Intel® Rapid Storage Technology

User Guide

August 2011

Revision 1.0
INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL’S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER, AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. Intel products are not intended for use in medical, life saving, or life sustaining applications.

Intel may make changes to specifications and product descriptions at any time, without notice.

Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them.

The Intel® Rapid Storage Technology may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order. Intel, Intel® Rapid Storage Technology, Intel® Matrix Storage Technology, Intel® Rapid Recover Technology, and the Intel logo are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Other names and brands may be claimed as the property of others. Copyright © 2011, Intel Corporation. All rights reserved.
Contents
1 Introduction.................................................................................................................................5
  1.1 Terminology............................................................................................................................5
2 Intel® Rapid Storage Technology Features ..................................................................................8
  2.1 Feature Overview......................................................................................................................8
  2.2 RAID 0 (Striping).....................................................................................................................8
  2.3 RAID 1 (Mirroring) ..................................................................................................................9
  2.4 RAID 5 (Striping with Parity)...................................................................................................9
  2.5 RAID 10 ...................................................................................................................................10
  2.6 Matrix RAID ............................................................................................................................10
  2.7 RAID Migration .......................................................................................................................11
  2.8 RAID Level Migration .............................................................................................................11
  2.9 Intel® Rapid Recover Technology ............................................................................................12
  2.10 Advanced Host Controller Interface .....................................................................................12
    2.10.1 Native Command Queuing ..............................................................................................12
    2.10.2 Hot Plug ..........................................................................................................................13
3 RAID BIOS Configuration ..........................................................................................................14
  3.1 Overview ................................................................................................................................14
  3.2 Enabling RAID in BIOS .........................................................................................................14
4 Intel® Rapid Storage Technology Option ROM ..........................................................................15
  4.1 Overview ................................................................................................................................15
  4.2 User Interface ............................................................................................................................15
  4.3 Version Identification ...............................................................................................................16
  4.4 RAID Volume Creation ............................................................................................................16
5 Loading Driver during Operating System Installation ..............................................................21
  5.1 Overview ................................................................................................................................21
  5.2 F6 Installation Method .............................................................................................................21
    5.2.1 Automatic F6 Diskette Creation .......................................................................................21
    5.2.2 Manual F6 Diskette Creation ............................................................................................21
    5.2.3 F6 Installation Steps ..........................................................................................................22
6 Intel® RAID Storage Technology Installation ................................................................. 24
   6.1 Overview .................................................................................................................. 24
   6.2 Where to Obtain the Software ............................................................................... 24
   6.3 Installation Steps .................................................................................................... 25
   6.4 Confirming Software Installation ......................................................................... 27
   6.5 Version Identification ......................................................................................... 28
7 RAID-Ready Setup .................................................................................................... 29
   7.1 Overview .............................................................................................................. 29
   7.2 System Requirements ......................................................................................... 29
   7.3 RAID-Ready System Setup Steps ....................................................................... 29
8 Converting RAID-Ready to Full RAID .................................................................... 30
   8.1 Overview ............................................................................................................. 30
   8.2 RAID-Ready to 2-drive RAID 1 ........................................................................... 30
9 Verify and Repair ...................................................................................................... 34
   9.1 Overview ............................................................................................................. 34
   9.2 Actions during Verify and Repair ....................................................................... 34
Appendix A: Error Messages ....................................................................................... 35
   A.1 Incompatible Hardware .................................................................................... 35
   A.2 Operating System Not Supported ...................................................................... 35
   A.3 Source Hard Drive Cannot Be Larger .............................................................. 35
   A.4 Hard Drive Has System Files ............................................................................ 35
   A.5 Source Hard Drive is Dynamic Disk .................................................................. 36
1 Introduction

The purpose of this document is to enable a user to properly set up and configure a system using Intel® Rapid Storage Technology. It provides steps for set up and configuration, as well as a brief overview on Intel® Rapid Storage Technology features.

The information in this document is relevant only on systems with a supported Intel chipset and a supported operating system.

Supported Intel chipset and operating system information is available at the Intel® Rapid Storage Technology support web page.

Note: The majority of the information in this document is related to either software configuration or hardware integration. Intel is not responsible for the software written by third party vendors or the implementation of Intel components in the products of third party manufacturers.

