Intel® Rapid Storage Technology

User Guide

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Contents

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

Term	Description
AHCI	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.
Continuous Update Policy	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.
Intel® Rapid Storage Technology Option ROM	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.
Master Drive	The hard drive that is the designated source drive in a recovery volume.
Matrix RAID	Two independent RAID volumes within a single RAID array.
Member	A hard drive used within a RAID array.

Term	Description
Migration	The process of converting a system's data storage configuration from a non-RAID configuration (pass-thru) to a RAID configuration.
Hot Plug	The unannounced removal and insertion of a Serial ATA hard drive while the system is powered on.
NCQ	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.
On Request Update Policy	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.
OS	Operating System
Port0	A serial ATA port (connector) on a motherboard identified as Port0.
Port1	A serial ATA port (connector) on a motherboard identified as Port1.
Port2	A serial ATA port (connector) on a motherboard identified as Port2.
Port3	A serial ATA port (connector) on a motherboard identified as Port3.
POST	Power-On Self Test
RAID	Redundant Array of Independent Drives: allows data to be distributed across multiple hard drives to provide data redundancy or to enhance data storage performance.
RAID 0 (striping)	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.
RAID 1 (mirroring)	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.
RAID 5 (striping with parity)	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.
RAID 10 (striping and mirroring)	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.

Term	Description
RAID Array	A logical grouping of physical hard drives.
RAID Level Migration	The process of converting a system's data storage configuration from one RAID level to another.
RAID Volume	A fixed amount of space across a RAID array that appears as a single physical hard drive to the operating system. Each RAID volume is created with a specific RAID level to provide data redundancy or to enhance data storage performance.
Recovery Drive	The hard drive that is the designated target drive in a recovery volume.
Recovery Volume	A volume utilizing Intel(R) Rapid Recover Technology.

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.

RAID 0 Overview

Hard Drives Required:	2-6
Advantage:	Highest transfer rates
Fault- tolerance:	None – if one disk fails all data will be lost
Application:	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.

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.

RAID 1 Overview

Hard Drives Required:	2
Advantage:	100% redundancy of data. One disk may fail, but data will continue to be accessible. A rebuild to a new disk is recommended to maintain data redundancy.
Fault- tolerance:	Excellent – disk mirroring means that all data on one disk is duplicated on another disk.
Application:	Typically used for smaller systems where capacity of one disk is sufficient and for any application(s) requiring very high availability. Available in specific mobile configurations.

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.

RAID 5 Overview

Hard Drives Required:	3-6
Advantage:	Higher percentage of usable capacity and high read performance as well as fault-tolerance.
Fault- tolerance:	Excellent - parity information allows data to be rebuilt after replacing a failed hard drive with a new drive.
Application:	Storage of large amounts of critical data. Not available in mobile configurations.

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

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

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:
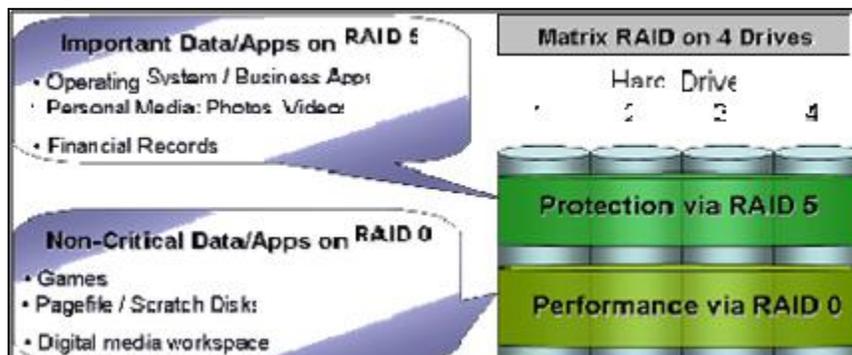
2.7   RAID Migration

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:

Hard Drives Required:	2
Advantage:	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*.
Disadvantage:	No increase in volume capacity.
Application:	Critical data protection for mobile systems; fast restoration of the master drive to a previous or default state.

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 - 10.5.0.1034
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    WDC WD1600AAJS-7 WD-WMAP9D045721              149.0GB Non-RAID Disk
  3    WDC WD1600AAJS-7 WD-WMAP9D046479              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 - 10.5.0.1034
           Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
===============================[ MAIN MENU ]===============================
    1.   Create RAID Volume           4.   Recovery Volume Options
    2.   Delete RAID Volume           5.   Acceleration Options
    3.   Reset Disks to Non-RAID      6.   Exit
=======================[ DISK/VOLUME INFORMATION ]=========================
  RAID Volumes:
  None defined.

