



Intel Embedded Server RAID Technology 2 (ESRT2)

User's Guide

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1 Overview

This document describes the features of the Intel® Embedded Server RAID Technology 2. It also includes instructions to use the ESRT2 Configuration Utility and the Human Interface Infrastructure Configuration Utility. You can use these utilities to create RAID storage configurations on drives controlled by the on-board disk controller.

1.1 Intel Embedded Server RAID Technology 2 Features

The ESRT2 is a host-based RAID solution that utilizes the chipset, the processor, and memory of the server board to provide data protection. ESRT2 includes advanced technologies and world-class features that support up to eight ports, which depends on the hardware platform (see next section: Device Support). This support provides a cost-effective way to achieve data protection with higher transfer rates and reliability.

The following sections list the features available for devices, RAID features, error handling, drivers, BIOS, UEFI support and RAID management.

1.1.1 Device Support

The ESRT2 offers the following device support:

- Support for up to eight physical drives (depending on the hardware platform¹)
- Support for SATA 6Gb/s drives
- Support for SAS 12Gb/s drives (depending on the hardware platform²)
- Support for solid state drives (SSDs)
- Support for Advanced Format 512e drives
- Support for SATA CD/DVD-ROM (AHCI-based chipsets only)
- Support for SATA tape devices (AHCI-based chipsets only)
- Optical device (CD/DVD) hot plug feature used to connect optical devices while the operating system is running
- Hot plug support (online drive insertion and removal)
- Support for drive roaming
- Support for disk coercion (None, 128 MB, and 1 GB)
- Support for drives of maximum storage capacity available in the market

¹ It is not possible to mix drives across different controllers.

² Some controllers only support SATA drives.

1.1.2 RAID Features

The ESRT2 supports the following RAID features:

- Support for RAID 0, RAID 1, RAID 5, and RAID 10 configurations (RAID 5 only with the proper Activation Key installed)
- Support for up to eight virtual drives
- Support for virtual drives larger than 2 TB (in UEFI mode)
- Stripe size of 64 KB only
- Virtual drive availability immediately after creation
- Support for the random deletion of virtual drives
- Support for array cache setting
- Support for migration path from ESRT2 to the Intel Mid-Tier and Mainstream SAS RAID controllers
- Check consistency for RAID 1, RAID 5, and RAID 10

- Drive group initialization support (fast and full)
- Support for auto or manual rebuild
- Ability to set the rates for the background initialization (BGI), consistency check, and patrol read operations
- Automatic resumption of rebuilding, check consistency, full initialization, and BGI processes
- Global hot spare support

1.1.3 Error Handling

The ESRT2 supports the following error handling features:

- Soft bad block management (SBBM) support
- Error/event logging and notification

1.1.4 Driver Features

The ESRT2 RAID driver supports the following features:

- Error logging and notification
- Support for Microsoft Windows Server 2003*, Microsoft Windows Server 2008*, Microsoft Windows Server 2008R2*, Microsoft Windows Server 2012*, Microsoft Windows Server 2012R2*, Microsoft Windows Vista*, Microsoft Windows 7*, Microsoft Windows 8*, and Microsoft Windows 8.1* and Microsoft Windows 10*
- Support for Red Hat* Linux
- Support for SLES* 2.4, 2.6, and 3.0 kernels

1.1.5 BIOS Features

The Embedded RAID BIOS has the following features:

- Support for Interrupt 13 and Enhanced Disk Drive Specification
- Support for Int19h
- Option ROM size of 64 KB
- Support for BIOS boot specification (BBS) (If available in system BIOS, this feature lets you select the controller from which to boot.)
- Support for power-on self-test (POST)
- Support for post memory management (PMM): Specification v7, July 2010
- Industry-standard EBDA
- POST and run-time BIOS support for device insertion and removal
- Support for Stop On Error during boot-up
- Automatic resumption of rebuilding, check consistency, and full initialization, and BGI (BGI is used in RAID 5 configurations only)

1.1.6 Unified Extensible Firmware Interface Features

The ESRT2 supports the following Unified Extensible Firmware Interface (UEFI) features:

- UEFI integration with AMI core systems with basic functionality
- Human Interface Infrastructure (HII) compatibility with AMI core system BIOS
- Driver health protocol (DHP) implementation with AMI core system BIOS

1.1.7 RAID Management Features

The following features are available to manage the virtual drives and the physical drives in the system:

- Configuration information display (in the Intel® RAID Web Console 2)
- Physical drive properties and virtual drive properties
- Drive group (array) management
- Error logging and notification
- Auto configuration support of newly added drives
- Ability to save and restore a configuration

1.2 RAID Overview

This section provides a brief overview of the types of RAID configurations that the ESRT2 supports.

The first step in creating a RAID storage configuration is to configure drives in drive groups (also known as arrays). A drive group is a group of one to eight physical disks that is treated by the host computer system as one large disk drive, or virtual drive. Only one RAID level can be assigned to a drive group.

- A RAID 0 drive group consists of one to eight drives.
- A RAID 1 drive group consists of two drives.
- A RAID 5 drive group consists of three to eight drives.
- A RAID 10 drive group consists of four, six, or eight drives.

Note: Some hardware configurations do not support eight drives. Depending on the hardware, the actual maximum number of drives for RAID 0, RAID 5 and RAID 10 drive groups can be fewer than eight.

You can use any of these three strategies when creating RAID drive groups and virtual drives:

- **Maximize Fault Tolerance**
You can maximize fault tolerance to protect against loss of data by creating a RAID 1 drive group with mirroring. All data is written to the primary drive in the drive group and is also written (mirrored) to a second drive.
- **Maximize Virtual Drive Performance**
You can maximize virtual drive performance by creating a RAID 0 drive group with striping. Data is broken into segments and can be simultaneously written to or read from several different stripes on several different drives in the drive group.
RAID 10 drive groups combine both striping and mirroring to provide high data transfer rates and data redundancy.
- **Maximize Storage Capacity**
You can maximize storage capacity when selecting a RAID level. Striping alone (RAID 0) requires less storage space than mirrored data (RAID 1) or distributed parity (RAID 5). A RAID 5 drive group, which provides redundancy for one drive failure without duplicating the contents of entire drives, requires less space than a RAID 1 drive group.

1.2.1 RAID 0 Configuration Description

A RAID 0 configuration provides disk striping across all drives in the drive group. The RAID 0 configuration does not provide any data redundancy, but does offer the best performance of any RAID level. The RAID 0 configuration breaks up data into smaller segments called strips, and then stripes the data segments across each drive in the drive group. The size of each data segment is determined by the strip size, which is 64 KB.

Note: It is possible to create each disk as a single-drive RAID 0 drive group. However, spanning across single drive RAID 0 drive groups is not supported.

By breaking up a large file into smaller segments, and writing or reading from several drives at the same time, the ESRT2 Configuration Utility can read or write the file faster. This feature makes the RAID 0 configuration ideal for applications that require high bandwidth but do not require fault tolerance.

- Uses** Provides high data throughput, especially for large files; any environment that does not require fault tolerance.
- Strong Points** Provides increased data throughput for large files; no capacity loss penalty for parity.
- Weak Points** Does not provide fault tolerance; all data lost if any drive fails.
- Drives** One to eight.

The following figure shows a RAID 0 drive group with two drives.

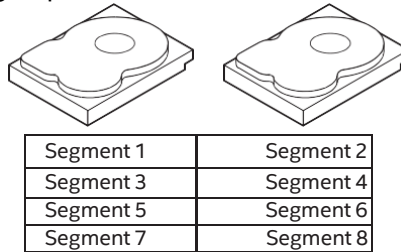


Figure 1. RAID 0 Drive Group Example with Two Drives

1.2.2 RAID 1 Configuration Description

The RAID 1 configuration duplicates all data from one drive to a second drive. The RAID 1 configuration provides complete data redundancy, but at the cost of doubling the required data storage capacity.