Customers should always contact the place of purchase or system/software manufacturer with support questions about their specific hardware or software configuration.

1.1 Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHCI</td>
<td>Advanced Host Controller Interface: an interface specification that allows the storage driver to enable advanced Serial ATA features such as Native Command Queuing, native hot plug, and power management.</td>
</tr>
<tr>
<td>Continuous Update Policy</td>
<td>When a recovery volume is using this policy, data on the master drive is copied to the recovery drive automatically as long as both drives are connected to the system.</td>
</tr>
<tr>
<td>Intel® Rapid Storage Technology Option ROM</td>
<td>A code module built into the system BIOS that provides boot support for RAID volumes as well as a user interface for configuring and managing RAID volumes.</td>
</tr>
<tr>
<td>Master Drive</td>
<td>The hard drive that is the designated source drive in a recovery volume.</td>
</tr>
<tr>
<td>Matrix RAID</td>
<td>Two independent RAID volumes within a single RAID array.</td>
</tr>
<tr>
<td>Member</td>
<td>A hard drive used within a RAID array.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Migration</td>
<td>The process of converting a system’s data storage configuration from a non-RAID configuration (pass-thru) to a RAID configuration.</td>
</tr>
<tr>
<td>Hot Plug</td>
<td>The unannounced removal and insertion of a Serial ATA hard drive while the system is powered on.</td>
</tr>
<tr>
<td>NCQ</td>
<td>Native Command Queuing: a command protocol in Serial ATA that allows multiple commands to be outstanding within a hard drive at the same time. The commands are dynamically reordered to increase hard drive performance.</td>
</tr>
<tr>
<td>On Request Update Policy</td>
<td>When a recovery volume is using this policy, data on the master drive is copied to the recovery drive when you request it. Only changes since the last update process are copied.</td>
</tr>
<tr>
<td>OS</td>
<td>Operating System</td>
</tr>
<tr>
<td>Port0</td>
<td>A serial ATA port (connector) on a motherboard identified as Port0.</td>
</tr>
<tr>
<td>Port1</td>
<td>A serial ATA port (connector) on a motherboard identified as Port1.</td>
</tr>
<tr>
<td>Port2</td>
<td>A serial ATA port (connector) on a motherboard identified as Port2.</td>
</tr>
<tr>
<td>Port3</td>
<td>A serial ATA port (connector) on a motherboard identified as Port3.</td>
</tr>
<tr>
<td>POST</td>
<td>Power-On Self Test</td>
</tr>
<tr>
<td>RAID</td>
<td>Redundant Array of Independent Drives: allows data to be distributed across multiple hard drives to provide data redundancy or to enhance data storage performance.</td>
</tr>
<tr>
<td>RAID 0 (striping)</td>
<td>The data in the RAID volume is striped across the array’s members. Striping divides data into units and distributes those units across the members without creating data redundancy, but improving read/write performance.</td>
</tr>
<tr>
<td>RAID 1 (mirroring)</td>
<td>The data in the RAID volume is mirrored across the RAID array's members. Mirroring is the term used to describe the key feature of RAID 1, which writes duplicate data to each member; therefore, creating data redundancy and increasing fault tolerance.</td>
</tr>
<tr>
<td>RAID 5 (striping with parity)</td>
<td>The data in the RAID volume and parity are striped across the array’s members. Parity information is written with the data in a rotating sequence across the members of the array. This RAID level is a preferred configuration for efficiency, fault-tolerance, and performance.</td>
</tr>
<tr>
<td>RAID 10 (striping and mirroring)</td>
<td>The RAID level where information is striped across a two disk array for system performance. Each of the drives in the array has a mirror for fault tolerance. RAID 10 provides the performance benefits of RAID 0 and the redundancy of RAID 1. However, it requires four hard drives.</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
2 Intel® Rapid Storage Technology Features

2.1 Feature Overview

The Intel® Rapid Storage Technology software package provides high-performance Serial ATA (SATA) and SATA RAID capabilities for supported operating systems.

The key features of the Intel® Rapid Storage Technology are as follows:

- RAID 0
- RAID 1
- RAID 5
- RAID 10
- Matrix RAID
- RAID migration and RAID level migration
- Intel® Rapid Recover Technology
- Advanced Host Controller Interface (AHCI) support

2.2 RAID 0 (Striping)

RAID 0 uses the read/write capabilities of two or more hard drives working in unison to maximize the storage performance of a computer system.

