TANDY®

Technician Series
Diagnostics Software

DISKREL

Floppy/Hard Disk Diagnostics For MS-DOS Compatible Computers

01-0220 Computer Technical Services

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DISKREL

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DISKREL

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GENERAL DESCRIPTION

The DISKREL test is a diagnostic which tests drive data reliability on Tandy MS-DOS computers. The program is designed to test all types of 5 1/4" and 3 1/2" floppy drives with various densities (360K, 720K, 1.2M, 1.44M). Additionally, it will test many different sizes of hard drives and hard cards, including SCSI and IDE.

FEATURES

The DISKREL test is a menu driven program which permits the configuration of the program to best fit the computer under test. Once configured the user may select from a variety of tests running in either continuous or variable mode. A status bar is displayed to show the amount of testing completed. During the testing process, errors are recorded in detail in an easy to read table. A hardcopy of this table can be produced for future reference. In addition to the detailed error table, a cumulative count of errors is displayed on the main menu during the tests.

EQUIPMENT REQUIRED

The DISKREL test may be used on Tandy MS-DOS computers with floppy and/or hard drives. For testing of the floppy drives a known good, blank, bulk erased diskette for floppy data reliability testing is needed. The only other requirement is the appropriate diagnostic disk containing the DISKREL program.

LOADING DISKREL

There are two ways to access the DISKREL diagnostic. The first is through the main menu of the diagnostic disk. The key corresponding to the DISKREL test is pressed to load the DISKREL program. The second method to access the DISKREL diagnostic is directly from MS-DOS. The name of the DISKREL diagnostic is typed at the MS-DOS prompt:

A>DISKREL<ENTER>

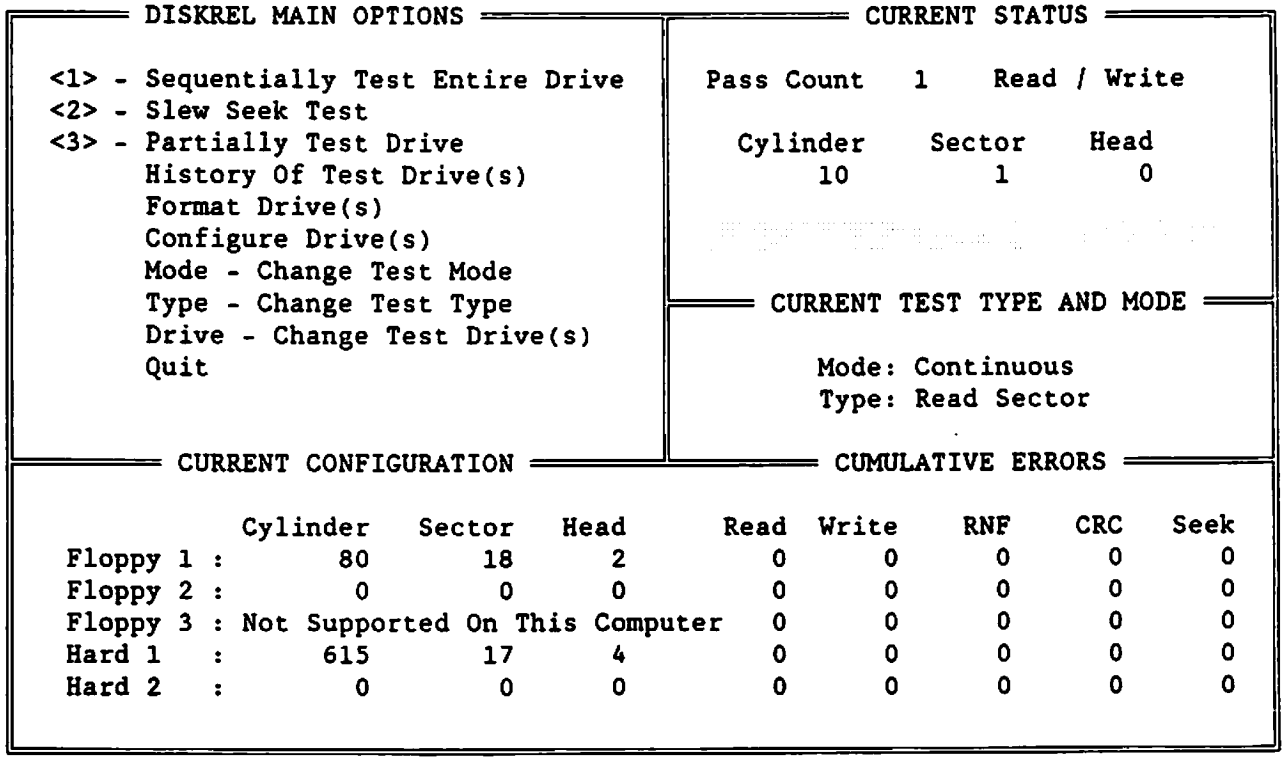
The copyright screen will then be displayed.