  Physical Devices:
  Port Device Model    Serial #                      Size Type/Status(Vol ID)
  0    WDC WD1600AAJS-7 WD-WMAP9D045633              149.0GB Non-RAID Disk
  2    WDC WD1600AAJS-7 WD-WMAP9D045721              149.0GB Non-RAID Disk
  3    WDC WD1600AAJS-7 WD-WMAP9D046479              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.

```
      Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1034
          Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
================================[ MAIN MENU ]================================
 1.   Create RAID Volume              4.   Recovery Volume Options
 2.   Delete RAID Volume              5.   Acceleration Options
 3.   Reset Disks to Non-RAID         6.   Exit
=========================[ DISK/VOLUME INFORMATION ]=========================
RAID Volumes:
None defined.

Physical Devices:
Port Device Model      Serial #                   Size Type/Status(Vol ID)
0    WDC WD1600AAJS-7  WD-WMAP9D045633         149.0GB Non-RAID Disk
2    WDC WD1600AAJS-7  WD-WMAP9D045721         149.0GB Non-RAID Disk
3    WDC WD1600AAJS-7  WD-WMAP9D046479         149.0GB Non-RAID Disk




       [↑↓]-Select              [ESC]-Exit            [ENTER]-Select Menu
```

3. Type in a volume name and press Enter or press Enter to accept the default volume name.

```
      Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1034
          Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
==========================[ CREATE VOLUME MENU ]==========================

                      Name:    Volume0
                RAID Level:    RAID0(Stripe)
                     Disks:    Select Disks
                Strip Size:    128KB
                  Capacity:    298.0  GB
                      Sync:    N/A
                             Create Volume


=================================[ HELP ]=================================



      Enter a unique volume name that has no special characters and is
                        16 characters or less.




        [↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

4. Select the RAID level by using the up and down arrow keys to scroll through the available values,
    then press Enter.

```
   Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1034
   Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
 ===========================[ CREATE VOLUME MENU ]==========================

                    Name:  Volume0
              RAID Level:  RAID0(Stripe)
                   Disks:  Select Disks
              Strip Size:   128KB
                Capacity:   0.0     GB
                    Sync:  N/A
                           Create Volume

 ==================================[ HELP ]==================================




               RAID 0: Stripes data (performance).




       [↑↓]Change    [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```
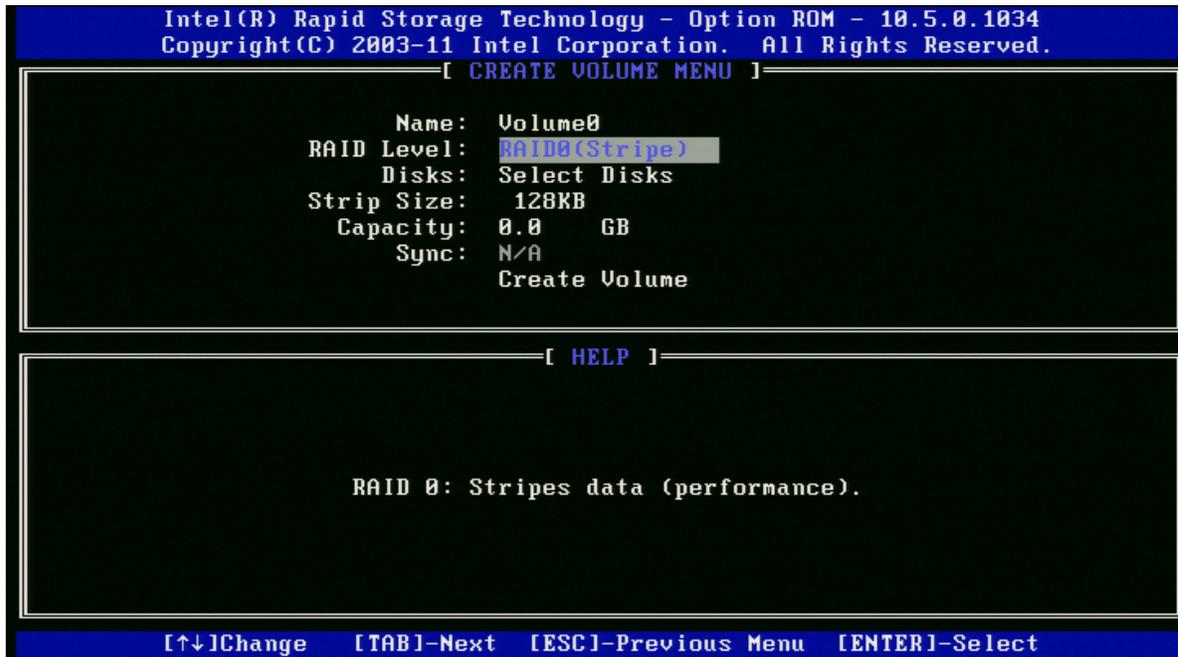
5. Press Enter to select the physical disks. A dialog similar to the following will appear:

```
   Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1034
   Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
 ===========================[ CREATE VOLUME MENU ]==========================

                    Name:  Volume0
              RAID Level:  RAID0(Stripe)
                         =[ SELECT DISKS ]=

  Port Drive Model            Serial #              Size Status
  0    WDC WD1600AAJS-75PSA WD-WMAP9D045633       149.0GB Non-RAID Disk
  2    WDC WD1600AAJS-75PSA WD-WMAP9D045721       149.0GB Non-RAID Disk
  3    WDC WD1600AAJS-75PSA WD-WMAP9D046479       149.0GB Non-RAID Disk



          Select 2 to 6 disks to use in creating the volume.

 ==[↑↓]-Prev/Next [SPACE]-SelectDisk [ENTER]-Done==




       [↑↓]Change    [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

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.