- Uses** Databases or any other mission critical environment that requires fault tolerance.
- Strong Points** Provides complete data redundancy; RAID 1 is ideal for any application that requires fault tolerance.
- Weak Points** Requires twice as many drives; performance is impaired during drive rebuilds.
- Drives** Two.

The following figure shows a RAID 1 drive group.

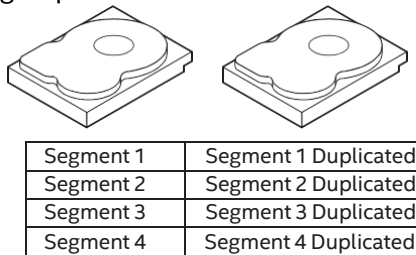


Figure 2. RAID 1 Drive Group

1.2.3 RAID 5 Configuration Description

The RAID 5 configuration includes parity and disk striping at the block level. Parity is the data's property of being odd or even, and parity checking is used to detect errors in the data. In a RAID 5 configuration, the parity information is distributed to all drives. The RAID 5 configuration is best suited for networks that perform a lot of small input/output (I/O) transactions simultaneously.

Note: The RAID 5 configuration is a premium feature. You might need to install an activation key to enable a RAID 5 configuration.

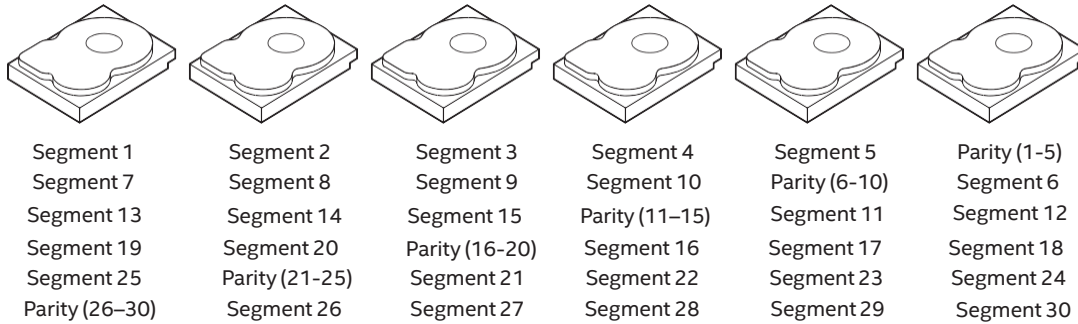
The RAID 5 configuration addresses the bottleneck issue for random I/O operations. Because each drive contains both

data and parity, numerous write operations can take place concurrently.

- Uses** Provides high data throughput. Use the RAID 5 configuration for transaction processing applications because each drive can perform read and write operations independently. If a drive fails, the RAID controller uses the parity drive to recreate all missing information. Use also for office automation and online customer service that requires fault tolerance. Use for any application that has high read request rates but low write request rates.
- Strong Points** Provides data redundancy, high read rates, and good performance in most environments. Provides redundancy with lowest loss of capacity.
- Weak Points** Not well suited to tasks that require a lot of small write operations due to the parity creation/write overhead. Drive performance will be reduced if a drive is being rebuilt or a background initialization is in progress. Environments with few processes do not perform as well because the RAID overhead is not offset by the performance gains in handling simultaneous processes.

Drives Three to eight.

The following figure shows a RAID 5 drive group with six drives.



Note: Parity is distributed across all drives in the drive group.

Figure 3. RAID 5 Drive Group

1.2.4 RAID 10 Configuration Description

The RAID 10 configuration is a combination of RAID 1 and RAID 0 drive groups. It breaks up data into smaller blocks, and then stripes the blocks of data to each RAID 1 RAID set. Each RAID 1 RAID set then duplicates its data to its other drive. The size of each block is determined by the strip size parameter, which is 64 KB. A RAID 10 drive group can sustain one drive failure in each drive group and maintain data integrity.

Note: On a RAID 10 drive group, you can create only one virtual drive, and that virtual drive must occupy the entire space of the RAID 10 drive group.

- Uses** Works best for data storage that must provide 100 percent redundancy of a RAID 1 configuration (mirrored drive groups) and that also requires the enhanced I/O performance of a RAID 0 configuration (striped drive groups). The RAID 10 configuration works well for medium-sized databases or any environment that requires a higher degree of fault tolerance and moderate to medium capacity.
- Strong Points** Provides both high data transfer rates and complete data redundancy.
- Weak Points** Requires twice as many drives.
- Drives** Four, six, or eight.

The following figure shows a RAID 10 drive group with four drives.

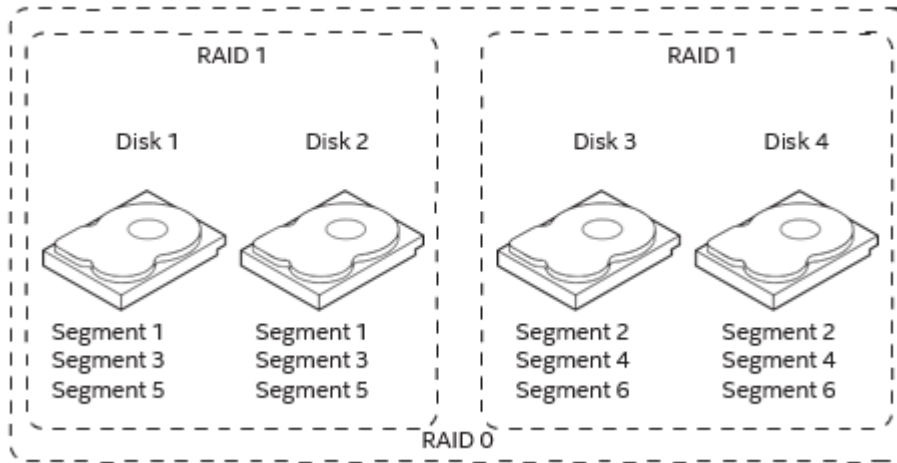


Figure 4. RAID 10 Drive Group

2 ESRT2 Configuration Utility

You can invoke the ESRT2 Configuration Utility by pressing Ctrl+E at boot-up time. You can use this utility to configure disk drive groups and virtual drives, and to perform other configuration tasks in a pre-boot environment. You can perform the following functions:

- Select a configuration method for drive groups and virtual drives
- Create drive groups
- Define virtual drives
- Initialize virtual drives
- Access controllers, virtual drives, and drive groups to view their properties
- Create hot spare drives
- Verify that the redundancy data in virtual drives using RAID level 1, RAID level 5, and RAID level 10 is correct
- Rebuild failed drives
- Reconstruct virtual drives after changing RAID levels or adding a drive to a drive group

Note: If the ESRT2 Configuration Utility does not display, go into the BIOS setup and disable UEFI boot, Quick boot, Fast boot, Silent boot, Intel® Rapid boot, and Quick POST, then reboot. If still unable to access the configuration utility, check for a system BIOS update.

2.1 Performing a Quick Configuration

This section provides high-level instructions to quickly configure drive groups and virtual drives with the ESRT2 Configuration Utility. These instructions are intended for users that are familiar with configuration utilities and tools. See Section 2.4, Configuring Drive Groups and Virtual Drives, on page 9, for detailed configuration instructions. To ensure the best performance, select the optimal RAID level for the virtual drive you create. For an explanation of RAID levels, see Section 1.2, RAID Overview, on page 3.