OPERATING DISKREL

When starting the program a copyright screen will be displayed. At this point remove the diagnostic diskette to prevent accidental erasure of the disk. Press the **<ENTER>** key to display the main menu screen. The configuration command should be selected to configure the test for the system it will be executed on. A series of pop up windows will be displayed for easy configuration. The mode to be used for testing (variable or continuous) and the type of testing to be executed (read sector, read cylinder, etc.) should then be selected. The drives to be tested must be selected through the "Drive - Change Test Drive" option before the tests can be executed. The disk may also be formatted prior to the execution of the tests. The format done through this selection is valid for use in this diagnostic only. A sequential test of the entire drive, a slew seek test of the entire drive, or a partial sequential test can be selected. If any errors occur during the testing process the "History of Test Drive(s)" command may be selected to display the history error table.

DISPLAY DESCRIPTION

The initial screen displayed upon execution of the DISKREL test is the copyright screen. After the **<ENTER>** key has been pressed the main screen of DISKREL will be displayed. The screen is divided into four sections. The top left section contains all the tests which may be selected along with the commands to set up the desired test environment. The top right hand portion of the screen contains the current status of the testing. During the execution of the tests the current location being tested is displayed and the status bar is updated as the testing process continues. The section under the status box contains the current test mode and type. The bottom section of the screen contains the current configuration of the drives and the current cumulative error count of each drive. Additionally, a help line is located at the bottom of the screen under the current configuration and cumulative error section on the main screen.



DISKREL MAIN OPTIONS

<1> - Sequentially Test Entire Drive
<2> - Slew Seek Test
<3> - Partially Test Drive
History Of Test Drive(s)
Format Drive(s)
Configure Drive(s)
Mode - Change Test Mode
Type - Change Test Type
Drive - Change Test Drive(s)
Quit

CURRENT STATUS

Pass Count 1 Read / Write

Cylinder	Sector	Head
10	1	0

CURRENT TEST TYPE AND MODE

Mode: Continuous
Type: Read Sector

CURRENT CONFIGURATION

CUMULATIVE ERRORS

	Cylinder	Sector	Head	Read	Write	RNF	CRC	Seek
Floppy 1 :	80	18	2	0	0	0	0	0
Floppy 2 :	0	0	0	0	0	0	0	0
Floppy 3 :	Not Supported On This Computer			0	0	0	0	0
Hard 1 :	615	17	4	0	0	0	0	0
Hard 2 :	0	0	0	0	0	0	0	0

The history table displays the errors incurred during the testing process. The left section of the history table contains the location of the error. The first column displays the drive on which the error occurred. If the drive number is preceded by an 'F' the error occurred on a floppy drive. Otherwise the drive number is preceded by an 'H' which denotes the error occurred on a hard drive. After the drive number the specific location of the error is given. The right portion of the table contains a cumulative count of the errors which occurred at that particular location on the disk. The errors are listed under the appropriate column for the specific error which occurred. If the error which occurred during testing is not a read, write, RNF (record not found), CRC (cyclic redundancy check), or seek error a hex code is listed in the "Other" column. A table of these hex codes is listed in the appendix.

Note:
There are two tables of hex codes in the appendix. The second table pertains only to tests which are executed on a 344 meg SCSI drive with a 16 head BIOS. The first table corresponds to all other drives.

The commands which can be executed from this screen are listed below the table. The possible commands are to print the table, clear the table, display the next or previous page of the table, or exit the table and return to the main menu screen.

