TeraSci - ATAPI Test Station Manual

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ATAPI Test Station
For Optical Disk Drives

Operator's Manual

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This document is designed to provide a Test Operator and the Process Manager with the basic steps on how to use the TeraSci Optical Disk Automatic Test Equipment.

If there are any question regarding the use of our equipment or that may occur while reading this document, please contact Technical Support Department (engineering@terasci.com) at the TeraSci offices in Huntington Beach, California for assistance, or to your designated Technical Support Service Manager.

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Introduction

ATAPI TEST DESCRIPTION

This document is intended to be a brief description of the TeraSci ATAPI test process. It will define the basic test steps that are used to test an optical drive. The TeraSci ATAPI process is script based. Each optical drive has a unique API or FLG profile (which is equivalent to the drivers in Windows) that defines which script steps are to be executed for that particular drive. The "MODELS.CSV" file will contain the product model name (from the drive Inquiry data) and the appropriate API or FLG profile name used to test that model number. New drives (un-profiled) are added to the Models file weekly (if not daily). Since each drive has a unique profile the read and write code is optimized for that drive. In addition any unique code sequences for a drive are accommodated.

The common script steps are:

- **Set Start:** This script step sets up the hardware and initializes all of the program variables.

- **Inquiry Test:** This step performs an Inquiry command. It checks to see if the drive firmware is at the proper revision level. The system has a text file (FWREV) that contains those model numbers that require firmware revision level checks. If the drive model number is in the FWREV file the drive revision code level must match the revision level in FWREV. If a mismatch occurs an error message is displayed on the screen and added to the TRK file (test results). After the firmware check, this routine checks for the correct region code setting and the user/manufacture resets. Since each drive has a unique profile this code is only present for DVD's. The correct region code settings come from SITE.API which is a file controlled by the site managers. The parameters of this file vary from site to site and can be easily edited.

- **Check Mode Page:** This script step accesses all of the available mode pages and sets flags in the TRK file to indicate which pages are present in the drive under

test. This is for information only (logged to the data base). This step does not fail a drive if it aborts a mode sense command to an illegal page.

- **Condition CD:** This script step calls "Get Media" (routine discussed in detail below) routine to prompt the operator to insert the Reference Disc. It reads the signature (disk identification written by TeraSci) and verifies the correct disk is installed. This step then performs 10 full seeks to "Condition" the seek actuator. This can be viewed as a short "warm up" procedure before testing begins.

- **Average Seek @Max:** This script step calculates the average seek rate of the drive at the maximum drive speed on a Reference Disc. 10 seeks of 1/3 of the disk media range are performed. The average of all 10 seeks is used as the "Average Seek Time" and is logged. The worst case seek time is also logged.

- **Full Seek @Max:** This script step calculates the full seek rate of the drive at the maximum drive speed on a Reference Disc. 10 full stroke seeks are perform. The average of the 10 seeks is logged as the "Full Stroke Seek Time". The worst case seek time is also logged.

- **Screen Read Test:** This script step reads 4 tracks of various lengths. This step is performed on the TeraSci Reference Disk. This disk is a CDR with a known format. Each read command must execute without an error and the data is checked (byte for byte) to verify a successful read. The first track (2) is close to the drive ID, the 2nd track (14) at about the middle of the disk and the 3rd and 4th tracks (22 and 23) are close to OD of the media.

- **Test CD-R/W:** This script step calls "Get Media" (discussed in detail below) to get the CD-R/W Disc. This step can be "Read Only" for ROM drives or R/W for writers. The PROFILE will determine which test is performed. The CD R/W test will exercise 3 areas of the media, the ID, MID and OD. Approximately 5MB are tested in each area. For ROM drives the test disk is a TAO written disk (with 1 large track). Each of the 3 areas (ID, MID and OD) are read and verified. For writers the disk is a packet written disk with one large track. The write operation is performed first (all three areas) and then the same blocks are read and compared. If a data error or the data fails to compare the message "Data compare error" is displayed and the drive fails the CD R/W test.

- **Test DVD +RW:** This script step calls "Get Media" (discussed in detail below) to get the DVD +RW Disc. It sets the "write mode page" for DVD writing and writes a test pattern at the "ID", "MID" and "OD" (5MB each). It reads and verifies each of the test tracks. If an error or the data fails to compare the message "Data compare error" is displayed and the drive fails the DVD +RW test . If the drive is a DVD ROM the write steps are skipped and the three data areas are read and verified.

- **Test DVD +R:** This script step calls "Get Media" (discussed in detail below) to get the DVD +R Disc. It sets the "write mode page" for DVD writing and writes a test pattern at the next available space (15MB). It reads and verifies the test tracks. If an error or the data fails to compare the message "Data compare error" is displayed and the drive fails the DVD +R test. If the drive is a DVD ROM the write step is skipped and the first 15MB are read and verified.

- **Test DVD –RW:** This script step calls "Get Media" (discussed in detail below) to get the DVD -RW Disc. It sets the "write mode page" for DVD writing and writes a test pattern at the "ID", "MID" and "OD" (5MB each). It reads and verifies each of the test tracks. If an error or the data fails to compare the message "Data compare error" is displayed and the drive fails the DVD -RW test. If the drive is a DVD ROM the write steps are skipped and the three data areas are read and verified.

- **Test DVD RAM:** This script step calls "Get Media" (discussed in detail below) to get the DVD RAM Disc. It sets the "write mode page" for DVD writing and writes a test pattern at the "ID", "MID" and "OD" (5MB each). It reads and verifies each of the test tracks. If an error or the data fails to compare the message "Data compare error" is displayed and the drive fails the DVD RAM test.

- **BLU-RAY -R:** This script step calls "Get Media" (discussed in detail below) to get the DVD RAM Disc. It sets the "write mode page" for DVD writing and writes a test pattern at the "ID", "MID" and "OD" (5MB each). It reads and verifies each of the test tracks. If an error or the data fails to compare the message "Data compare error" is displayed and the drive fails the BD-R test.

- **Release CD:** This script is used to check the door release button. The software issues an Allow Command and the operator is prompted to "Push the Button and remove the Media". Once the operator informs the system to continue the door is closed (5.25) or was closed by the operator and the system verifies that there is "No Media Present". This step is executed even if the test was previously aborted to insure that the test media is removed from the drive.

- **Log Out Results**: This is the last script and it prepares the final test results that are sent to the server. It also sets the final disposition of the drive (Pass or Fail) and puts the error description (if needed) into the status line.

Get Media:

This routine is called whenever a new disk is needed for testing. It is called with the media flags set and the message requesting the appropriate media. The media flags determine the type of disk that is required for the test. The first step is to issue an Allow command and open the door. The message (sent by the calling routine) is displayed and the software waits for the operator to confirm that the media is inserted in the drive. The software will close the door (5.25 inch) and issue a Prevent command.

The software will check the drive status for Ready and media present. Then the software will read block zero of the media. This block (and all other blocks) contains a media description and a media serial number. If a read error occurs or the media description does not match the media flags 10 retries are performed. At the end of all of the retries if the sequence is still unsuccessful the door is opened and the message "Wrong Disk" is displayed. The operator can verify the proper media is installed or try another piece of media. If the problem persists they can abort the test and fail the drive.

If the sequence executes to the point where data is read from the disk the media serial number is logged into the MMS file. The MMS file keeps track of each piece of media used in the test. There are several counters associated with each piece of media. The first is the number of times that piece of media has been used. The

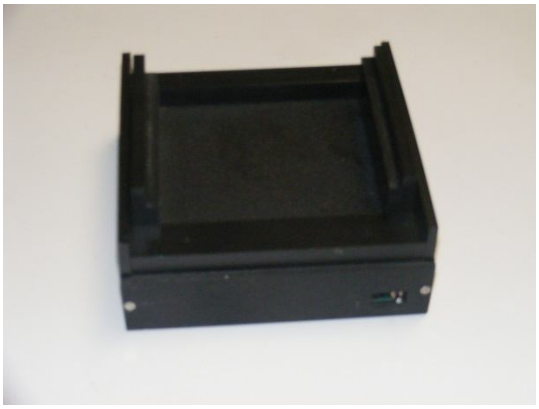
second is the number of times that piece of media has failed. The third is the number of consecutive times the media has failed.

Within the LIMIT.API file there are thresholds for each of these counters. For example there is a threshold for the number of times a piece of media can be used. If that threshold is exceeded the operator is prompted to discard that piece of media and use another disk (with the same media descriptor). The three thresholds are the number of times a disk can be used, the maximum percentage of times it can fail, and the number of consecutive times it can fail.

Hardware System Components

The TeraSci ATAPI Test System is designed to test ATAPI optical drives, and supports nearly every Optical Disc Drive (ODD) product in use today. The TeraSci ODD test system consists of several components:

1. ODD test module – Individual modules



ODD test module with adaptable rails to support most ODD size footprints.