```
                          [ SELECT DISKS ]
 Port Drive Model           Serial #            Size Status
 ▶0   WDC WD1600AAJS-75PSA WD-WMAP9D045633     149.0GB Non-RAID Disk
 ▶2   WDC WD1600AAJS-75PSA WD-WMAP9D045721     149.0GB Non-RAID Disk
 ▶3   WDC WD1600AAJS-75PSA WD-WMAP9D046479     149.0GB Non-RAID Disk


        Select 2 to 6 disks to use in creating the volume.

 [↑↓]-Prev/Next [SPACE]-SelectDisk [ENTER]-Done
```
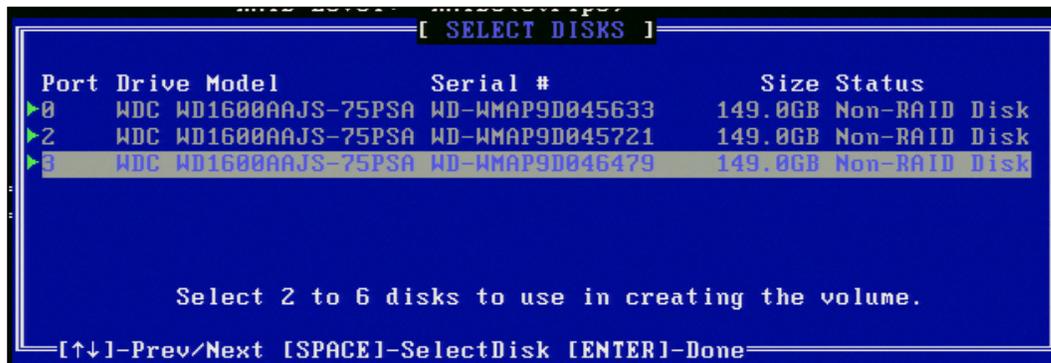
7. Unless you have selected RAID 1, select the strip size by using the up and down arrow keys to scroll through the available values and then press Enter.

```
    Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1034
    Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
                      [ CREATE VOLUME MENU ]
                 Name:  Volume0
           RAID Level:  RAID0(Stripe)
                Disks:  Select Disks
           Strip Size:  128KB
             Capacity:  447.0  GB
                 Sync:  N/A
                        Create Volume


                            [ HELP ]


                The following are typical values:

                     RAID0  - 128KB
                     RAID10 - 64KB
                     RAID5  - 64KB




        [↑↓]Change   [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

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).

```
        Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1034
           Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
    ═══════════════════════════[ CREATE VOLUME MENU ]═══════════════════════════
    ┌────────────────────────────────────────────────────────────────────────┐
    │                     Name:    Volume0                                     │
    │               RAID Level:    RAID0(Stripe)                               │
    │                    Disks:    Select Disks                                │
    │               Strip Size:    128KB                                       │
    │                 Capacity:    447.0   GB                                  │
    │                     Sync:    N/A                                         │
    │                              Create Volume                               │
    │                                                                          │
    └────────────────────────────────────────────────────────────────────────┘

    ═══════════════════════════════[ HELP ]════════════════════════════════════
    ┌────────────────────────────────────────────────────────────────────────┐
    │                                                                          │
    │                                                                          │
    │       The default value indicates the maximum capacity using the selected│
    │         disks. Entering a lower capacity allows you to create a second   │
    │                         volume on these disks.                           │
    │                                                                          │
    │                                                                          │
    │                                                                          │
    └────────────────────────────────────────────────────────────────────────┘
          [↑↓]Change    [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

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