Perform the following steps to configure drive groups and virtual drives using the ESRT2 Configuration Utility:

1. Boot the system.
2. Press Ctrl+E to start the ESRT2 Configuration Utility.
3. Select **Configure** on the **Management Menu** screen.
4. Select a configuration method from the **Configuration** menu (**Easy Configuration**, **New Configuration**, or **View/Add Configuration**).
5. Create drive groups using the available drives.
6. Designate hot spare disks (optional).
7. Define the virtual drive(s) using the space in the drive groups.
8. Initialize the new virtual drives.

2.2 Management Menu

The **Management Menu** screen appears when you start the ESRT2 Configuration Utility.

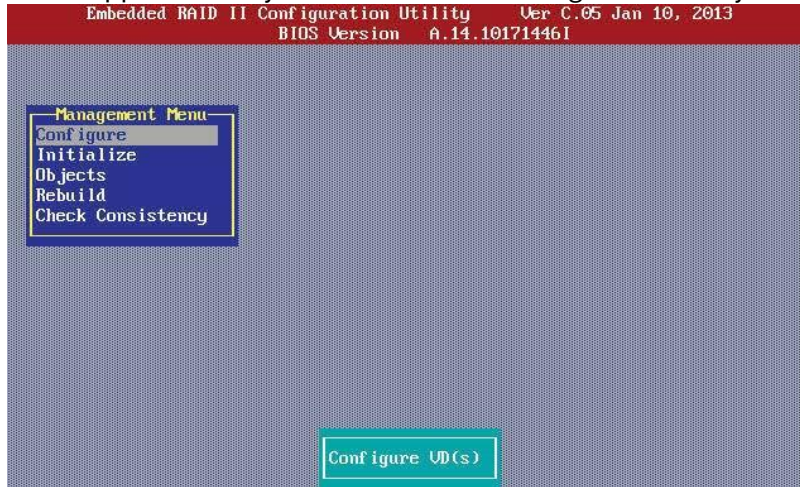


Figure 5. Configuration Utility Management Menu Screen

Note: The minimum screen resolution for the Embedded RAID GUI is 640 × 480.

2.3 Configuration Menu

Use the **Configuration Menu** screen to configure drive groups and virtual drives. This section describes the configuration options.

2.3.1 Configuration Menu Options

The **Configuration Menu** screen provides four methods to modify and/or create a virtual drive configuration: **Easy Configuration**, **New Configuration**, **View/Add Configuration**, and **Clear Configuration**, as shown in the following figure. The following table describes these methods. The **Configuration Menu** has an **Advance** submenu that lets you set specific options. The available options depend upon the configuration method you use.

Table 1. ESRT2 Configuration Utility– Configuration Menu

Option	Description
Easy Configuration	The Easy Configuration option automatically associates every drive group with one virtual drive. Through the Advance Menu, the Easy Configuration option lets you modify the RAID level. Section 2.5.2, Using the Easy Configuration Option, on page 11, provides detailed instructions.
New Configuration	The New Configuration option lets you modify the RAID level, virtual drive size, and disk spanning (associating virtual drives with multiple drive groups). If you select the New Configuration option, the CU deletes the existing configuration information when saving the new configuration. Section 2.5.3, Using the New Configuration Option, on page 13, provides detailed instructions.
View/Add Configuration	The View/Add Configuration option lets you control the same virtual drive parameters as the New Configuration option without disturbing the existing configuration information. The View/Add Configuration option also lets you enable the Configuration on Disk feature. Section 2.5.4, Using the View/Add Configuration Option, on page 16, provides detailed instructions.
Clear Configuration	The Clear Configuration option erases the current configuration information. Section 2.6, Clearing a Storage Configuration, on page 18, provides detailed instructions.
Specify Boot Drive	The Specify Boot Drive option lets you specify a virtual drive as the boot drive on the controller, if you have created virtual drives. Section 2.7, Configuring a Bootable Virtual Drive, on page 19, provides detailed instructions.

2.4 Configuring Drive Groups and Virtual Drives

The following sections provide detailed instructions for configuring drive groups and virtual drives with the ESRT2 Configuration Utility.

Note: Use drives with the same capacity when you create a storage configuration. If you use drives with different capacities in one drive group, the CU limits each drive to the capacity of the smallest drive.

The number of physical drives in a specific drive group determines the possible RAID levels that you can implement with the drive group.

- RAID level 0 requires from one to eight physical drives.
- RAID level 1 requires two physical drives.
- RAID level 5 requires three to eight physical drives.
- RAID level 10 requires four, six, or eight physical drives.

2.5 Creating a Storage Configuration

This section explains how to use the ESRT2 Configuration Utility to configure RAID drive groups and virtual drives to create storage configurations.

2.5.1 Selecting the Configuration Method

The Easy Configuration option automatically associates each drive group with one virtual drive. Follow these steps to open the **Configuration Menu** screen, and select a configuration method:

1. On the **Management Menu** screen, highlight **Configure** with your cursor, and press <Enter>. The **Configuration Menu** screen appears, as shown in the following figure.



Figure 6. Configuration Menu Screen

2. Select a configuration option.
 - **Easy Configuration**
Automatically associates every drive group with one virtual drive.
 - **New Configuration**
Clears the existing configuration and lets you create a new configuration.
 - **View/Add Configuration**
Retains the existing storage configuration and adds new drives to it (this option does not cause any data loss).
 - **Clear Configuration**
Clears the existing configuration.

Caution: If you choose to clear the existing configuration or to create a new configuration, the system deletes all the existing data in the configuration. Make a backup of any data that you want to keep before you choose an option.

3. Press <Enter>. The configuration screen appears for the configuration option that you selected. A dialog box warns that you will lose data if you select **Clear Configuration** or **New Configuration**. The following sections describe the configuration steps for each configuration method.

2.5.2 Using the Easy Configuration Option

Follow these instructions to create a configuration with the Easy Configuration option, with or without redundancy:

1. On the **Management Menu** screen, highlight **Configure** with your cursor, and press <Enter>.

The **Configuration Menu** screen appears, as shown in the following figure.