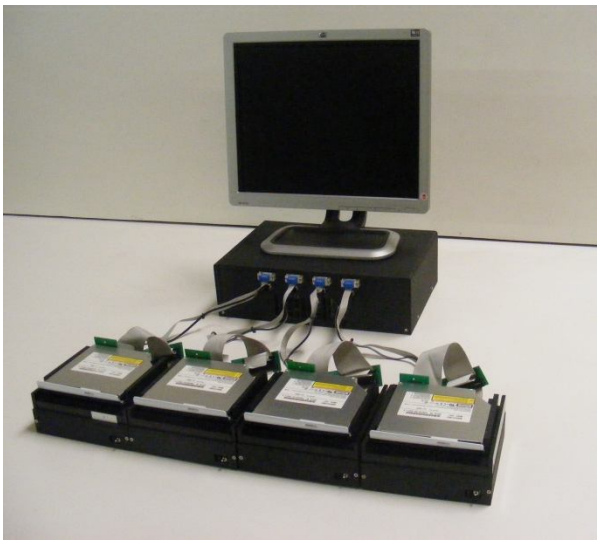
ODD test module connected to the CPU with the data and power cables, and an ODD drive on board ready for test.

2. CPU test station: capable of supporting up to 4 ODD test modules at a time

CPU – 4 port test station. Complete stand alone computer

The CPU station is a complete PC type computer with 4 communications ports for the individual test modules. The CPU also has a video port for the LCD display, and an

Ethernet port for connection to the TeraSci Engineering and Communication on-site server.



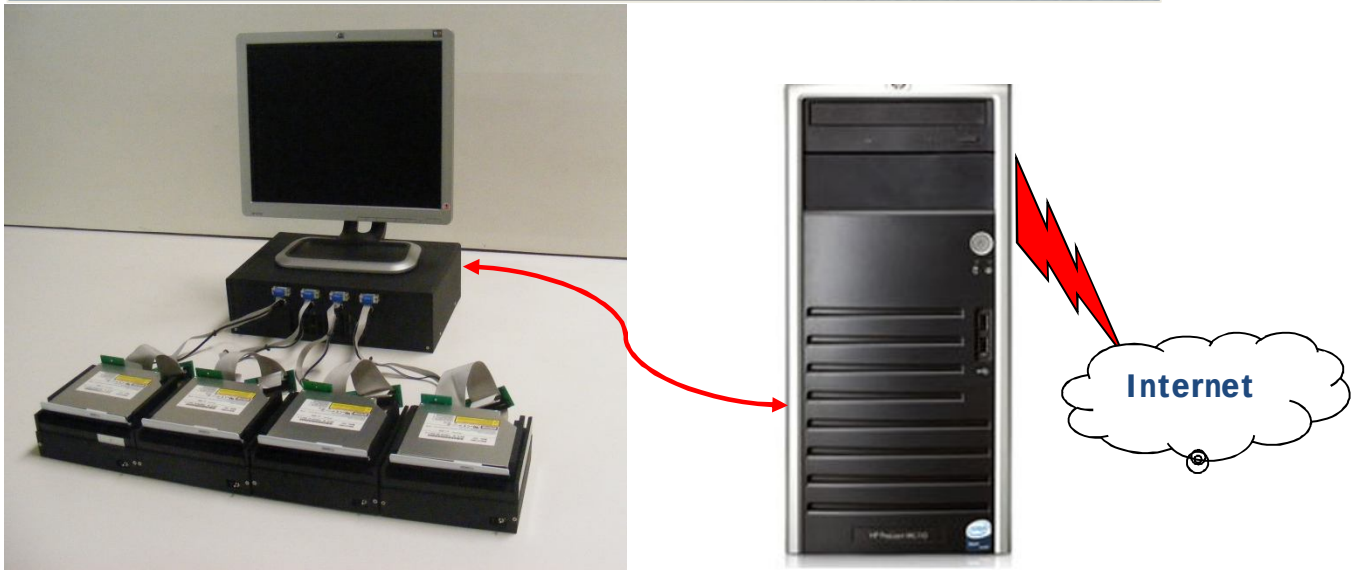
Typical 4 port test station.

CPU with 4 ODD test modules attached

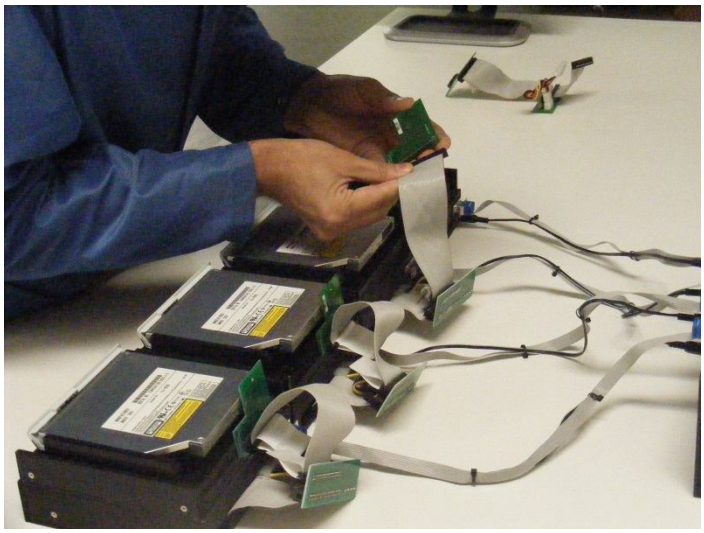
3. TeraSci Engineering and Communication site server

The TeraSci solution consists of at least two computer systems. One of the computers is a Microsoft based network server with an SQL data base. This system is used to store the Tracker DBMS system and all the test results. It also allows remote access via the Internet, to the test results and Failure Analysis type reports. The server also contains the test software library, which can also be updated through the remote access connection. The second and subsequent computers are located next to the test stations. These computer stations also contain the TeraSci ATAPI interface cards, and power control boards that are used by the operator to test the drives. The test stations are Linux based. New versions of these test station CPU's will be available in a LINUX format.

Engineering & Comm. Server



The operator is required to connect the drives to the system, perform a visual inspection of the drives, start the test ports, change CD's as required and log out the drives when the test completes.



Connecting the test cables

This test system requires several different CD and DVD disks for testing the drives. One of the CD's is a reference disk. This disk is used as a read only disk to perform seek and read tests. A second CD is a RW CD that is formatted by the test system. This disk is used to check the read and write capability for CD writers. A third disk is the DVD RW disk. This disk is used to check the read and write capability for DVD writers and the read capability for DVD ROM's.

- Test disks
- All test media is included in the program
- All test disks are generated by TeraSci and shipped to each site

One of the primary weaknesses for testing any removable media system is the media itself. The TeraSci system addresses this issue with a software health monitoring system called:

Media Management System (MMS)

Each of the disks used in the system has an imbedded serial number (our system formats its own media). As each piece of media is placed in the test drive, the media serial number is read and logged on the server in the MMS.CSV. Each media type has a threshold for failure. The failure thresholds are set in the LIMIT.API file and each site can set them to their own sensitivity. There are three failure thresholds: total number of times the media was used, number of consecutive times a single piece of media failed, and the percentage of times a piece of media failed. Using this system

removes the subjective criteria for removing media from the process, and it is more proactive than a fixed Preventative Maintenance (PM) schedule.

Connecting the Drives

The test system has 4 test ports. Each port has a signal cable and a power cable. The system has a power board for each test port. The power board has an on/off switch and a power LED. After connecting the power and signal cables the unit should be powered-on. After power-on the activity LED on the front panel will flash. The operator must verify that the LED flashes. Once the power switch is on, during the test, the power on each port is controlled by the software and therefore, a test operator does not need to worry about resetting the power after plugging in a new drive for test.

While connecting the power and signal cable the operator should check the Master Slave jumper (only for 3.5" drives) to verify it is in the master position or the cable select position (OEM dependent). The operator should also perform a visual check of the power and signal cables for bent, broken or missing pins. Both the power and signal cables are keyed (polarized) and the operator should be careful not to reverse or force the connectors.

The operator should also check for any visual damage to the drive case, to the labels, and to the plastic bezel and door. Only permanent labels should be affixed to the drive, any additional labels should be removed. If in removing an extra label the drive is scratched or the adhesive cannot be completely removed the drive should be rejected for cosmetic damage should the site specific guidelines require this type of failure for cosmetic issues. However, this drive might still be acceptable as a "B" or "C" stock item.

The four ports on the ATAPI system are completely independent. The drives can be connected and disconnected at any time without interfering with another port. Care should be exercised not to bump a drive while it is testing. A physical shock to an operational drive can cause an error.

The four port cables are labeled 1 through 4. These numbers correspond to the test port numbers, and the operator must be able to distinguish which drive is connected to which port.

Tracker DBMS Overview

The Tracker DBMS is a web accessible tool that provides all of the extensive data that is generated as a result of the use of the TeraSci fully integrated solution:

1. Test system management
2. Automated Data Base entry software
3. Shipping and Receiving function
4. Internet connection and synchronization
5. Web Based Reporting
6. Security and user permissions
7. CSR system management
8. Remote monitoring and Health Management System tracking

A full description of the Tracker DBMS is provided in additional documentation.

Operator's Instructions

ODD Test Equipment

The following description is for one individual ODD test port. You would repeat the following steps for each of the 4 ODD test modules/ports if you are using all 4 available ports. If you are only using one of the ODD test module/ports, then follow the steps below:

The keyboard, hand scanner, monitor, network cables, etc. should all be plugged in and powered on to start the test process.