```
        Intel(R) Rapid Storage Technology - Option ROM - 10.5.0.1034
           Copyright(C) 2003-11 Intel Corporation.  All Rights Reserved.
    ═══════════════════════════[ CREATE VOLUME MENU ]═══════════════════════════
    ┌────────────────────────────────────────────────────────────────────────┐
    │                     Name:    Volume0                                     │
    │               RAID Level:    RAID0(Stripe)                               │
    │                    Disks:    Select Disks                                │
    │               Strip Size:    128KB                                       │
    │                 Capacity:    447.0   GB                                  │
    │                     Sync:    N/A                                         │
    │         ┌──────────────────────────────────────────────────┐            │
    │         │ 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.              │
    │                                                                          │
    │                                                                          │
    └────────────────────────────────────────────────────────────────────────┘
          [↑↓]Change    [TAB]-Next   [ESC]-Previous Menu   [ENTER]-Select
```

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.

Operating system	Total drive volume	F6 installation method
Windows 7*	Less than 2 Terabytes	Recommended but not required[1]
	More than 2 Terabytes[2]	Required
Windows Vista*	Less than 2 Terabytes	Recommended but not required[1]
	More than 2 Terabytes[2]	Required
Windows XP*	Less than 2 Terabytes	Required
	More than 2 Terabytes[2]	Required

[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:
    http://downloadcenter.intel.com/Product_Filter.aspx?ProductID=2101
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
http://downloadcenter.intel.com/Product_Filter.aspx?ProductID=2101

2. Extract the driver files at the command prompt by running the following command:
   {filename} –A -P {path}   *Example: IATA_CD_10.6.0.1022.EXE –A –P C:\TEMP*

3. The following directory structure will be created:

   \Drivers
       \x32
       \x64

4. Copy the IAAHCI.CAT, 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.
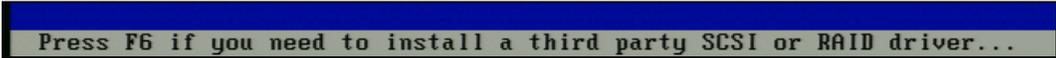
```
Press F6 if you need to install a third party SCSI or RAID driver...
```

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'.
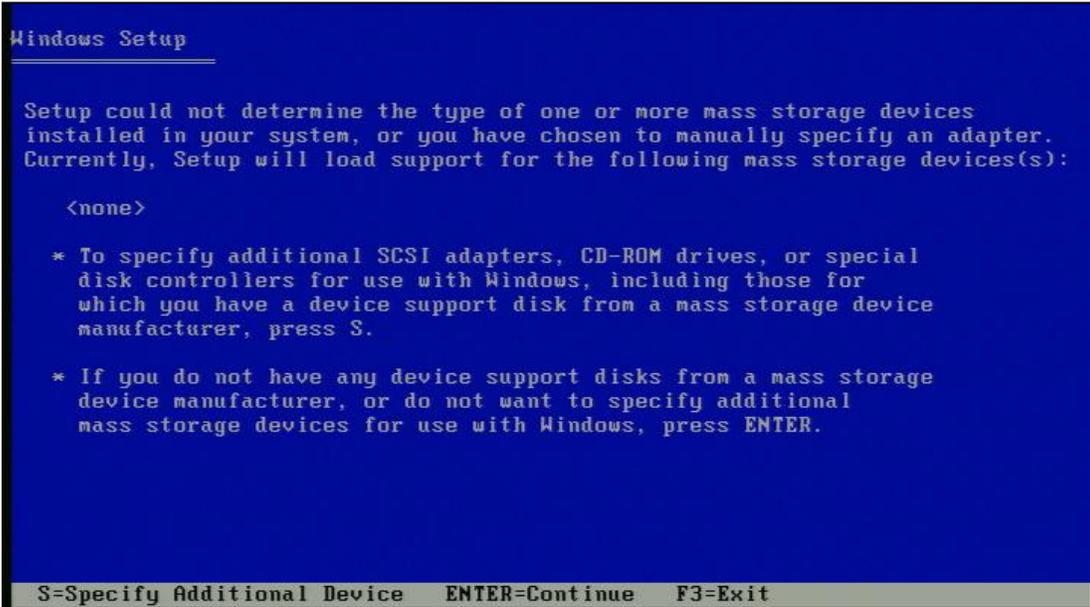
```
Windows Setup


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.

```
Windows Setup




                Please insert the disk labeled

           Manufacturer-supplied hardware support disk

                       into Drive A:

             *   Press ENTER when ready.




  ENTER=Continue   ESC=Cancel   F3=Exit
```

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.

```
Windows Setup


      You have chosen to configure a SCSI Adapter for use with Windows,
      using a device support disk provided by an adapter manufacturer.

      Select the SCSI Adapter you want from the following list, or press ESC
      to return to the previous screen.


    Intel(R) ICH10D/DO SATA AHCI Controller
    Intel(R) ICH10R SATA AHCI Controller
    Intel(R) 5 Series 4 Port SATA AHCI Controller
    Intel(R) 5 Series 6 Port SATA AHCI Controller




  ENTER=Select   F3=Exit
```