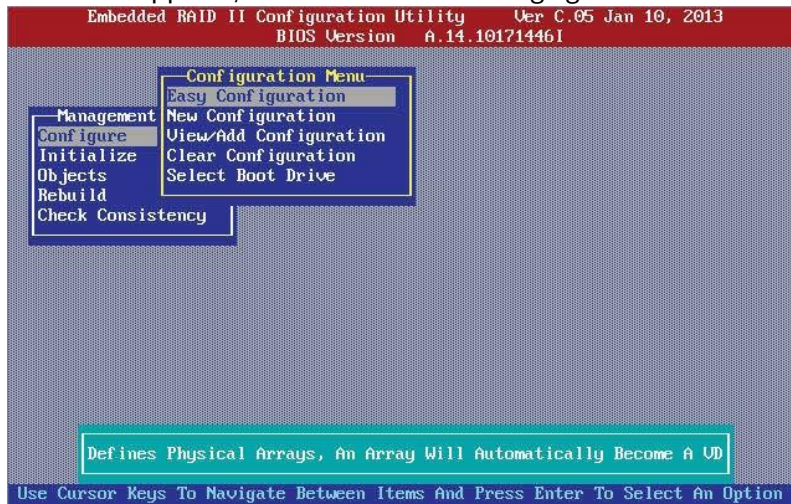


Figure 7. Configuration Menu Screen

2. Use your cursor to highlight **Easy Configuration** and press <Enter>. The following screen appears.

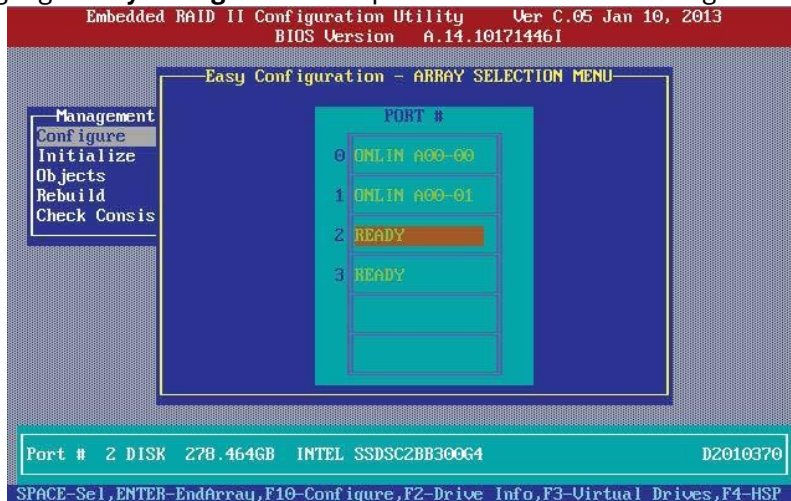


Figure 8. Easy Configuration – Array Selection Menu

3. Press the space bar to select a drive and add it to the drive group.
4. Repeat step 3 to add additional drives to the drive group.
5. Press <F10> to continue configuration.

The **Select Configurable Array(s)** dialog box appears, as shown in the following figure.



Figure 9. Drive Group Selection

6. Press the space bar to select the drive group.
7. Press <F10> to continue configuration.

The **Virtual Drive(s) Configured** dialog box appears, as shown in the following screen. This screen shows the virtual drive number, RAID level, drive group size, number of stripes, stripe size, and drive status.



Figure 10. Virtual Drive Parameters Dialog Box

8. Change the virtual drive options from the defaults listed on the screen as needed. Use the cursor keys to navigate between the virtual drive parameters and press <Enter> to select an option. Here are brief explanations of the virtual drive options:
 - **RAID Level**
The drop-down menu lists the possible RAID levels for the virtual drive. In some cases, only one RAID level is available, depending on the number of drives in the drive group.
 - **Size**
This setting specifies the capacity of the virtual drive.
 - **Disk Write Cache Policy**
When the disk Write Cache is **On**, a write transaction is considered to be complete when all the data has been written to the disk cache.
When disk Write Cache is **Off**, the write transaction is complete only when the data has been written to the disk.
 - **Read Ahead Policy**
When disk Read Ahead is **On**, extra data is read sequentially ahead of the data that is actually requested, and this extra data is stored in cache memory. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly. This setting speeds up reads for sequential data, but there is little improvement when accessing random data.

- **Accept**
Select this option to accept the virtual drive parameters.
 - **SPAN**
Choose whether to span drive groups. This setting is available only for RAID 10 drive groups.
9. Highlight **Accept** and press <Enter> after you select your virtual drive parameters. The virtual drive configuration appears, as shown in the following screen.

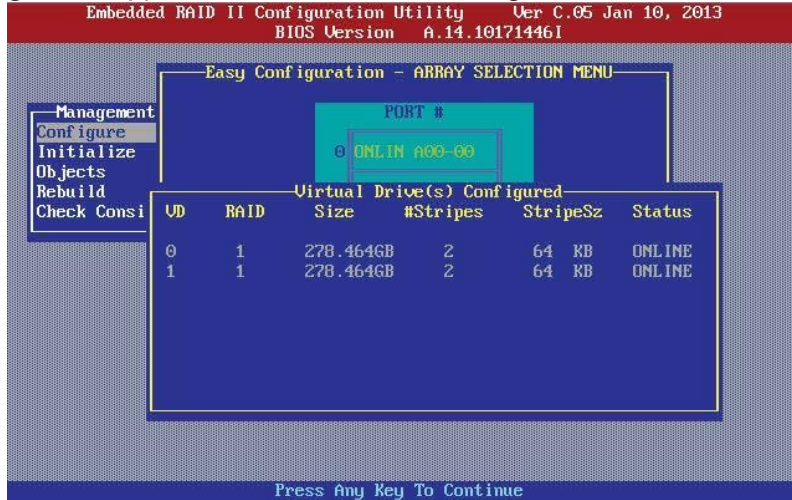


Figure 11. Virtual Drive Configuration Parameters

10. Press any key to continue.
11. Click **Yes** at the prompt to save the configuration. ESRT2 Configuration Utility begins a background initialization of the virtual drives.

Note: New RAID 5 virtual drives require a minimum number of drives for a background initialization to start. If there are fewer drives than the minimum number requires, the background initialization will not start.

2.5.3 Using the New Configuration Option

If you select the New Configuration option, the CU deletes the existing configuration information on the selected controller when it saves the new configuration.

Follow these instructions to create a configuration with the Easy Configuration option, with or without redundancy:

1. On the **Management Menu** screen, highlight **Configure** with your cursor, and press <Enter>.

The **Configuration Menu** screen appears, as shown in the following figure.



Figure 12. Configuration Menu Screen

- Highlight **New Configuration** with your cursor, and press <Enter>. The following screen appears. This screen displays the drives.



Figure 13. New Configuration – Array Selection Menu

- Press the space bar to select a drive and add it to the drive group.
- Repeat step 3 to add additional drives to the drive group.
- Press <F10> to continue the configuration.

The **Select Configurable Array(s)** dialog box appears, as shown in the following figure.



Figure 14. Drive Group Selection

- Press the space bar to select the drive group.
- Press <F10> to continue the configuration.

The **Virtual Drive(s) Configured** dialog box appears, as shown in the following screen. This screen shows the virtual drive number, RAID level, drive group size, number of stripes, stripe size, and drive status.



Figure 15. Virtual Drive(s) Configured Dialog Box

8. Change the virtual drive options from the defaults listed on the screen as needed. Use the cursor keys to navigate between the virtual drive parameters and press <Enter> to select an option. Here are brief explanations of the virtual drive options:
 - **RAID Level**
The drop-down menu lists the possible RAID levels for the virtual drive. In some cases, only one RAID level is available, which depends on the number of drives in the drive group.
 - **Size**
This setting specifies the capacity of the virtual drive.
 - **Disk Write Cache Policy**
You can disable the write cache option when you create a virtual drive, but you can enable this option later using the configuration utilities. When the disk Write Cache is **On**, a write transaction is considered to be complete when all the data has been written to the disk cache.
When disk Write Cache is **Off**, the write transaction is complete only when the data has been written to the disk.
 - **Read Ahead Policy**
When disk Read Ahead is **On**, extra data is read sequentially ahead of the data that is actually requested, and this extra data is stored in cache memory. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly. This setting speeds up reads for sequential data, but there is little improvement when accessing random data.
 - **Accept**
Select this option to accept the virtual drive parameters.
 - **SPAN**
Choose whether to span drive groups. This setting is available only for RAID 10 drive groups.
9. Highlight **Accept** with your cursor, and press <Enter> after you select your virtual drive parameters. The virtual drive configuration appears, as shown in the following screen.