There are two different modes that an operator must know:

ATAPI and ATAPI/M

ATAPI is the normal test process for the drives.

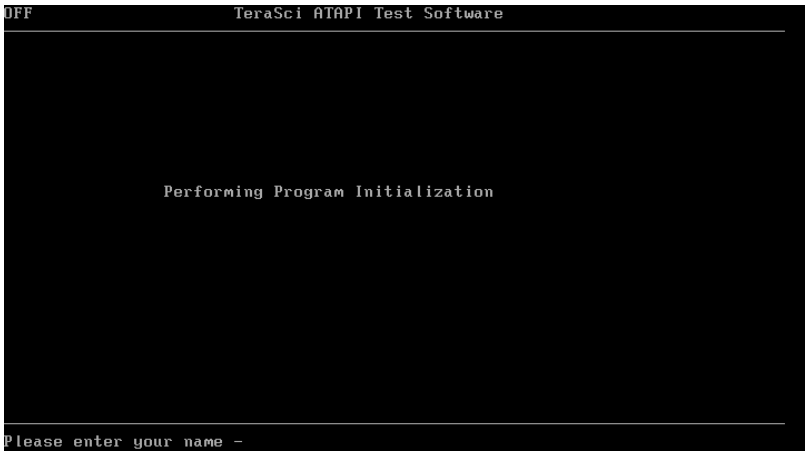
The ATAPI/M or ATAPI/T are for the site manager or other designated media test person.

ATAPI : This mode is used to test all the optical drives.

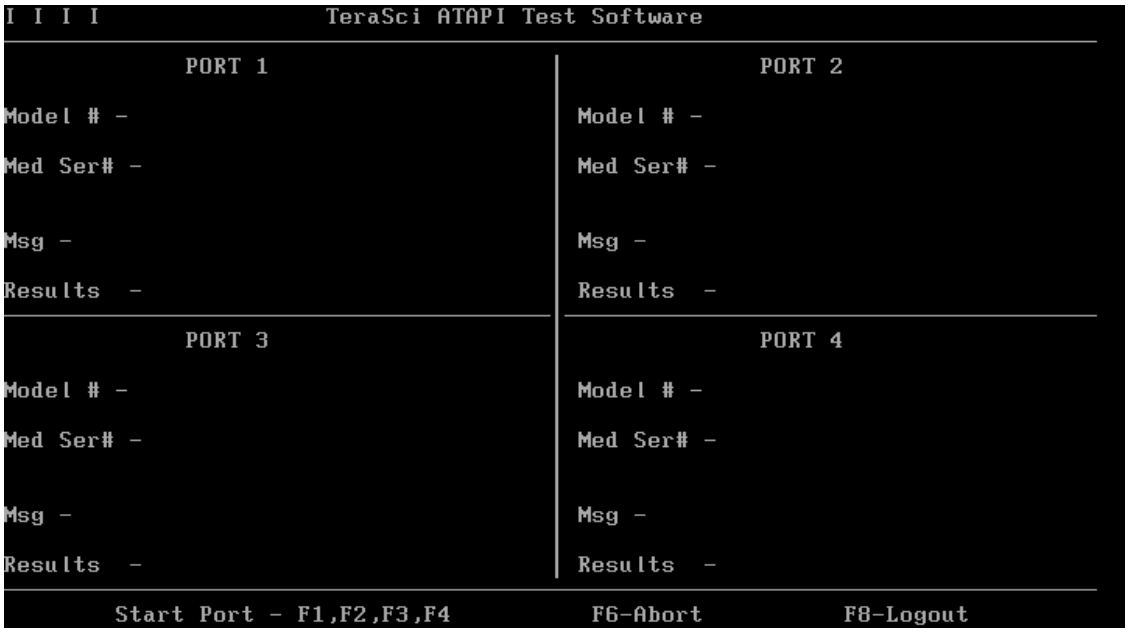
Turn on the red power button on the front of the ODD CPU (CPU).

-Type in "**T"** at the **prompt**

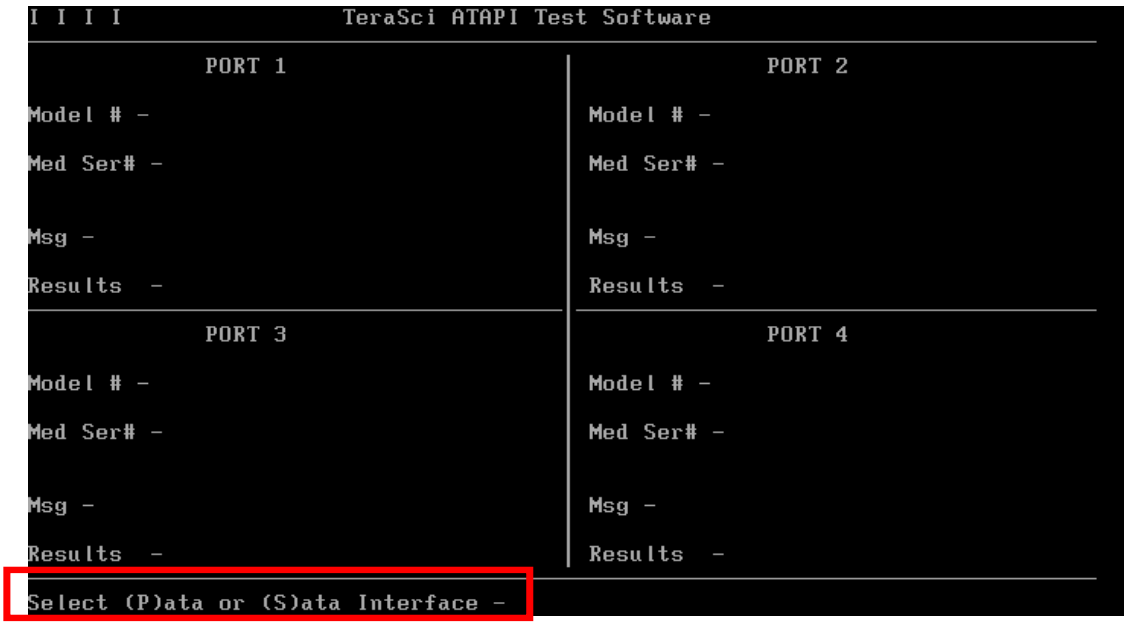
-Login with the operator User ID and Password: "Please enter your name"



Then Press **"F1"** key to start port-1.



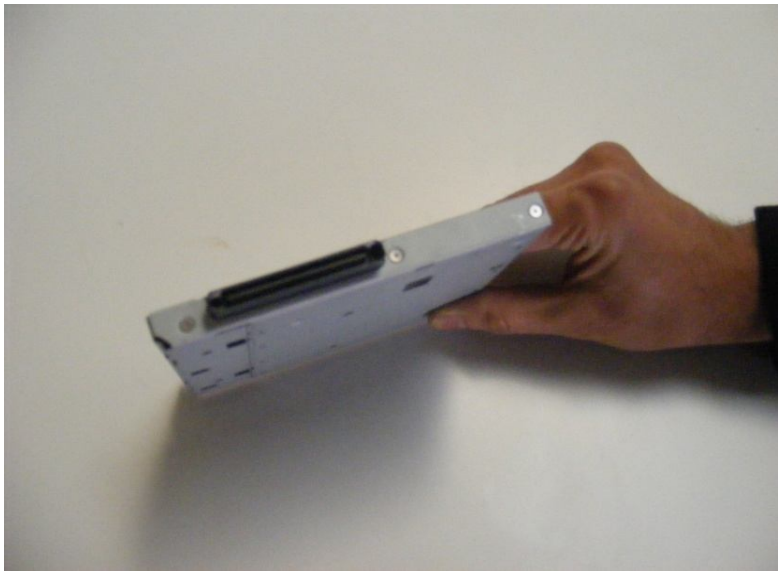
-At the bottom of the screen Select (P)ata or (S)ata Interface depending on which type of ODD drive you are testing.



