the fundamental unit in the addressing scheme that CP/M uses to specify the location of files on the disk. When a file is accessed by CP/M, it decodes each block number into the appropriate track and sector numbers for the various sectors that make up a block.

On a standard 8-inch, soft-sectored, IBM-format floppy (standard CP/M format), the blocks are 1K (1024 bytes) each. CP/M can support 1K, 2K, 4K, 8K and 16K blocks. 1K blocks are most efficient in disk space utilization, but there are some constraints. CP/M requires memory space for an ALLOCATION MAP for each drive (volume). This table uses 1 bit for each block on the block on the volume and is used by the system to keep track of which blocks are allocated (used in some disk file). Thus 1K blocks require more memory space than larger block sizes.

For example, if a disk volume was 4720K bytes in size (a typical size for Corvus 10MB drives), your allocation map for 2K blocks would require 295 bytes (4720/2*8) per volume, but only 37 bytes if 16K blocks were used. The default setting is 8K blocks, which uses 74 bytes for the allocation map.

There are some "rules of thumb" that can be helpful in choosing the block size. Volumes that consist primarily of small files should normally be configured with a small block size, and volumes with large files would be configured with a large block size. For example, a volume with two 1000K files would waste at most 32K of disk space if configured with 16K blocks (1.6 percent of space used).

A tradeoff among block size, file access speed and memory utilization can affect your choice of block size. In particular, the Corvus CP/M linkage program, CLINK2, typically uses less than 1K of RAM when using 8K blocks. If smaller blocks are used, more than 1K of RAM may be needed. This would force you to move the CP/M down by 2K to allow the link to fit above the CP/M, or shift the link down by several 256-byte pages if the link is below the CP/M. The extra memory is needed because each mounted Corvus volume may require as much as 40 bytes of parameter tables plus 1 bit/block of volume size for the allocation tables.

The directory space in CP/M is also allocated in units of blocks. Each directory uses 32 bytes. One 8K block can hold 256 directory entries. However, on large directories, CP/M performs slower because directory searches take longer. In addition, after each warm boot, CP/M must completely scan the directory of each new volume that is selected in order to build its allocation table.

There is an additional detail that affects choice of directory size. The last 16 bytes of a directory entry gives a list of the block numbers used by the file. A directory entry can describe the allocation of only 8 blocks for large volumes (more than 256 blocks), since 2 bytes are used to describe each block number. Should the file size exceed 8 blocks, more directory entries are used until the complete file allocation is described. These additional entries do not show up with the directory listing command (DIR). This detail partly explains why file access is faster with larger block sizes. For example, a 2000K file on a volume using 2K blocks will use up 126 directory entries (the last entry is a null entry) all by itself. However, the same file on a volume using 8K blocks would use only 32 directory entries. Thus, the directory size depends not only on how many files you expect to save, but also upon the typical file size, block size, and system performance speed.

EXM This is the extent mask, which is determined by the block size and the size of the disk, plus the DSM size. This number is the number of 16K units that are allocated by one directory entry. See the table below:

	EXTENT MASK	
BLOCK SIZE	DSM<256	DSM>=256
1K	0	Not Applicable
2K	1	0
4K	3	1
8K	7	3
16K	15	7

DSM This is one less than the size of the volume, measured in units of blocks. This does not include the reserved tracks (OFF), but does include both the directory area and data file areas.

DRM This is one less than the maximum number of directory entries allowed. On a standard CP/M eight-inch floppy, DRM is 63. If you have a large number of short files, this number may not be enough. However, choosing a number too large degrades system performance in several ways. First, it allocates disk space that can only be used by the directory. Second, directory searches are slower. Third, it slows down the initial drive LOGON operation after a warm boot. This last situation occurs only on removable media where a checksum is made of each directory sector.

AL0 and AL1 These two bytes are used to pre-initialize the drive allocation map. They reserve the blocks used by the directory so that no data files can be saved there. On a standard 1024-block CP/M volume, the directory has a maximum of 64 entries. At 32 bytes per entry, this gives 2048 bytes. With a block size of 1K, the first 2 blocks must be pre-allocated for the directory. This is done by setting bits 7 and 6 of AL0 to 1 and the other bits of AL0 and AL1 to 0, so

AL0 = 0C0H
AL1 = 0

If DRM = 255 (that means 256 directory entries) on a system with 2K blocks, 4 blocks would need to be pre-allocated, so

AL0 = 0F0H
AL1 = 0

CKS This is the size of the directory checksum array, determined by the formula:

(DRM+1)/4 (rounded up to integer value)

for a removable disk, or 0 otherwise.

