



*Storage Technology Division*

***Drive Fitness Test  
Usage Instructions***

To support World Wide Web release of DFT v2.10

*9 February, 2001*

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# What is Drive Fitness Test?

IBM has a long track record of innovation in the hard disk drive industry, starting with the development of the first disk drive in 1958. Many technologies common today in disk drives were first introduced on IBM disk drives, pursuing goals of providing highest performance and capacity in highly reliable mechanisms within industry standard form factors.

One of the latest innovations has been the introduction of Drive Fitness Test (DFT), now available on the Worldwide Web. The purpose of DFT is to test a hard disk drive while it remains inside a personal computer, even when the primary operating system may no longer be bootable. This is suggested when it is suspected that there is a malfunction that could be related to the hard disk drive. This is helpful, as often problems occur with data content and management unrelated to the function of the disk drive itself. In these cases, a reload of the operating system, or similar recovery action, is all that would be required to recover the computer. This avoids unnecessary disturbance of the disk drive and usually will preserve other existing data belonging to the user, which may not have been backed up.

The basic Drive Fitness Test (i.e. Quick, Advance and Exerciser) is non-destructive, which means that it will not perform any write operations in the user data area. This option was chosen to ensure the maximum integrity of user data.

When run, the Drive Fitness Test will provide a result, from which the condition of the drive - electronics and storage mechanism - can be determined. This can then be used to either choose to change a drive that is defective, or take other actions to restore the functionality of the PC. A further diagnosis may determine that the drive has been subjected to handling damage.

In the event that you have a IBM drive which is reported by DFT as defective, then you will be provided with a Technical Return Code (TRC) which will allow you to check and if appropriate generate a Returns Material Authorisation (RMA) via our web based warranty support process.

**NOTE:** DFT will **NOT** generate a TRC for failed drives that were not manufactured by IBM.

In addition to hard drive testing, DFT contains utilities, which allows the following functions to be carried out: -

- S.M.A.R.T (Self-Monitoring, Analysis and Reporting Technology) to be enabled or disabled.

- Erasure of the disk Master Boot Sector

- Total Erasure of the data in the user area of the disk

- View useful information about the drive, e.g. Microcode level, Spec. Compliance.

More information and background about DFT is available from  
<http://www.storage.ibm.com/hardsoft/diskdrdl/technolo/dft/dft.htm>

# DFT System Fundamentals

The Drive Fitness Test provides for in-depth testing of IBM disk drives and basic testing of Other Manufacturers drives. This new version will support standard disk drives with the ATA/IDE and SCSI interfaces. The test will not overwrite customer data.

The Drive Fitness Test (DFT) application is designed to run under DOS and should have been received as a executable file *dft32-vxxx.exe* (where *xxx* may vary), over the Internet, or as a prepared floppy diskette. If the file has been received over the Internet you will need to follow the procedure below to prepare a suitable diskette.

If you have received a prepared floppy, proceed to the section below entitled **DFT Hardware Support and Restrictions**.

## Creating a DFT Test Diskette

### Windows 9x & NT

The Drive Fitness Test set-up program ( *dft32-vxxx.exe* ) includes IBM PC DOS2000 and the Drive Fitness Test. In order to run the set-up program you will need to have access to a system that is running any of the following operating systems, Windows'95, Windows'98, Windows Millennium, Windows NT, or Windows 2000 and a formatted 1.44-MB diskette. Running the set-up program creates an IBM PC DOS2000 bootable diskette that contains the Drive Fitness Test.

It is recommended that before starting the set-up program, all open Windows applications should be closed.

The following represents two examples of how the DFT diskette can be created.

#### *Method A.*

1. Insert a formatted diskette into the Floppy drive, (**A:** or **B:**).
2. Using Windows Explorer, locate the program *dft32-vxxx.exe* downloaded from the Internet.
3. To start diskette creation double-click on the program icon and follow the on screen instructions. **Note:** you have the option to select your country location and keyboard layout, the default for these options is United States.

#### *Method B.*

1. Click Start, then select Run.
2. Click the Browse button to locate the *dft32-vxxx.exe* set-up program.
3. Click on the filename, then click Open.
4. Click OK to run the *dft32-vxxx.exe* set-up program.
5. Insert a formatted 1.44-MB diskette into the required floppy drive ( A or B if your system has 2 floppy drives ), select the target floppy on the set-up screen then click next to continue.
6. Follow the on screen instructions.

## Linux

The Drive Fitness Test image file (e.g. dft-v210img.bin) includes IBM PC DOS2000 and the IBM Drive Fitness Test. The name of the image file will change according to the release version of DFT.

Running the Linux Disk Dump (DD) utility creates an IBM PC DOS 2000 bootable diskette that contains the Drive Fitness Test Utility.

A formatted 1.44-MB diskette is required to create the DFT diskette.

To create the bootable DFT diskette under Linux:

1. Download the DFT image file (dft-v1.XXimg.bin) into a known directory on your PC.
2. Insert a formatted 1.44-MB diskette into your floppy disk drive.
3. Make sure that the floppy disk is unmounted.
4. Change directory to where you saved the DFT image.
5. Run the Disk Dump (DD) utility with the following parameters:  
**DD if=dft-v210img.bin of=/dev/fd0 bs=8k**
6. The bootable DFT diskette will now be created, Note this could take a couple of minutes.

## DFT hardware support and restrictions

DFT will run on ATA and SCSI attached disk drives. From version 2.1 onwards DFT will also support testing of disk drives that have been manufactured by OEM manufactures in addition to IBM. However the depth of testing which will be carried out on the non-IBM drives will be less than that performed on the IBM drives.

DFT will run on SCSI drives if these drive are attached to SCSI controllers that have a DOS ASPI layer that supports hard disk drives. Some SCSI controllers have ASPI layers that offer support only for removable media devices e.g. CD-ROM's, Tape etc. if you have this type of controller a ASPI Manager that allows hard disk support will be required in order to test your SCSI hard disk drives using DFT.

DFT supports UDMA/33, UDMA/66, and UDMA/100 plug-in PCI-to-ATA adapters from Promise Technologies, CMD and adapters based on the HIGHPOINT HPT366 and HPT370 chipset. Windows sees these adapters as SCSI controllers through a non-standard architecture and drives attached to these adapters will be reported as being attached via PCI adapters.

Drive configurations **NOT** supported: drives attached using ATA RAID and Multi-Channel SCSI RAID controllers.

## SCSI Requirements:

To test SCSI drives DFT requires a DOS loadable ASPI manager for the SCSI Controller that the drives are attached to. **Note:** Some ASPI managers offer support only for removable media devices e.g.

CD-ROM's, Tape etc. check the documentation that was supplied with your SCSI controllers or contact your SCSI controller supplier to see if this is the type of ASPI managers you have.

DFT is supplied with ASPI managers that support several different types of SCSI controllers, see the section '*Supplied ASPI Managers*' at the end of this document. If your SCSI controller is not listed you will need to obtain a DOS ASPI manager that supports your controller. Check the software supplied with your controller or the web page of your controller manufacturer.

Having obtained a DOS loadable ASPI manager you will need to update the DFT diskette as follows,

1. Copy the ASPI manager program(s) to the **ASPI** sub-directory on the diskette.
2. Using a text editor (e.g. Notepad, Wordpad etc.) edit the file **Config.sys** on the diskette to include the ASPI manager under the **SCSI** heading.

e.g. **DEVICE=A:\ASPI\abcdef.sys** where abcdef.sys is the name of your ASPI manager.

(Your controller documentation should detail how to add an ASPI manager to a configuration file).

## Running DFT

Place the prepared floppy disk in the system to be tested and boot the system either by powering off then on or pressing the reset button or by pressing the <Ctrl><Alt><Delete> keys.

When the system restarts you will be offered a menu with two options

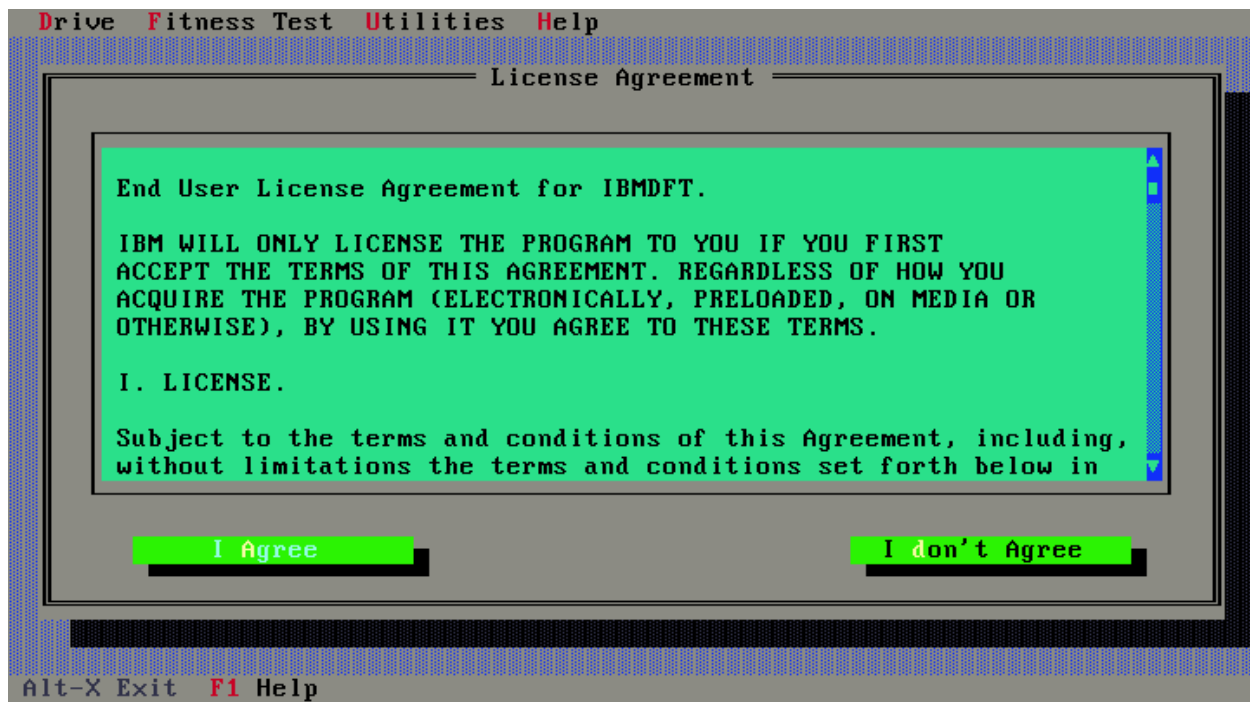
1. SCSI and ATA support
2. ATA support only

Select option **2** if you have only or wish to test only ATA drives.

Select option **1** if you have only SCSI or a mix of SCSI and ATA drives.

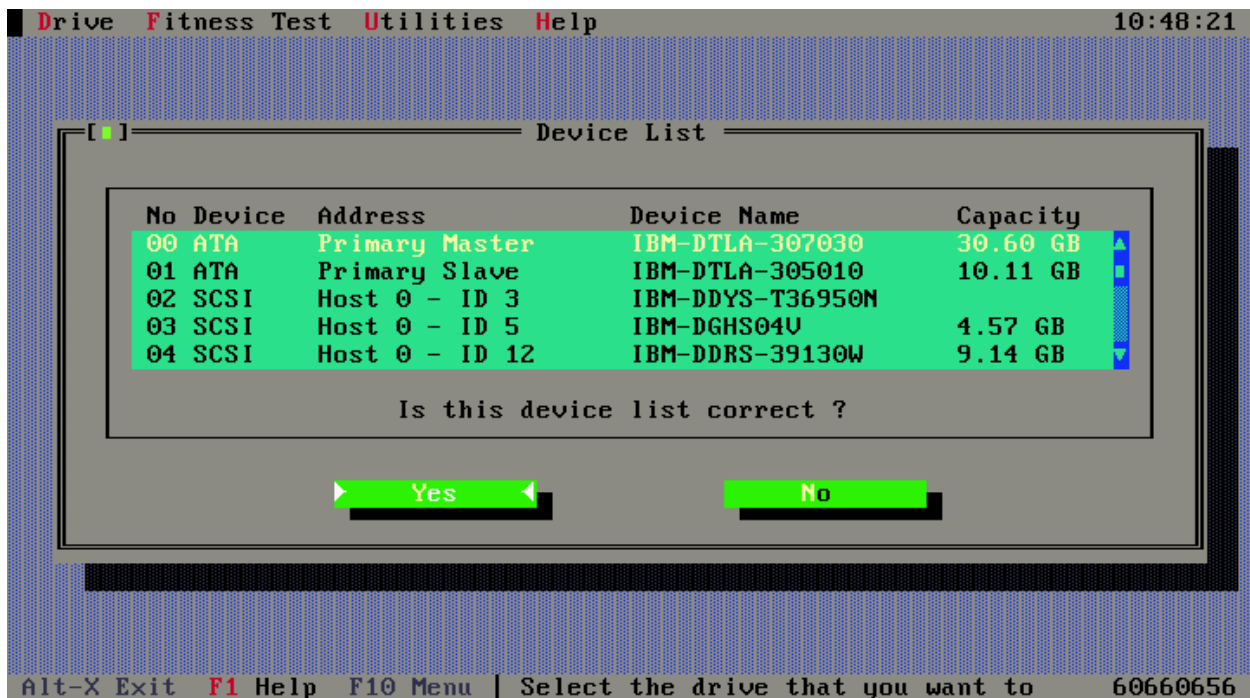
**Note:** the system will attempt to load all the ASPI files listed in the config.sys file, if the relevant SCSI controller is not installed in the system an error message may be displayed on the screen. This is normal and isn't a problem.

**IBMDFT** will be loaded automatically and you will be presented with License Agreement as shown below.



This is a license agreement, which you should review prior to accepting using the “**I Agree**” button. The positioning and tab keys can be used to navigate through the license agreement and buttons.