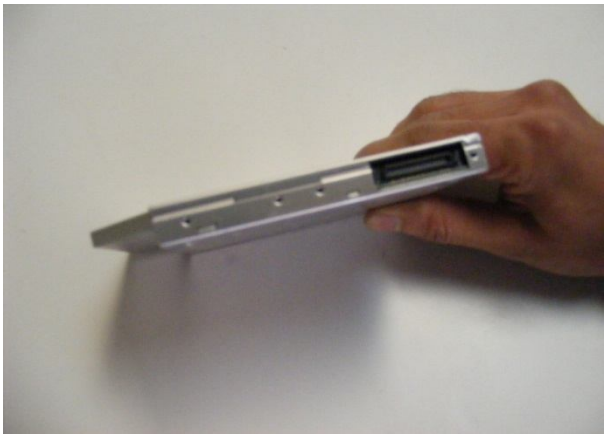
Following are pictures for some of the more common Interface types

PATA 5.25”

PATA Compaq 2.5” Laptop



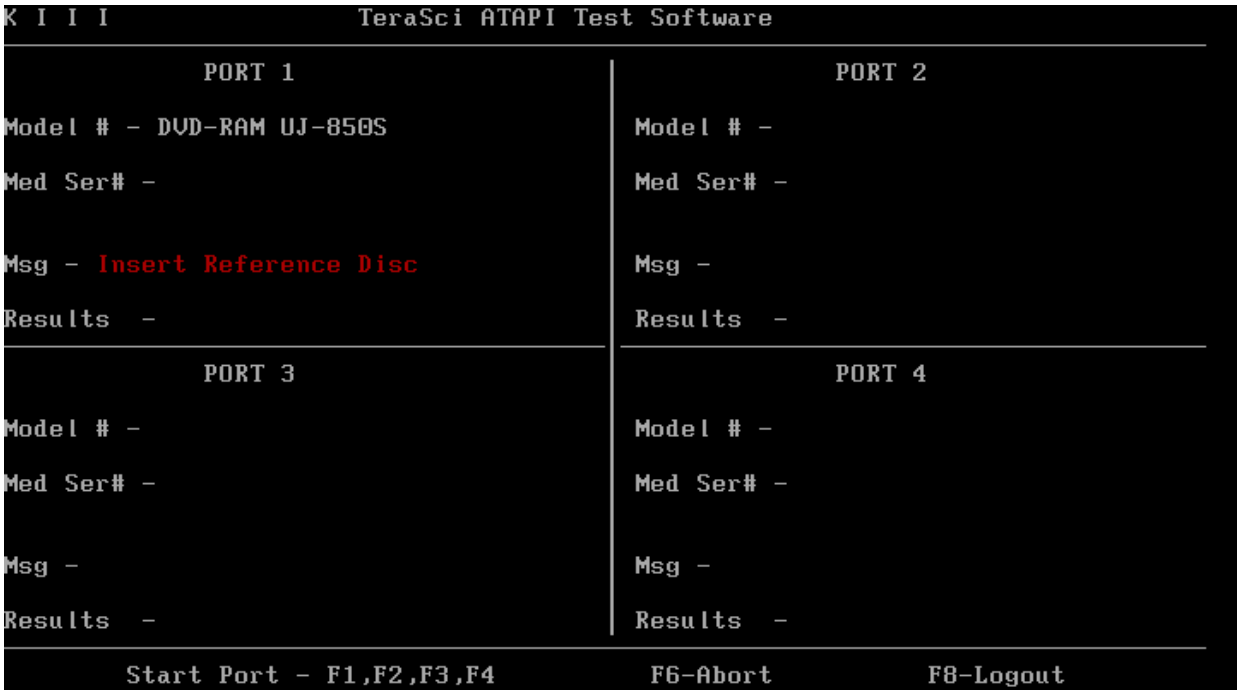
PATA 50pin 2.5” Laptop



SATA 5.25”

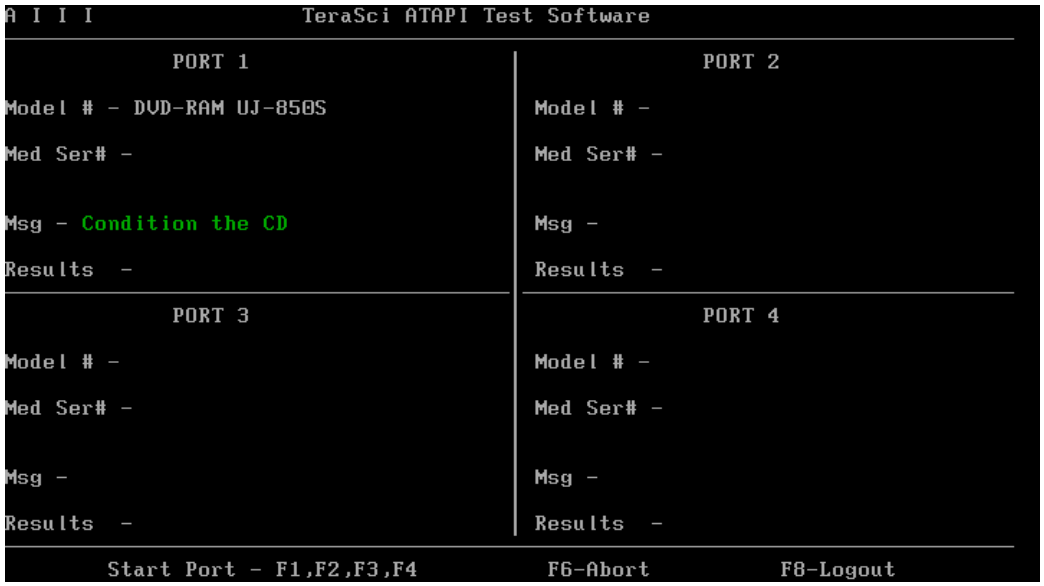
Micro SATA 2.5” Laptop

After you select one of the drive types The drive door opens displaying **“Insert Reference Disc”** on the screen.



- Insert the Reference disk that is labeled “Reference Disk” and press **“F1”.**

- The door will close and start running the test.

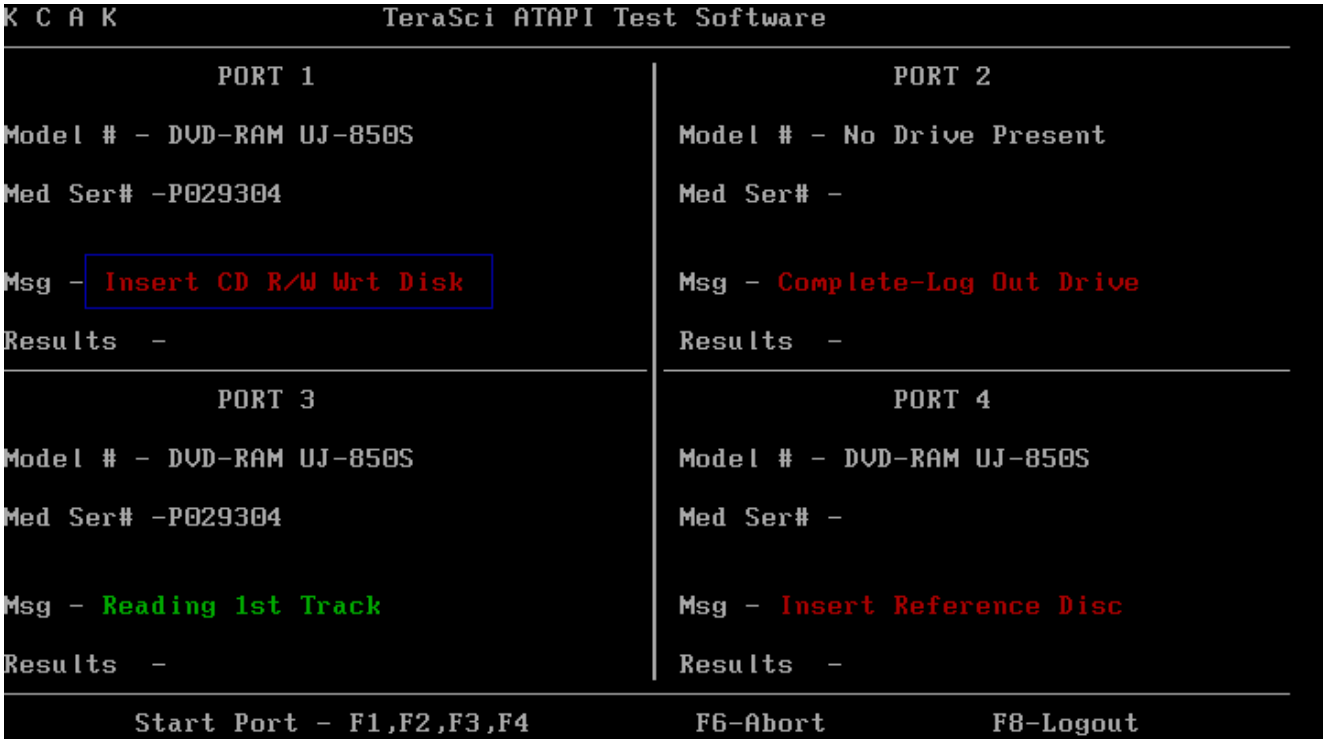


- For the rest of the disks, follow the instructions displayed on the screen.

If you are running another, or all 4 ports simultaneously, then load the second ODD drive onto port 2 and press F2 for port 2.

- Repeat this process for ports 3 & 4 and press F3 and F4 to start those tests.
- At the end of each test, the system will ask that you insert the next test disk into the drive. These test disks are different depending on what type of drive you are testing i.e. CD-ROM, DVD, DVR, etc. Simply follow the directions on the screen and insert the designated test disk. There are different quantities of test disks

depending on the technology type. It might be one disc or several. Again, simply follow the instructions that are presented on the screen.