The following table provides an overview of the advantages, the level of fault-tolerance provided and the typical usage of RAID 0.

<table>
<thead>
<tr>
<th>RAID 0 Overview</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hard Drives Required:</strong></td>
<td>2-6</td>
</tr>
<tr>
<td><strong>Advantage:</strong></td>
<td>Highest transfer rates</td>
</tr>
<tr>
<td><strong>Fault-tolerance:</strong></td>
<td>None - if one disk fails all data will be lost</td>
</tr>
<tr>
<td><strong>Application:</strong></td>
<td>Typically used in desktops and workstations for maximum performance for temporary data and high I/O rate. 2-drive RAID 0 available in specific mobile configurations.</td>
</tr>
</tbody>
</table>
2.3 **RAID 1 (Mirroring)**

A RAID 1 array contains two hard drives where the data between the two is mirrored in real time to provide good data reliability in the case of a single disk failure; when one disk drive fails, all data is immediately available on the other without any impact to the integrity of the data.

The following table provides an overview of the advantages, the level of fault-tolerance provided and the typical usage of RAID 1.

<table>
<thead>
<tr>
<th><strong>RAID 1 Overview</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hard Drives Required:</strong></td>
</tr>
<tr>
<td><strong>Advantage:</strong></td>
</tr>
<tr>
<td><strong>Fault-tolerance:</strong></td>
</tr>
<tr>
<td><strong>Application:</strong></td>
</tr>
</tbody>
</table>

2.4 **RAID 5 (Striping with Parity)**

A RAID 5 array contains three or more hard drives where the data and parity are striped across all the hard drives in the array. Parity is a mathematical method for recreating data that was lost from a single drive, which increases fault-tolerance.

The following table provides an overview of the advantages, the level of fault-tolerance provided and the typical usage of RAID 5.

<table>
<thead>
<tr>
<th><strong>RAID 5 Overview</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hard Drives Required:</strong></td>
</tr>
<tr>
<td><strong>Advantage:</strong></td>
</tr>
<tr>
<td><strong>Fault-tolerance:</strong></td>
</tr>
<tr>
<td><strong>Application:</strong></td>
</tr>
</tbody>
</table>
2.5 RAID 10

A RAID 10 array uses four hard drives to create a combination of RAID levels 0 and 1. It is a striped set whose members are each a mirrored set.

The following table provides an overview of the advantages, the level of fault-tolerance provided and the typical usage of RAID 10.

**RAID 10 Overview**

<table>
<thead>
<tr>
<th>Hard Drives Required:</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantage:</td>
<td>Combines the read performance of RAID 0 with the fault-tolerance of RAID</td>
</tr>
<tr>
<td>Fault- tolerance:</td>
<td>Excellent – disk mirroring means that all data on one disk is duplicated on another disk.</td>
</tr>
<tr>
<td>Application:</td>
<td>High-performance applications requiring data protection, such as video editing. Not available in mobile configurations.</td>
</tr>
</tbody>
</table>

2.6 Matrix RAID

Matrix RAID allows you to create two RAID volumes on a single RAID array.

As an example, on a system with an Intel® 82801GR I/O controller hub (ICH7R), Intel® Rapid Storage Technology allows you to create both a RAID 0 volume as well as a RAID 5 volume across four Serial ATA hard drives.

**Example of Matrix RAID:**

![Matrix RAID Diagram]
2.7 RAID Migration

The RAID migration feature enables a properly configured PC, known as a RAID-Ready system, to be converted into a high-performance RAID 0, RAID 1, RAID 5, or RAID 10 configuration by adding one or more Serial ATA hard drives to the system and invoking the RAID migration process from within Windows.

The following RAID migrations are supported:

- RAID-Ready to 2,3,4,5 or 6-drive RAID 0
- RAID-Ready to 2-drive RAID 1
- RAID-Ready to 3,4,5 or 6-drive RAID 5
- RAID-Ready to 4-drive RAID 10

Note: All migrations may not be available as each migration is supported on specific platform configurations.

The migrations do not require re-installation of the operating system. All applications and data remain intact.