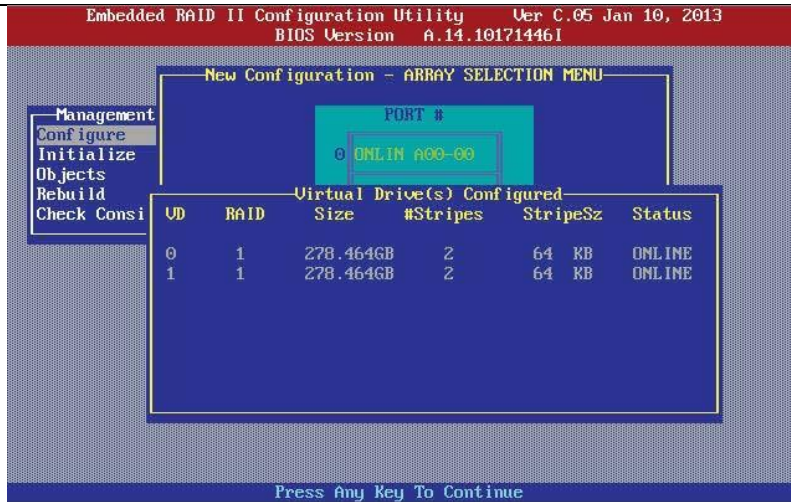


Figure 16. Virtual Drive Configuration Parameters

10. Press any key to continue.
11. Click **Yes** at the prompt to save the configuration.
The Intel® Server RAID Configuration Utility begins a background initialization of the virtual drives.
New RAID 5 virtual drives require a minimum number of drives for a background initialization to start. If fewer drives exist than the minimum, the background initialization will not start.

2.5.4 Using the View/Add Configuration Option

The View/Add Configuration option allows you to control the same virtual drive parameters as the New Configuration option without disturbing the existing configuration information.

Follow these instructions to create a configuration with the Easy Configuration option, with or without redundancy:

1. On the **Management Menu** screen, highlight **Configure** with your cursor, and press <Enter>.
The **Configuration Menu** screen appears, as shown in the following figure.

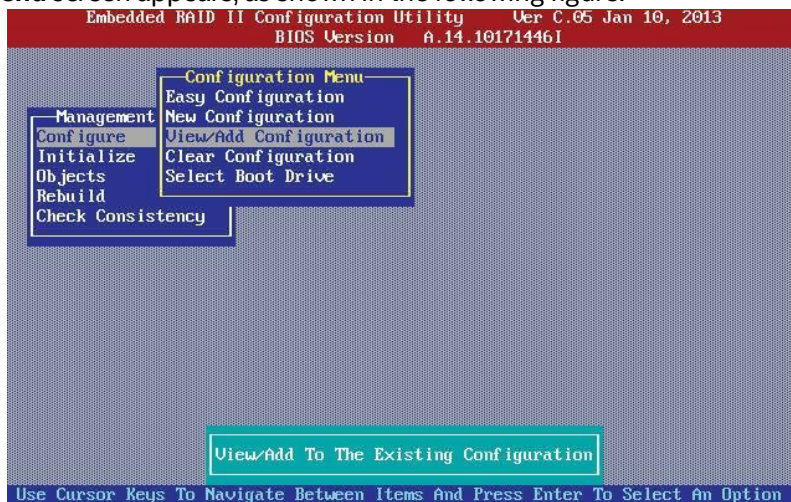


Figure 17. Configuration Menu Screen

- Highlight **View/Add Configuration** with your cursor, and press <Enter>. The following screen appears.



Figure 18. View/Add Configuration – Array Selection Menu

- Press the space bar to select a drive and add it to the drive group.
- Repeat step 3 to add additional drives to the drive group.
- Press <F10> to continue the configuration.
- The **Select Configurable Array(s)** dialog box appears, as shown in the following figure.



Figure 19. Select Configurable Arrays Dialog Box

- Press the space bar to select the drive group.
- Press <F10> to continue the configuration.
- The **Virtual Drive(s) Configured** dialog box appears, as shown in the following screen. This screen shows the virtual drive number, RAID level, drive group size, number of stripes, stripe size and drive status.

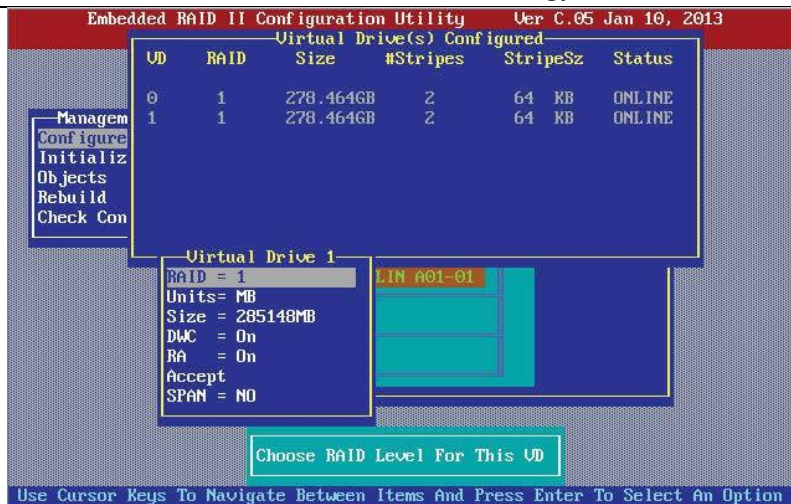


Figure 20. Virtual Drive Parameters Dialog Box

10. Change the virtual drive options from the defaults listed on the screen as needed. Use the cursor keys to navigate between the virtual drive parameters and press <Enter> to select an option. Here are brief explanations of the virtual drive options:
 - **RAID Level**
The drop-down menu lists the possible RAID levels for the virtual drive. In some cases, only one RAID level is available, which depends on the number of drives in the drive group.
 - **Size**
This setting specifies the capacity of the virtual drive.
 - **Disk Write Cache Policy**
You can disable the write cache option when you create a virtual drive, but you can enable this option later using the configuration utilities. When the disk Write Cache is **On**, a write transaction is considered to be complete when all the data has been written to the disk cache.
When disk Write Cache is **Off**, the write transaction is complete only when the data has been written to the disk.
 - **Read Ahead Policy**
When disk Read Ahead is **On**, extra data is read sequentially ahead of the data that is actually requested, and this extra data is stored in cache memory. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly. This setting speeds up reads for sequential data, but there is little improvement when accessing random data.
 - **Accept**
Select this option to accept the virtual drive parameters.
 - **SPAN**
Choose whether to span drive groups. This setting is available only for RAID 10 drive groups.
11. Highlight **Accept** with your cursor, and press <Enter>. The virtual drive configuration appears.
12. Press any key to continue.
13. Click **Yes** at the prompt to save the configuration.
The ESRT2 Configuration Utility begins a background initialization of the virtual drives.
New RAID 5 virtual drives require a minimum number of drives for a background initialization to start. If fewer drives exist than the minimum required, the background initialization will not start.

2.6 Clearing a Storage Configuration

Caution: Before you clear a storage configuration, be sure to back up all the data you want to keep.

To clear a storage configuration, follow these steps:

1. On the Management Menu screen, select **Configure > Clear Configuration**. The following screen appears.

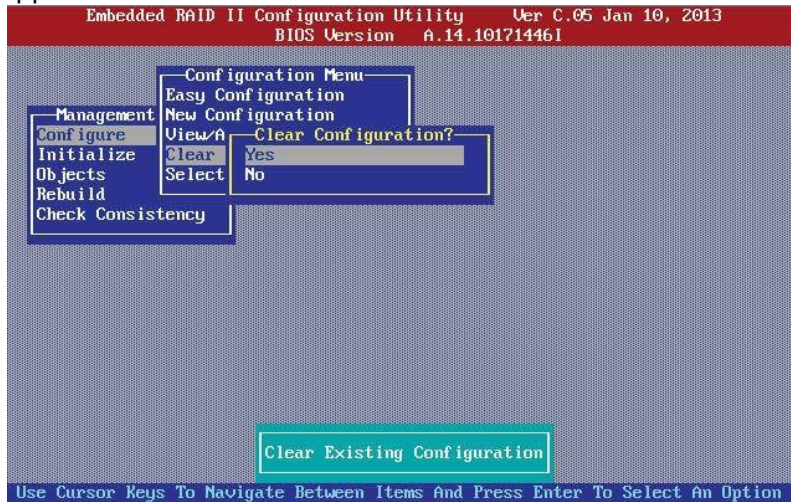


Figure 21. Clear Configuration Option

2. At the prompt, select **Yes** to confirm and press <Enter>. The virtual drive is deleted from the configuration.

2.7 Configuring a Bootable Virtual Drive

The default boot virtual drive is LD 0. If you change the boot drive to another virtual drive, the BIOS and the CU preserve this change. However, if you delete the new boot virtual drive, you must be sure to configure another virtual drive for booting. The CU does not automatically select a different boot virtual drive.