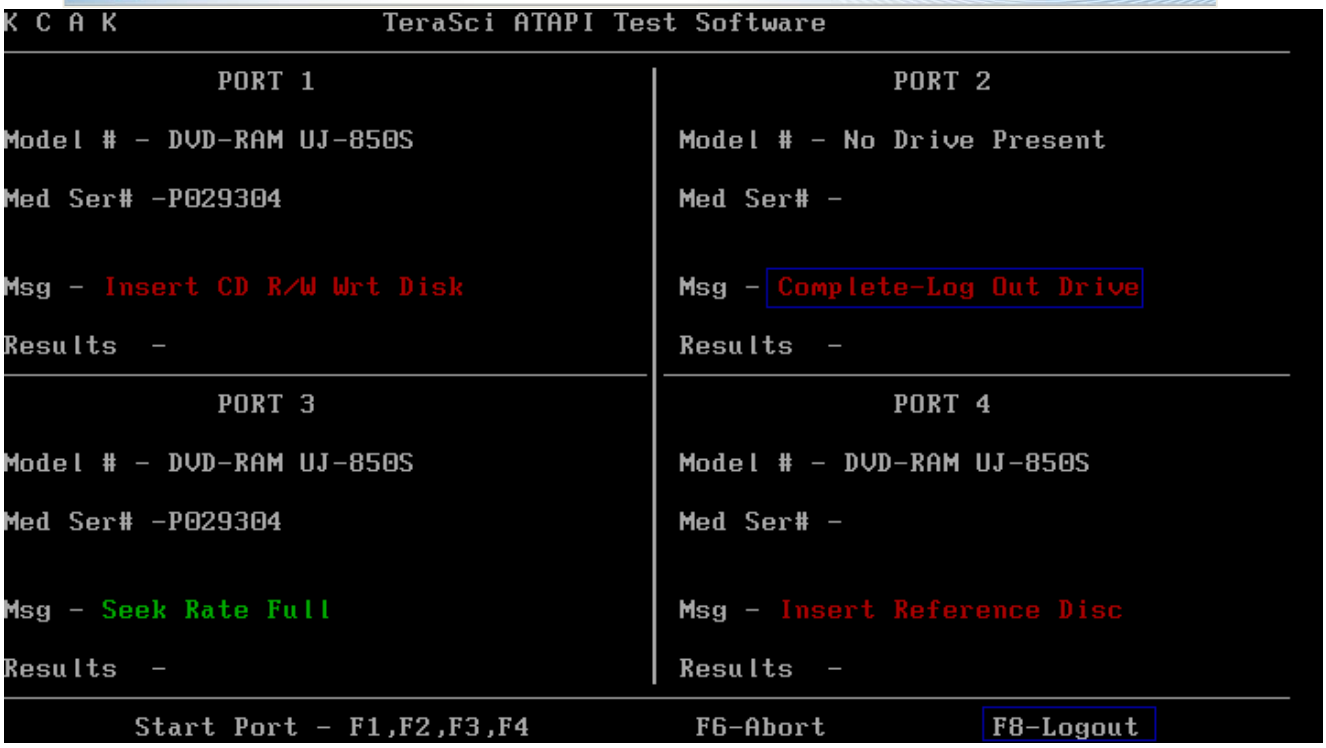


- At the end of each test, the system will send you a prompt at the Message Line saying:

"**Press Button & Remove CD" and close the door to the drive.**

To end the tests press the F1 through F4 keys to exit the media testing steps in the process, and start the Log Out process.

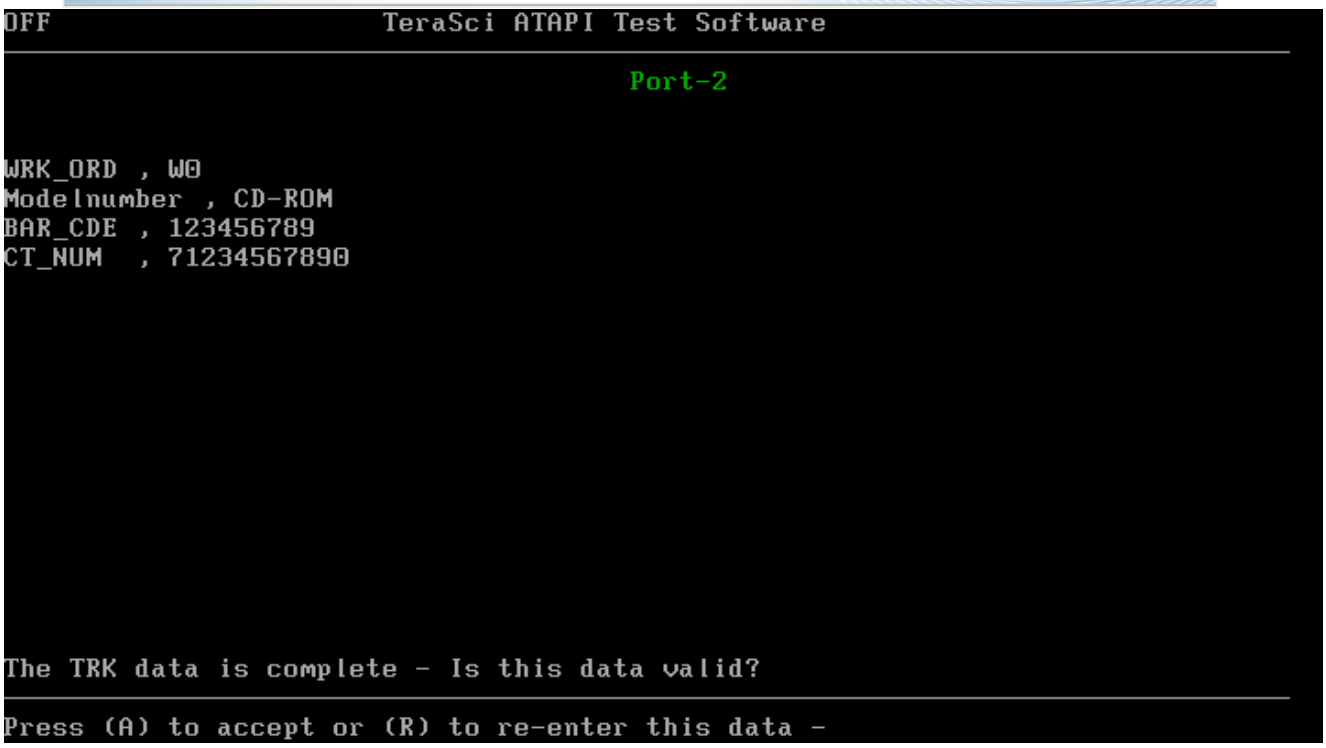
- At the end of all the test disks a "**Complete Logout Drive"** message is displayed (This message is also displayed in case of a failure)



- Press "**F8"** to logout a drive (bottom right of screen) and enter all the required information about the drive. This information is used to create a log file and is stored in the database that could be useful at any given time, if for some reason there are some unexpected failures that demand a thorough analysis.


OFF
TeraSci ATAPI Test Software
Enter the Work Order - W0000


OFF
TeraSci ATAPI Test Software
Port-2
WRK_ORD , W0
Modelnumber , CD-ROM
Enter the Serial No - 123456789



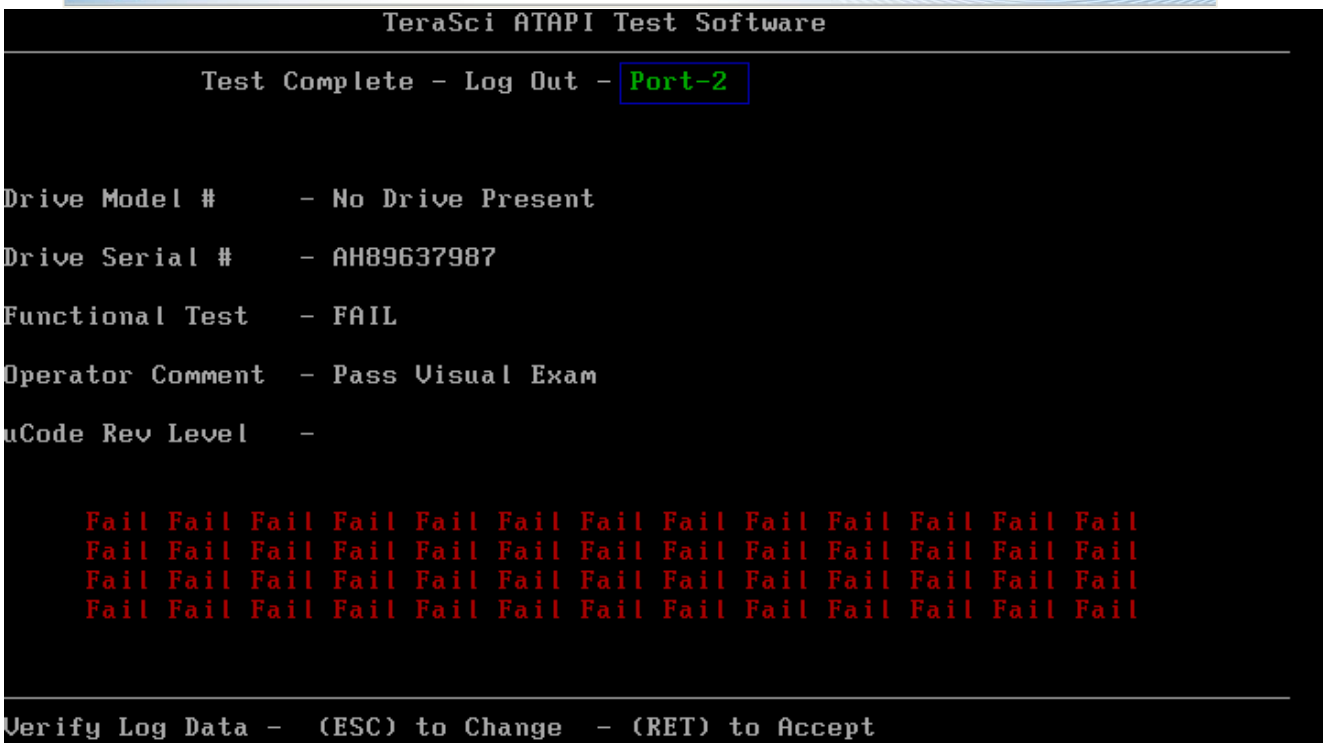
If all steps are OK, the system will ask you to press “A” to accept or “R” to retry. You would Retry if you do not agree with some of the data that is presented. A Retry allows you to edit data on the drive should this be necessary, for example scanning the CT number instead of the Part number.