Refer to [Supported RAID Migrations](#) for more information on migrations and the platforms on which each migration is supported.

2.8 RAID Level Migration

The RAID level migration feature enables a user to migrate data from a RAID 0, RAID 1, or RAID 10 volume to RAID 5 by adding any additional Serial ATA hard drives necessary and invoking the modify volume process from within Windows. The following RAID level migrations are supported:

- 2-drive RAID 0 to 3,4,5 or 6-drive RAID 5
- 3-drive RAID 0 to 4,5 or 6-drive RAID 5
- 4-drive RAID 0 to 5 or 6-drive RAID 5
- 2-drive RAID 1 to 3,4,5 or 6-drive RAID 5
- 4-drive RAID 10 to 4,5 or 6-drive RAID 5

Note: All migrations may not be available as each migration is supported on specific platform configurations.

RAID level migrations do not require re-installation of the operating system. All applications and data remain intact.

Refer to [Supported RAID Migrations](#) for more information on migrations and the platforms on which each migration is supported.
2.9 Intel® Rapid Recover Technology

Intel® Rapid Recover Technology utilizes RAID 1 (mirroring) functionality to copy data from a designated master drive to a designated recovery drive. The master drive data can be copied to the recovery drive either continuously or on request.

When using the continuous update policy, changes made to the data on the master drive while the system is not docked are automatically copied to the recovery drive when the system is re-docked. When using the on request update policy, the master drive data can be restored to a previous state by copying the data on the recovery drive back to the master drive.

The following table provides an overview of the advantages, the disadvantages and the typical usage of Intel® Rapid Recover Technology.

**Recovery Volume Overview:**

<table>
<thead>
<tr>
<th>Hard Drives Required</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantage</td>
<td>More control over how data is copied between master and recovery drives; fast volume updates (only changes to the master drive since the last update are copied to the recovery drive); member hard drive data can be viewed in Microsoft Windows Explorer*.</td>
</tr>
<tr>
<td>Disadvantage</td>
<td>No increase in volume capacity.</td>
</tr>
<tr>
<td>Application</td>
<td>Critical data protection for mobile systems; fast restoration of the master drive to a previous or default state.</td>
</tr>
</tbody>
</table>

2.10 Advanced Host Controller Interface

Advanced Host Controller Interface (AHCI) is an interface specification that allows the storage driver to enable advanced SATA features such as Native Command Queuing and Native Hot Plug.

Refer to [Supported Chipsets for AHCI](#) for more information.

2.10.1 Native Command Queuing

Native Command Queuing (NCQ) is a feature supported by AHCI that allows SATA hard drives to accept more than one command at a time. NCQ, when used in conjunction with one or more hard drives that support NCQ, increases storage performance on random workloads by allowing the drive to internally optimize the order of commands.

Note: To take advantage of NCQ, you need the following:

- Chipset that supports AHCI
- Intel® Rapid Storage Technology
- One or more SATA hard drives that support NCQ
2.10.2 Hot Plug

Hot plug, also referred to as hot swap, is a feature supported by AHCI that allows SATA hard drives to be removed or inserted while the system is powered on and running. As an example, hot plug may be used to replace a failed hard drive that is in an externally-accessible drive enclosure.

Note: To take advantage of hot plug, you need the following:

- Chipset that supports AHCI
- Intel® Rapid Storage Technology
- Hot plug capability correctly enabled in the system BIOS by the motherboard manufacturer
3 RAID BIOS Configuration

3.1 Overview

To install the Intel® Rapid Storage Technology, the system BIOS must include the SATA RAID option ROM and you must enable RAID in the BIOS.

3.2 Enabling RAID in BIOS

Note: The instructions to enable RAID in the BIOS are specific to motherboards manufactured by Intel with a supported Intel chipset. The specific BIOS settings on non-Intel motherboards may differ. Refer to the motherboard documentation or contact the motherboard manufacturer or your place of purchase for specific instructions. Always follow the instructions that are provided with your motherboard.

Depending on your Intel motherboard model, enable RAID by following either of the steps below.

1. Press the F2 key after the Power-On-Self-Test (POST) memory test begins.
2. Select the Configuration menu, then the SATA Drives menu.
3. Set the Chipset SATA Mode to RAID.
4. Press the F10 key to save the BIOS settings and exit the BIOS Setup program.