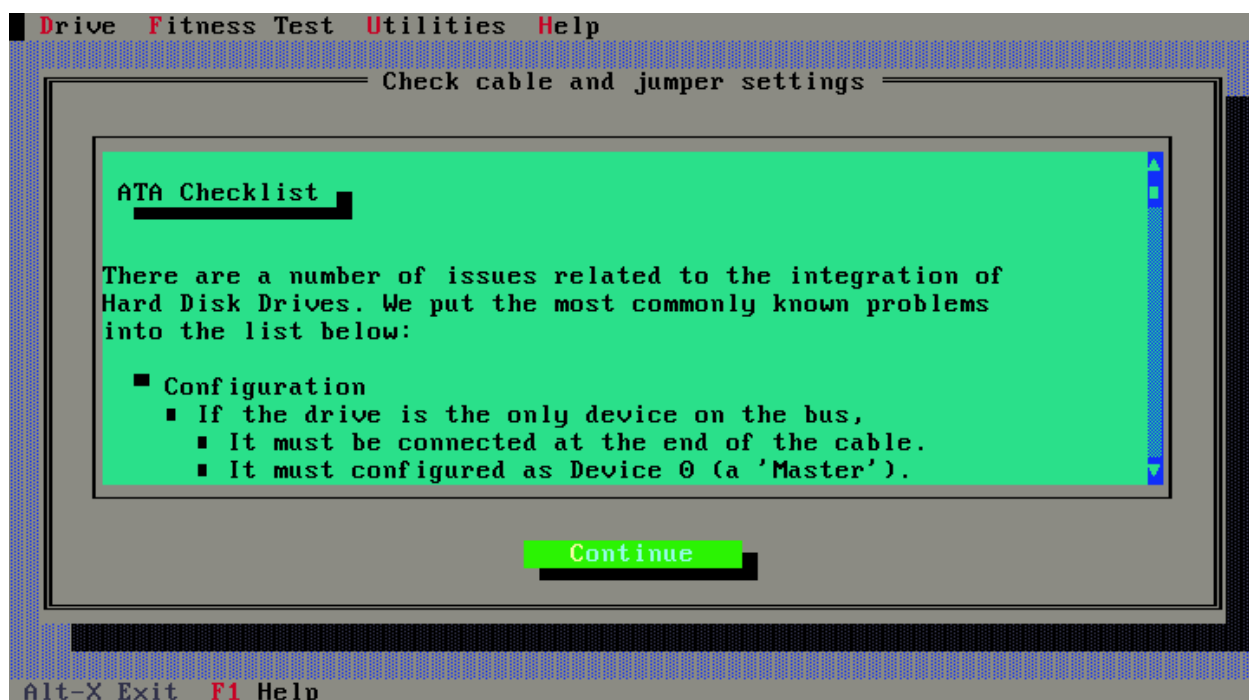
The program will progress only if the user accepts the license using **I agree**. DFT will then analyse the connected drives and proceed to the screen below



If the drives in the list represents what you know to be installed in your system then you should press the **Yes** button, after which you will be presented with the main DFT Test Menu, see page 11.

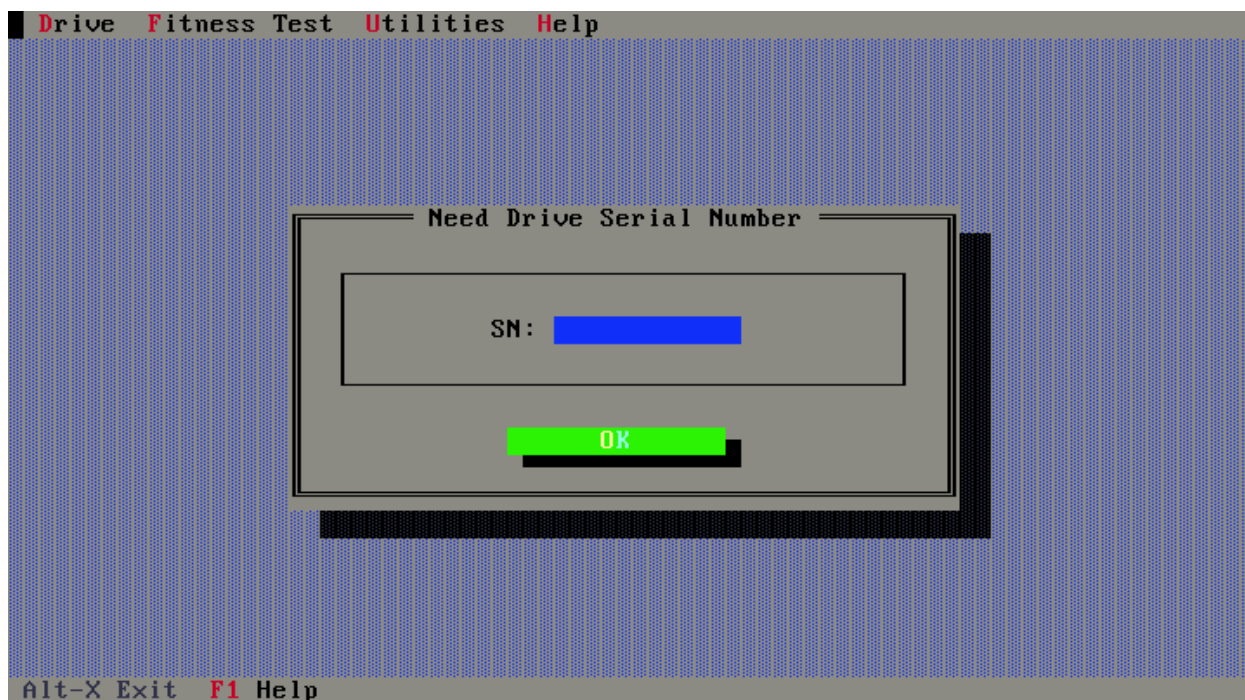


If the list doesn't contain the drive(s) that you wish to test then select **No**, you will be presented with the screen below. This window provides information about cabling and jumper settings, which could prevent your drive from being detected, please power-off your system and check that your drive is correctly installed and re-start the DFT test.

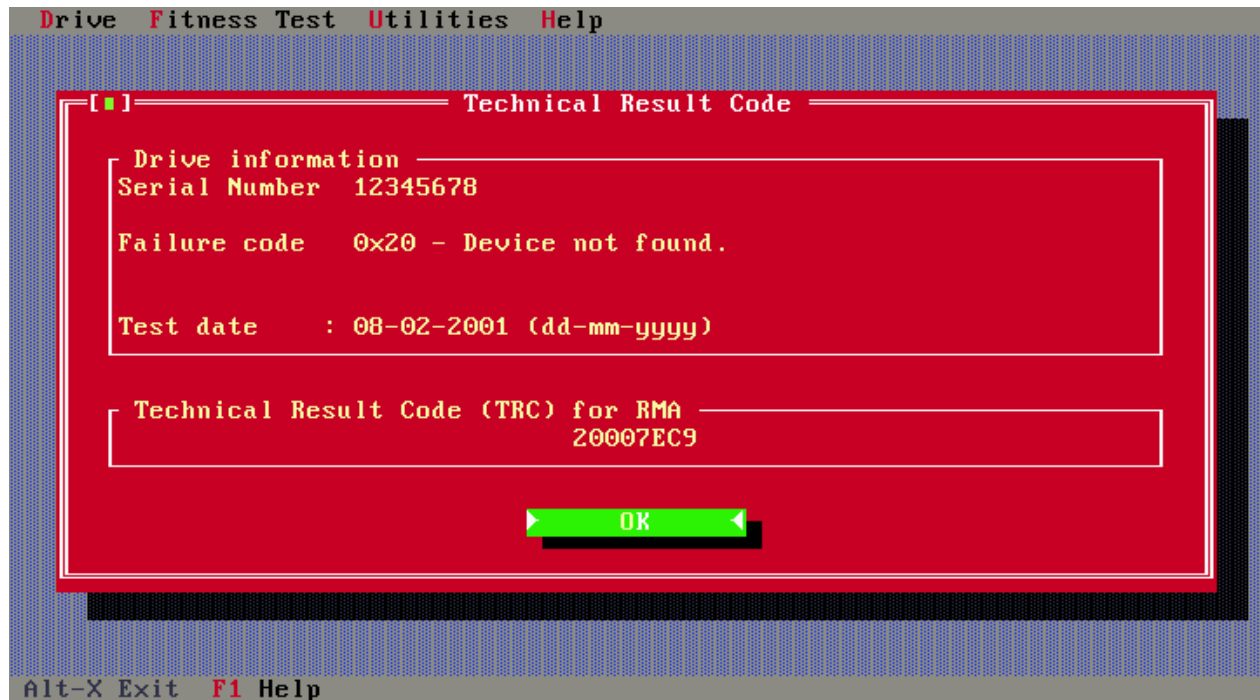


**NOTE :** the following applies for non-detected IBM drives only

If you have made all the checks and your **IBM** drive is still not detected then press the continue button, after which you will be presented with the following screen, type in the serial number of the **IBM** drive that DFT failed to detect and press OK to continue.

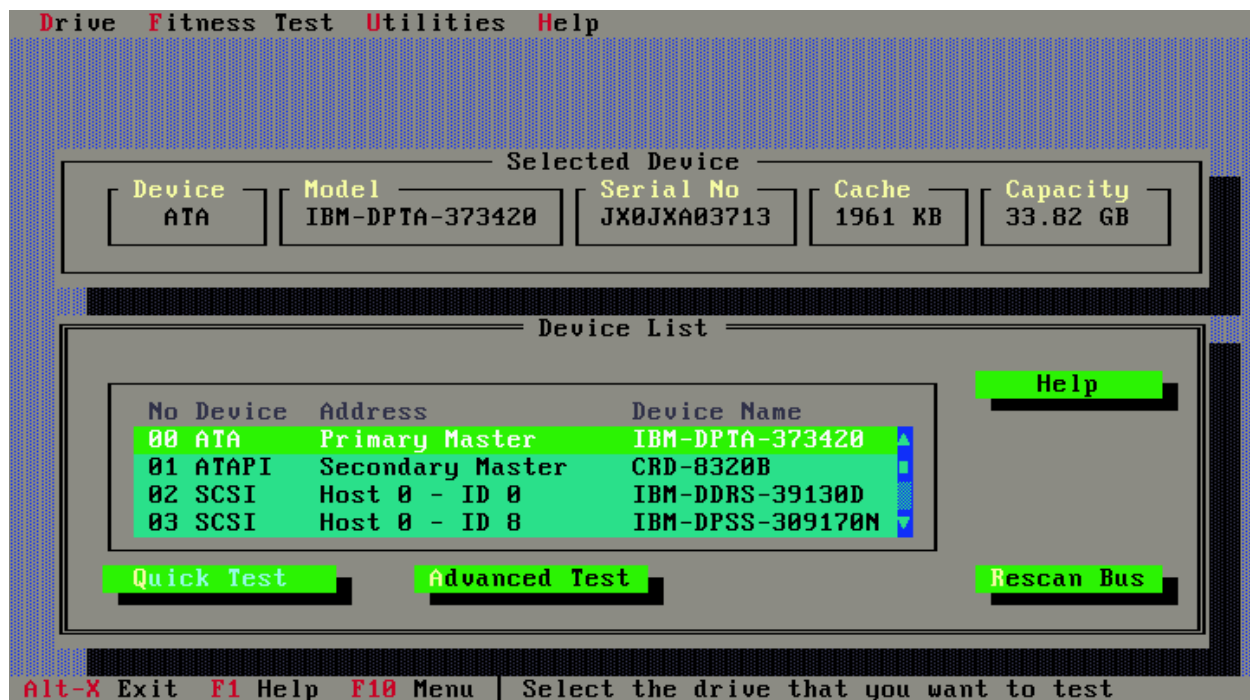


The following screen shows the Technical Result Code window, this window contains information which you will require in order to use the IBM web based warranty process or when calling the Technical Support Centre. Please make record this information and press OK when finished.



If this is the only IBM drive in your system or the only drive you wished to test when the following screen is displayed you can exit the program and shutdown your machine.

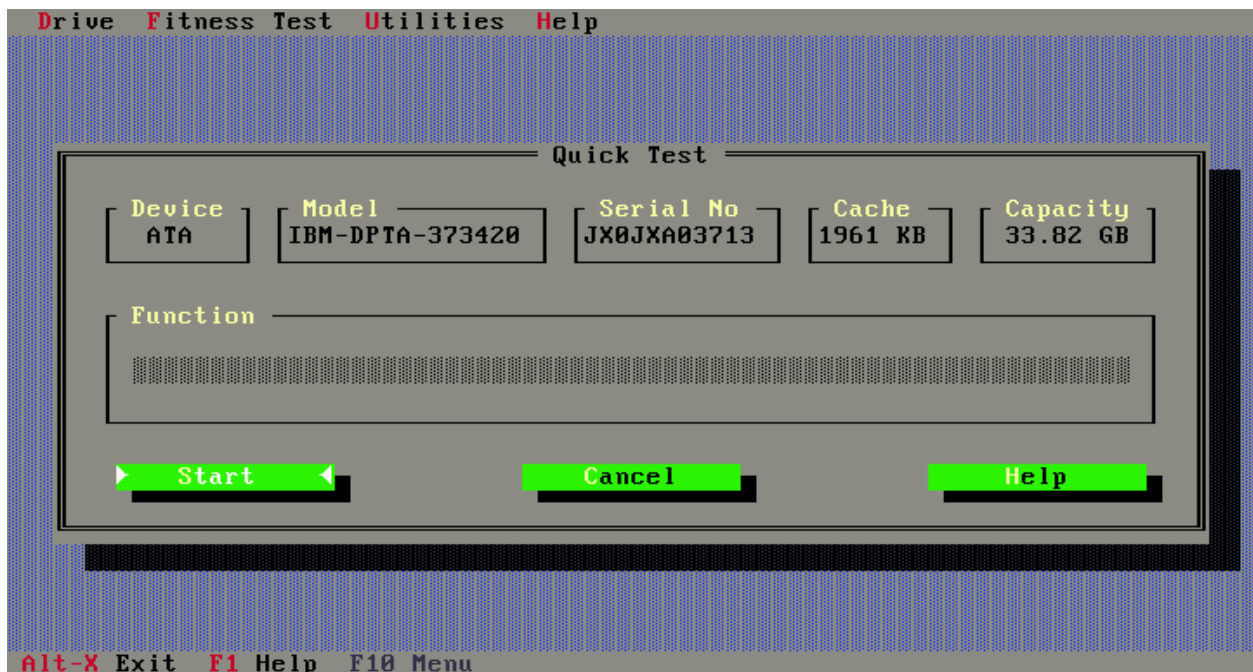
The following picture shows the main DFT Test Menu screen,



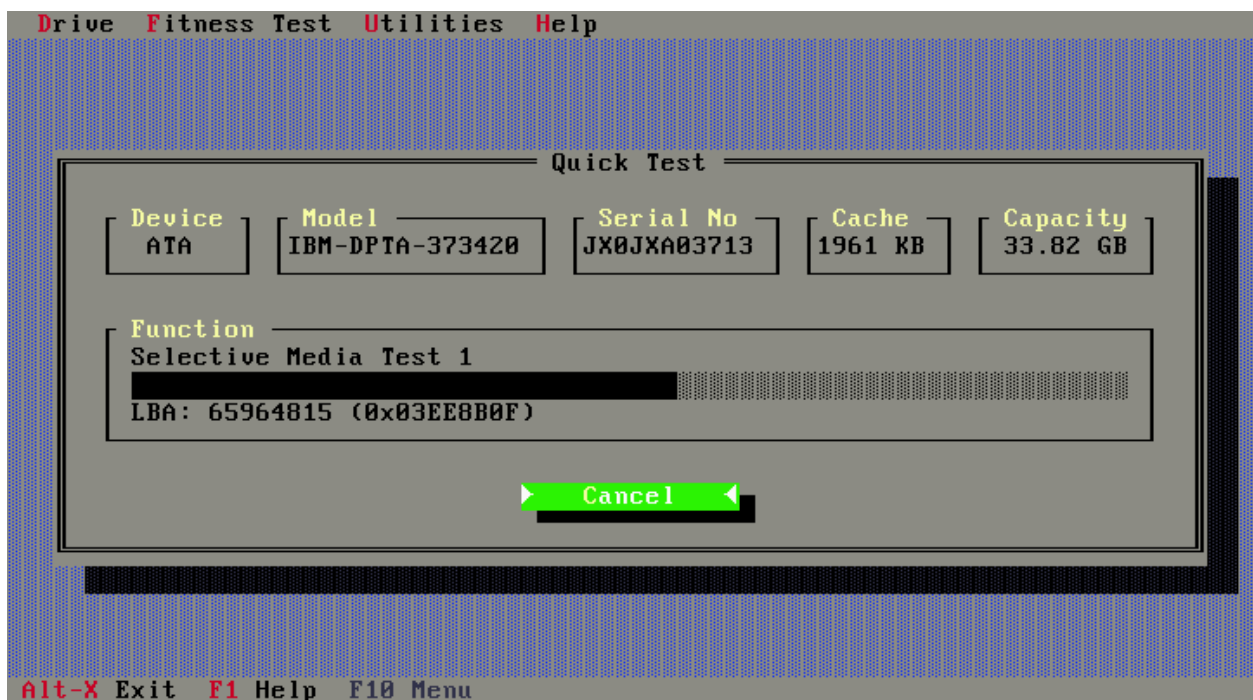
In this example, there are four drives present in the menu, one ATA hard disk, one ATAPI CD-ROM and two SCSI hard disk, with the ATA drive selected. The path generally to be taken is to select the **Quick Test** simply by pressing the **Enter** key.