When you press the “A” option the following screen appears:

Be sure to always select option one if all visual parameters are acceptable.

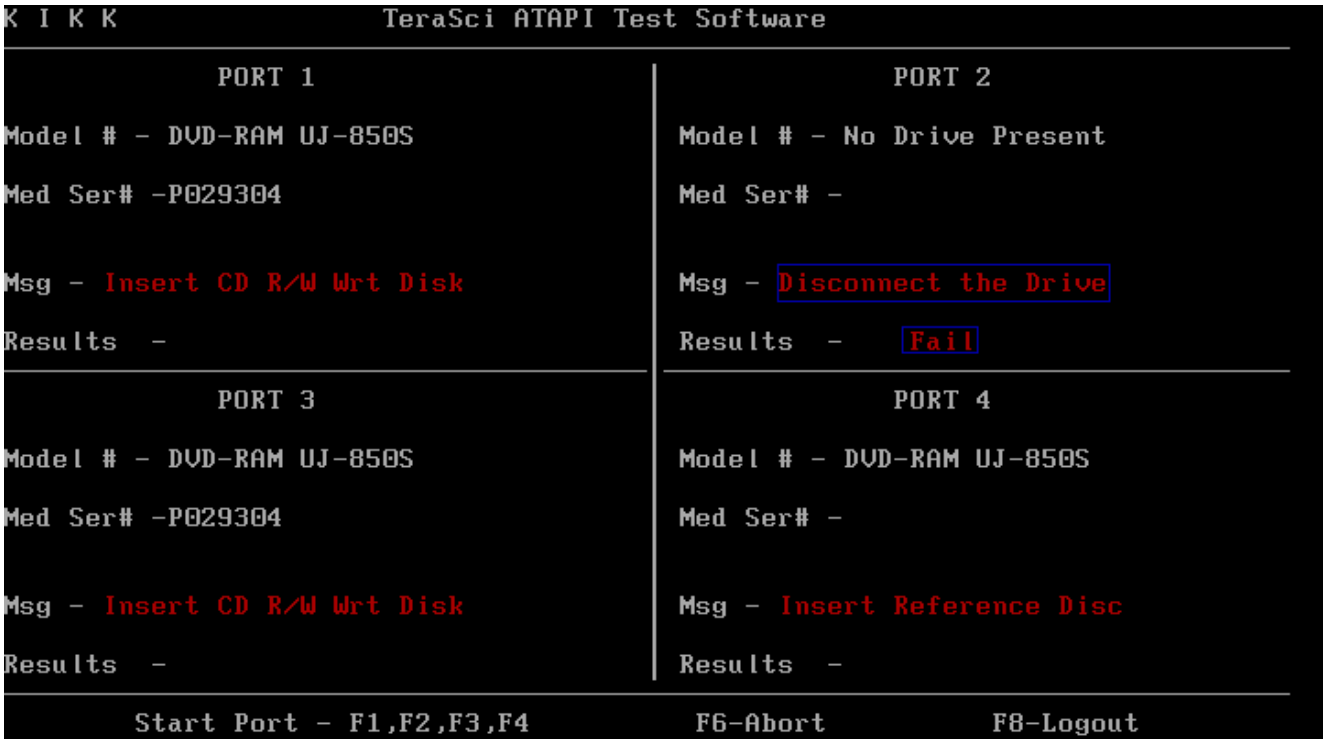
Selecting any other option will automatically fail the drive.

- Press one
- Enter



- Press return to accept. Or Escape to make changes
- Be sure to pay attention to the ports you are logging out by looking at the Port Number at the top of the screen. These are listed in green i.e. Port-1 or Port-2. After the port number is displayed, then scan the bar code number into the system, again, paying attention that if the system is indicating Port 2 that your are scanning the ODD that is located in Port 2.

Once all the information is entered and the drive is logged out, a message is displayed asking operator to **"Disconnect the drive".** At this point the operator can disconnect the drive and connect a new drive to be tested.



View the test "Results" field at the end of each test window to see if the drive Passed or Failed.

Send all drives to the WIP SHIP station for final disposition. The WIP ship station closes the "story" on each drive and is the Final Quality

Control (QC) point in the process. This is where all of the process data is generated as well which allows us to generate customer required reports. Passed drives will then be sent to the packaging are for cleaning, ESD wrapping, etc. Failed drives will either be taken to repair, RMA or scrap depending on the site's policy for the material.

Site Managers process for testing of replacement TeraSci test media.

ATAPI/M or MN: This mode is used to **format** the new media before it can be used to test the optical drives in ATAPI-mode. In our case we only use this feature to format CD R/W media and the DVD R/W media.

For example to format a **CD-RW** media using **PORT-1**:

- Type in **"MN"** at the **prompt**
- Press the **"Enter"** key 3-times.
- Press the **"F1"** key to start the port-1.
- A menu with 5-options will appear on the screen.
- Choose the appropriate option and press the number assigned to it. In our case we will press **"3" ,** which is **"Format CD R/W Media"**
- The door of the drive connected to the port-1 will open at this point, asking the operator to **"Please insert R/W CD".**
- Insert a CD-R/W media in the drive and press **"F1".**
- The door will close and will start formatting the media.

- Once the format is complete, a message will be displayed telling the operator if the format completed successfully or not.

To format more than one media at a time using other ports, repeat the above steps replacing **"F1"**with the respective port number.

Troubleshooting the ATAPI board:

Also, in order to troubleshoot the ATAPI board an operator can type in "**ATAPI /B".** It is a tool that allows an operator to make sure that there is proper communication between the hardware and the ATAPI-board and also that the SRAM on the board is working as expected in reading from and writing data onto it.

- Press **"Enter"** once.
- A message is displayed asking **"Reset the u'Ps (Y)es or (No)" .**
- Press **"Y"** to reset the microprocessor.
- It takes you to a screen where you can run the "**F8" test** (Communication Test) or the **"F7" test (**SRAM test).

- To run the Communication Test (COM-test), type in **"F8"** and press **"Enter".**
- The system will ask you which port you want to run the COM-test for. Press **"C"** for the current port that is active; **"2"** for ports-1 & 2; and **"4"** for all 4-ports. A perfectly good port should run the test with no values in the third row that says **"Port X bad";** where "X" is the port number 1~4.
- To run the SRAM Test, press **"F7"** and press **"Enter".**
- Press **"S"** for Soft-Reset.
- The last line on the screen "**SRAM/Hardware Sts"** tells if the test passed or failed.

Note: The active port is displayed on the top-left of the screen (PORT -01). One can change the ports by:

