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# **WINCHESTER DISK SYSTEMS**

## **USER'S MANUAL**

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PLEASANTON, CA 94566  
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SUNOL SYSTEMS  
UNIVERSAL WINCHESTER DISK SYSTEMS  
USER'S MANUAL

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WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. As temporarily permitted by regulation it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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SUNOL SYSTEMS  
UNIVERSAL WINCHESTER DISK SYSTEMS

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### 1.0 INTRODUCTION

The Sunol Universal Mass Storage System is a self contained Winchester hard disk storage system which can be attached to a wide variety of micro- and mini-computers through use of simple host adapter cards. It is available with optional floppy disk or tape cartridge back-up contained within its cabinet. It has an intelligent controller card based on the Z-80 microprocessor.

It is totally plug compatible with the line of disk products offered by Corvus Systems of San Jose, California. Because it is compatible, it can be installed on any system using Corvus host adapter cards and software. This includes both single user systems and multiple user systems based on the Corvus Omninet local area network and the Corvus Constellation multiplexer.

In addition, the Sunol system offers the advantages of automatic data error correction through use of ECC (Error Correcting Code). Storage capacity is increased up to 50% through use of RLL (Run Length Limited) coding. This also provides improved performance by providing faster data transfer between the drive and the controller.

### 2.0 SPECIFICATIONS

SUNOL MODEL	EPROM CYLxHDS	-----USER CAPACITY-----			-----DRIVE-----	
		TRACKS	BLOCKS	BYTES	MANUFACTURER	MODEL
SSD-5	306x2	599	10,183	5,213,696	MINISCRIBE	CM5206 2006
SSD-7			15,574	7,973,888		
SSD-8			15,574	7,973,888		
SSD-10	306x4	1211	20,587	10,540,544	CMI	CM5412
SSD-14			31,486	16,120,832		
SSD-16			31,486	16,120,832		
SSD-15	306x6	1823	30,991	15,867,392	CMI	CM5619
SSD-21			47,398	24,267,776		
SSD-24			47,398	24,267,776		
SSD-16	480x4	1907	32,419	16,598,528	MINISCRIBE	4020
SSD-25			49,582	25,385,984		



SSD-35	512x8	4083	69,411	35,538,432	QUANTUM	Q540
SSD-40	987X3	2948	76,648	39,243,776	VERTEX	V130
SSD-51	640x6	3827	99,502	50,945,024	TULIN	TL240
SSD-65	987X5	4922	127,972	65,521,664	VERTEX	V150
SSD-92	987X7	6896	179,296	91,799,552	VERTEX	V170

### 3.0 CONTROLS AND DISPLAYS

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#### 3.1 SWITCHES

An 8 position DIP switch is provided to control the operating mode of the Sunol disk system. It is located on the Display printed circuit card directly behind the Sunol Systems logo.

	MSB							LSB
BIT	7	6	5	4	3	2	1	0
POSITION	LEFT							RIGHT

SWITCH	1	2	3	4	5	6	7	8
FUNCTION	FLOPPY	TAPE	CACHE	2 DISK	MLTPLXR MODE	FORMAT	RLL	COMMAND TRACE

### 3.1.5 MULTIPLEXER MODE (SWITCH 5)

-----

This switch enables the addressing for a multiplexer so that the Sunol disk system can be shared among a number of host computers. It must be on whenever the disk system is attached to a multiplexer. It must be off whenever the disk system is attached directly to a host adapter or to a network disk server. IF THIS SWITCH IS NOT SET CORRECTLY, THE DISK SYSTEM WILL NOT WORK PROPERLY.

### 3.1.6 FORMAT (SWITCH 6)

-----

This switch enables the format command. The format command does a physical format of the entire disk. This operation will erase all data recorded on the disk. This switch should be off during normal operation of the disk so that data is not accidentally destroyed. This switch must be on when running programs that format the disk.

## 3.2 INDIVIDUAL LED'S

-----

Individual LED's are provided on the front panel to indicate certain status or error conditions. The LED's ARE constantly updated to display the current status.

LED's are provided for the following functions:

POWER	ERROR
BUSY	ECC
NETWK	READ
WRT PROT	WRITE

POWER is lit whenever the main power switch is turned on.

BUSY is lit whenever the controller is executing a command from the host computer.