# Quick Test

This leads to the next screen. Here the test is ready to start on the selected drive.



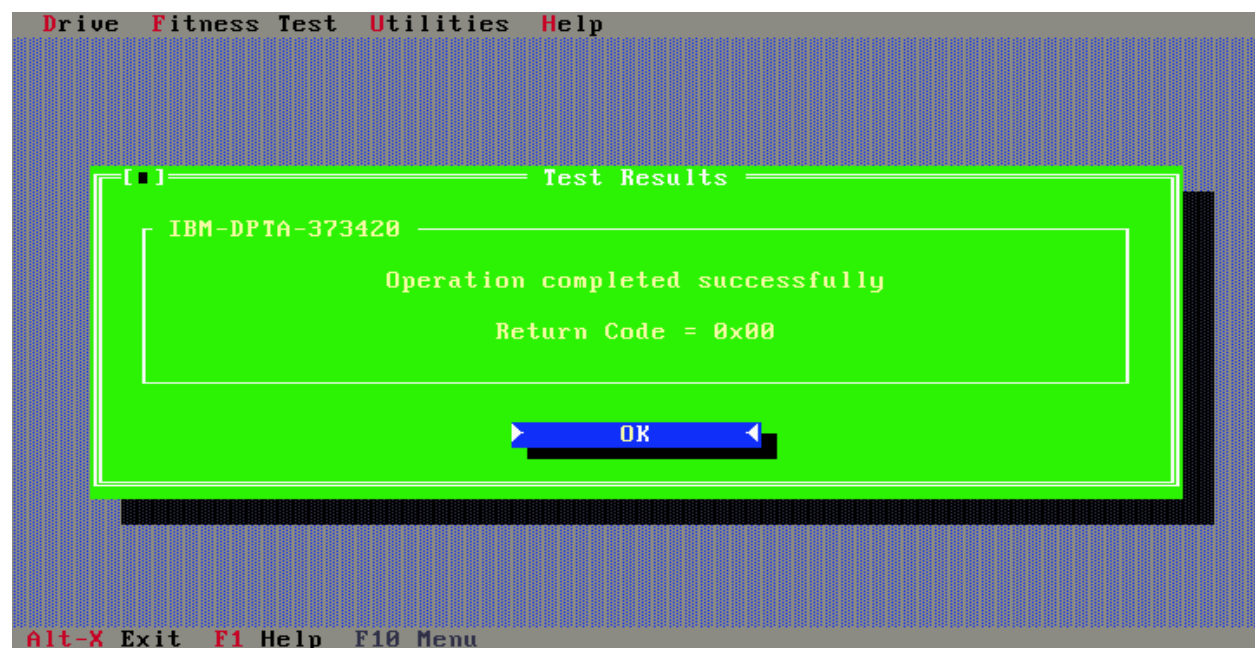
All that needs to be done is to press enter again to **Start** the test, which is seen running in the next screen.



In the screen above, the DFT test is running. The active part of the test is seen to be named (Selective Media Test 1), and the progress bar illustrates progress through the active stage. DFT execution for the Quick Test should be less than 3 minutes in most circumstances.

DFT only performs read tests in the user data area, so your data files will not be overwritten.

The next screen shows the conclusion of a test. In this case, the drive passed the DFT testing.

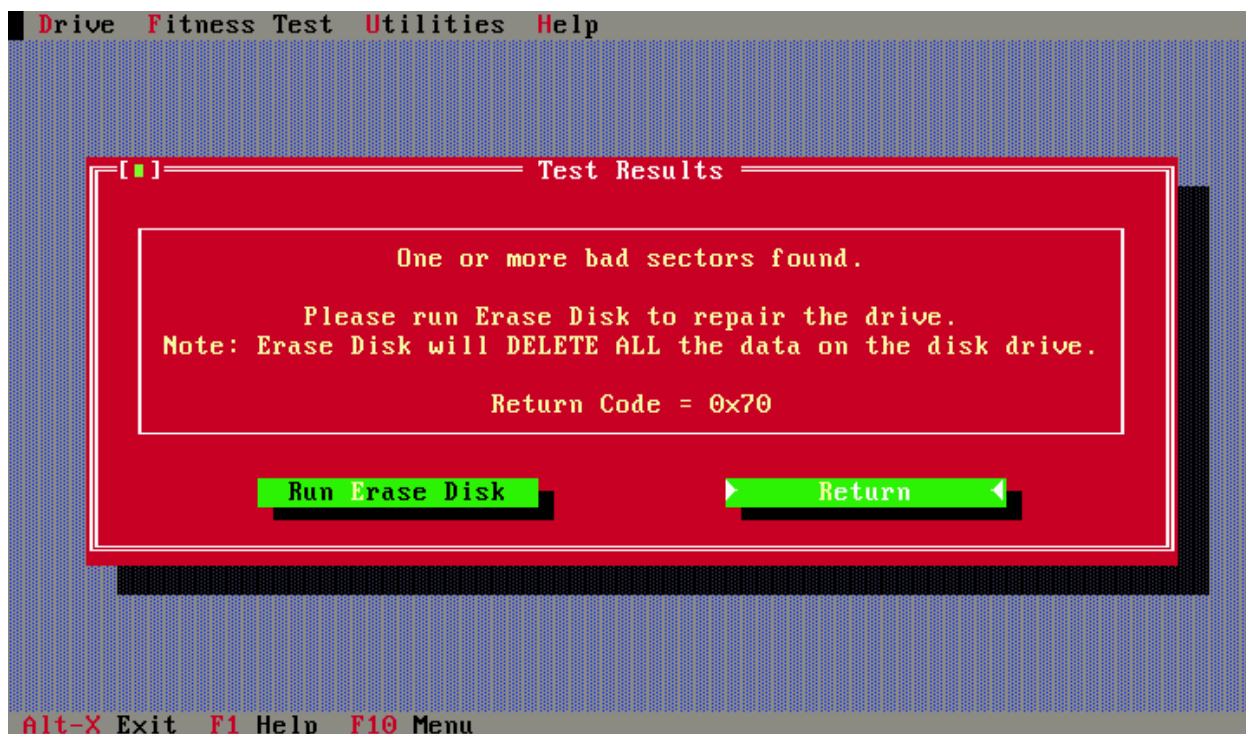


What does passing Quick Test mean if my system is not starting up correctly?

If the system is failing to boot (start up), then your next steps may be to

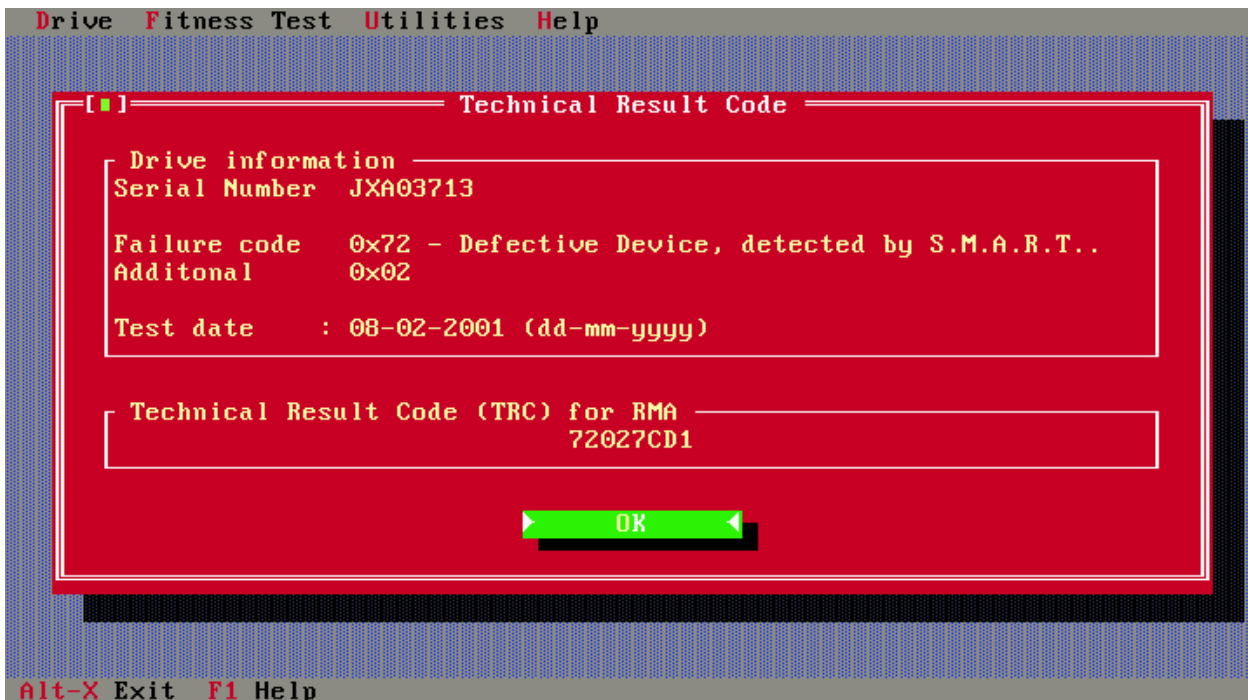
- proceed to check all of the data on the drive using Advanced Test (described below)
- or analyse the PC in other ways, in particular with respect to rebuilding the operating system (usually Windows 95, 98 or NT). Please review the PC and operating system manuals and use PC manufacturers support lines if appropriate.

If a failure is recorded, then a red screen appears. If the cause of failure is due to a media error (for example a bad write) then you will be presented with a screen as shown below giving the opportunity to run Erase Disk. **NOTE – Erase Disk WILL delete all the data on your disk.**



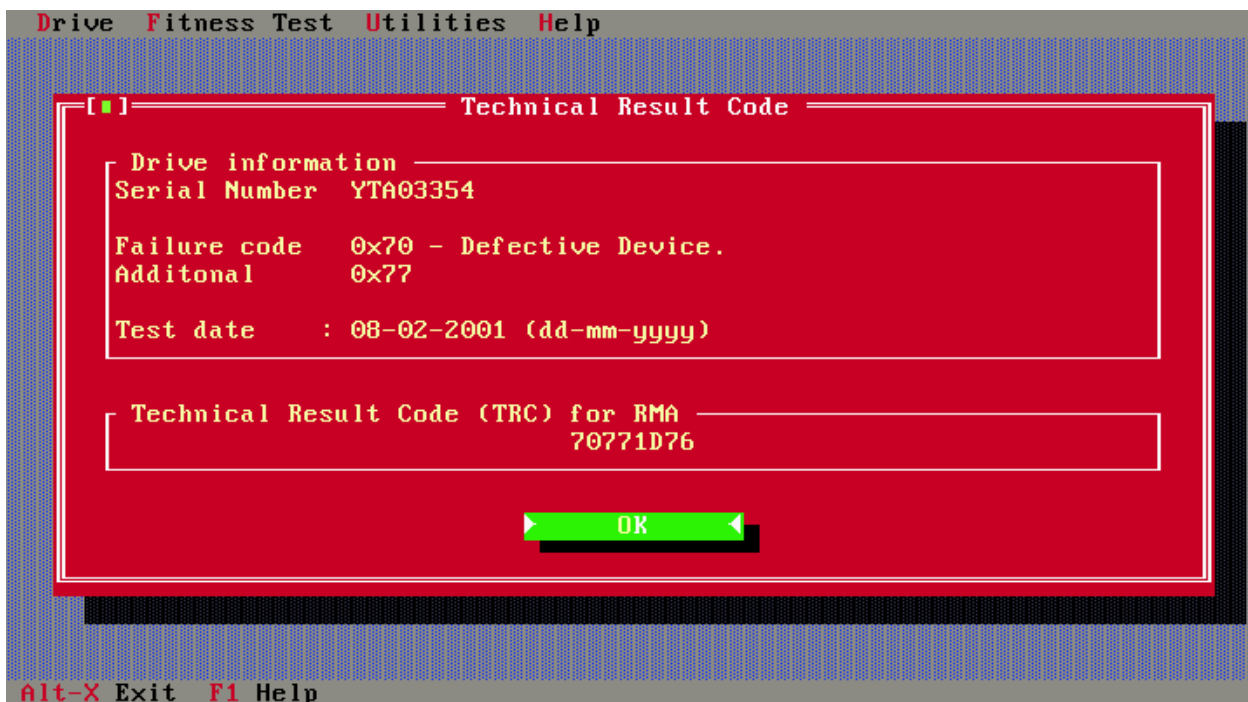


The next screen shows an example of a non-media test failure.