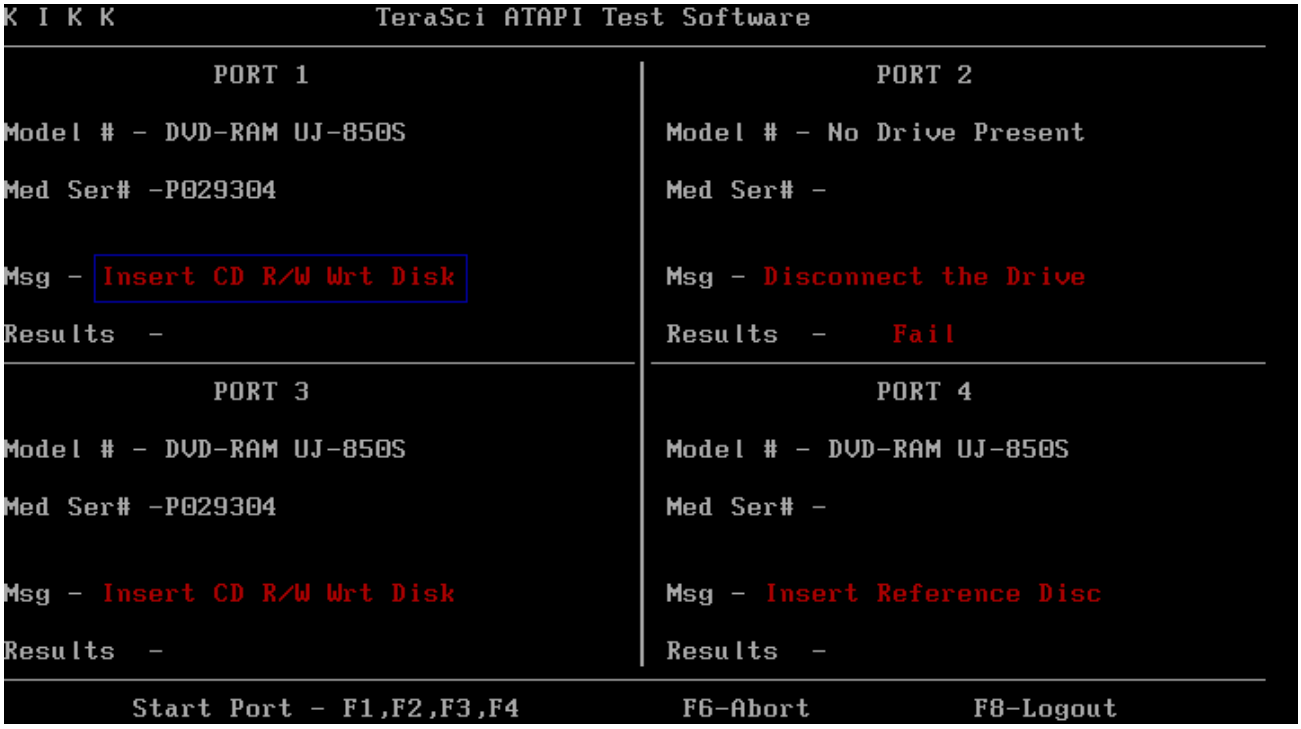
- Pressing **"F1"** twice and typing in the port number to be made active. (Port 1~4).
- Press **"Esc"** key once to get back to the main screen where one can perform the COM-test and the SRAM-test.

Single Disc Test "./ATAPI/T"

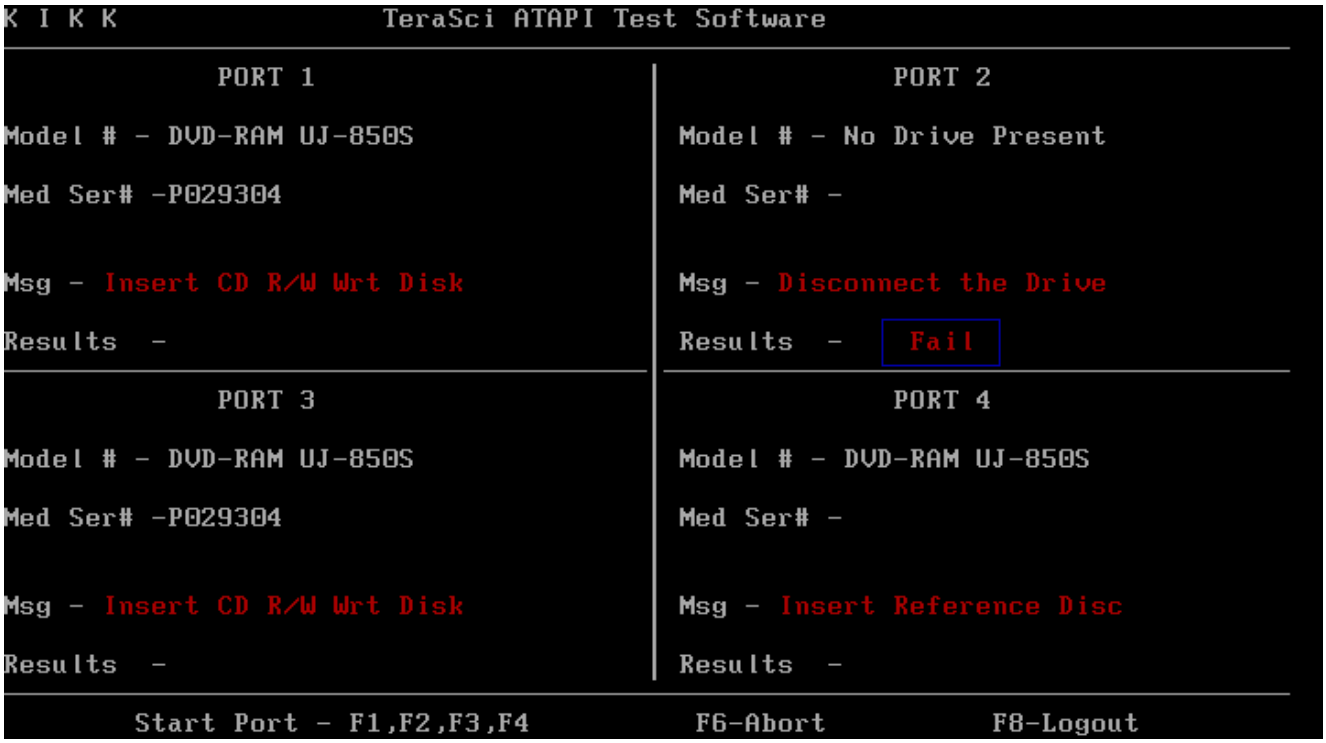
Attached are the code updates for all the sites. You will need to install the ATAPI.EXE code as well as update all the ports with the new ATAXO.BIN code. This code release adds some of the features that you had requested me in the past and are listed below:

1) Single disc test
   - This tool is accessed by typing in "cd linodd", press <ENTER> and then **"./ATAPI /T"**. Once you login and start the port, the system will take you to **"ATAPI Identify Drive & Inquiry Data" screen".** This screen displays all the useful information about the drive and the test media to be tested. At this point insert the test media that needs to be tested and wait for the drive to go ready. You can load/unload the disc by pressing the **"F3"** key. Once the drive is ready it will display the "Capacity", "Media Serial#" and the "MMS CNTS" fields (this field is only populated if the media serial# exists in the MMS.CSV file). Once the system recognizes the media serial#, you can run the single disc test by pressing the **"F2"** key. You don't have to enter any other information at this point and the system will run the single disc test by itself. At the completion of the test, the system will prompt you if the disc passed or failed the test and if you want to update the disc entry in the MMS file in case of a successful test. All media update step does is it clears out the fail counters in the MMS.CSV file. If the media serial# doesn't exist in the file, the system will prompt it as well.

2) Media Ser# on the screen for each port



3) Pass/Fail message in green/red colors.



Operating Guidelines For The Site Manager

To start the test software, type "T" at the Linux prompt.

When using TCPIP to connect to the server there is an automatic date and time update function. This function can be added to the AUTOEXEC.BAT file to insure the proper time and date are set on each of the test systems.

The ATAPI test software will display 4 test port windows. See figure 1 for the format of the ATAPI test program's main screen. At the bottom of the screen is a command line. The command line defines actions that are initiated by pressing a function key, generally F1 through F8. These commands will be defined below.

Each of the test port windows has four entries. The top entry is the unit under test model number, the next line is the bar code, the next line is a message line, and the last line is a disposition line. Once a unit has been started the software will automatically display the unit model number and the bar code. Most of the optical drives do not support a serial number in the inquiry data. Therefore most optical drives will not display a unique serial number in the serial number line.

The message line is used to inform the operator of the test progress and to prompt the operator to perform certain tasks. Test progress information will always be displayed in green on the message line. A green message is for information only and does not require any operator intervention. When the software requires operator intervention the message line will display a red message. The operator must perform the required action and then press the function key that corresponds to that port. For example the message line for port 1 may display the message "**Insert the Test Disk**" in red. The operator should see that the drive connected to port 1 has the door open. The operator is being asked to insert the test disk into the drive tray. After the operator has placed the disk into the proper tray, they can inform the software that they have completed the task by pressing F1. The software will acknowledge the operator by closing the door and changing the message from a red one to a green one, and continuing the test.

In summary, if the operator sees a red message they must perform a given action, and press the function key that corresponds to that port, or action, to acknowledge that they have satisfied the required action. In this manner the operator can interact with the test software with a minimal number of keystrokes.

After a drive has been logged out the message line will display "**Disconnect the Drive**" in red. The disposition line will then display the Pass **(in green)** or Fail (**in red**) information. The operator should separate the Passed and Failed drives for appropriate disposition.

The main menu consists of three primary actions. F1 through F4 correspond to the 4 test ports and are used to start a port or to acknowledge a message that required operator intervention.

F6 is used to abort a test port. When the operator presses F6 the command line will change to a new prompt, the operator can press F1 through F4 to abort the respective port. This will stop the test activity, and cause that port to fail the drive connected. If the operator accidentally presses F6 they can press Escape to exit the abort function, without aborting any ports.

F8 is used to Log Out any ports that have completed the test process. The message line will display the message "**Complete – Log Out Drive**" in red. When the operator presses F8 the software will display a log out screen and prompt the operator to enter the appropriate information. The Log Out Process will be defined in a later section of this manual.

The Test Sequence

Once drives have been connected to the test system, the operator can start a given port by pressing F1 to F4 for the corresponding port. For example to start port 2, press F2. Once the operator presses F2 the software will check to see if a drive is connected to port 2. The software will check for the drive as a Master, a Slave drive or Cable Select drive. Only drives with the master jumper or cable select jumper installed will be tested. If the drive has the Slave jumper installed, the message line will inform the operator of this fact and abort the test process. Refer to the error recovery section to see the appropriate action to recover.