NETWK is lit whenever the controller is being accessed over its network interface.

WRT PROT is lit whenever the currently selected disk drive is protected against being written on.

ERROR is lit whenever an error of any type is detected. Additional information about the error type can be found in the STATUS display.

ECC is lit whenever an ECC error occurs. If it is an uncorrectable error, the ERROR LED will also be lit. If it is correctable, the ERROR LED will not be lit and the error will be corrected totally invisibly to the host computer.

READ is lit whenever the controller is performing a disk read operation.

WRITE is lit whenever the controller is performing a disk write operation.

-----  
3.3 SEVEN SEGMENT DISPLAYS  
-----

3.3.1 STATUS DISPLAY  
-----

The status display gives information about the operating status of the disk system. For example, when the system is first powered up, it flashes a status of 23 which indicates drive speed error. The 23 remains displayed until the drive comes up to speed; at which time the display changes to 00 to indicate normal error free operation.

The status is displayed in decimal form and represents the five least significant bits of the Return Code as given below.

STATUS DISPLAY	MEANING
00	Normal status (no errors)
01	Seek timeout
02	Seek fault
03	Seek error
04	Sector ID ECC error
05	Recalibrate fault
06	Recalibrate timeout
07	Drive not on line
08	Write fault
09	----
10	Read data fault
11	Data ECC error (corrected unless error light on also)

12	Sector not found
13	Write protected
14	Illegal sector address
15	Illegal command
16	Drive not acknowledged
17	Acknowledge stuck active
18	Timeout
19	Fault
20	Data ECC error
21	Seek
22	Verification
23	Drive speed error
24	Drive illegal address error
25	Drive R/W fault error
26	Drive servo error
80	Sector not found

### 3.3.2 DRIVE DISPLAY

Each physical drive can be partitioned into up to 7 virtual drives. The drive number that is displayed is the currently selected virtual drive. The number displayed will range from 1 to 9. Drive 8 is the floppy disk and drive 9 is the cartridge tape drive. The number displayed is decimal.

### 3.3.3 TRACK DISPLAY

The Track Display indicates the physical cylinder location of the read/write heads. On currently delivered models, this number will range from 000 to 986. The number displayed is decimal.

### 3.3.4 HEAD DISPLAY

The Head Display indicates the physical read/write head that is selected. On currently delivered models, this number will range from 0 to 7. The number displayed is decimal.

### 3.3.5 SECTOR DISPLAY

The Sector Display indicates the physical sector number on the track. On currently delivered models, this number will range from 00 to 25. The number displayed is decimal.

#### 4.0        INSTALLATION INSTRUCTIONS

-----

The installation consists of the following steps:

1. Physical installation.
  2. Verify disk (ECC read check).
  3. Spare out any bad tracks.
  4. Re-format only if necessary (and go back to 2).
  5. Install microcode (only if using Corvus software).
  6. Set up VDO table.
  7. Set up multiplexer table (if quadplexer or multiplexer to be used).
  8. Initialize pipes (if desired).
  9. Initialize directories for operating system.
  10. Write boot tracks for operating system.
- =====

#### 4.1        PHYSICAL INSTALLATION

-----

1. Power off host computer.
  2. Install host adapter card in host.
  3. Install 34 conductor flat cable from host adapter to Sunol disk box. Pin 1 ( red stripe ) must be on bottom at the disk box.
  4. Plug Sunol power cable into 110V, 60HZ power source.  
Foreign units use 220V, 50HZ power.
  5. Turn on host and disk box. Wait for disk to come up to speed.
  6. If you have a Quadplexer, refer to the section on Quadplexer installation.
- =====

#### 4.2        VERIFY DISK (ECC READ CHECK)

-----

1. Put your normal operating system diskette into your computer and boot up your operating system.
2. Put Sunol diskette into host and type "SUNDIAG" and press return. This loads the Sunol disk diagnostic program.
3. When the menu appears, type "V" for the verify disk option. You will then be asked which disk you wish to verify. Type "1" and Return.
4. The disk will now read every sector on the entire physical disk. Any sector which cannot be read will be reported at the end of

the operation.