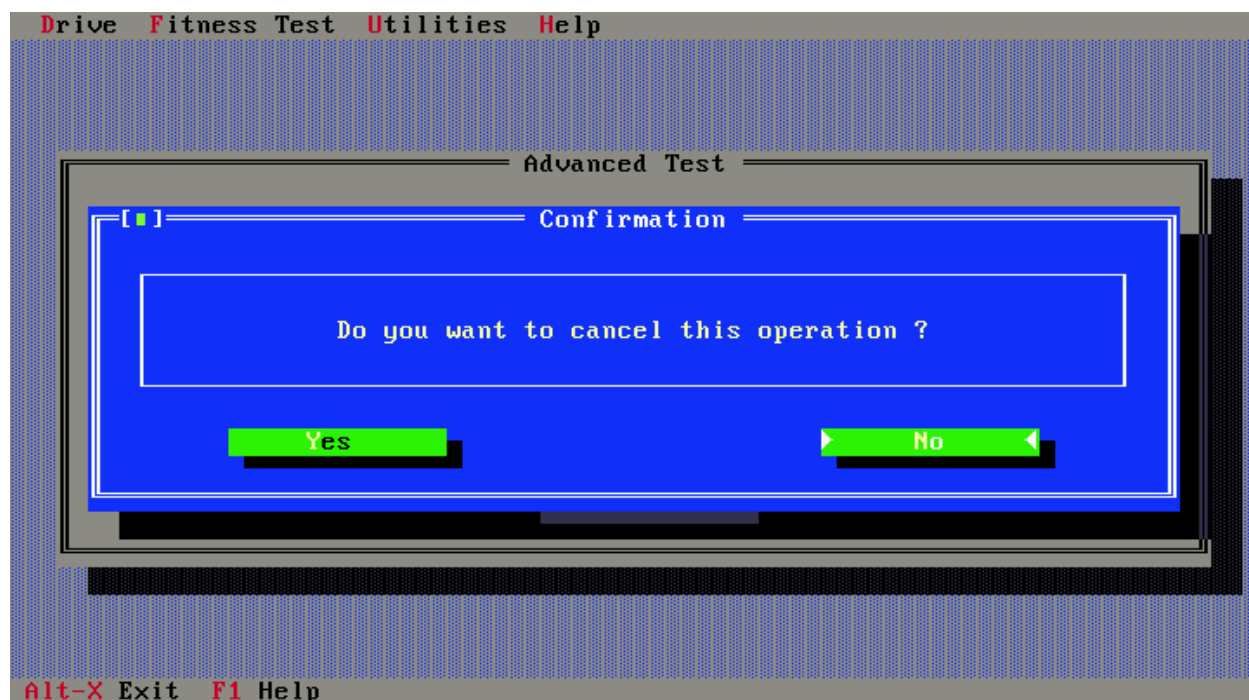
In this case, the failing return code 0x72 represents a S.M.A.R.T. error. The S.M.A.R.T. system is a disk drive's way of notifying of possible failure in the future (see Utilities Section for more information on S.M.A.R.T.).

In all cases of test failures the following screen will be displayed.

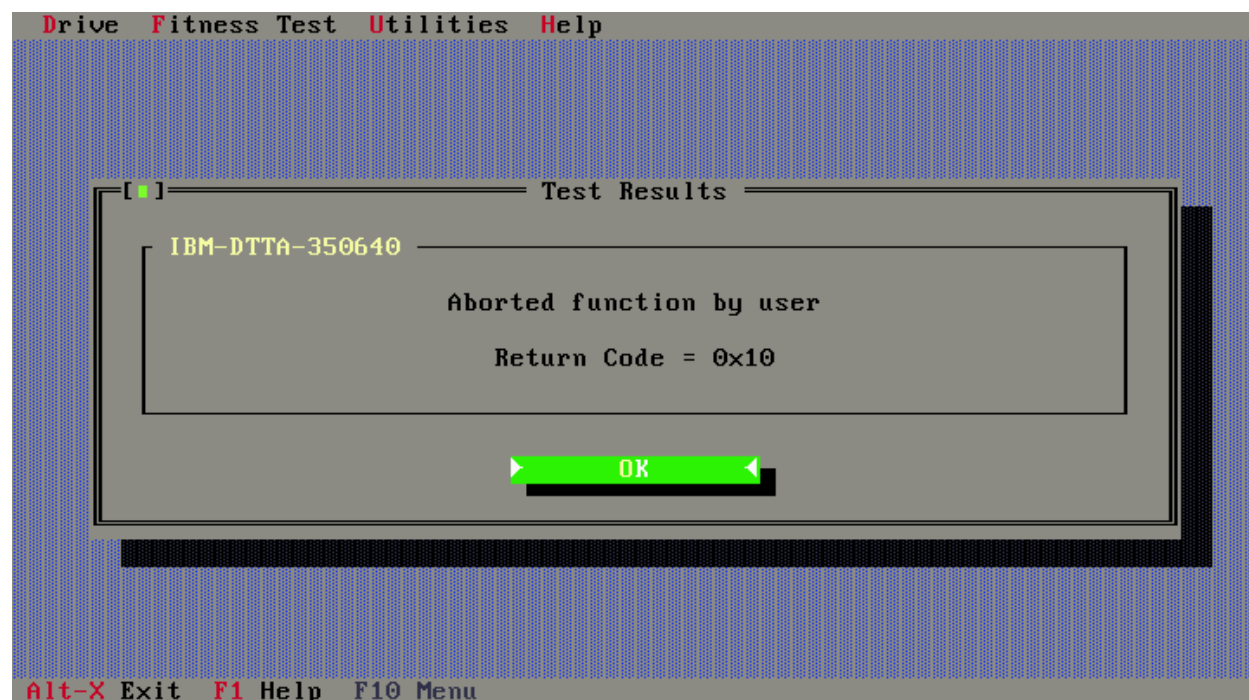


In all cases the test result should be noted as it may be required in discussion with your supplier or support centre in order to take steps to replace the hard drive or to obtain a RMA (return materials authorisation) through the IBM web based warranty process.

If the test is stopped, for example by pressing the **cancel** button during test, the following will appear.



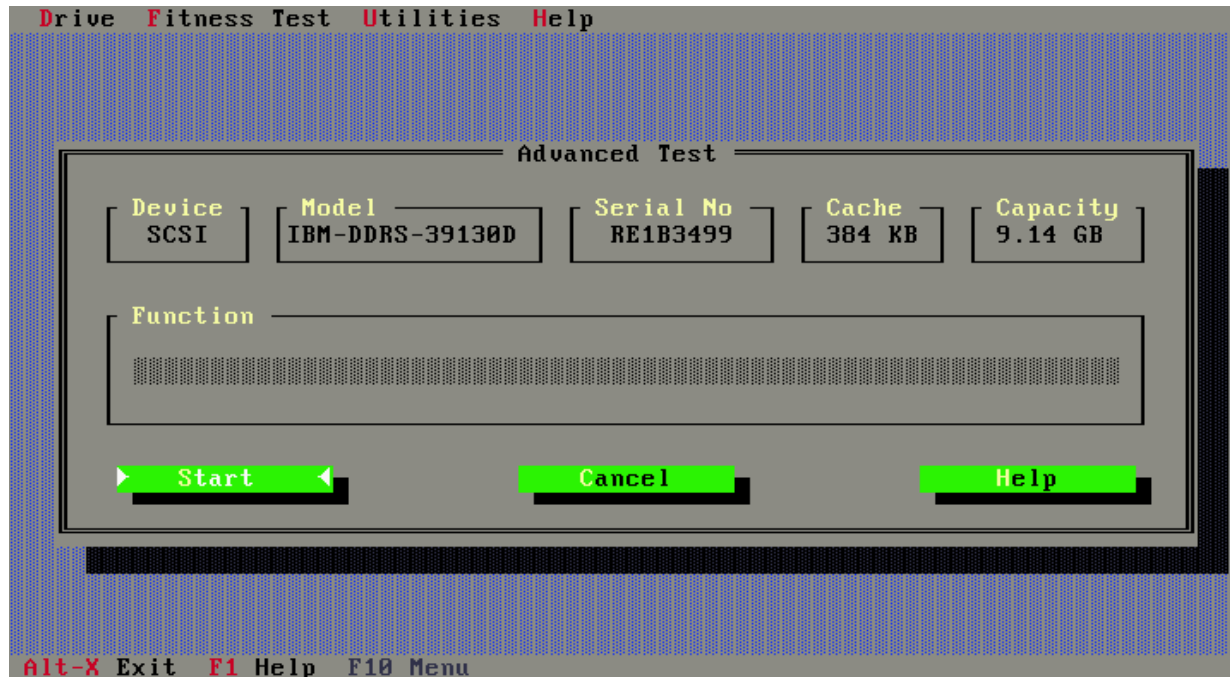
If **Yes** is selected, then the test will be stopped as shown in the next screen.



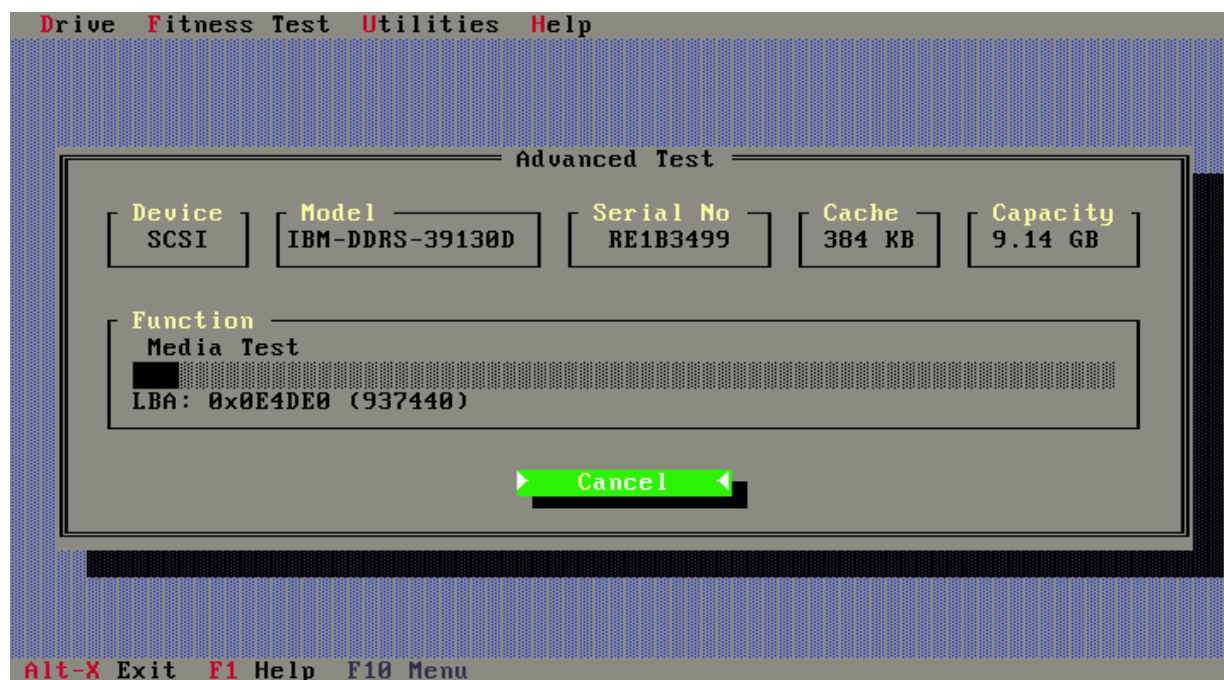
This says that testing has **not** been completed, and is not a statement of either pass or fail. Testing must be restarted and completed normally. The return code 0x10 is not an error.

## Advanced Test

If the **Advanced Test** option is selected, testing is similar to Quick Test, but all of the data area of the selected disk drive will be tested.



DFT only performs a read test in the user data area, so your data will not be overwritten. Execution time will normally be up to about 40 minutes, but this can be longer for very large capacity drives. Progress will be illustrated as shown here.