Location			Error Count					
Drive	Cylinder	Head	Read	Write	RNF	CRC	Seek	Other
F1	0	0	1	0	1	0	0	00
F1	0	1	1	0	1	0	0	00
F1	1	0	1	0	1	0	0	00
F1	1	1	1	0	1	0	0	00
F1	2	0	1	0	1	0	0	00
F1	2	1	1	0	1	0	0	00
H1	1251	0	1	0	0	0	0	21
H1	1251	1	1	0	0	0	0	21
H1	1251	2	1	0	0	0	0	21
H1	1251	3	1	0	0	0	0	21
H1	1251	4	1	0	0	0	0	21
H1	1251	5	1	0	0	0	0	21
H1	1251	6	1	0	0	0	0	21
H1	1251	7	1	0	0	0	0	21
H1	1251	8	1	0	0	0	0	21
H1	1251	9	1	0	0	0	0	21
H1	1251	10	1	0	0	0	0	21
H1	1251	11	1	0	0	0	0	21

<ESC> - Exit <C> - Clear <P> - Print <PgUp> - Previous <PgDn> - Next

COMMANDS

Main Menu Commands

<1> - Sequentially Test Entire Drive

This test sequentially seeks through the entire disk. If the test type is read sector the test will begin with cylinder 0, head 0, and sector 1. It then will read cylinder 0, head 1, and sector 1. It continues this pattern until all the heads have been read at cylinder 0. Sector 1 is then tested at cylinder 1 for all the heads. When all cylinders and heads on sector one have been read, the process will start over for sector 2. This pattern is continued until all sectors have been read. If the test type is read cylinder the test again begins reading at cylinder 0, head 0, sector 1. It reads all the sectors at this location and proceeds to the next head at cylinder 0 and reads all the sectors. This is continued until all cylinders have been read. If the test type is read and write the disk is stepped through in the order of the read cylinder test type, but instead of only executing a read, a write is also done. A write is done at the first cylinder for all heads. After the write has been completed a read is done at that same cylinder. This pattern continues until all cylinders have been written to and read from.

Note:
The read and write test destroys all data on the drive being tested.

<2> - Slew Seek Test

This test seeks the entire disk alternating from the outside of the disk to the inside of the disk. If the test type is read sector, the test begins reading from cylinder 0, head 0, and sector 1. After all the heads are read from cylinder 0 and sector 1 the test reads from the last cylinder on the disk. All heads are read at sector 1 followed by a read at cylinder 1 for all the heads. The test then moves to the last cylinder minus one and again reads all the heads at sector 1. This process continues until all cylinders have been read. The test then moves through all sectors following this same pattern. The read cylinder test moves through the disk in the same manner, but rather than read one sector at a time all sectors are read on a particular cylinder before moving to the next cylinder. The read and write test seeks through the disk in the same order as the read cylinder but does a write and a read for each cylinder before seeking to the next cylinder to test.

<3> - Partially Test Drive

The partial test command tests the drive sequentially. Instead of reading the entire disk as in the "Sequentially Test Entire Drive" selection, it tests only the portion of the drive chosen in the select partial test area. The user will be given an opportunity to change the current defaults before the test executes. The user should press the **<Y>** key if the defaults are to be changed. The user is then prompted to input the desired defaults. If the current defaults are to be used the **<N>** key should be pressed. The user may also change the defaults for the partial test area during the configuration of the drive. If the **<N>** key is pressed the default is the entire disk will be tested. If the **<Y>** key is pressed the user will be prompted to input the new defaults. The test executes according to test type in the same manner that the sequential test executes with the exception of the amount of the drive which is tested.

<H> - History of Test Drive(s)

This option displays the history error table which includes detail on errors incurred during the testing of the drive. The history error table screen contains the following commands:

<C> - Clear Table
This command clears the history table. If this command is selected all entries in the history error table will be deleted. The cumulative error counts on the main menu screen are also cleared.

<P> - Print Table
This command will provide a hardcopy of the history table for the user. After this command is selected a pop up window will be displayed for selection of the drive histories to be printed. The "All" selection will print the entire history error table. After a drive (or drives) has been selected, the user will be requested to select the LPT port for printing. The table will then be printed.

<PgUp> - Display Previous Page
This command displays the previous page of the history error table. If a beep is sounded when the **<PgUp>** key is pressed, the page displayed is the first page of the table.

<PgDn> - Display Next Page
This command displays the next page of the history error table. If a beep is sounded when the **<PgDn>** key is pressed, the page displayed is the last page of the table.

<ESC> - Exit
This command exits the history error table and displays the DISKREL main screen.