5. Any tracks which are reported as bad should be entered into the bad track table using Sundiag or one of the Corvus diagnostics. A maximum of 7 tracks may be spared out. Track zero must not be spared out because the spare track list is recorded on track zero.
6. If the read/write heads have shifted in shipment, an excessive number of errors may show up in the verify procedure. Should this occur, the drive should be physically re-formatted. This can be done using Sundiag or one of the Corvus diagnostics.

=====

#### 4.6      SETTING THE VIRTUAL DRIVE OFFSET (VDO) TABLE

-----

Your Sunol drive may be configured as from 1 to 7 virtual drives. This is done in the controller microcode. The software disk drivers in your system may also split each virtual drive into several pseudo-drives. If the software and the microcode are not in agreement as to the number and size of the virtual drives, then the system will not work properly. Incorrect setting of the Virtual Drive Offset (VDO) table has been frequently found to be the cause of installation problems.

If you are using a Corvus host adapter kit, The VDO table may be inspected and/or changed by running a diagnostic program supplied in the host adapter kit. This program is known by various names, including DIAGNOSTIC, DIAG, and CDIAGNOS.

For CP/M installations, the software normally expects only one virtual drive which is broken into several sub-drives by the software. For CP/M, run the program CDIAGNOS and set the VDO table as follows:

```
DRIVE 1 = 0
DRIVE 2 = -
DRIVE 3 = -
DRIVE 4 = -
DRIVE 5 = -
DRIVE 6 = -
DRIVE 7 = -
```

For Apple installations, the software normally expects one virtual drive at or below 10 MB and two virtual drives above 10 MB. The 10 MB drive is normally split into two 5 MB drives by the software. For Apple, run the program DIAGNOSTIC and set the VDO table as follows:

10 MB and below	above 10 MB
-----	-----
DRIVE 1 = 0	DRIVE 1 = 0

DRIVE 2 = -1

DRIVE 2 = 976

DRIVE 3 = -1

The BSYSGEN program currently being delivered by Corvus divides each virtual drive into a maximum of 99 volumes. If the virtual drive size is larger than 99 volumes, this program will report an error in calculating the number of volumes. This program also limits the maximum number of virtual drives to two. This program will also report an error if virtual drive two is larger than virtual drive one.

For IBM and MSDOS installations, the software normally expects one virtual drive. The software splits the one virtual drive into a number of sub-drives. For IBM or MSDOS, run the program DIAG and set the VDO table as follows:

DRIVE 1 = 0  
DRIVE 2 = -  
DRIVE 3 = -  
DRIVE 4 = -  
DRIVE 5 = -  
DRIVE 6 = -  
DRIVE 7 = -

=====

#### 4.7 SETTING THE MULTIPLEXER TABLE

-----

##### MULTIPLEXER SWITCH

-----

The multiplexer switch is located on the Display Card directly behind the front panel. It is switch 5, which is the 4th switch from the right hand side as you face the display. This switch must be on to enable the polling of the Quadplexer inputs.

Conversely, this switch must be off if no Quadplexer or multiplexer is attached.

##### MULTIPLEXER TABLE

-----

A multiplexer table is recorded in sector 3 of the reserved area of the hard disk. This table tells the disk controller what is attached to each port of the Quadplexer. This table must be set properly so that the system will work properly. This table can be set by using Sundiag or one of the Corvus diagnostic programs.

The multiplexer table has 8 positions. They are numbered 1 through



8. Positions 1 through 4 correspond to connectors J1 through J4 respectively on the Quadplexer. Positions 5 through 8 in the table should be set to a hexadecimal 00, indicating that nothing is connected to these ports. An entry should be made for each of the positions 1 through 4 to indicate what is attached to these ports.

Any port which is open should have its corresponding multiplexer table entry set to a hexadecimal 00 so that time is not wasted polling users that do not exist.

Any port which has another Quadplexer or multiplexer attached must have its corresponding multiplexer table entry set to a hexadecimal 01 so that polling of the attached Quadplexer or multiplexer is enabled. If its table entry is not correct, the attached Quadplexer will not work.

Any port which has a computer attached to it must have its corresponding multiplexer table entry set to a hexadecimal 80. If the computer's table entry is erroneously set for a multiplexer, the computer will receive multiplexer polling signals which will confuse it and cause errors.