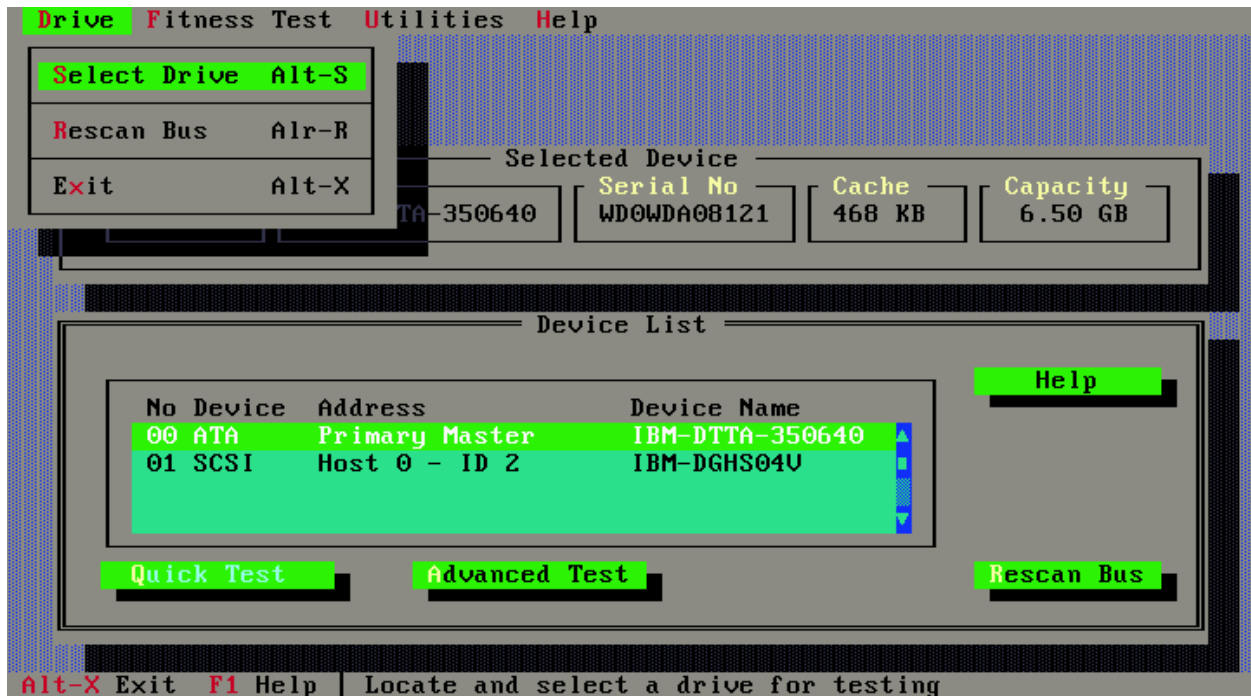




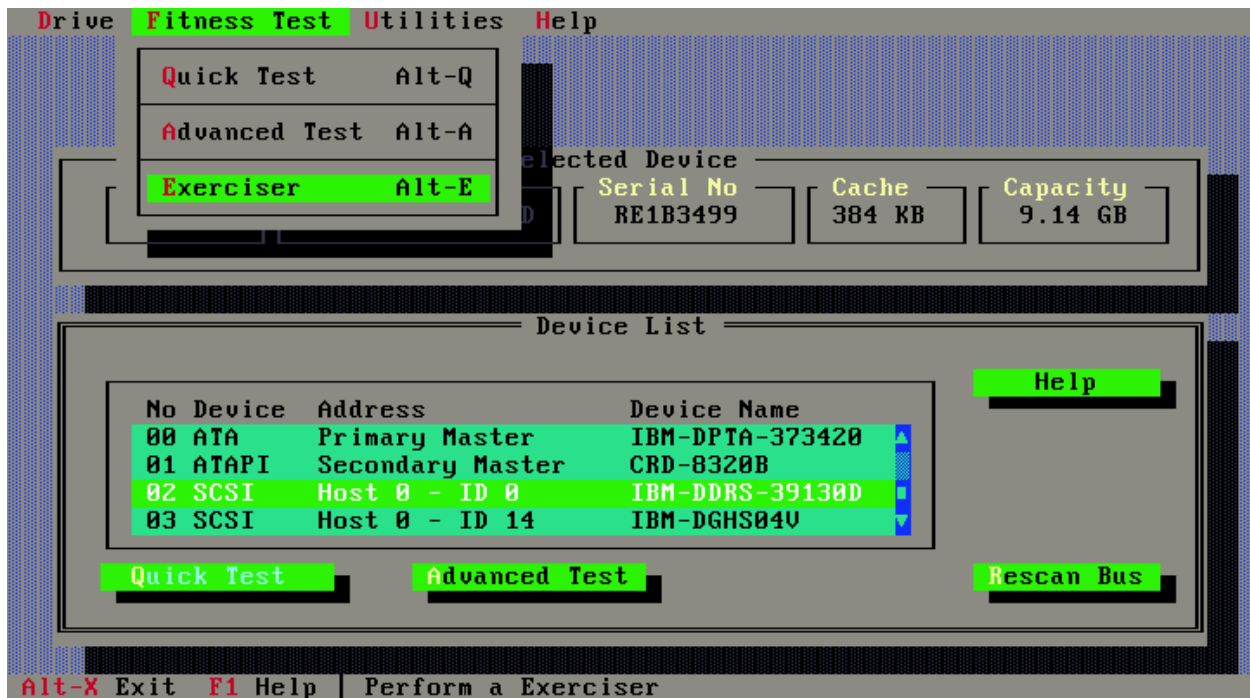
# Advanced Topics

## Menus

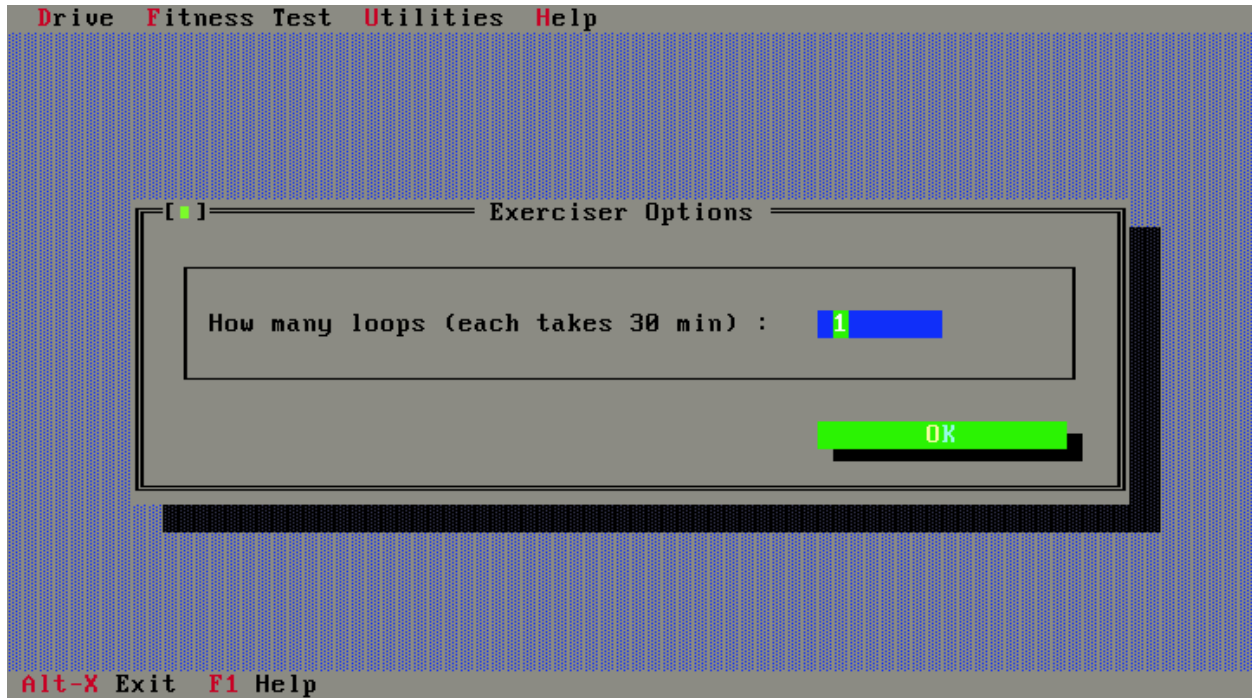
Use F10 to select the highlighted DOS menu keys, as illustrated below. These are generally repeat functions but also allow access to additional tests and utilities.



The **Exerciser test**, as shown in the next screen, can be accessed from the menu or by using the Alt-E key combination.

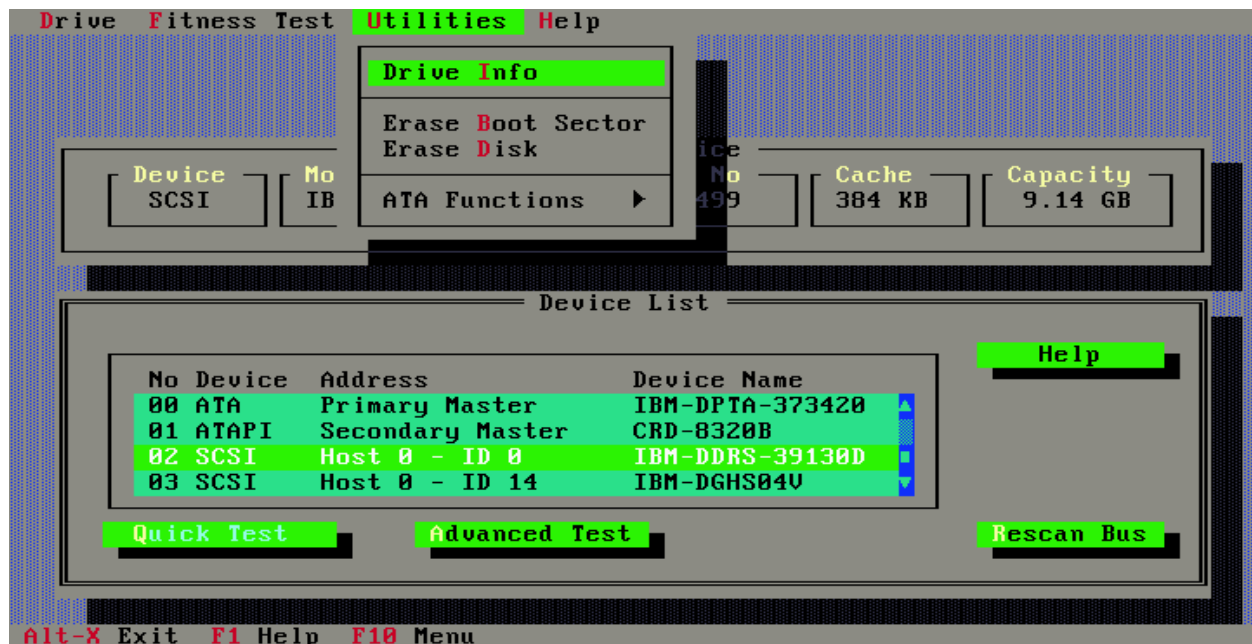


The Exerciser is an **Advanced Test** with the addition of a number of additional 30 minute drive tests. The number of these 30 minute periods is set in the following screen. The pass / fail / abort mechanism is similar to that of Quick Test.

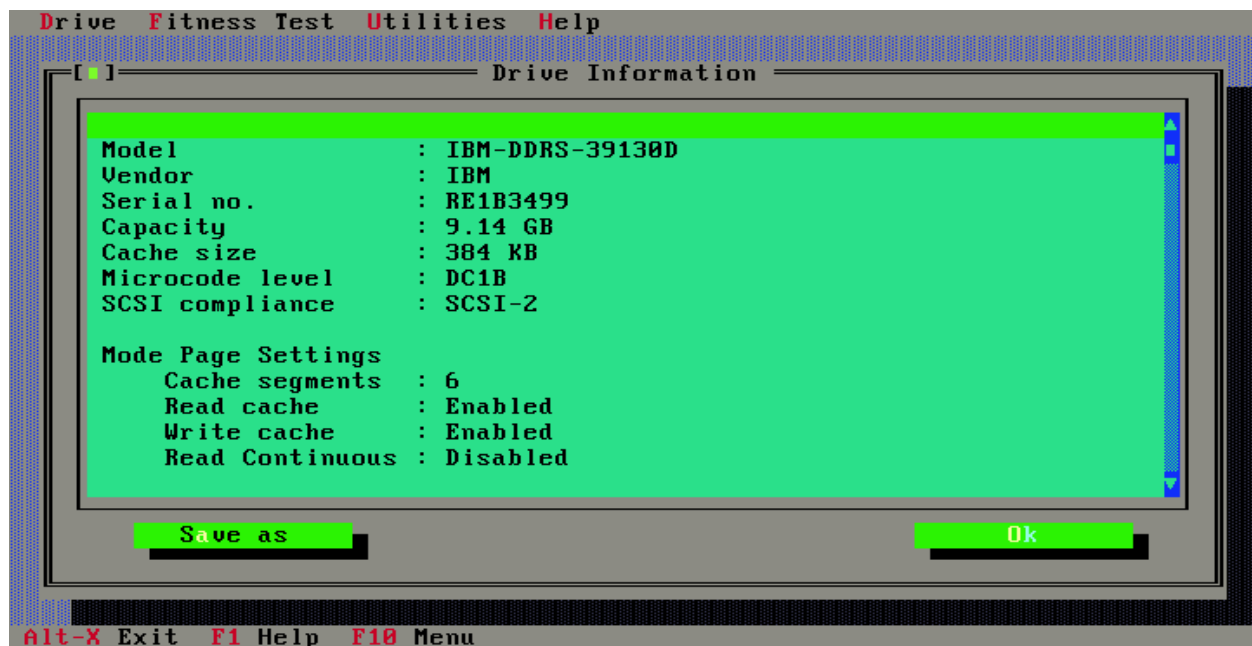


## Utilities

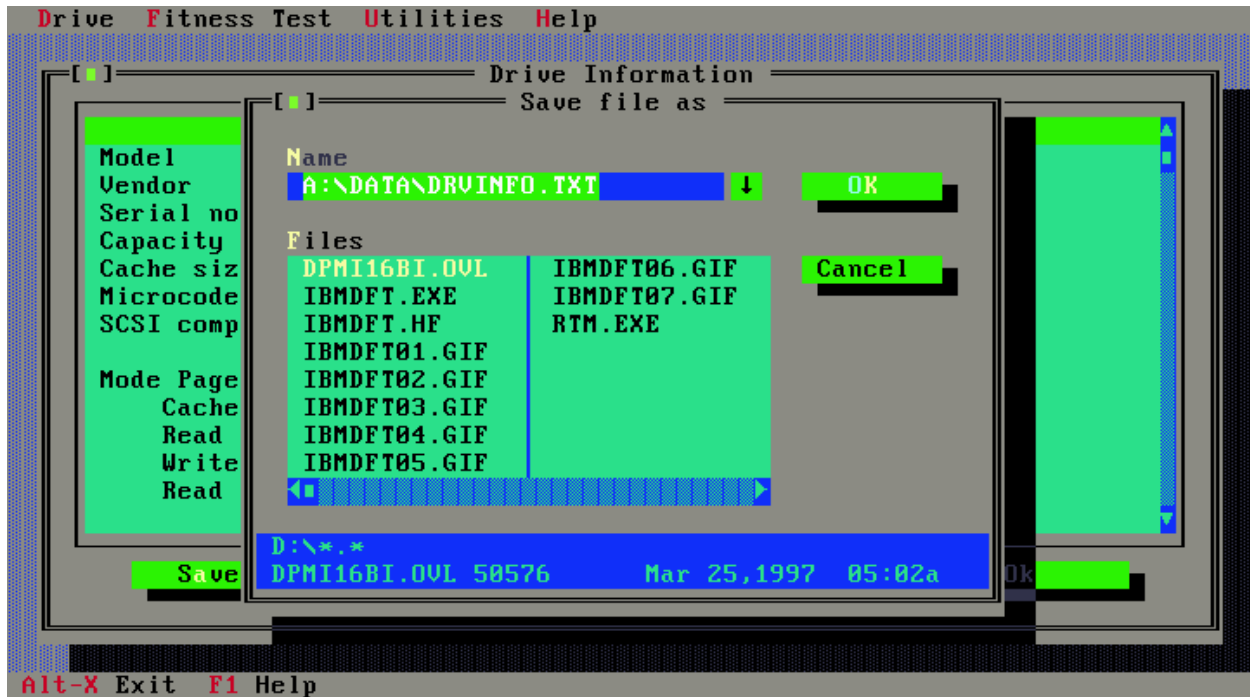
The Utilities menu as shown below, gives you access to several useful tools. These should be used with **CARE**, for unlike the test described earlier the *Erase Boot Sector* and *Erase Disk* utilities **WILL** permanently erase data from your drive(s).



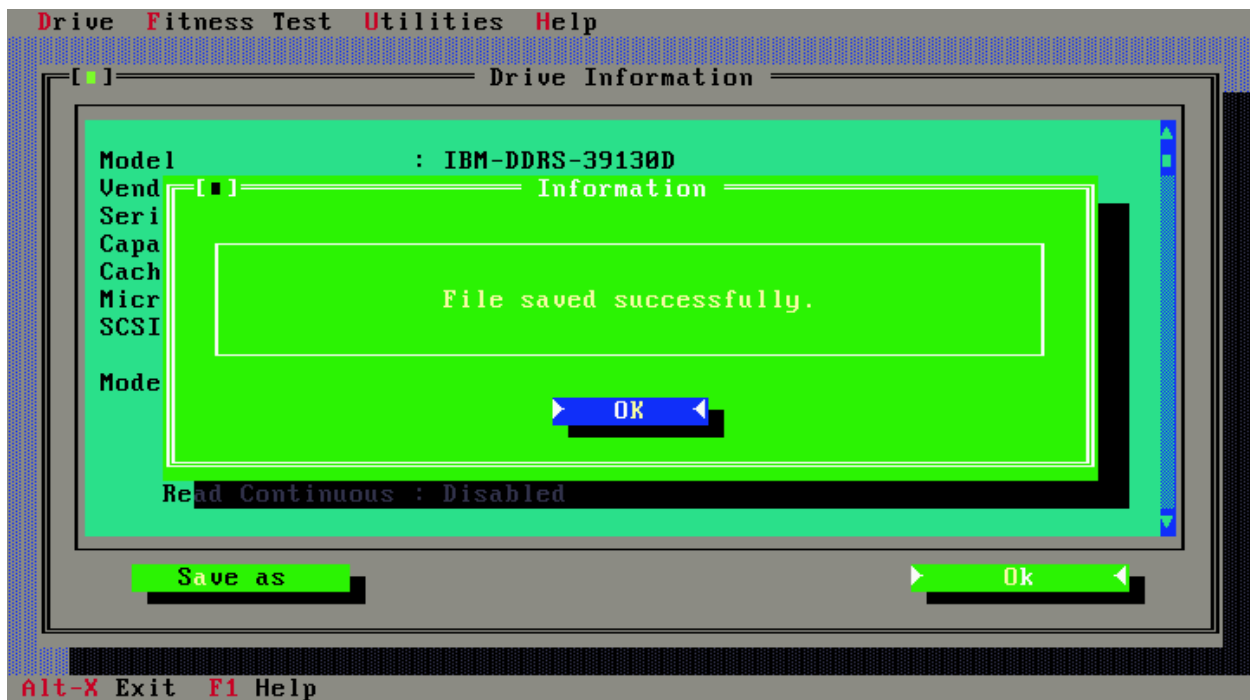
Selection of the **Drive Info.** Option as shown above will display useful information about the selected drive, see following screen. This information will be useful if you need to report a problem back to your drive supplier or IBM.