OR

1. Press the F2 key after the Power-On-Self-Test (POST) memory test begins.
2. Select the Advanced menu, then the Drive Configuration menu.
3. Set the Drive Mode option to Enhanced.
4. Enable Intel® RAID Technology.
5. Press the F10 key to save the BIOS settings and exit the BIOS Setup program.
4 Intel® Rapid Storage Technology Option ROM

4.1 Overview

The Intel® Rapid Storage Technology option ROM provides the following:

- Pre-operating system user interface for RAID volume management
- Ability to create, delete and reset RAID volumes
- RAID recovery

4.2 User Interface

To enter the Intel® Rapid Storage Technology option ROM user interface, press Ctrl-I when prompted during the Power-On Self Test (POST).

Option ROM prompt:

```
Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1834
Copyright(C) 2003-11 Intel Corporation. All Rights Reserved.
RAID Volumes:
None defined.
Physical Devices:
Port Device Model  Serial #  Size Type/Status(Vol ID)
  2 WD WD160AABJS-7  WD-WNAP99045721 149.0GB Non-RAID Disk
  3 WD WD160AABJS-7  WD-WNAP99046479 149.0GB Non-RAID Disk
Press {CTRL-I} to enter Configuration Utility...
```

In the user interface, the hard drive(s) and hard drive information listed for your system will differ from the example in Figure 3.

Option ROM user interface:

```
Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1834
Copyright(C) 2003-11 Intel Corporation. All Rights Reserved.
[ MAIN MENU ]
3. Reset Disks to Non-RAID 5. Acceleration Options 6. Exit
RAID Volumes:
None defined.
Physical Devices:
Port Device Model  Serial #  Size Type/Status(Vol ID)
  0 WD WD160AABJS-7  WD-WNAP99045633 149.0GB Non-RAID Disk
  2 WD WD160AABJS-7  WD-WNAP99045721 149.0GB Non-RAID Disk
  3 WD WD160AABJS-7  WD-WNAP99046479 149.0GB Non-RAID Disk
[↑↓]-Select  [ESC]-Exit  [ENTER]-Select Menu
```
4.3 Version Identification

To identify the version of the Intel® Rapid Storage Technology option ROM in the system BIOS, enter the option ROM user interface. The version number is located in the upper right corner.

4.4 RAID Volume Creation

Use the following steps to create a RAID volume using the Intel® Rapid Storage Technology user interface:

Note: The following procedure should only be used with a newly-built system or if you are reinstalling your operating system. The following procedure should not be used to migrate an existing system to RAID 0. If you wish to create matrix RAID volumes after the operating system software is loaded, they should be created using the Intel® Rapid Storage Technology software in Windows.

1. Press Ctrl-I when the following window appears during POST:
2. Select option for **Create RAID Volume** and press Enter.

3. Type in a volume name and press Enter or press Enter to accept the default volume name.
4. Select the RAID level by using the up and down arrow keys to scroll through the available values, then press Enter.

5. Press Enter to select the physical disks. A dialog similar to the following will appear:
6. Select the appropriate number of hard drives by using the up and down arrow keys to scroll through the list of available hard drives. Press the Space bar to select a drive. When you have finished selecting hard drives, press Enter.

7. Unless you have selected RAID 1, select the strip size by using the up and down arrow keys to scroll through the available values and then press Enter.
8. Select the volume capacity and press Enter. Note: The default value indicates the maximum volume capacity using the selected disks. If less than the maximum volume capacity is chosen, creation of a second volume is needed to utilize the remaining space (i.e. a matrix RAID configuration).

```
Name: VolumeA
RAID Level: RAID0(Stripe)
Disks: Select Disks
Strip Size: 128KB
Capacity: 666 GB
Sync: N/A
Create Volume

The default value indicates the maximum capacity using the selected disks. Entering a lower capacity allows you to create a second volume on those disks.
```

9. At the Create Volume prompt, press Enter to create the volume. The following prompt will appear:

```
WARNING: ALL DATA ON SELECTED DISKS WILL BE LOST.
Are you sure you want to create this volume? (Y/N):

Press ENTER to create the specified volume.
```

10. Press the <Y> key to confirm volume creation.
11. Exit the option ROM user interface by selecting the Exit option.
12. Press the <Y> key again to confirm exit.