Any port which has an Omninet Disk Server attached to it should have its corresponding multiplexer table entry set to a hexadecimal 80 (same entry as for a computer).

Any port which has a printer server attached to it should have its corresponding multiplexer table entry set to a hexadecimal 80 (same entry as for a computer).

If you should accidentally disable all the multiplexer table entries, you will find that you are locked out of the disk drive. If this happens, you must disconnect the Quadplexer, turn off the multiplexer switch, directly connect one of the computers to the drive, and run the diagnostic to re-enable some of the Quadplexer ports.

#### 4.7 DISK FORMATTING WITH CDIAGNOS.COM

Formatting the disk using the Corvus program CDIAGNOS is at best a tricky proposition. This is because there is an undocumented trick involved in doing it. To format the disk, use the following procedure:

```
A>CDIAGNOS                                <--- enter
--- CORVUS DISC DIAGNOSTIC ---

    --- TEST MENU ---
```

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

TASK (0 TO LIST) : 6

<--- enter

CONTROLLER CODE FILE NAME ( CORVXX.CLR) :CORVB184.FMT

<--- enter

DO YOU REALLY WANT TO FORMAT THE DISC FIRST

( AND ERASE ALL THE DATA ON IT) (Y/N) ? Y

<--- enter

IS FORMAT SWITCH ON (OR FORMAT JUMPER INSTALLED) (Y/N) ? Y

<--- enter

CORVUS DRIVE # (1-4) ? 1

<--- enter

-- THIS WILL TAKE ABOUT 1 MINUTE --

CORVUS DRIVE # (1-4) ? 1

<--- enter

----- CONTROLLER CODE FILE HEADER MESSAGE -----

CORVUS REV B CONTROLLER CODE REV 35 11/01/81

THIS CODE IS TO BE USED WITH THE 'REV B' CORVUS CONTROLLER.  
IT IS AN UPWARD REVISION OF THE 'REV. 2' CONTROLLER CODE  
USED ON THE 'REV. A' CONTROLLER. IT WILL ONLY WORK ON  
'REV B' DRIVES. FEATURES INCLUDE:

1. BETTER BUILT IN DIAGNOSTICS.
2. ACCESS TO DRIVE CONFIGURATION TABLES.
3. SUPPORT FOR PIPES.
4. SUPPORT FOR 5MBYTE DRIVES.
5. DOWNWARD COMPATABILITY WITH READ/WRITE COMMANDS  
OF 'REV A' CONTROLLER.

-----  
CODE LENGTH = 40 (512 BYTE BLOCKS)

THE CONTROLLER CODE HAS BEEN WRITTEN. NOW TURN  
OFF THE FORMAT SWITCH (OR REMOVE THE JUMPER)  
AND RESET THE DRIVE BY EITHER FLIPPING THE  
DRIVE RESET SWITCH OR BY POWERING IT DOWN.

TASK (0 TO LIST) :

Note that when entering the Corvus microcode file name, you must type in the file name with an extension of .FMT to make it format. If you type in an extension of .CLR or .INI, it will NOT format.

Note also that CDIAGNOS will not let you format if you do not have the Corvus microcode on the disk.

\*\*\*\*\*  
=====

## 5.0 INSTALLATION TROUBLESHOOTING

### 5.1 VIRTUAL DRIVE CONFIGURATION

Your Sunol drive may be configured as from 1 to 7 virtual drives. This is done in the controller microcode. The software disk drivers in your system may also split the drive into a number of sub-drives. If the software and the microcode are not in agreement as to the number and size of the virtual drives, then the system will not work properly. Incorrect setting of the Virtual Drive Offset (VDO) table has been frequently found to be the cause of installation problems.

If you are using a Corvus host adapter kit, The VDO table may be inspected and/or changed by running a diagnostic program supplied in the host adapter kit. This program is known by various names, including DIAGNOSTIC, DIAG, and CDIAGNOS.