<F> - Format Drive(s)

This command formats a disk. After the selection of this command a pop up window is displayed for selection of the drive to be formatted. The drive which is selected must be configured, otherwise an error message will be displayed. The user then will select whether one cylinder or the entire disk is to be formatted. If the option to format one cylinder is selected, the user is prompted to input which cylinder is to be formatted. If the format is being executed on a hard drive a message to input the interleave is displayed. After a legal interleave has been input a message is displayed warning the user that all data on the disk will be destroyed. This message will be displayed immediately following the selection of formatting one cylinder or the entire drive when formatting a floppy disk. **This format will destroy all data on the disk as well as any operating system present on the disk.** To continue the format the user must press the **<ENTER>** key. If any other key is pressed the format process is aborted. If a floppy disk is being formatted a message to insert the disk to be tested is displayed. The DASD type will then be set. If an error occurs while trying to set the DASD type, an error message will be displayed and the format routine will be exited. If no error occurs while setting the DASD type the format will be executed. At any time during the format routine the **<ESC>** key may be pressed to exit from the format process.

Note:
As with any other low level format program for the Tandy 1200HD, the format function in DISKREL for a hard drive on the 1200HD requires approximately one hour to execute.

<C> - Configure Drive(s)

This command sets up the type of drives installed in the computer to be tested. After the selection of this command a pop up window is displayed to choose the drive to be configured. If one of the floppy drives is selected another pop up window is displayed to choose the size of the drive. At this point a message directing the user to install the disk to be used for testing is displayed. The next selection is relevant to the partial test. The user may either keep the current default of the entire drive or change the default. If the user presses the <Y> key to change the default, the user is prompted to input the starting and ending cylinder and the starting and ending sector to test. If the user wishes to keep the current defaults the <N> key is pressed.

If one of the hard drives is selected a table of hard drive types is displayed. If the test is being executed on one of the Tandy 1000 family machines a table of different drive models is displayed. Both of these tables has an "Other" option in order for the user to select a configuration which is not included in the table.

Note:
If the diagnostic is being executed on a Tandy 5000MC and the user is configuring a SCSI drive the other option is not available. All configuring of the SCSI drives must be done through the "SCSI: 64 Head" option.

The "1400HD/2800HD" drive configuration should be selected on the 1000 hard drive table for 1400FD's which have been upgraded with a hard drive.

Refer to Notes and Jumpers for specific information on heads, cylinders, and sectors for hard drives.

<M> - Mode - Change Test Mode

This command allows the user to change the mode in which the test is being executed. Following the selection of this command a pop up window is displayed allowing for the selection of continuous or variable testing. If variable testing is chosen the user is prompted to enter the number of passes the test is to be executed.

<T> - Type - Change Test Type

This command enables the user to select the type of testing to be executed. A pop up window is displayed with the possible selections of read sector, read cylinder, or read and write.

<D> - Drive - Change Test Drive(s)

This command allows the user to activate and deactivate drives for testing. Following the selection of this command an arrow will point to floppy drive 1 at the bottom section of the main screen. If the drive being pointed to should be selected for testing the **<ENTER>** key should be pressed. Likewise if the drive is selected and the user wishes to deselect the drive the **<ENTER>** key should be pressed. The up and down arrows are pressed to move from one drive to another. On color systems if the drive is selected the drive number will be displayed in yellow and the current configuration will be in white. If the drive is deselected the drive number will be displayed in red and the drive configuration will be in grey. On monochrome systems, selected drives will be in high intensity and deselected drives will be in low intensity. If the test is being executed on a computer which does not support three floppy drives, the user will be unable to select floppy drive three for testing. A message will appear under the configuration section for floppy 3 which states that a third floppy drive is not supported on this computer. The command to select and deselect drives for testing may be exited by pressing the **<ESC>** key.

<Q> - Exit DISKREL

Pressing the **<Q>** key allows the user to exit the program. The user will be prompted to insert the diagnostic disk back into the drive and press the **<ENTER>** key.

APPENDIX

Usage Notes

This diagnostic does not support the testing of ESDI drives.

When testing hard drives the possibility exists that errors may occur on the last cylinder of the drive. This is usually due to the fact that this cylinder is sometimes used as the landing zone. By looking at the partition table it can be determined where the partition extends and if the errors are valid. For example, if the drive type lists the drive as having 1024 (0 - 1023) cylinders and errors are occurring at cylinder 1023 FDISK may be used to see if the partition actually extends to 1023. If it only extends to 1022 the errors at cylinder 1023 may be ignored.