Note: To change any of the information before the volume creation has been confirmed, you must exit the Create Volume process and restart it. Press the <Esc> key to exit the Create Volume process.
5 Loading Driver during Operating System Installation

5.1 Overview

The chart below shows the circumstances in which the F6 installation method must be used during an operating system installation.

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Total drive volume</th>
<th>F6 installation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 7*</td>
<td>Less than 2 Terabytes</td>
<td>Recommended but not required&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>More than 2 Terabytes&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Required</td>
</tr>
<tr>
<td>Windows Vista*</td>
<td>Less than 2 Terabytes</td>
<td>Recommended but not required&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>More than 2 Terabytes&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Required</td>
</tr>
<tr>
<td>Windows XP*</td>
<td>Less than 2 Terabytes</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>More than 2 Terabytes&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Required</td>
</tr>
</tbody>
</table>

1 Windows 7 and Windows Vista both include drivers for RAID/AHCI during installation.
2 For Intel® Desktop Boards, you must first enable UEFI in the BIOS when using total drive volume greater than two Terabytes. For non-Intel motherboards, refer to the motherboard documentation to see if this is a requirement.

5.2 F6 Installation Method

The F6 installation method requires a 3.5" diskette with the driver files.

5.2.1 Automatic F6 Diskette Creation

To automatically create a diskette that contains the files needed during the F6 installation process, follow these steps:

1. Download the latest F6 Driver Diskette utility from Download Center:
   

2. Run the .EXE file.
3. Follow all on-screen prompts.

Note: Choose either the 32-bit or the 64-bit version, depending on your operating system.

5.2.2 Manual F6 Diskette Creation

To manually create a diskette that contains the files needed during the F6 installation process, follow these steps:

1. Download the Intel® Rapid Storage Technology and save it to your local drive (or use the CD shipped with your motherboard which contains the Intel® Rapid Storage Technology). Note: The Intel® Rapid
Storage Technology can be downloaded from Download Center at

2. Extract the driver files at the command prompt by running the following command:

3. The following directory structure will be created:

   \Drivers
   \x32
   \x64

4. Copy the IAAHCLCAT, IAACHI.INF, IASTOR.CAT, IASTOR.INF, IASTOR.SYS, and TXTSETUP.OEM files to
   the root directory of a diskette.

   Note: If the system has a 32-bit processor, copy the files found in the \x32 folder; if the system has a 64-bit
   processor, copy the files found in the \x64 folder.

5.2.3 F6 Installation Steps

To install the Intel® Rapid Storage Technology driver using the F6 installation method, complete the
following steps:

1. Press F6 at the beginning of Windows setup when prompted in the status line with the ‘Press F6 if
   you need to install a third party SCSI or RAID driver’ message.

   Press F6 if you need to install a third party SCSI or RAID driver...

2. After pressing F6, nothing will happen immediately; setup will temporarily continue loading drivers and
   then you will be prompted with a screen to load support for mass storage device(s). Press S to ‘Specify
   Additional Device’.

   Windows Setup

   Setup could not determine the type of one or more mass storage devices
   installed in your system, or you have chosen to manually specify an adapter.
   Currently, Setup will load support for the following mass storage devices(s):
   <none>

   × To specify additional SCSI adapters, CD-ROM drives, or special
     disk controllers for use with Windows, including those for
     which you have a device support disk from a mass storage device
     manufacturer, press S.

   × If you do not have any device support disks from a mass storage
     device manufacturer, or do not want to specify additional
     mass storage devices for use with Windows, press ENTER.

   S=Specify Additional Device   ENTER=Continue   F3=Exit
3. Enter > key. Refer to the Automatic F6 Diskette Creation section above for instructions.

4. Select the RAID or AHCI controller entry that corresponds to your BIOS setup and press Enter. Note: Not all available selections may appear in the list; use the up and down arrow keys to see additional options.

5. Press Enter to confirm.

Windows setup will now continue. Leave the diskette in the diskette drive until the system reboots itself because Windows setup will need to copy the files again from the diskette. After Windows setup has copied these files again, remove the diskette so that Windows setup can reboot as needed.
6 Intel® Rapid Storage Technology Installation

6.1 Overview

After installing an operating system onto a RAID volume or on a SATA hard drive when in RAID or AHCI mode, the Intel® Rapid Storage Technology can be loaded from within Windows. This installs the following components:

- User interface (i.e. Intel® Rapid Storage Technology software)
- Tray icon service
- Monitor service, allowing you to monitor the health of your RAID volume and/or hard drives.