For CP/M installations, the software normally expects only one virtual drive which is broken into several sub-drives by the software. For CP/M, run the program CDIAGNOS and set the VDO table as follows:

DRIVE 1 = 0  
DRIVE 2 = -  
DRIVE 3 = -  
DRIVE 4 = -  
DRIVE 5 = -  
DRIVE 6 = -  
DRIVE 7 = -

For Apple installations, the software normally expects one virtual drive at or below 10 MB and two virtual drives above 10 MB. The 10 MB

drive is normally split into two 5 MB drives by the software. For Apple, run the program DIAGNOSTIC and set the VDO table as follows:

10 MB and below	above 10 MB
DRIVE 1 = 0	DRIVE 1 = 0
DRIVE 2 = -1	DRIVE 2 = 976
	DRIVE 3 = -1

The BSYSGEN program currently being delivered by Corvus divides each virtual drive into a maximum of 99 volumes. If the virtual drive size is larger than 99 volumes, this program will report an error in calculating the number of volumes. This program also limits the maximum number of virtual drives to two.

For IBM and MSDOS installations, the software normally expects one virtual drive. The software splits the one virtual drive into a number of sub-drives. For IBM or MSDOS, run the program DIAG and set the VDO table as follows:

```
DRIVE 1 = 0
DRIVE 2 = -
DRIVE 3 = -
DRIVE 4 = -
DRIVE 5 = -
DRIVE 6 = -
DRIVE 7 = -
```

## 5.2 CP/M DIRECTORY PROBLEMS

If the disk you are working with has been used with a different operating system or if your linkage program has been changed, you may experience problems with your CP/M system. The only sure cure for CP/M directory problems is to erase the entire directory area by filling it with hexadecimal E5's. One way to do this is to reformat the entire disk.

It should be noted that typing ERA \*.\* will NOT clear out the entire directory area. Even if the system tells you there are no files on the disk, it will still run into problems when it tries to write into an area of the directory that has not been entirely filled with E5's.

## 5.3 DISK FORMATTING WITH CDIAGNOS.COM

Formatting the disk using the Corvus program CDIAGNOS is at best a tricky proposition. This is because there is an undocumented trick involved in doing it. To format the disk, use the following procedure:

A>CDIAGNOS

<--- enter

--- CORVUS DISC DIAGNOSTIC ---  
( VERSION 2.2XE )

--- TEST MENU ---

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

TASK (0 TO LIST) : 6

<--- enter

CONTROLLER CODE FILE NAME ( CORVXX.CLR) :CORVB173.FMT

<--- enter

DO YOU REALLY WANT TO FORMAT THE DISC FIRST

( AND ERASE ALL THE DATA ON IT) (Y/N) ? Y

<--- enter

IS FORMAT SWITCH ON (OR FORMAT JUMPER INSTALLED) (Y/N) ? Y

<--- enter

CORVUS DRIVE # (1-4) ? 1

<--- enter

-- THIS WILL TAKE ABOUT 1 MINUTE --

CORVUS DRIVE # (1-4) ? 1

<--- enter

----- CONTROLLER CODE FILE HEADER MESSAGE -----

CORVUS REV B CONTROLLER CODE REV 35      11/01/81

THIS CODE IS TO BE USED WITH THE 'REV B' CORVUS CONTROLLER.  
IT IS AN UPWARD REVISION OF THE 'REV. 2' CONTROLLER CODE  
USED ON THE 'REV. A' CONTROLLER. IT WILL ONLY WORK ON  
'REV B' DRIVES. FEATURES INCLUDE:

1. BETTER BUILT IN DIAGNOSTICS.
2. ACCESS TO DRIVE CONFIGURATION TABLES.
3. SUPPORT FOR PIPES.
4. SUPPORT FOR 5MBYTE DRIVES.
5. DOWNWARD COMPATABILITY WITH READ/WRITE COMMANDS  
OF 'REV A' CONTROLLER.

-----  
CODE LENGTH = 60 (512 BYTE BLOCKS)

THE CONTROLLER CODE HAS BEEN WRITTEN. NOW TURN  
OFF THE FORMAT SWITCH (OR REMOVE THE JUMPER)  
AND RESET THE DRIVE BY EITHER FLIPPING THE  
DRIVE RESET SWITCH OR BY POWERING IT DOWN.

TASK (0 TO LIST) :

Note that when entering the Corvus microcode file name, you must  
type in the file name with an extension of .FMT to make it format. If you  
type in an extension of .CLR or .INI, it will NOT format.

Note also that CDIAGNOS will not let you format if you do not  
have the Corvus microcode on the disk.