The drive information displayed above can be saved to a text file in the **data** sub-directory on the floppy drive. The default name of the text file is **DRVINFO.TXT** as shown below, you can change the filename by typing over this name with for example the drive serial number.



The following screen will be displayed to confirm that the file has been saved.

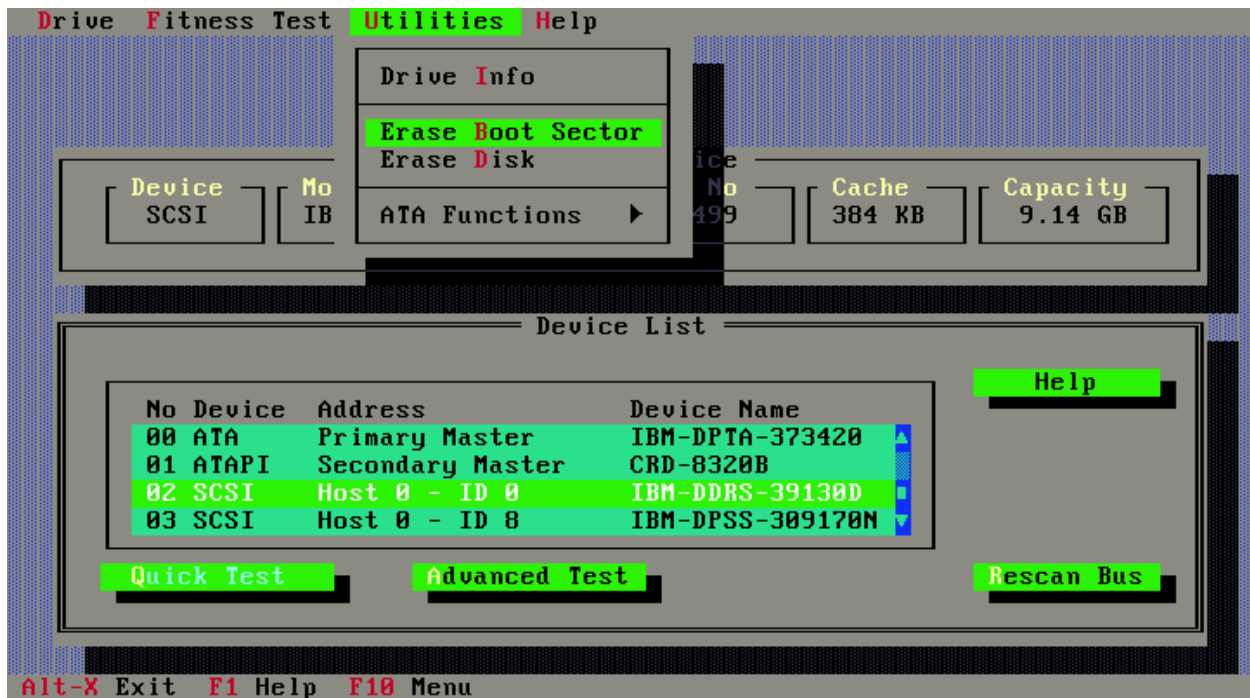




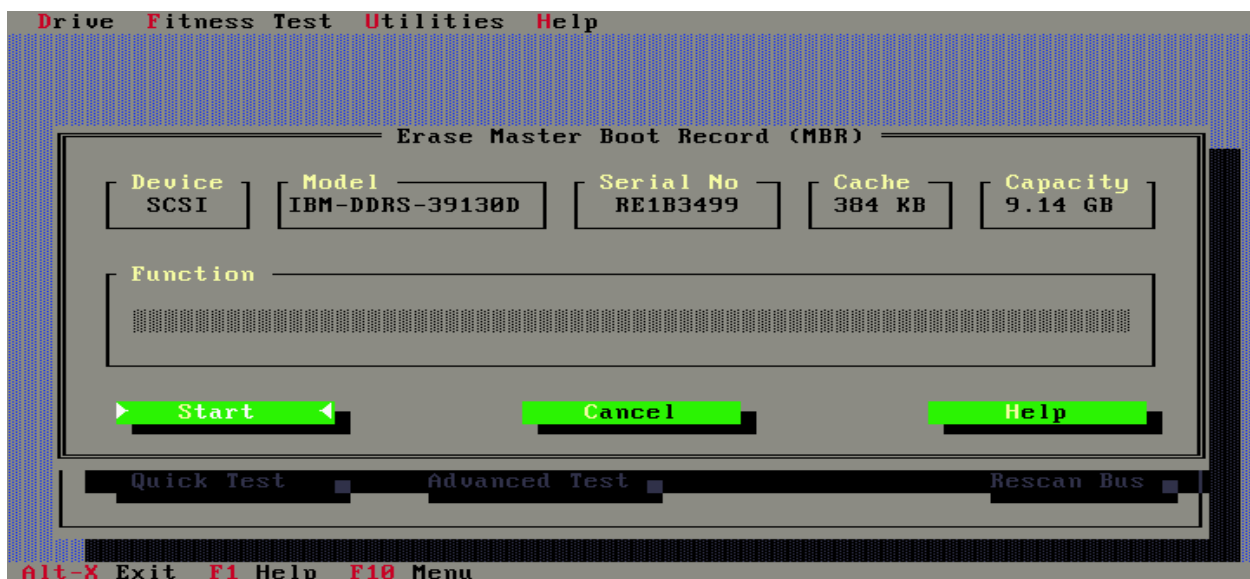
## Erase Boot Sector

The boot sector of a disk contains the start-up programs for your operating system, it also contains information about how your disk is partitioned. If this sector becomes corrupted in any way and this is your boot drive you may not be able to start your system or access data on the drive. Re-installation of your operating system in a small number of cases may not fix the problem, for these cases you will need to erase the boot sector, partition the drive and re-install your operating system.

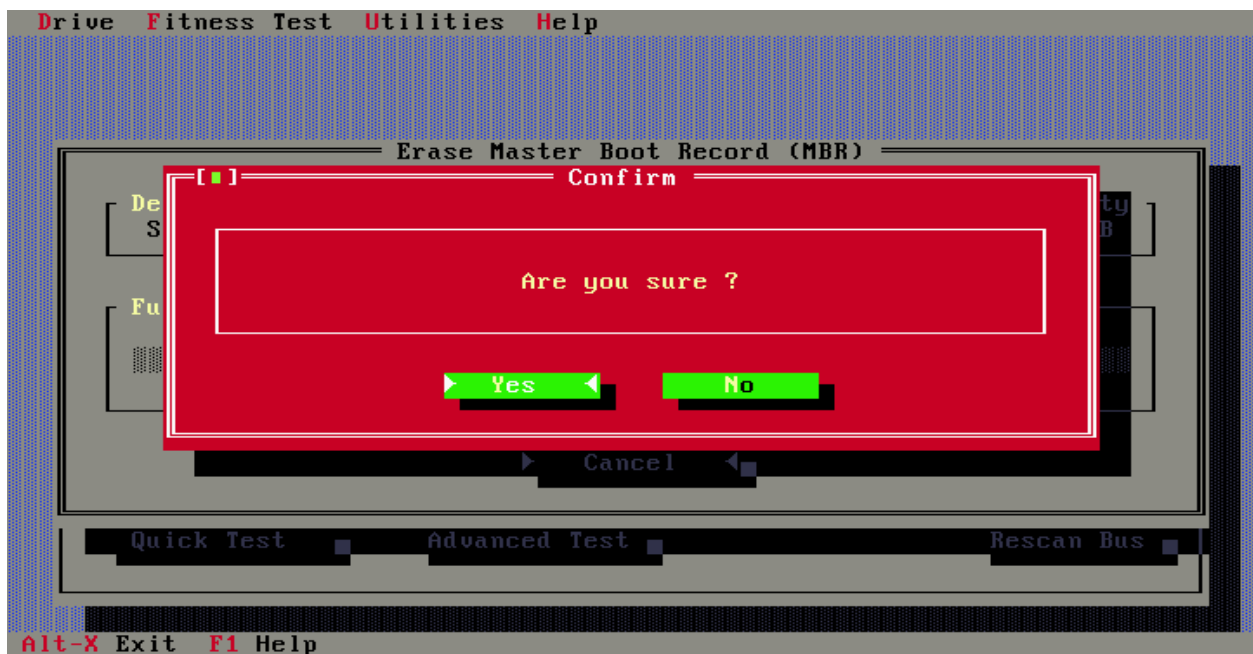
This utility will erase the boot sector by over writing the original information in this sector with zeros. It can be used with both IDE and SCSI drives.



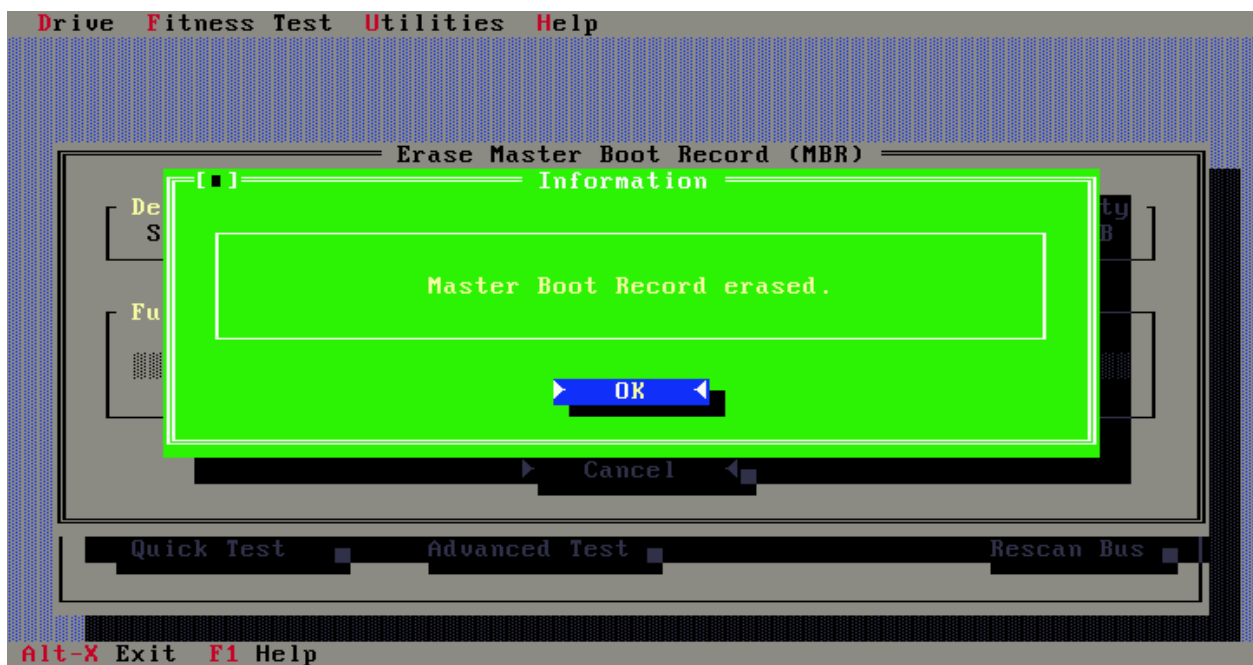
Selecting Erase Boot Sector from the Utilities menu above will display the following screen



This utility will overwrite data on your hard drive, to ensure that you really wish to do this you will be presented with several confirmation screens as shown below, select **YES** in each case to continue.

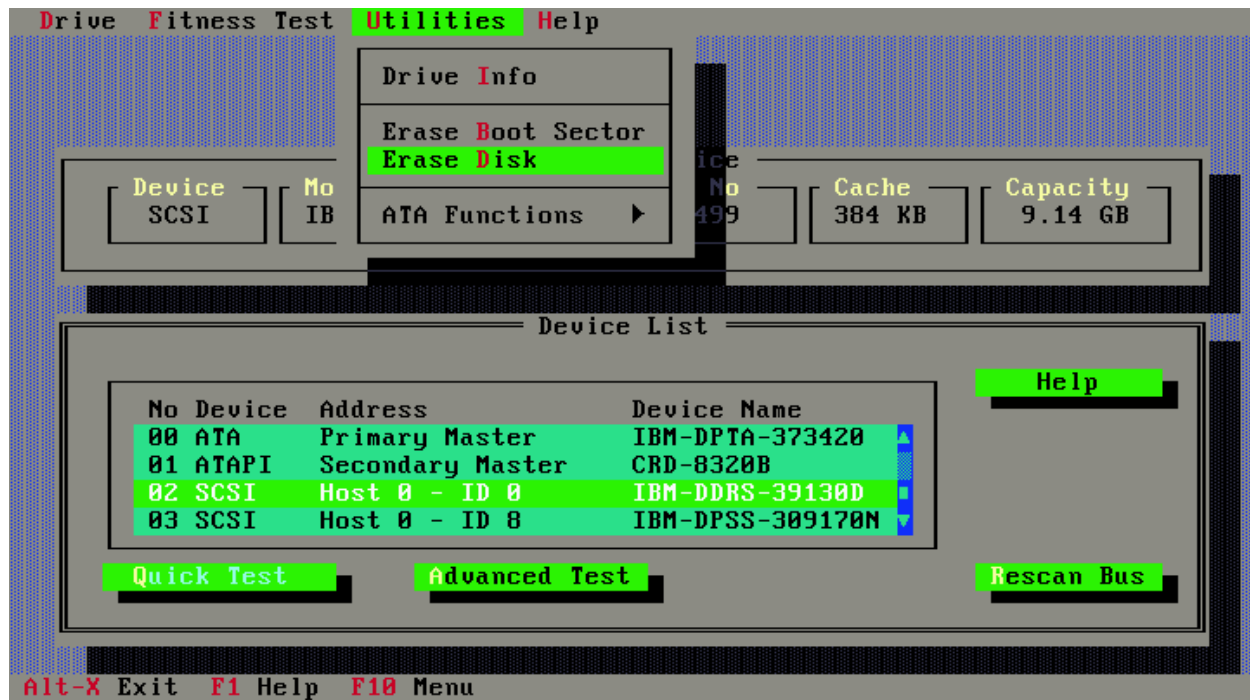


The following screen will be displayed when the operation has been completed successfully.