**Warning:** The Intel® Rapid Storage Technology driver may be used to operate the hard drive from which the system is booting or a hard drive that contains important data. For this reason, you cannot remove or un-install this driver from the system; however, you will have the ability to un-install all other non-driver components.

The following non-driver components can be un-installed:

- Intel® Rapid Storage Technology software
- Help documentation
- Start Menu shortcuts
- System tray icon service
- RAID monitor service

6.2 Where to Obtain the Software

If a CD or DVD was included with your motherboard or system, it should include the Intel® Rapid Storage Technology software.

The latest version of Intel® Rapid Storage Technology can also be downloaded from Download Center at: http://downloadcenter.intel.com/Product_Filter.aspx?ProductID=2101
6.3 Installation Steps

Note: The instructions below assume that the BIOS has been configured correctly and the RAID driver has been installed using the F6 installation method (if applicable).

1. Run the Intel® Rapid Storage Technology installation file.
2. On the welcome screen, click Next to continue.

3. Review the Warning screen and click Next to continue.
4. Review the License Agreement and click **Yes** to accept the license agreement terms.

5. Review the Readme File Information and click **Next** to continue.
6. Click Finish to complete the installation and restart the system.

6.4 Confirming Software Installation

Refer to the image below to confirm that Intel® Rapid Storage Technology has been installed.
If installation was done using F6 or an unattended installation method, you can confirm that the Intel® Rapid Storage Technology was loaded by following these steps:

*Note: The following instructions assume Classic mode in Windows® XP.*

1. Click the Start button and then Control Panel.
2. Double-click the System icon.
3. Select the Hardware tab.
4. Click the Device Manager button.
5. Expand the SCSI and RAID Controllers entry.
6. Right-click the SATA RAID Controller entry.
7. Select the Driver tab.
8. Click the Driver Details button. The iastor.sys file should be listed. Example: Refer to Figure 5.

**Driver details example:**

![Driver File Details](image)

*NOTE: The controller shown here may differ from the controller displayed for your system.*

6.5 **Version Identification**

1. Open the Intel® Rapid Storage Technology software.
2. Click the Help button and then the About button.

![Intel® Rapid Storage Technology](image)

*NOTE: The version information shown here may differ from the information displayed for your system.*
7 RAID-Ready Setup

7.1 Overview

A RAID-Ready system is a system configuration that allows a user to perform a RAID migration at a later date.

For more information on RAID migrations, see the RAID Migration section of this User Guide (Section 8).

7.2 System Requirements

In order for a system to be considered RAID-Ready, it must meet all of the following requirements:

- Contains a supported Intel chipset
- Includes a single SATA hard drive
- RAID must be enabled in the BIOS
- Motherboard BIOS must include the Intel® Rapid Storage Technology option ROM
- Intel® Rapid Storage Technology must be loaded
- A partition that does not take up the entire capacity of the hard drive (4-5MB of free space is sufficient)

7.3 RAID-Ready System Setup Steps

To set up a RAID-Ready system, follow these steps:

1. Enable RAID in system BIOS using the steps listed in Enabling RAID in BIOS (Section 3.2).
2. Install the Intel® Rapid Storage Technology driver using the steps listed in F6 Installation Steps (Section 5.2.3)
3. Install Intel® Rapid Storage Technology using the steps listed in Installation Steps (Section 6.3)
8 Converting RAID-Ready to Full RAID

8.1 Overview

This section explains how to convert (or migrate) from a RAID-Ready system to a fully-functional RAID system. The example in this section describes the migration steps for RAID 1.

8.2 RAID-Ready to 2-drive RAID 1

To convert a RAID-Ready system into a system with a 2-drive RAID 1 volume, follow these steps:

Warning: This operation will delete all existing data from the additional hard drive or drives and the data cannot be recovered. It is critical to backup all important data on the additional drives before proceeding. The data on the source hard drive, however, will be preserved.