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6.0      QUADPLEXER  
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#### INTRODUCTION

-----

Sunol Systems' Quadplexer provides an inexpensive way to connect  
up to 4 computers to the same hard disk. The computers can be the same  
or can be different makes and models.

More extensive systems can be configured by "daisy chaining"  
two levels of Quadplexers or by connecting an Omninet Disk Server onto  
any of the 4 input ports of the Quadplexer.

No changes in host system software are required when running  
through the Quadplexer. The Quadplexer itself is totally transparent  
to the user.

If the host systems are running different Operating System software,  
it is advisable to set the Virtual Drive Offset (VDO) table so that each  
Operating System has a virtual drive all to itself. Communications  
between these unlike systems can then be accomplished by making use of the  
"Pipes" option.

#### PHYSICAL INSTALLATION

-----

Prior to installing the Quadplexer, the multiplexer table should be set  
up as described below.

Install short cable which is provided between connector J5 on the  
Quadplexer and the back of the Sunol drive. Be careful to observe polarity

markings on both ends of the cable.

Install 34 pin flat cables between each host adapter board and one of the connectors J1 through J4 on the Quadplexer. Again be careful to observe the polarity markings on both ends of the cables.

If you are doing two level multiplexing, then simply cable from connector J5 of the Quadplexer furthest from the drive to any of the connectors J1 through J4 of the Quadplexer closest to the drive.

If you have an Omninet disk server, it can be connected to any of the connectors J1 through J4.

That's all there is to the installation. Power to run the Quadplexer is provided in the 34 pin flat cable from the Sun01 drive.

#### MULTIPLEXER SWITCH

-----

The multiplexer switch is located on the Display Card directly behind the front panel. It is switch 5, which is the 4th switch from the right hand side as you face the display. This switch must be on to enable the polling of the Quadplexer inputs.

Conversely, this switch must be off if no Quadplexer or multiplexer is attached.

#### MULTIPLEXER TABLE

-----

A multiplexer table is recorded in sector 3 of the reserved area of the hard disk. This table tells the disk controller what is attached to each port of the Quadplexer. This table must be set properly so that the system will work properly. This table can be set by using Sundiag or one of the Corvus diagnostic programs.

The multiplexer table has 8 positions. They are numbered 1 through 8. Positions 1 through 4 correspond to connectors J1 through J4 respectively on the Quadplexer. Positions 5 through 8 in the table should be set to a hexadecimal 00, indicating that nothing is connected to these ports. An entry should be made for each of the positions 1 through 4 to indicate what is attached to these ports.

Any port which is open should have its corresponding multiplexer table entry set to a hexadecimal 00 so that time is not wasted polling users that do not exist.

Any port which has another Quadplexer or multiplexer attached must have its corresponding multiplexer table entry set to a hexadecimal 01 so that polling of the attached Quadplexer or multiplexer is enabled. If its table entry is not correct, the attached Quadplexer will not work.



Any port which has a computer attached to it must have its corresponding multiplexer table entry set to a hexadecimal 80. If the computer's table entry is erroneously set for a multiplexer, the computer will receive multiplexer polling signals which will confuse it and cause errors.

Any port which has an Omninet Disk Server attached to it should have its corresponding multiplexer table entry set to a hexadecimal 80 (same entry as for a computer).

If you should accidentally disable all the multiplexer table entries, you will find that you are locked out of the disk drive. If this happens, you must disconnect the Quadplexer, turn off the multiplexer switch, directly connect one of the computers to the drive, and run the diagnostic to re-enable some of the Quadplexer ports.

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## 7.0 SUNOL CARTRIDGE TAPE DRIVE

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### INTRODUCTION

-----

Your Sunol cartridge tape drive provides a quick and easy way to backup your Sunol hard disk. More than this, it can be used as a random access device. The files that have been backed up onto the tape need not be restored all together. You may individually pick out files to be restored and restore only them if you wish.

### RETENSIONING

-----

The first thing that you will notice about your Sunol drive is that it automatically retensions the tape whenever it is powered up or whenever a tape cartridge is inserted. To retension the tape, the drive runs the tape from one end to the other and back. This takes about three minutes.

After the retensioning, the head is moved to track 0. This is the "rattling" sound you hear when the tape stops. This sound is normal and does not indicate a problem with the drive. You will hear this sound whenever the tape head is re-positioned from one tape "stream" to another.