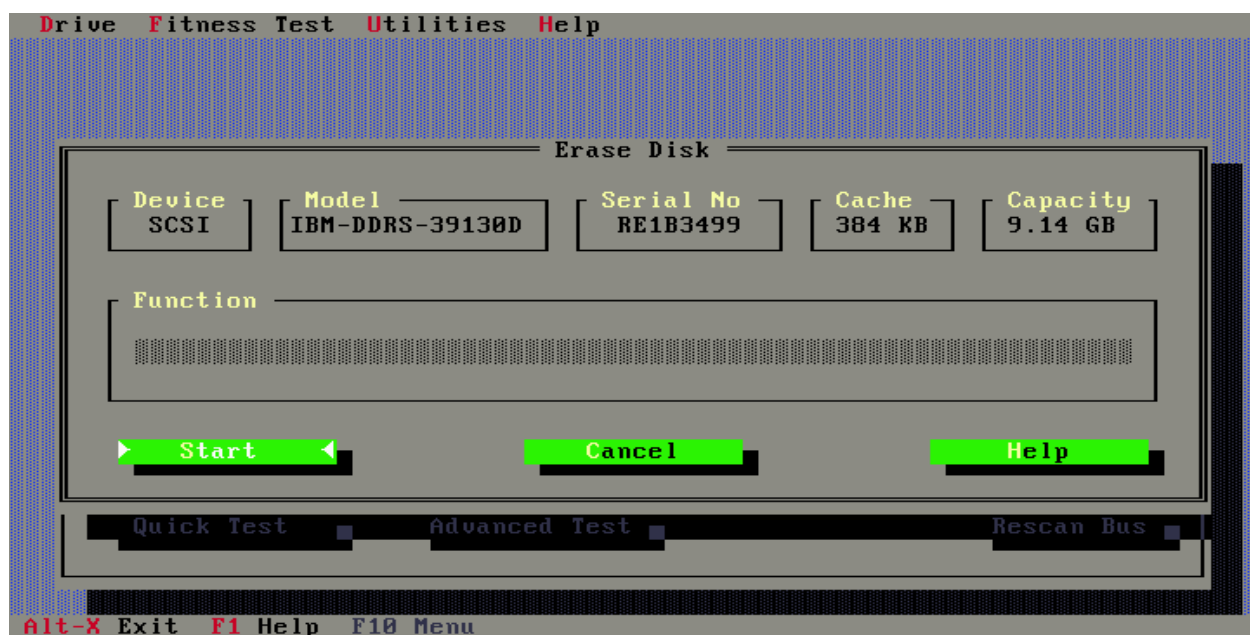


# Erase Disk

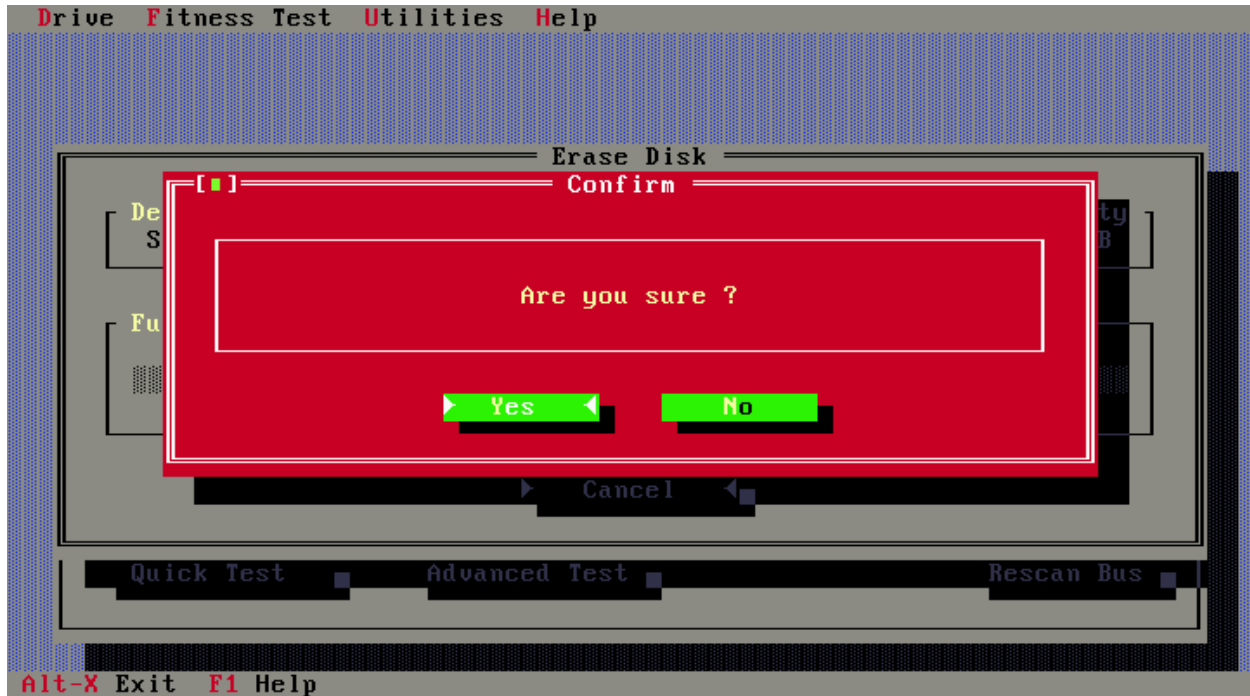
This utility will write zeroes to every sector of your hard drive including the boot sector, and can be used with both IDE and SCSI drives. This utility is meant to be used to clean-up disk which have errors written to the media (e.g. where a system has been powered off whilst writing data out to the drive). This utility can take a long time to run (more than an hour) depending on the capacity of the drive and the system configuration.



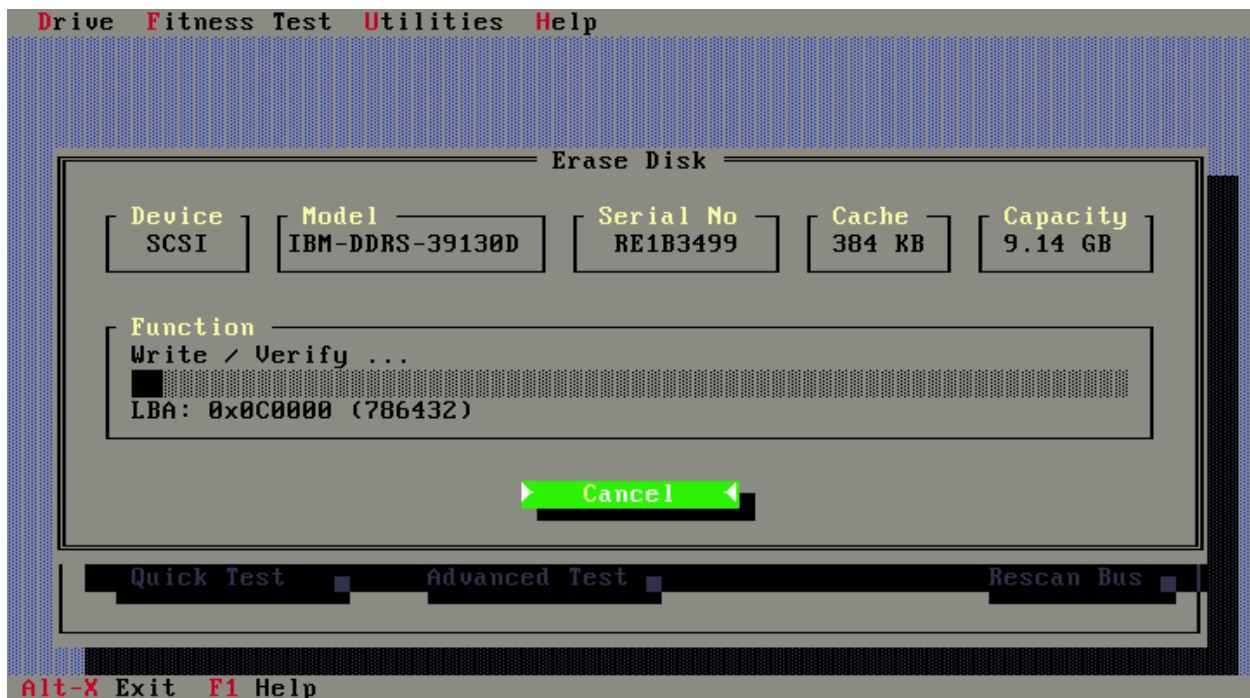
Selecting Erase Disk from the Utilities menu above will display the following screen



As with the Erase Boot Sector utility, Erase Disk will overwrite data on your hard drive, to ensure that you really wish to do this you will be presented with several confirmation screens as shown below, select yes in each case to continue

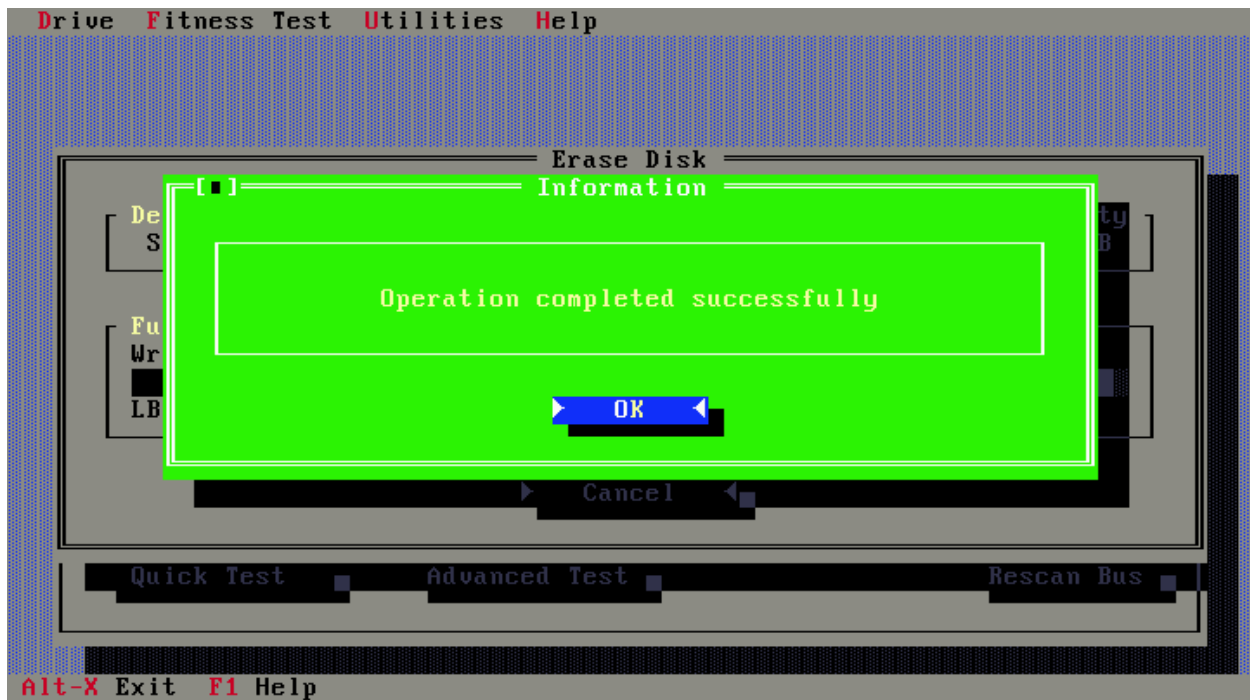


Progress will be illustrated as shown below





The following screen will be displayed when the operation has been completed successfully.



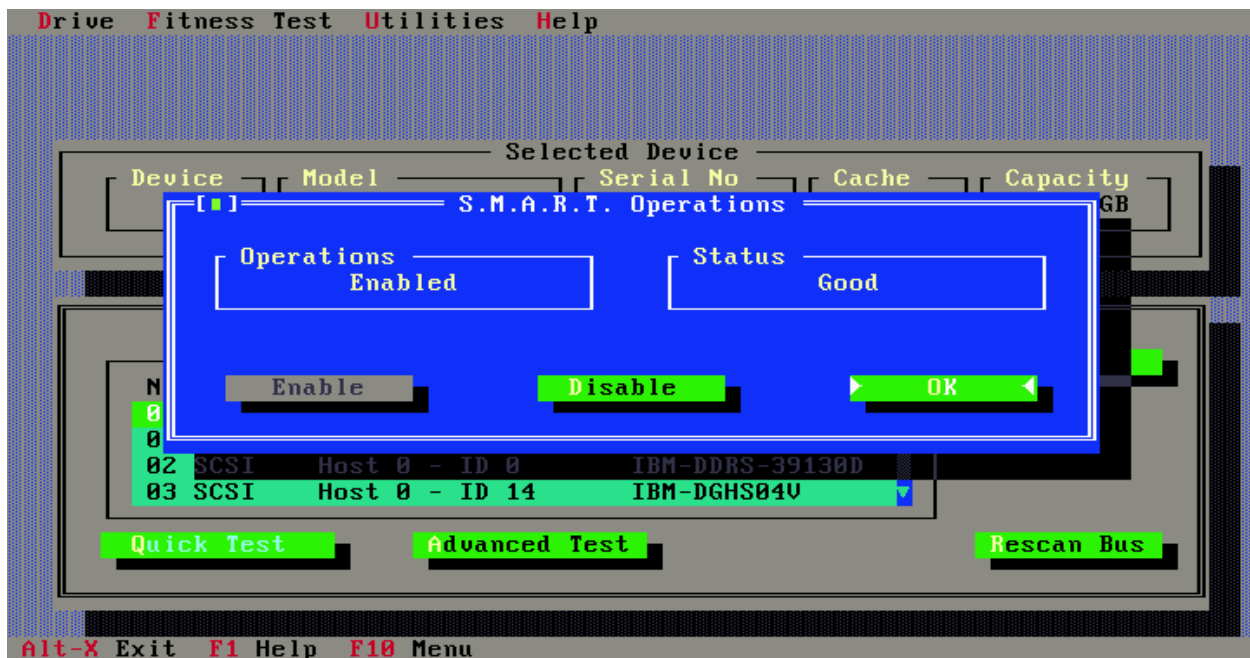
# ATA Functions

## S.M.A.R.T Operations.

S.M.A.R.T. - **S**elf-**M**onitoring, **A**nalysis and **R**eporting **T**echnology is intended to protect user data and prevent unscheduled system downtime that may be caused by predictable degradation and/or fault of the disk device. By monitoring and storing critical performance and calibration parameters, S.M.A.R.T. devices employ sophisticated data analysis algorithms to predict the likelihood of near-term degradation or fault conditions.



To enable/disable S.M.A.R.T., select S.M.A.R.T. Operations from the utilities menu as shown above, S.M.A.R.T. can now be enabled or disabled on the selected drive by selecting enable/disable as shown below.



## Error Code and first aid for your drive

The following table defines all the currently supported error codes. For example if during testing of your hard drive DFT reports a error code of 0x70 as shown on page 14, this indicates that your hard disk drive has one or more bad sectors. In most of these cases the drive can heal itself of these errors. To do this first back-up all your data from the problem drive ( if possible ) then run DFT again and select the Erase Disk option which is under the Utilities heading. If you already have a backup of the data on the hard disk or the data isn't important you can opt to run Erase Disk from the Test Result screen. Once erase disk has completed you can then run one of the test options Quick or Advance to confirm that the drive has been healed. The result code, which should be displayed, is 0x00 if the test returns another code then you should check with your drive/system vendor if the drive can be return for warranty replacement.