Follow these steps to configure a bootable virtual drive:

1. On the **Management Menu** screen, select **Configure > Select Boot Drive**. The following screen appears.



Figure 22. Select Boot Drive Option

2. Select a virtual drive from the list to be the designated boot drive. The virtual drive is configured to be the boot drive.

2.8 Initializing Virtual Drives

This section explains the two methods used to initialize a virtual drive with the ESRT2 Configuration Utility.

Please notice that if the controller's *Fast Init* property is enabled, fast initialization is used. In fast initialization, the utility quickly writes zeroes to the first and last 8-MB regions of the new virtual drive. If the controller's *Fast Init* property is disabled, the utility performs a complete initialization on the virtual drive and this process can take a long time if the physical disk drives are large. See section 2.12 for the different controller properties.

Caution: When you initialize a virtual drive, all the existing data on the virtual drive is erased.

2.8.1 First Initialization Method

Follow these steps to initialize a virtual drive using the Initialize menu.

1. On the **Management Menu** screen, highlight **Initialize** with the cursor, and press <Enter>. The list of virtual drives appears.
2. Use the cursor to highlight the virtual drive you want to initialize (if more than one virtual drive exists).
3. Press <Enter>.

The following screen appears.

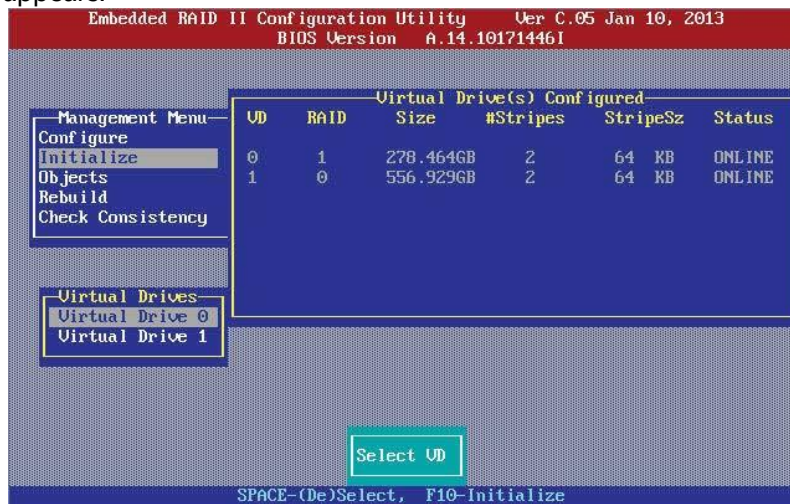


Figure 23. Initializing a Virtual Drive – First Method

4. Press <F10>.
5. Select **Yes** at the prompt and press <Enter> to begin the initialization. A graph shows the progress of the initialization until it is complete.
6. After the initialization is complete, press Esc to return to previous menus.

If you press Esc while initialization is in progress, the following options appear:

 - **Stop**
(Available only if *Auto Resume* is enabled on the controller:
Management Menu > Objects > Adapter > AutoResume.)
The initialization is stopped, and the ESRT2 Configuration Utility stores the percentage of the initialization already completed. If *Auto Resume* is enabled, and if *Fast Init* is *not* enabled, the initialization resumes where it left off when you restart it, instead of starting over from 0 percent.
 - **Continue**
The initialization continues normally.
 - **Abort**
The initialization is completely aborted. If you restart initialization, it begins at 0 percent.

2.8.2 Second Initialization Method

Follow these steps to initialize a virtual drive using the Objects menu.

1. On the **Management Menu** screen, select **Objects > Virtual Drive**. A list of configured virtual drives appears.
2. Use the cursor to highlight the virtual drive you want to initialize (if more than one virtual drive exists), and press <Enter>.

The following screen appears.



Figure 24. Initializing a Virtual Drive – Second Method

3. Highlight **Initialize** with your cursor on the virtual drive submenu, and press <Enter>.
4. Select **Yes** at the prompt, and press <Enter>.
The utility displays a bar graph showing the initialization progress.
5. When initialization completes, press Esc to return to the previous menu. If you press Esc while initialization is in progress, the **Stop**, **Continue**, and **Abort** options are available, as explained in Section 2.8.1, First Initialization Method, on page 20.

2.9 Rebuilding a Drive

The ESRT2 Configuration Utility lets you rebuild a drive of a redundant drive group if the drive group has a failed drive. If the failed drive is still good (that is, if the drive is physically present and its capacity is greater than or equal to the defined capacity of the drive group), it will be rebuilt. If the drive is too small, an error message appears and the CU does not allow the drive to be rebuilt.

Note: You cannot rebuild a failed drive if the drives capacity is even 1 byte smaller than the defined capacity of the drive group.

Follow these steps to rebuild a drive:

1. On the **Management Menu** screen, highlight **Rebuild** and press <Enter>.
2. When the list of drives appears, highlight the failed (*FAIL*) drive that you want to rebuild and press the spacebar to select it.
3. After you select the drive, press <F10> to start the rebuild, and then select **Yes** at the confirmation prompt. The rebuild process begins, and a graph shows the progress of the rebuild until it is complete. Although the CU changes the disk drive state to *Rebuild* at this point, the change does not appear on the screen while the rebuild operation is in progress.
If the CU detects a media error on the source drive during the rebuild operation, it initiates a sector read for that block. If the sector read fails, the CU adds entries to the SBBM table, writes this table to the target drive, and

displays an error message.

Additional error messages appear if the SBBM table is 80 percent full or 100 percent full. If the SBBM table is completely full, the rebuild operation is aborted, and the drive is marked as *FAIL*.

4. When the rebuild is complete, the CU displays the message that the rebuild is successful.
5. Press Esc to display the **Management Menu** screen.

The state of the rebuilt disk drive changes from *FAIL* to *ONLINE*.

If you press Esc while the rebuild is running, the following options display:

- **Stop**

Available only if the *AutoResume* property is enabled on the adapter:
Management Menu > Objects > Adapter > AutoResume.

The rebuild is stopped, and the CU stores the percentage of the rebuild already completed. If the *AutoResume* property is enabled, the rebuild resumes where it left off when you restart it, instead of starting over from 0 percent.

- **Continue**

The rebuild continues normally.

- **Abort**

The rebuild is completely aborted and the disk drive remains in the *FAIL* state. If you restart the rebuild, it begins at 0 percent.

2.10 Creating a Global Hot Spare Drive

The ESRT2 Configuration Utility lets you create global hot spare drives to protect against data loss. A hot spare is an unused drive that you can use to rebuild the data from a failed drive and re-establish redundancy, in case of a disk failure in a redundant RAID drive group (RAID 1, RAID 5, or RAID 10).

Note: Dedicated hot spare drives are not supported by the ESRT2 Configuration Utility.

Note: When you select a drive to change into a global hot spare, be sure it is the same type of drive as the drives in the drive group that it will protect.

You can create a hot spare when you configure a new storage configuration, as described in the previous sections.

To add a hot spare drive to an existing redundant storage configuration, follow these steps:

1. On the **Management** menu, select **Configure > View/Add Configuration**.
2. Select **Physical Drive**. A list of physical drives appears.
3. Highlight an unconfigured drive or a *Ready* drive with your cursor, and press <F4>. The following screen appears.