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.
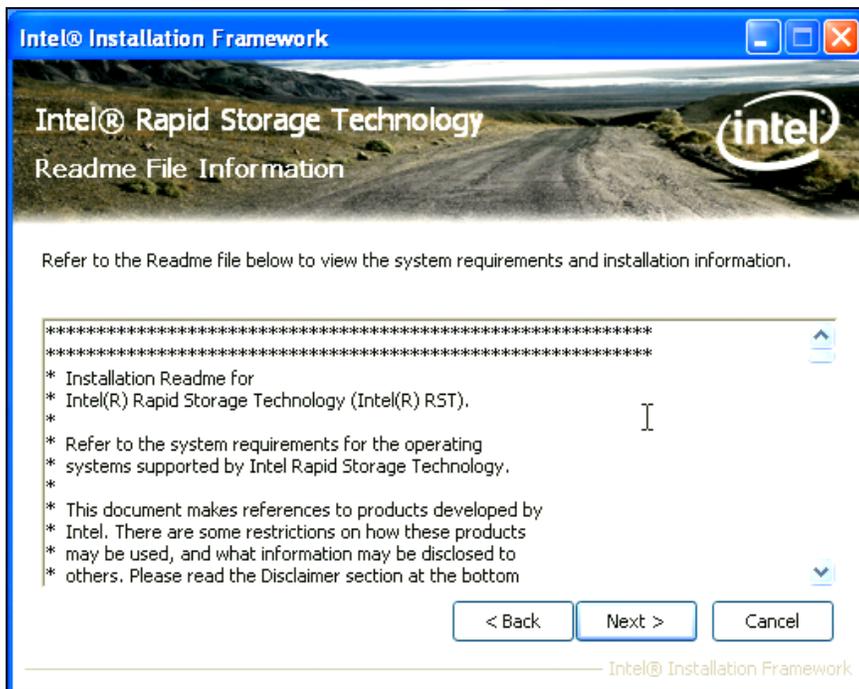
6. Click Finish to complete the installation and restart the system.
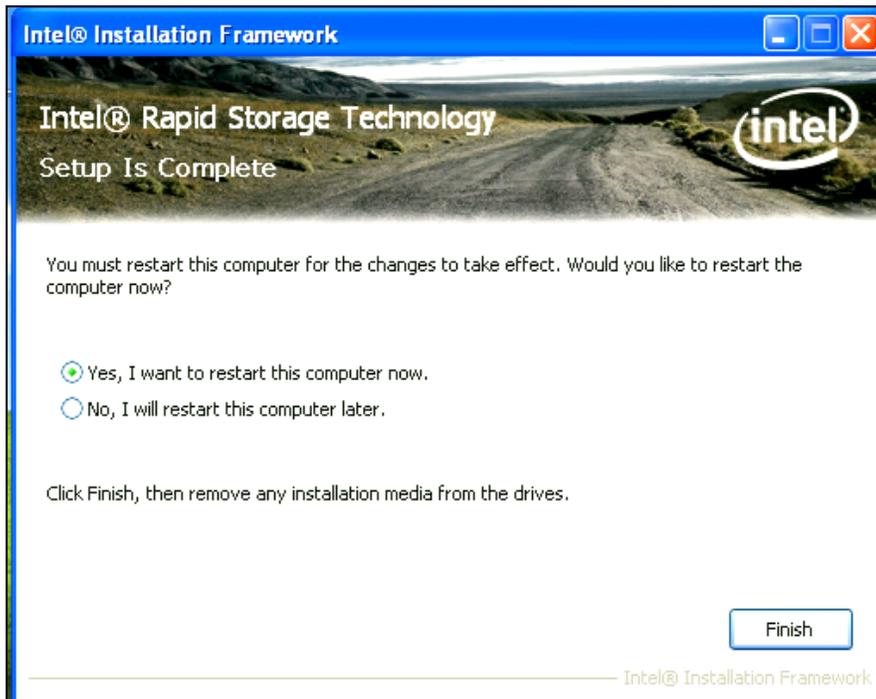
6.4   Confirming Software Installation

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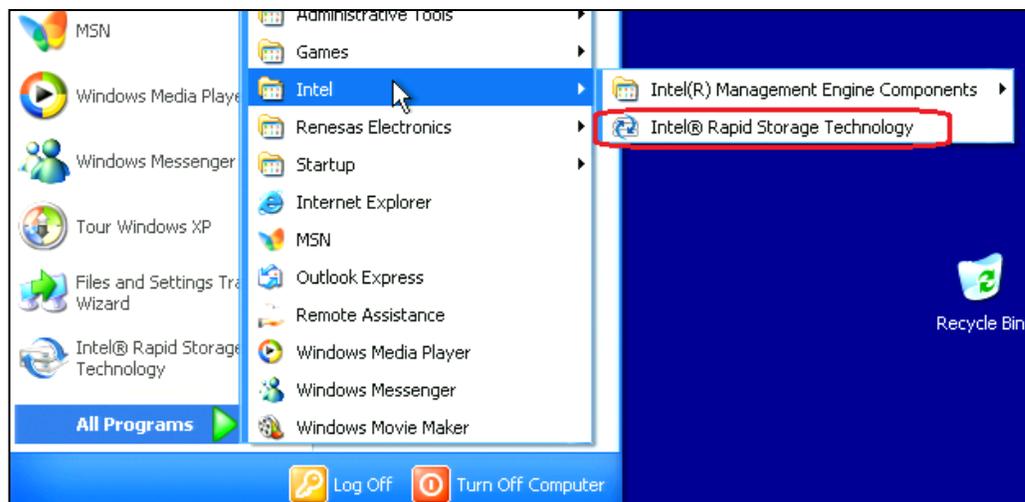
If installation was done using F6 or an unattended installation method, you can confirm that the Intel®
Rapid Storage Technology was loaded by following these steps:

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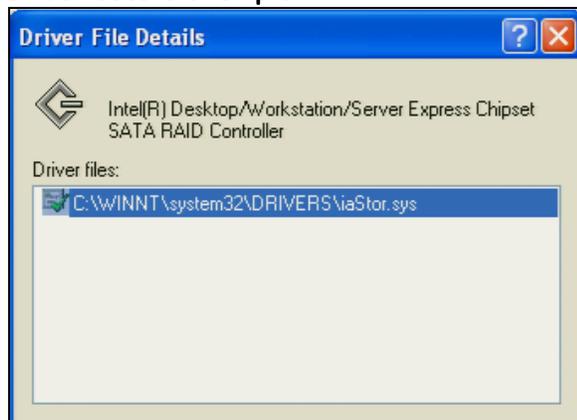
NOTE: The controller shown here may differ from the controller displayed for your system.

6.5   Version Identification

1. Open the Intel® Rapid Storage Technology software.
2. Click the **Help** button and then the **About** button.
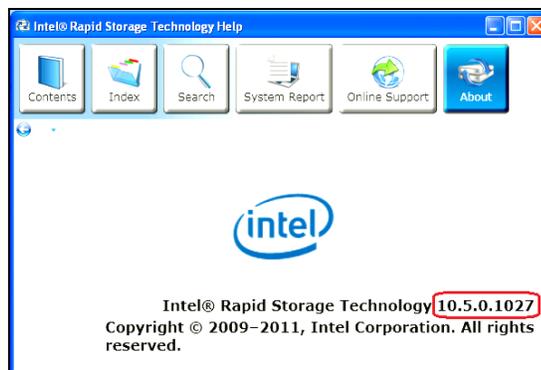
NOTE: The version information shown here may differ from the information displayed for your system.