On the 1100FD the "Display timeout interval" command in the setup program for this computer should be set to "never" before executing DISKREL in order to prevent DISKREL from timing out during the testing process.

On some 1400LT's an error may occur when attempting to reset the drive. If an error occurs a brief message is displayed informing the user of the error. The test is then executed normally. This problem should be ignored.

When executing the tests on the 1400LT a cursor may appear under the arrow pointing to the drive being tested. This has no side effects on the tests other than visual and should be ignored.

When formatting the Miniscribe 8438 3 1/2 inch 20 meg hard card on the 1000SX the drive will recalibrate between each cylinder. This increases the time to format the drive considerably. If a faster format is desired the format utilities provided with the drive should be used.

On the 1400FD when formatting a disk which is write protected on floppy drive 2, the write protect will not be detected until approximately cylinder 34.

When performing a read/write test on a bulk-erased, write-protected disk on floppy drive 1 on the 5000MC, the write-protect is not detected.

Program Error Messages

Memory Allocation Errors

History Table Is Full:
This error message indicates the history error table is full. After this message has been displayed no more errors will be recorded in the table. A solution to this problem is to print the current errors in the table and then clear the history table.

No Memory Available For History Table:
This error message indicates that there is not enough memory for the allocation of the history error table. No errors will be recorded in the history table if this error occurs.

Error Freeing Allocated Memory:
This error message indicates an internal program error. The computer should be rebooted and the program reloaded.

Error Allocating Memory For Disk Table:
This error message indicates the memory for the table used in formatting could not be allocated. The format command is not valid after this message. One possible solution for this error is to reboot the computer and reload the program.

Testing Errors

Error Resetting Drive:
This error message indicates the disk could not be reset back to track 0.

No Drives Activated For Testing:
This error message occurs when an attempt is made to test a drive and no drives have been selected for testing. The 'Drive - Change Test Drive' command should be selected and the desired drives activated.

No Configuration Set For Drive:
This error message occurs when an attempt is made to test a drive which has not been configured. In order to test the drive the user should select the 'Configure Drive' command and configure the drive to be tested.

Drive Not Ready:
This error message usually indicates no disk is present in the drive or the drive door is not closed. This problem is usually corrected by simply inserting a disk in the drive or closing the drive door.

Printer Errors

Printer Busy:
This message indicates the printer is currently busy with another task.

Printer Out Of Paper:
This message indicates more paper should be loaded into the printer.

Printer I/O Error:
This message indicates an input/output error has occurred.

Printer Not Selected:
This message indicates the printer was not selected before attempting to print.

Printer Time Out:
This message indicates there was no response from the printer. Possible causes could be the printer being off line or the cable not being connected.

No Entries For Drive Selected:
This message indicates there are no error entries listed for the particular drive selected. If this error occurs another drive which has entries listed in the table should be selected.

Input Errors

Illegal Entry For Current Configuration:
This error indicates the number input is not in the range of the current drive configuration. A new value within the current drive configuration should be input.

Illegal Interleave:
This error indicates the interleave amount input is not valid for the current drive.

Ending Input Is Less Than Starting Input:
This error occurs when entering the partial test area. The error indicates the ending value for testing is less than the beginning value for testing.

Cylinder Exceeds 2048 Cylinder Maximum:
This error occurs when the configuration for the maximum cylinder exceeds 2048.

Sector Exceeds 32 Sector Maximum:
This error occurs when the configuration for the maximum sector exceeds 32.

Head Exceeds 64 Head Maximum:
This error occurs when the configuration for the maximum head exceeds 64.

Format Errors

Error Setting DASD - Do Not Use Format Selection On This Disk:
This error indicates an internal programming error when attempting to set the DASD. The DASD is set during the configuration of a floppy drive after the prompt to insert the disk to be used for testing. The DASD is used in formatting, therefore the "Format A Drive" command should not be used on this disk if this error occurs. One possible solution to this error is to reconfigure the floppy drive using a different disk.

Testing Error Messages

Read:
This error occurs during a read operation when a sector on the disk could not be read from.

Write:
This error occurs during a write operation when the data written to the disk cannot be verified.

RNF:
This error indicates a record not found error. This occurs during a read or write operation if a sector could not be found.

CRC:
This indicates a cyclic redundancy check error. The CRC of a sector does not match the CRC expected in that sector.