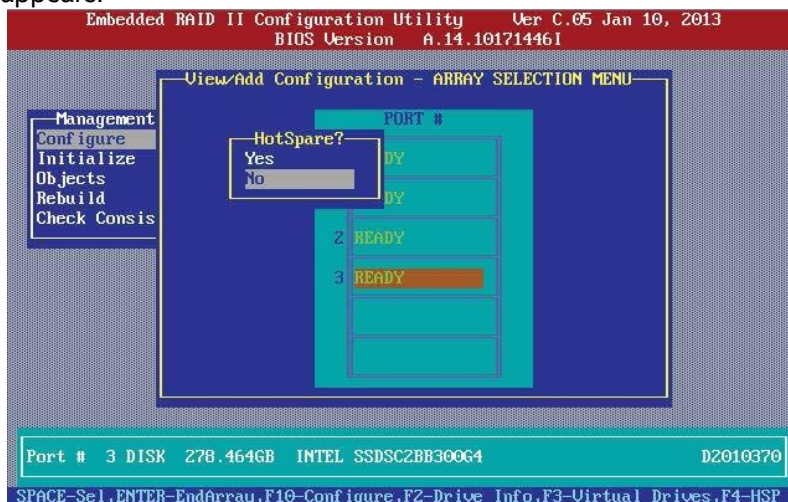


Figure 25. View/Add Configuration – Array Selection Menu

4. In the **HotSpare** dialog box, select **Yes** and press <Enter>.
5. Select **Yes** from the pop-up menu to create the hot spare drive.

2.11 Checking Data Consistency

The Check Consistency feature verifies the consistency of the data on the physical drives that are part of RAID 1, RAID 5, or RAID 10 virtual drives. The ESRT2 Configuration Utility automatically corrects any differences found in the data when a consistency check is run.

Follow these steps to check consistency:

1. On the **Management Menu** screen, highlight **Check Consistency** with your cursor, and press <Enter>. A list of configured virtual drives appears.
2. Use the cursor to highlight a virtual drive (if there is more than one virtual drive).
3. Press the spacebar to select the virtual drive.

Note: If you select a RAID 0 virtual drive, a message appears stating that a Check Consistency cannot be performed. To continue, deselect the virtual drive, highlight a redundant virtual drive, and press the spacebar again.

4. Press <F10>.
5. At the prompt, select **Yes** to start the Check Consistency operation, and press <Enter>.

A graph shows the progress of the Check Consistency operation until it is complete.

If the ESRT2 Configuration Utility finds any data inconsistencies while comparing the source drive and the target drive, the utility fixes the inconsistency by writing the source data to the target drive. When this happens, a message notifies you that inconsistent data exists on the drives and that the repair has been performed.

If you press Y, the program skips the bad block and continues. If you press N, the program aborts the consistency check. The same message appears if the program finds a hard media error on the target drive.

If you press Esc while the Check Consistency operation is running, the following options appear:

- **Stop**
Available only if the *AutoResume* property is enabled on the adapter:
Management Menu > Objects > Adapter > AutoResume.
The Check Consistency operation is stopped, and the ESRT2 Configuration Utility stores the percentage of the task already completed. If the *AutoResume* property is enabled, the Check Consistency operation resumes where it left off when you restart it, instead of starting over from 0 percent.
- **Continue**
The Check Consistency operation continues normally.
- **Abort**
The Check Consistency operation is completely aborted. If you restart it, it begins at 0 percent.

2.12 Displaying and Changing Controller Properties

This section explains how you can use the ESRT2 Configuration Utility to display and change the properties for the controllers.

2.12.1 Displaying and Changing Controller Properties

Follow these steps to display the properties of a controller.

1. On the **Management Menu** screen, select **Objects > Adapter**. The list of controllers appear in a dialog box.

2. Highlight a controller with your cursor, and press <Enter>. The following screen appears.

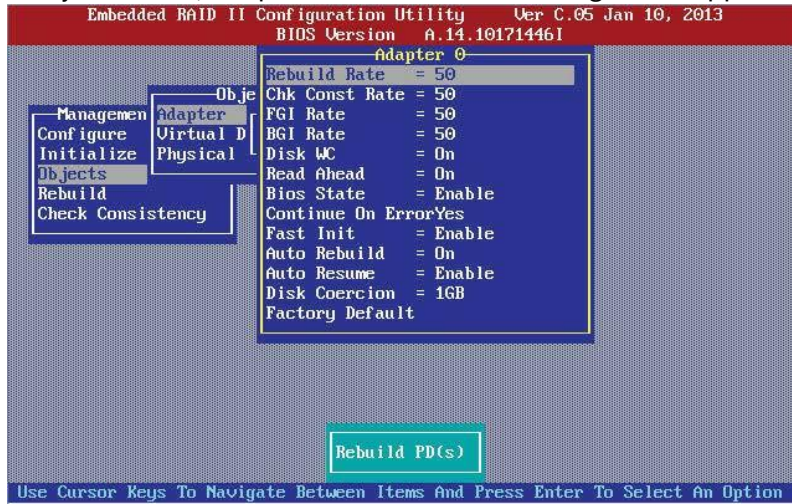


Figure 26. Controller Properties Screen

The following table describes the entries/options listed on the controller properties screen. Intel recommends that you leave these options at their default settings to achieve the best performance, unless you have a specific reason for changing them.

Table 2. Controller Properties and Values

Property	Options	Default
Rebuild Rate	0 to 100 (percentage of system resources) Use this option to select the rebuild rate for drives connected to the selected controller. The rebuild rate is the percentage of system resources dedicated to rebuilding a failed drive. The higher the number, the more system resources devoted to a rebuild.	30
Chk Const Rate	0 to 100 (percentage of system resources) Use this option to select the amount of system resources dedicated to consistency checks of virtual drives connected to the selected controller.	30
FGI Rate (Foreground Initialization Rate)	0 to 100 (percentage of system resources) Use this option to select the amount of system resources dedicated to foreground initialization of virtual drives connected to the selected controller.	30
BGI Rate (Background Initialization Rate)	0 to 100 (percentage of system resources) Use this option to select the amount of system resources dedicated to background initialization of virtual drives connected to the selected controller.	30
Disk WC (Disk Write Cache)	Off, On You can disable the Disk Write Cache option when you create a virtual drive, but you can enable this option later using the configuration utilities. When the disk Write Cache is On , a write transaction is considered to be complete when all the data has been written to the disk cache. When disk Write Cache is Off , the write transaction is complete only when the data has been written to the disk.	Off (Write Through Enabled)

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Property	Options	Default
Read Ahead (RA)	On, Off When Disk Read Ahead is On , extra data is read sequentially ahead of the data that is actually requested, and this extra data is stored in cache memory. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly. This setting speeds up reads for sequential data, but there is little improvement when accessing random data.	On
BIOS State	Enable, Disable Use this option to enable or disable the BIOS for the selected controller. If the boot device is on the selected controller, the BIOS must be enabled; otherwise, the BIOS should be disabled or it might not be possible to use a boot device elsewhere.	Enable
Cont On Error	No, Yes Enable this option if you want the boot process to continue when the controller BIOS encounters an error during boot-up.	Yes
Fast Init	Enable, Disable A fast initialization quickly writes 0s to the first and last 10-MB regions of the new virtual drive and then completes the initialization in the background. It is seldom necessary to use this option, because the virtual drive was already initialized when you created it.	Enable
Auto Rebuild	On, Off Auto-rebuild allows a failed drive to be replaced and the data automatically rebuilt by <i>hot-swapping</i> the drive in the same drive bay. The RAID drive group continues to handle requests while the rebuild occurs.	On
Auto Resume	Enable, Disable When enabled, you can stop a consistency check, rebuild, or initialization, and resume it later where it left off, instead of aborting it and starting over.	Enable
Disk Coercion	None, 128MB, 1GB Note: The Disk Coercion property can be accessed only when no configuration is present for the controller. Otherwise, an error message appears. Drive coercion is a tool to force drives of varying capacities to be the same capacity so they can be used in a drive group. The coercion mode options are None, 128MB-way, and 1GB-way. The number you choose depends on how much the drives from various vendors vary in their actual size.	1GB
Factory Default	Returns the settings to the factory default settings.	N/A

3. To change the value of a controller property, use the cursor to highlight the property, and press <Enter>.
4. Select or type a different value for the property, and press <Enter>.
When you are finished, press Esc until you return to the **Management Menu** screen.