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**.
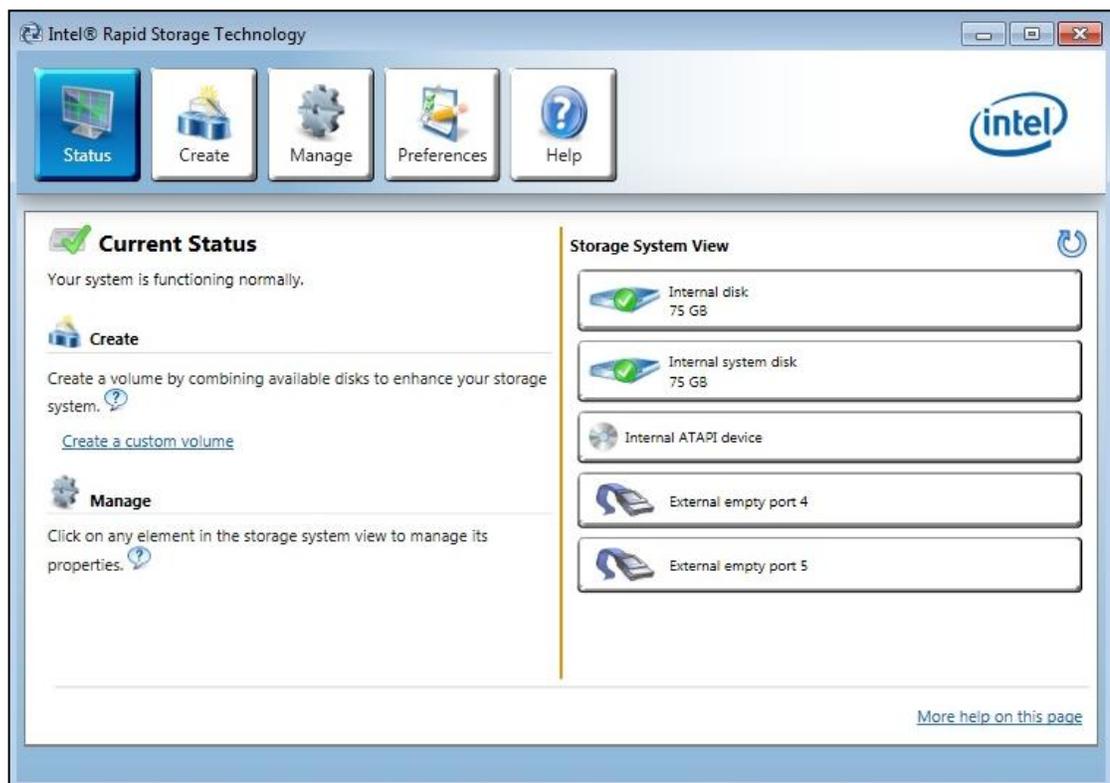
4. On the Select Volume Type screen, select **Real-time data protection (RAID 1)** and then click **Next.**
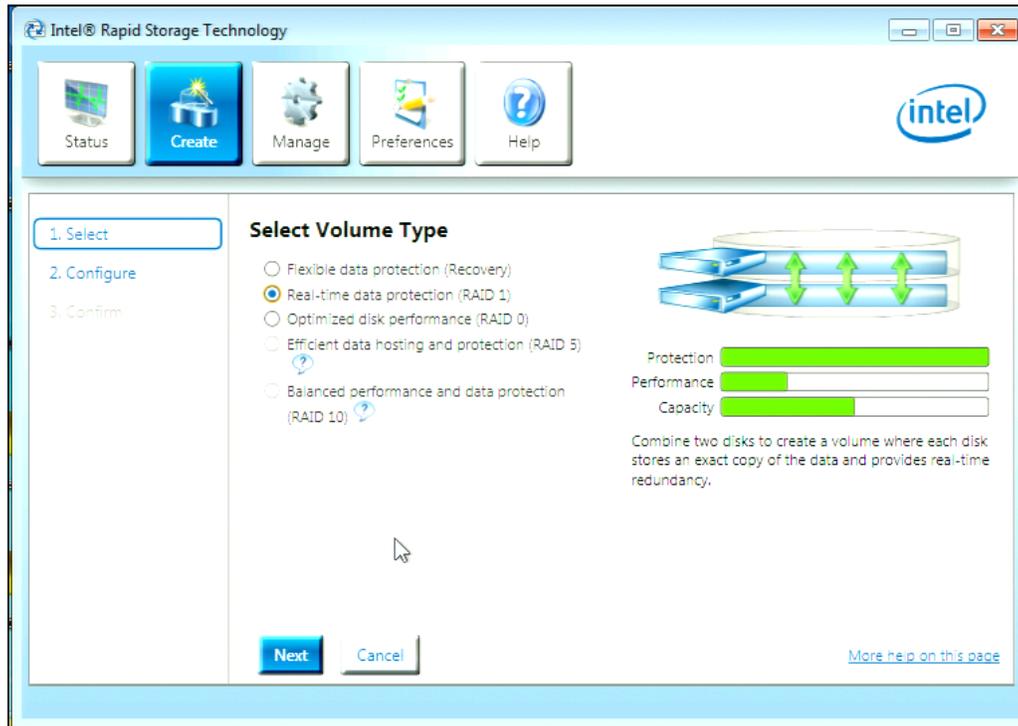
5. On the Configure Volume screen:
   a. Select the two installed disks
   b. Choose to keep data on the "System" disk
   c. Click **Next**
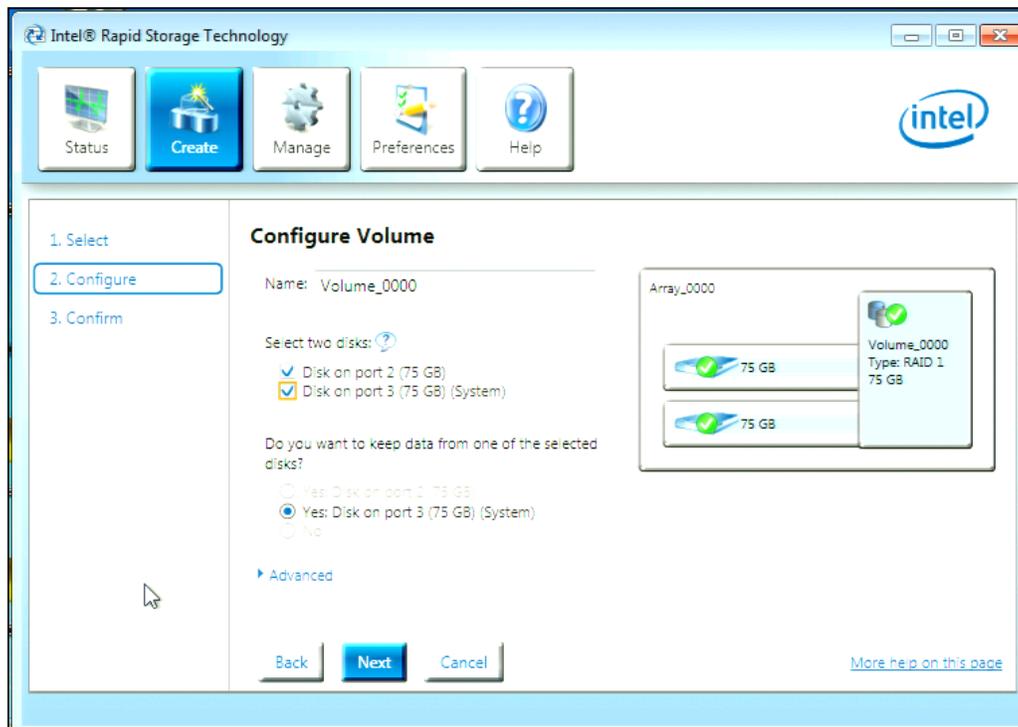