1. Install an additional SATA hard drive in the system.
2. Start Windows and open the Intel® Rapid Storage Technology software.
3. Select Create a custom volume.
4. On the Select Volume Type screen, select **Real-time data protection (RAID 1)** and then click **Next**.

5. On the Configure Volume screen:
   a. Select the two installed disks
   b. Choose to keep data on the “System” disk
   c. Click **Next**
6. Review the warning screen and then click **Create Volume**.

7. Review the confirmation screen and then click **OK**.
8. After the volume has been created, click **OK** on the completion screen.

![Volume Creation Complete](image)

9. Review the Status screen, now showing the RAID array just created.

![Status Screen](image)

10. The data migration will begin and may take some time. During the migration, you can see the current status by holding the mouse pointer over the Intel® Rapid Storage Technology status bar icon.

![Data Migration Status](image)
9 Verify and Repair

9.1 Overview

Verify and Repair checks a volume for inconsistent or bad data. It may also fix any data problems or parity errors.

The Verify process happens...
- Automatically after a hard system shutdown or system crash (except when configured for RAID 0)
- Manually when started from within the Intel® Rapid Storage Technology software

The UI displays two functions:
- Verify Only
- Verify and Repair

9.2 Actions during Verify and Repair

The Verify process checks each stripe rather than copying data. The driver walks through every stripe in the volume, starting at the lowest logical block address (LBA).

<table>
<thead>
<tr>
<th>Array Type</th>
<th>Actions</th>
</tr>
</thead>
</table>
| RAID 0     | Verify: checks for any read failures.  
             Repair: can’t repair since there is not a copy of good data |
| RAID 1     | Verify: checks for data mismatches and read failures  
             Repair: copies to mirror |
| RAID 5     | Verify: checks for parity issues and read failures  
             Repair: updates parity; assumes the data is correct and regenerates and rewrites parity |
| RAID 10    | Verify: checks for data mismatches and read failures  
             Repair: copies to mirror |
Appendix A: Error Messages

A.1 Incompatible Hardware

Issue: The following error message appears during installation:

Incompatible hardware. This software is not supported on this chipset. Please select ‘Yes’ to view the Readme file for a list of supported products. Refer to section 2 titled ‘System Requirements’.

To resolve this issue, install the Intel® Rapid Storage Technology software on a system with a supported Intel chipset or by ensuring that AHCI or RAID is enabled in the system BIOS.

A.2 Operating System Not Supported

Issue: The following error message appears during installation:

This operating system is not currently supported by this install package. Installer will now exit.

To resolve this issue, install the Intel® Rapid Storage Technology software on a supported operating system.

A.3 Source Hard Drive Cannot Be Larger

Issue: When attempting to migrate from a single hard drive (or a RAID-Ready configuration) to a RAID configuration, the following error message appears and the migration process will not begin:

The source hard drive cannot be larger than the selected hard drive member(s).

Do one of the following to correct the problem:
- If already inserted, select larger hard drive member(s).
- Insert larger hard drive(s) into the system, and re-launch the Create RAID Volume from Existing Hard Drive Wizard.

Follow the steps listed in the error message to resolve the problem.

A.4 Hard Drive Has System Files

Issue: The following error message appears after selecting a hard drive as a member hard drive during the Create RAID Volume process:

This hard drive has system files and cannot be used to create a RAID volume. Please select another hard drive.

Solution: Select a new hard drive.
A.5  Source Hard Drive is Dynamic Disk

Issue: When attempting to migrate from a RAID-Ready system to a full-RAID system, an error message is received that says the migration cannot continue because the source drive is a dynamic disk. However, Microsoft* Windows* Disk Management shows the disk as basic, not dynamic.

This issue may occur if there is not enough space for the migration to successfully complete. Instead of reporting that there is not enough space, the Intel Rapid Storage Technology software reports that the migration cannot continue because the source drive is a dynamic disk.

Note: This error is not related to the size of the destination hard drive(s). It may be received even if the destination hard drive(s) are equal to or greater in size than the source hard drive.

To resolve this issue:

- If there is a single partition on the source hard drive, reducing the size of the partition by a few MBs may resolve the issue and allow the migration to occur.
- If there are multiple partitions on the source hard drive, reducing the size of the second partition by a few MBs may resolve the issue and allow the migration to occur.