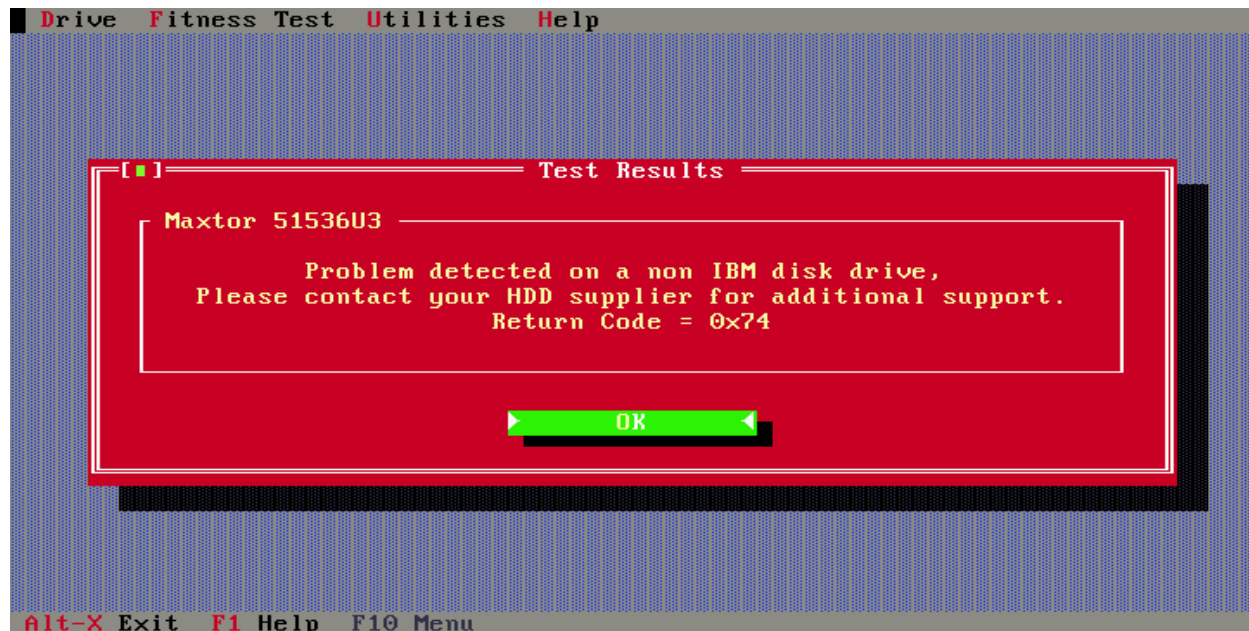
## DFT Error Codes

Codes	Description
<b>0x00</b>	<b>No Error</b> Command complete successfully.
<b>0x10</b>	<b>Test aborted by user.</b> The current test was cancelled by user and cannot be completed. Rerun the test to conclusion
<b>0x20</b>	<b>Selected device not present.</b> The selected device could not be found on the selected port. Check cabling and HDD connectors. If the drive is not seen by the BIOS or is not spinning
<b>0x21</b>	<b>ATA Master device not present.</b> An attempt was made to test an ATA Slave device, but an ATA Master can not be detected. A Master must be present to test a Slave. Check cabling and HDD connectors.
<b>0x22</b>	<b>Device Protected ,</b> The selected device is protected by a password. The drive is write and read protected and cannot be tested
<b>0x23</b>	<b>Format Degraded.</b> A SCSI low level format was interrupted.
<b>0x30</b>	<b>Out of memory.</b> There's not enough memory to execute this program.
<b>0x31</b>	<b>Wrong parameter.</b> There is a wrong or unknown parameter.
<b>0x33</b>	Function can not be executed on this device.
<b>0x40</b>	<b>System interrupts the current operation.</b> The System has interrupted the current operation, and the function was aborted. Please exit the program and check if any Power Saving Modes or Cache Programs (like SMARTDRV.EXE) are active. Disable those features and start this program again.
<b>0x41</b>	<b>Bad cable.</b> A data miss compare was detected during the cable test.
<b>0x42</b>	<b>Drive temperature problem.</b> The drive has exceeded the drive temperature limit
<b>0x43</b>	<b>Pending SCSI request .</b> The ASPI Device driver could not complete the SCSI request block. Check the SCSI configuration (cabling, termination, Ids etc.).
<b>0x44</b>	<b>Low System Performance</b>
<b>0x70</b>	<b>Device defective.</b> A general hard disk drive problem was detected. You can run the "Erase Disk" utility. If a subsequent test fails again, the drive is defective and should be replaced.
<b>0x71</b>	<b>Device not ready .</b> The selected drive is not ready for operation. Check cabling and HDD connectors.
<b>0x72</b>	<b>Device S.M.A.R.T. Error .</b> The Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) has detected a drive problem. The drive may fail soon and should be replaced as soon as possible.
<b>0x73</b>	<b>Device damaged by shock .</b> This device was damaged by an excessive shock
<b>0x74</b>	<b>S.M.A.R.T Self-test failed</b> An error was detected during S.M.A.R.T. self-test. You can run the "Erase Disk" utility of DFT. If a subsequent test fails again, the drive is defective and should be replaced

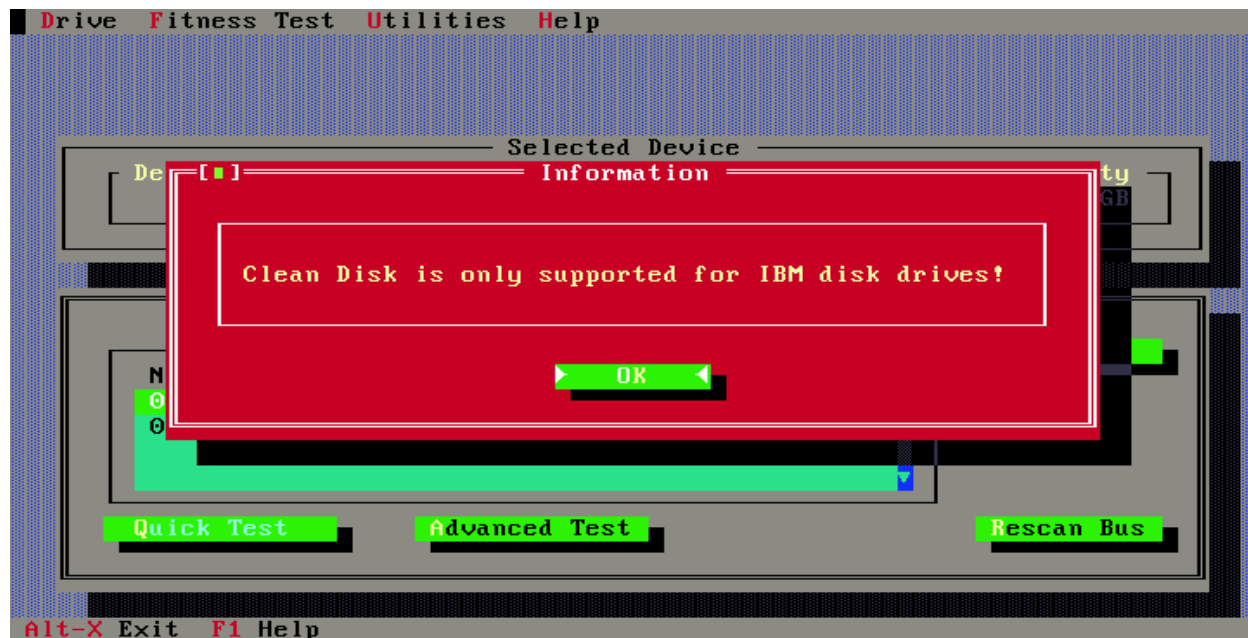
## Testing of Non-IBM Hard Disk Drives

This version of DFT now supports testing of hard disk drives, which were not manufactured by IBM. Due to vendor specific design parameters the depth of testing which will be carried out on the non-IBM drives will be less than that performed on the IBM drives.

Should DFT detect a problem with the drive, you will be presented with a result screen similar to that below. The recommendation is that you obtain a test utility specific to your drive from your drive manufacturer or your system supplier. Use this utility (if one is available) to re-test your drive, these utilities may also provide information which you will require should you need to replace the drive under warranty.



Running the Erase Disk function on non-IBM disk drives is also not supported with this version of DFT. The screen below will be displayed if you attempt to run Erase Disk on a non-IBM hard disk drive



# Supplied ASPI Managers

The following ASPI managers are supplied with the DFT Utility and provide support for the listed SCSI Controllers.

ASPI Manager	Version	Supported Controllers
ASPI2DOS.SYS 02-12-98	3.68	<ul style="list-style-type: none"> <li>• Adaptec AVA-1502P,1502AP</li> <li>• Adaptec AVA-1505</li> <li>• Adaptec AVA-1515</li> <li>• Adaptec AHA-1510/1520/1522</li> <li>• Adaptec AHA-1510A/1520A/1522A</li> <li>• Adaptec AHA-1510B/1520B/1522B</li> <li>• Adaptec AHA-1530P/1532P</li> <li>• Adaptec AVA-1502AE/AL,AVA-1505AE/AL,AVA-1505AES</li> <li>• Adaptec AIC-6260/6360/6370 based SCSI host adapters</li> <li>• Adaptec AVA-2825 host adapter</li> </ul>
ASPI4DOS.SYS 26-04-99	3.36S	<ul style="list-style-type: none"> <li>• Adaptec AHA-1540B/1542B</li> <li>• Adaptec AHA-1540C/1542C</li> <li>• Adaptec AHA-1540CF/1542CF</li> <li>• Adaptec AHA-1540CP/1542CP</li> </ul>
ASPI8DOS.SYS 02-12-98	1.35	<ul style="list-style-type: none"> <li>• Adaptec 2940 family of PCI to SCSI</li> <li>• Motherboards with SCSI onboard – that uses Adaptec AIC-78XX and AIC-75XX chipset</li> </ul>
ASPI8U2.SYS 06-12-99	1.07	<ul style="list-style-type: none"> <li>• Adaptec Dual &amp; Single Channel Ultra2 family of PCI to SCSI Controllers</li> <li>• Adaptec Dual &amp; Single Channel ULTRA160 PCI to SCSI Controllers</li> <li>• Motherboards with SCSI onboard – that uses Adaptec AIC-7890 and AIC-7891 chipset.</li> </ul>
ASPI8XX.SYS 13-04-99	4.06.00	<ul style="list-style-type: none"> <li>• Symbios SYM8751SP Single ended Controller</li> <li>• Motherboards with SCSI onboard – that uses Symbios 53C875J chipset.</li> </ul>
DPTDDL.SYS 31-03-98	003.EH	<ul style="list-style-type: none"> <li>• DPT PM3334UW Single Channel Raid Controller</li> </ul>
ISPI610.SYS 16-04-97	1.04	<ul style="list-style-type: none"> <li>• Initio INI-6100 / 6102 SCSI Controllers</li> </ul>
ISPI910.SYS 06-04-97	2.01	<ul style="list-style-type: none"> <li>• Initio INI-9100 / 9100W SCSI Controllers</li> <li>• Initio INI-9XXXU / 9XXXUW SCSI Controllers</li> </ul>
BTDOSM.SYS 26-04-99	4.30	<ul style="list-style-type: none"> <li>• BusLogic BT-946C</li> </ul>
ADV3550.SYS 15-05-98	3.1F	<ul style="list-style-type: none"> <li>• Advansys Ultra Wide ASPI Manager</li> </ul>
ADVASPI.SYS 19-05-98	2.8N	<ul style="list-style-type: none"> <li>• Advansys Universal ASPI Manager</li> </ul>
ASPIUWF.SYS 16-07-99	3.21	<ul style="list-style-type: none"> <li>• Tekram DC-390U/W/F/U2 and DC-310/U</li> </ul>

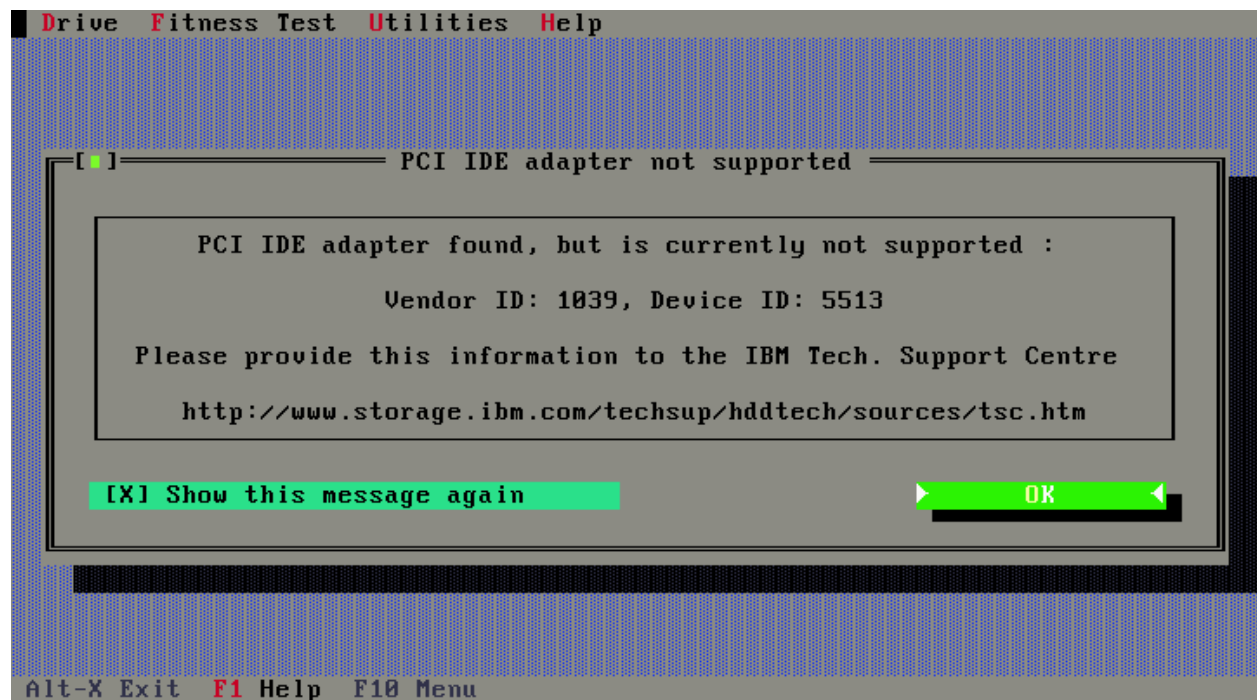
# Troubleshooting

## ASPI Manager Fails to Load

**Note:** Some implementation of SCSI on the Motherboard using the Adaptec AIC-7890 chipset will result in the ASPI Manager *ASPI8U2.SYS* (version 1.07), which is supplied on this DFT diskette, failing to load. Should this be the case and you are sure your SCSI controller is built around this chipset then you should replace the file *ASPI8U2.SYS* in the *A:\ASPI* sub-directory of the diskette with the *ASPI8U2.SYS* which should have been supplied as part of the software support package for your hardware.

## Unsupported PCI IDE Adapter

There are some instances where DFT when loading may display a message similar to that below. Note this is not an error condition but just a message to alert you that DFT does not recognise the chipset being used to control the PCI IDE Buses in your system. It is also a request for you to send the Vendor and Device ID codes to IBM Technical Support as indicated in the message so that future releases of DFT can cater for this chipset.



## **Drives Attached to PCI IDE Adapter not seen by DFT**

If using a Plug-in PCI IDE adapter that uses the Highpoint HPT366 chipset in some systems DFT will fail to detect drives attached to this adapter. To fix this problem ensure that the PCI IDE adapter BIOS is upgraded to the latest level. For example if using the EPUSB66 adapter then you will need to have BIOS level 1.25 or above.

BIOS updates can be obtained from the following web site: -

<http://www.highpoint-tech.com/drivers.htm>