Seek:
This error indicates a seek error occurred because the track being sought was not found.

Other:
This error column contains any errors which occur other than the five previous listed. The following list contains each of the possible hex codes and the error it indicates.

FFh	Sense Operation Failed
E0h	Status Error
CCh	Write Fault
BBh	Undefined Error
20h	Controller Failure
11h	ECC Corrected Data Error
0Fh	DMA Arbitration Level Out Of Range
0Eh	Control Data Address Mark Detected
0Dh	Invalid Number Sectors On Format
0Ch	Media Type Not Found
0Bh	Bad Cylinder Found
0Ah	Bad Sector Flag Detected
09h	Attempt To DMA Across A 64K Boundary
08h	DMA Overrun

07h	Drive Parameter Activity Failed
06h	Diskette Change Line Active
05h	Reset Failed
03h	Attempt To Write On Write Protected Disk
01h	Invalid Command
00h	No Error

The following hex error codes are used when testing a 344 Meg SCSI drive with a version 2.XX or 4.XX SCSI BIOS ROM.

49h	Inappropriate/illegal message
48h	Initiator detected error
47h	SCSI interface bus parity error
45h	Selection/Reselection failure
44h	Internal controller error
43h	Message Reject Error
42h	Power On diagnostic failure
41h	Data Path diagnostic failure
40h	RAM failure
32h	No Spare Defect Locations Available
31h	Medium Format corrupted
2Ah	Mode Select Parameters changed by another initiator
29h	Power On or Reset or Bus Device Reset
26h	Invalid field in parameter list
25h	Invalid LUN
24h	Illegal use of bit of byte in CDB
22h	Illegal function for device type
21h	Illegal Logical Block Address
20h	Invalid Command Operation Code
1Dh	Compare Error
1Ch	Primary Defect List not found
1Bh	Synchronous transfer error
1Ah	Parameter overrun
19h	Defect List error
18h	Recovered Read data with target's ECC correction
17h	Recovered Read data with target's Read retries
15h	Seek Positioning error
14h	No record found
13h	No Address Mark found in Data Field
12h	No Address Mark found in ID field
11h	Unrecovered Read error
10h	ID CRC or ECC error
09h	Track Following error
08h	Logical Unit communication failure
04h	Drive not ready
03h	Write Fault
02h	No Seek Complete
01h	No Index/Address Mark Found signal
00h	No Error

What "Interleave" Is

The interleave of a drive is a description of how sectors are laid out on the disk. Sector two is not physically next to sector one in most cases. Instead, the sectors are "mixed up" in a logical fashion. Let's take a nine sector track as an example. If we use an interleave of two, the sectors would be like this: (1,6,2,7,3,8,4,9,5, and back to 1). This is done by going around the disk clockwise a few times skipping one sector until all sectors have been laid down. Of course this is just an example of interleave, two is not usually used as a good interleave factor.

The reason interleave is needed is because the computer cannot transfer data from the disk to RAM fast enough. Let's try to load an entire track into RAM from a disk without interleave and see what would happen. First sector one will be read in and transferred to RAM. In the meantime remember that the disk is spinning quite fast, approximately 50+ MPH on hard drives. Now the computer wants sector two but finds that sector three is under the head. Sector two passed under the head while the computer was saving the first sector to RAM. So the computer must wait for sector two to come around again. Once the computer gets sector two and saves it to RAM, sector three has already passed under the head and the computer has to wait again. This will happen until all of the sectors of that track have been read. If an interleave of two were used in this example, sector two would be under the head at about the same time that the computer was ready to read sector two. This would eliminate the need to wait for the sector to pass under the head a second time.

For the purpose of using "DISKREL", the default interleave factor given is sufficient. Interleave is only important when the drive is being reformatted after "DISKREL" is completed. The interleave factor for hard drives varies with customer preference and the optimum performance of a particular drive.

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U.S.A.: FORT WORTH, TEXAS 76102
CANADA: BARRIE, ONTARIO L4M 4W5

TANDY CORPORATION

AUSTRALIA	BELGIUM	FRANCE	U. K.
91 Kurrajong Avenue Mount Druitt, N.S.W. 2770	Rue des Pieds d'Alouette, 39 5140 Naninne (Namur)	Centre Commercial des 3 Fontaines B.P. 147 95022 Cergy Pontoise Cedex	Bilston Road Wednesbury West Midlands WS10 7JN