If a drive is not detected the model number line will display the message "No Drive Present". Also, if a drive model number cannot be read properly by the tester, it will display the message "The Model is not in the Models file – Contact TeraSci…" Operator must pay attention to the model number displayed on the screen and, if, the model number displayed has any invalid characters.

Many types of drive failures can cause the drive to be completely inoperable. This can also be caused by the drive power and signal cables not being completely connected or bad cables. Always check the connections when this message is displayed. If you are certain the drive is properly connected, then assume the drive is inoperable, and Log Out the drive.

DRIVE NOT SUPPOTTED is also caused by bad drives and cables. If the software detects a drive is connected it will display the drive model number and the drive bar code. The software will look up the model number in the Models.CSV file and find the proper Profile (code set) to test this drive. Occasionally a drive model number will not be in the Models.CSV and a message "The Model is not in the Models file – Contact TeraSci…" will be displayed. At this point, the test operator must verify that the model number appears to be valid and not profiled in the Models.CSV file. If so, contact TeraSci to map this model number to an appropriate Profile or create a new Profile to test this drive. Note the exact model number and notify TeraSci for support via. email. In case the operator sees invalid characters in the model number, this indicates a bad connection between the port and the drive which might be caused by a bad cable or a bad connector.

Note: If you look closely at the model name displayed in the port window you can tell if the drive (or cables) is the problem or if the model (a valid model name) is not in the MODELS.CSV.

Under normal circumstances the drive will begin testing. The message line for the selected port will display a **green message** indicating that the test port has been started. The software will perform a few quick tests, open the drive tray and then a red message will be displayed. This message will request the operator to "**Insert Reference Disc**". The operator should place the media labeled "**Reference CD**" into the appropriate tray and press the corresponding function key. The software will close the door and resume the test sequence. The message line will inform the operator that the test has resumed. The software will execute several test steps and the message line will display those progress messages **in green**. Depending on the drive profile, at the end of the test a red message will be displayed, "**Insert CD R/W Wrt Disk**". The operator must insert a pre-Formatted "CD-R/W Wrt" test disk, and press the corresponding function key. The software will close the door and begin the write test. Again the software will display a series of progress messages in green.

If the drive being tested is a DVD drive the operator will be instructed to remove the CD RW disk, and insert the DVD disk. The tester will perform the necessary tests to check DVD read performance and if required the DVD write performance.

When all the tests have completed the software will display the message "**Press Button & Remove CD**" in red. The operator must press the drive button to open the tray and remove the CD. Then the operator must press the corresponding function key to inform the software the CD has been removed. The software will close the door and verify there is no CD present. In case of laptop drives, the operator will need to physically close the door and then press the corresponding function key. The software will then change the message line to "**Complete – Log Out Drive**" in red. This completes the test sequence description, and the normal operator interactions required to test a drive.

In summary, the normal sequence is for the operator to start the test process, insert the Test CD, remove the Test CD, insert the formatted CD RW disk, (if a DVD drive is being tested insert and remove the DVD Test disk) and press the drive button and remove the disk. Of course, the drives being tested may not work correctly and may

have problems. The message line will inform the operator if the software detects problems in the test sequence. For example the software may request that the operator "**Insert Reference Disc**". After the operator has inserted the disk and pressed the function key, the drive status might indicate there is no CD present, and this will be displayed on the message line in red. After the operator has determined that the correct CD is inserted, and it is not upside down, the operator can abort the test. Refer to the error description section for other error messages, and the appropriate actions.

Log Out Drives

Once a drive has completed the test process it must be logged out to transfer the test information to the data base. The operator presses F8 to start the log out process. The top of the log out screen (see figure 5) will display the port number for this log out process. It is normal to have more than 1 port ready to log out at the same time. The software will automatically select the lowest port number that is ready to log out. The operator should note which port the software has selected by observing the port number at the top of the screen.

The operator will be required to input information using a bar code scanner and the keyboard. The information entered will depend on a custom configuration for each customer. The following example is for one specific logout sequence. This sequence will vary from customer to customer.

The first input is the Product Part Number which is in bar code format on the drive label. It usually has a 5 by 5 format, Cxxxx – xxxxx. The operator should scan the bar code with the attached bar code scanner. The second input is the drive Serial Number, which is also on the drive label. Again the operator should scan the Serial Number with the bar code scanner. After the Serial number has been scanned, an optional message could be displayed at the bottom of the screen on the command line. This message will say “Bar Codes are not equal? – Is data correct (Y)es or (N)o – “. This message will be displayed if the drive serial number from the inquiry data and the drive serial number on the label are not equal. The serial number in the flash on the drive PCB and the serial number on the label must always be equal. If they are not equal it could be because the operator scanned the wrong drive, or the drive is a fraud. A fraud drive is defined as a drive that has been modified by a customer to make a warranty claim. If the operator scanned the wrong drive the appropriate answer to this question is “No”, the data is not correct. The software will start over and the operator can re-enter the part number and serial number. If the operator has scanned the correct drive the appropriate answer to this question is “Yes” the data is correct. The data will not be re-entered and will be added to the data base as entered.

After the serial number has been entered the software will display the operator comment table, (see Figure 6). This entry allows the operator to enter information that the operator has observed and that cannot be detected by the test software. For

example, the operator can indicate that the drive has physical damage, cosmetic defects, is too noisy, has a missing or torn label, and other problems. To select a comment, enter only the comment number, and press Return. If the operator enters any comment but number **"1 Pass Visual Exam"** the drive will be failed. Comment number **"0 Enter a Comment"** allows the operator to type in a free form comment up to 32 characters long. This option is available, but it is suggested it be used sparingly, and will cause the drive to be failed. If the two serial numbers do not match the operator should select comment number 4 (Fraud drive). This will fail the drive and set the drive disposition to scrap. The other comments are self-explanatory, and describe the normal drive failures.

After the log out data has been entered, the command line will display a prompt **"Verify Log Data – (ESC) to Change – (Ret) to Accept –".** The operator should quickly review the data on the screen and if it is incorrect press escape to re-enter the data. If all of the data is correct the operator should press Ret to log the data to the server. Once the operator has pressed Ret the test cycle for that drive is complete and the information has been added to the data base. The software will return to the main 4 port display. To log out the next drive the operator should press F8, and enter the data for the next drive. The message line for the port that was logged out will display "**Disconnect the Drive**". The disposition line for that port will display the pass or fail status for that port. The operator should route the drive to the appropriate destination based on the pass or fail status.

Error Messages

No Drive Present

This message indicates that a port has been started and the software cannot detect a drive connected. The operator should verify that the drive has the power and signal cables connected and that the cables are connected to same port that was started.
If the power supply was shorted the power cable may be connected but no power (either 5V or 12V) is available. A bad signal cable can also cause this problem. If the setup conditions are OK then this could indicate that the drive is completely inoperable. This is a normal failure and can occur as frequently as 20% of the drives.

Drive is Master

This error is a setup problem, and does not indicate a terminal problem for the drive. The operator should unplug the drive power, change the jumper from Master to Slave, and reconnect the drive power. Changing the Master, Slave jumper without power cycling the drive will not effect change the Master, Slave setting.

Wrong uCde Rev

Each CD RW drive has an appropriate Micro Code Revision Level. When the drive is not at that level the test software will display this message in red. The operator can press F6 to abort the test and fail the drive. The operator can also press the corresponding port function number and continue the test. When the process continues the software will update

the code in the drive to the latest revision level. If the drive accepts the code update, the test process will continue, this error will be ignored, and the drive will not fail the test for Wrong uCde Level.

Wrong Mode Page Data

This error is very similar to the Wrong uCde Level. It indicates that the drive has returned information that does not agree with the proper configuration for the drive model number. However, the will automatically fail the test process. This error cannot be repaired through the test process.

??? Wrong CD ???

As the operator is prompted to change CD's during the test process it is possible to put the wrong CD into the drive. This message indicates to the operator that the software has detected the wrong CD for a given test step. The operator can press the appropriate function key for the port and verify that the correct CD is installed. If the correct CD is in the drive, the operator should press F6 and abort the test.

CD Still Present

There are points in the test process that the software expects to find no CD inserted in the drive. If at one of these points a CD is present the software will display this message. The operator can remove the CD and

continue the test, or if in fact there was no CD present, the operator can abort the test process.

Seek Cmd Failed

This error will be displayed if the software encounters a seek error during the test process. The operator should note which CD was present in the drive at this point. When the operator acknowledges the error (presses the appropriate function key) the test process will be aborted and the drive will be failed. If the same CD causes another subsequent Seek Cmd Failed on another drive, the CD is suspect and should be discarded.

Too Many Overwrites

The CD RW disks are only good for 300 overwrites. After this number of overwrites has been reached the operator will be alerted, and that CD should be discarded.

Wrt Cmd Failed

This error will be displayed if the software encounters an error during the write process. This is another warning message. The operator should note which CD is the drive and then press the appropriate function key to acknowledge the message. The software will fail the drive being tested. If the same CD causes a subsequent Wrt Cmd Failed, the operator should discard the CD.