OFF This is the track offset from the starting track to the first directory track, consisting of reserved tracks typically used for saving the bootable copy of the configured CP/M.

Disk Parameter Header Table

CP/M requires a second table, the DISK PARAMETER HEADER, which is a 16-byte table containing buffers and pointers. Each volume in CP/M requires a table, similar to the example below:

```
DPEO:   DW   XLT,0           ; TRANS. TABLE, BUFFER
        DW   0, 0            ; BUFFERS
        DW   DIRBUF, DPBO    ; DIRECTORY BUFFER, PARAM. BLOCK
        DW   CSVO, ALVO      ; CHECK BUFFER, ALLOC. MAP
```

The table entries have the following significance:

XLT This is either a pointer to a logical-to-physical sector translation table, or 0 to indicate no translation. On a Corvus drive, this is set to 0 to disable, since the Corvus controller does this optimization internally.

DIRBUF This is a pointer to the beginning of a 128-byte buffer used for directory searches. CP/M only needs one such buffer.

DPBO This is a pointer to the start of a 15-byte DISK PARAMETER BLOCK for each volume. Volumes (logical drives) with the same layout can reference a common parameter block.

CSVO This is a pointer to the beginning of a buffer that contains a checksum byte for each 128-byte sector of the directory (of this volume). The size of this buffer is given by the CKS word of the DISK PARAMETER BLOCK described above.

ALVO This is a pointer to the beginning of a buffer used for the allocation map of the drive. Its size (in bytes) is given by the formula:

(DSM+1)/8 (rounded up to integer value)

where DSM is the disk size word used in the parameter block.

Corvus Disk Offset Table

This is a configuration table unique to the Corvus disk. This table uses four bytes for each drive and gives the 24-bit starting disk address (128-byte sectors) of each pseudo drive (volume), and the Corvus drive number that this pseudo drive is located on. A typical example would be:

```
PDRV0:   DW   820        ; 24-BIT STARTING DISK ADDRESS      (A)
         DB     2        ; UPPER 8 BITS OF DISK ADDRESS      (B)
         DB     1        ; ACTUAL CORVUS DRIVE # (1-4)       (C)
where: B * (256)^2 + A = STARTING DISK ADDRESS OF VOLUME
                         IN UNITS OF 128-BYTE SECTORS
```

Reconfiguring the CLINK2.ASM Program

To completely reconfigure your CLINK2.ASM program to fit your needs, follow the steps below:

1. Make a map of your disk(s), showing where each volume starts, and how many sectors long each volume is.
2. Decide on the block size and number of directory entries for each volume.
3. Create a DPBC entry for each volume size. Remember that you need to define a DPBC for each difference in the volume length, block size, or DRM. Below are some sample DPBC entries (3 separate examples):

ITEM	VOLUME SIZE (SECTORS)		
	Example 1 4906	Example 2 8192	Example 3 65536
Block Size (bytes/sectors)	4K/32	4K/32	8K/64
DSM	127	255	1023
BSH	5	5	6
BLM	31	31	63
EXM	3	1	3
DRM	255	255	255
AL0	C0H	C0H	F0H
AL1	00H	00H	00H
Size of Allocation Table	16	32	128
Size of Checksum Table (Corvus Disk)	0	0	04

4. Create a PDRV entry for each volume.
5. Create a DPE entry for each volume.
6. Create a CSV entry for each volume.
7. Create an ALV entry for each volume.
8. Set the equates for FMAX and DMAX to reflect the number of floppy drives and the number of pseudo drives (volumes) that can be mounted at once.
9. Set the equate for FREE for some available memory above CP/M. You may have to assemble CLINK2.ASM at least once and look at the calculation of the size of the code area required (the label LENC calculated at the end of CLINK2.ASM).

   Newer versions of CLINK2 calculate FREE on the basis of three user-specified values defined with labels: MSIZE, CLKSZ, and DELTA. You must insure that the value specified for CLKSZ (usually 400H, which is approximately 1K) is greater than or equal to the value found for LENC. These new CLINK2 programs check for this inequality and will issue an error message when you attempt to run CLINK2.COM if LENC is too large.
10. Assemble CLINK2.ASM and use LOAD to produce CLINK2.COM.
11. Use the PUTGET program to clear out the directory areas (you need only do this once).