## TAPE FORMATTING

Each tape cartridge must be physically formatted before it can be used to store or retrieve data. Formatting a new tape cartridge is done in the same way as formatting your hard disk. It can be done using Sundiag or one of the Corvus diagnostics.

You must be very careful to address the format toward the tape. Otherwise you may destroy data on your hard disk.

If you have only one virtual drive on your hard disk, then the tape will be virtual drive 2. If you have 2 virtual drives on your hard disk, the tape will be virtual drive 3. The tape will always be one drive above the last virtual drive on your hard disk.

Formatting the tape takes approximately 9 minutes.

## BACKING UP

The most common use of the tape drive is the backing up of your Sunol hard disk. The backing up process is a high speed copy operation in which the tape runs in the "streaming" mode. In this mode, the tape moves continuously. The controller alternately reads 15 sectors from the hard disk and then writes them to the tape. The backup operation takes approximately 1-1/2 minutes per megabyte.

The backup can be done using Sundiag or one of the Corvus Mirror programs.

The backup operation uses logical sector numbers within a virtual drive. The operation will stop when a virtual drive boundary is reached.

If your hard disk is larger than the 23 megabytes the tape can hold, we recommend you break it into a number of virtual drives, each of which is 23 megabytes or smaller in size.

If you have bad tracks on your hard disk that have been spared out, the proper spare tracks will be automatically fetched and used during the backup operation.

## TAPE VERIFYING

Verifying the tape can be done in the same way as verifying your hard disk. It can be done using Sundiag or one of the Corvus diagnostics. As with formatting, you must point the verify program toward the proper virtual drive.

The verify operation reads every sector on the entire physical tape cartridge and reports any sectors that cannot be read or in which an ECC (Error Correcting Code) error is found.

The Verify and Identify options on the Corvus Mirror programs (as opposed to the Corvus diagnostic programs) are not supported at this time

#### RESTORING

The restore operation does a high speed copy from the backup tape to the specified virtual hard disk. It will stop at virtual drive boundaries.

The restore operation can be done using Sundiag or one of the Corvus Mirror programs.

The restore operation takes approximately 1-1/2 minutes per megabyte.

Data for bad tracks that have been spared out will automatically be routed to the proper spare tracks during the restore operation.

#### RANDOM ACCESSING

Individual files on a tape cartridge can be accessed provided the following conditions are met:

1. Logical sector 0 on a virtual hard disk was backed up to logical sector 0 on the tape.
2. Your software link program has in it a virtual drive address for the tape.
3. Your software link program has in it the same number of reserved blocks for the backed up virtual hard disk and the tape.

If these conditions are met, then individual files may be read from and written to your tape drive just as though it were another virtual hard disk.

In random reading and writing, operation of the tape is MUCH slower than in the streaming mode because only one sector is accessed every time a segment of tape passes back and forth past the head.

The speed of random accessing can be improved somewhat by turning on Switch 3 to enable the cache buffer. Switch 3 is the 3rd switch from the left on the display card.

#### ADDRESS JUMPERS

The tape cartridge drive must have its address jumpers set as follows:

W1 IN

W2 OUT

W3 IN

These jumpers have been set at the factory and no user action should be required.

#### SPECIFICATIONS

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#### TAPE CARTRIDGE

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TYPE: MMM DC600A

TAPE WIDTH: 0.25 INCHES

LENGTH: 600 FEET ( Shorter tapes will NOT work !!! )

#### TAPE DRIVE

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CIPHER 525CT

TAPE SPEED: 78 INCHES PER SECOND

DATA CODE: MFM

DATA RATE: 417 K BITS PER SECOND  
52 K BYTES PER SECOND

252 SEGMENTS (CYLINDERS)

6 STREAMS (HEADS)

30 SECTORS PER TRACK

512 BYTES PER SECTOR

1501 TRACKS -- USER 23,055,320 BYTES

4 TRACKS -- RESERVED 61,440 BYTES

7	TRACKS -- SPARE	107,520	BYTES
1512	TRACKS -- TOTAL	23,224,320	BYTES

# **SUNOL SYSTEMS**

## **USER'S COMMENT FORM**

**MSDOS SUN\*LINK vers. 2.0**

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Tape

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