6. Review the warning screen and then click **Create Volume**.
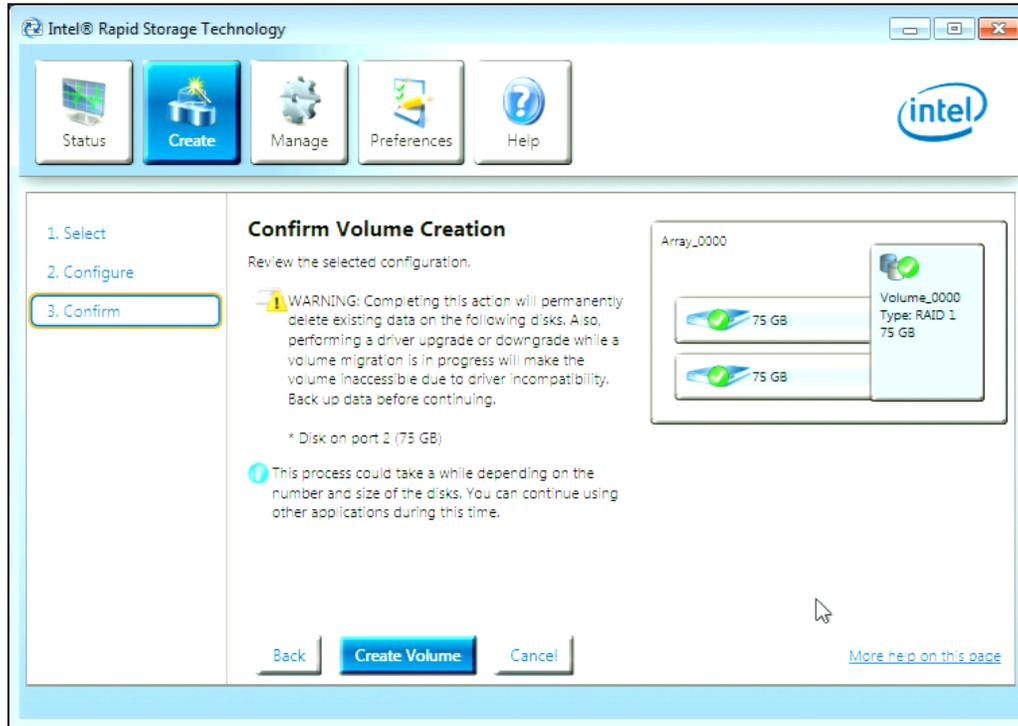
7. Review the confirmation screen and then click **OK.**
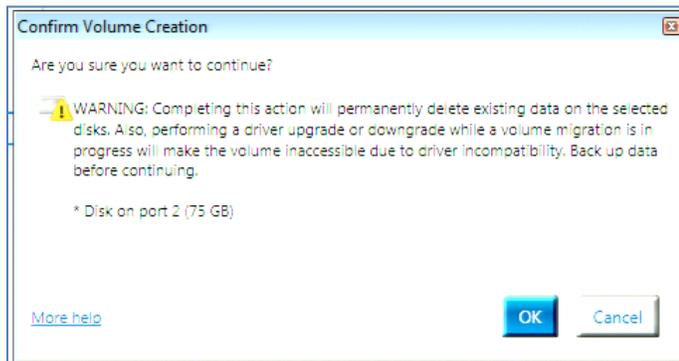
8. After the volume has been created, click **OK** on the completion screen.
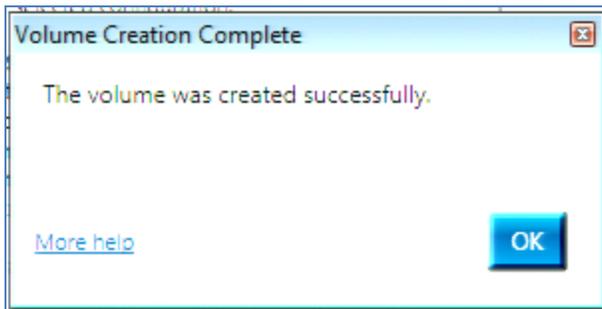
9. Review the Status screen, now showing the RAID array just created.
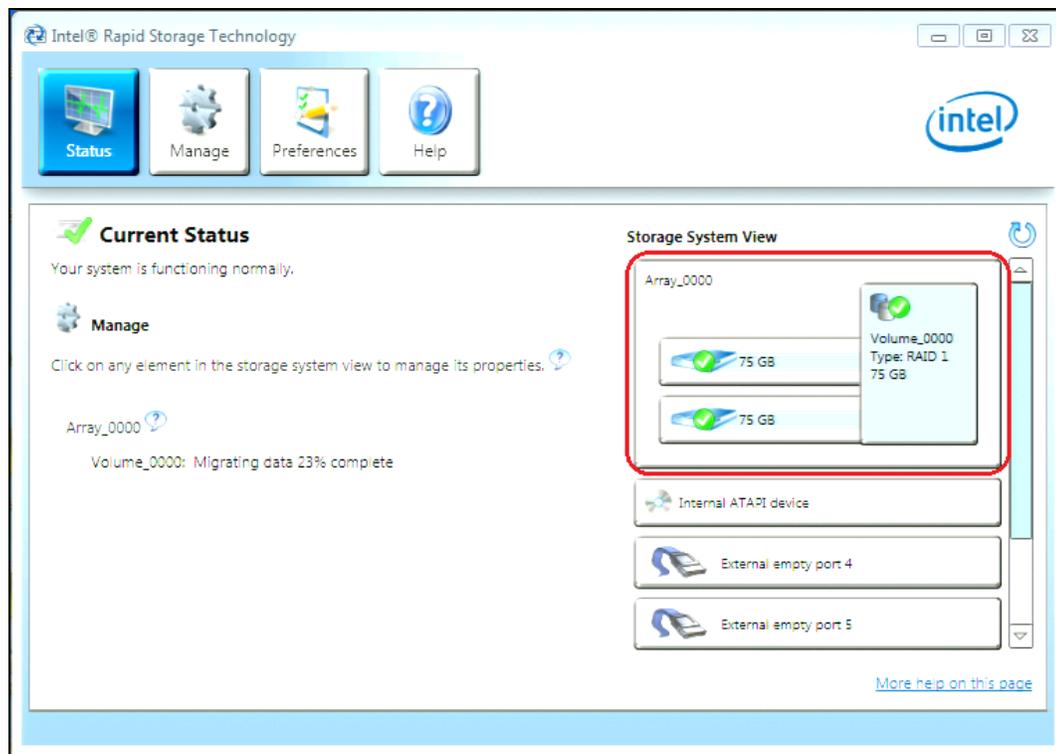
10. The data migration will begin and may take some time. During the migration, you can see the current status by holding the mouse pointer over the Intel® Rapid Storage Technology status bar icon.
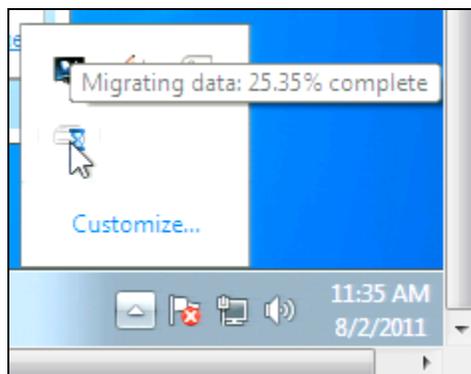
9 Verify and Repair

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).

Array Type	Actions
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.