2.12.2 Displaying and Changing Drive Properties

The ESRT2 Configuration Utility displays properties, policies, and operations for virtual drives. Follow these steps to display the virtual drive information.

1. On the **Management Menu** screen, select **Objects > Adapter**. The list of controllers appear in a dialog box.
2. Highlight a controller with your cursor, and press <Enter>. The **Physical Drive Selection Menu** screen appears.
3. Highlight a drive with your cursor, and press <Enter>.

The following screen appears. This screen lists the actions you can perform.



Figure 27. Virtual Drive Parameters Screen

4. Select the action you want to perform and press <Enter>. The options are:
 - **Make Hot Spare**
Only a drive in *Ready* state can be changed to a hot spare.
 - **Force Online**
Only a drive in *Failed* state can be forced online.
 - **Change Drv State**
Change an online (*Onlin*) drive to *Failed* state or a hot spare to *Ready* state.
 - **Drive Properties**
Display the device type, capacity, manufacturer name and model, and revision number.

2.13 Viewing or Changing Virtual Drive Properties

You can disable the write cache option when you create a virtual drive, but you can enable this option later using the ESRT2 Configuration Utility. When the Disk Write Cache is **On**, a write transaction is considered to be complete when all the data has been written to the disk cache. When Disk Write Cache is **Off**, the write transaction is complete only when the data has been written to the disk.

When Disk Read Ahead is **On**, extra data is read sequentially ahead of the data that is actually requested, and this extra data is stored in a cache. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly.

Note: When the Disk Write Cache is **On**, a danger that data could be lost exists if the power fails before the cached data is written to disk.

Follow these steps to view the Disk Write Cache or Read Ahead settings, or enable the Disk Write Cache setting:

1. On the **Management Menu** screen, select **Objects > Virtual Drive**. The list of virtual drives appears.
2. Highlight a virtual drive with your cursor, and press <Enter>. The list of virtual drive parameters appears.
3. Highlight **Disk WC** with your cursor, and press <Enter>. The **On/Off** dialog box opens.
4. Change the setting to **On** to enable the Disk Write Cache setting. The Disk Write Cache option is enabled.

2.14 Forcing Drives Online or Offline

To force a drive online or offline, follow these steps:

1. On the **Management Menu**, select **Objects > Physical Drive**.
2. Highlight a physical drive that is a member of a drive group, and press <Enter>.
3. Select **Force Offline** or **Force Online** from the menu.
 - If the drive was online, its status changes to *FAIL*.
 - If the drive was offline, its status changes to *ONLINE*.

3 Human Interface Infrastructure Configuration Utility

The Human Interface Infrastructure (HII) is used to configure controllers, drive groups, and virtual drives, and to perform other configuration tasks in a pre-boot environment when the server is configured for UEFI boot mode. In this boot mode the ESRT2 Configuration Utility (Ctrl+E) is not available. In order to invoke the HII utility, the system must be configured for UEFI boot mode: At boot time, enter the BIOS setup by pressing F2, select the Setup Menu, then Boot Maintenance Manager, then Advanced Boot Options. In Boot Mode select "UEFI", then you can save and exit pressing F10 and confirming with "Y". Once the system is configured for UEFI not mode, enter again the BIOS Setup by pressing F2 at boot time. Select the Setup Menu, then Advanced, then PCI Configuration, then UEFI Option ROM Control. Then select the desired ESRT2 controller to be managed (see figure 29 on the next page).

The HII Configuration Utility supports the hot plug feature. You can add and remove devices to a computer while the computer is running and the operating software automatically recognizes the change.

This chapter describes how to configure controllers, drive groups, and virtual drives with the HII Configuration Utility. To ensure the best performance, select the optimal RAID level for the virtual drive you create. For an explanation of RAID levels, see [Section 1.2, RAID Overview, on page 3](#).

3.1 Managing Controllers

This section explains how to use the HII Configuration Utility to view and change the properties for controllers, and clear a configuration.

3.1.1 Viewing Controller Properties

The HII Configuration Utility displays information for SATA and secondary SATA (sSATA) controllers. Perform the following steps to view the controller properties.

1. Choose the **Intel Embedded Server RAID Technology 2** for SATA or sSATA controllers from the **Advanced** tab in the **Setup Utility** and press <Enter>.

Note: If the **Intel Embedded Server RAID Technology 2** is not visible under the **Advanced tab**, then refer to the system's User's Guide.

Intel Embedded Server RAID Technology 2 (ESRT2)

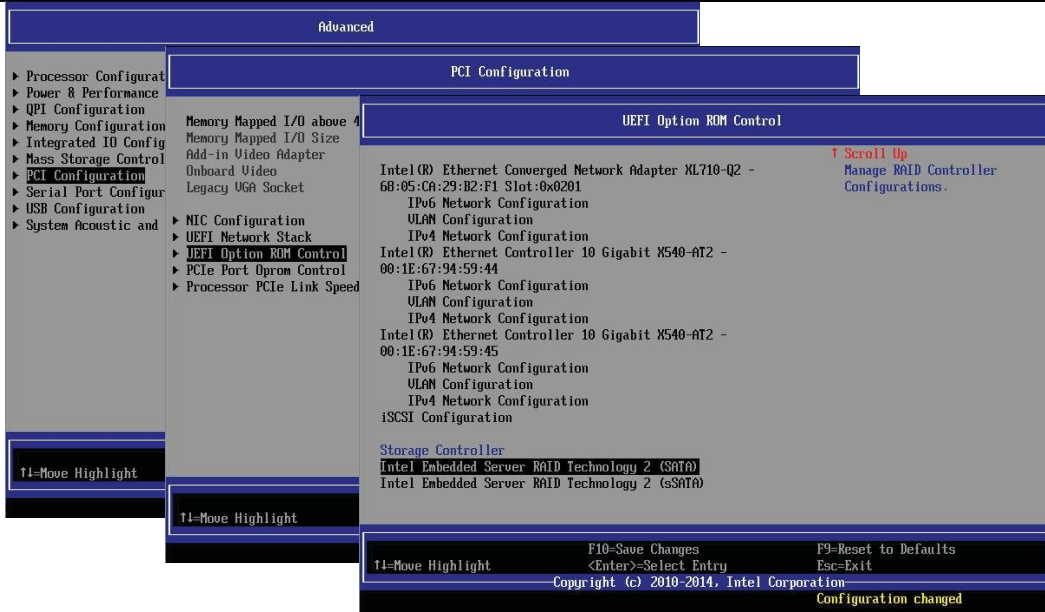


Figure 28. Select Intel Embedded Server RAID Technology 2

2. Highlight Controller Management on the Configuration Options screen and press <Enter>.



Figure 29. Configuration Options Screen

The **Controller Management** screen appears, as shown in the following figure.



Figure 30. Controller Management Screen

- Highlight View Controller Information and press <Enter>. The **Controller Management > View Controller Information** screen appears, as shown in the following figure.

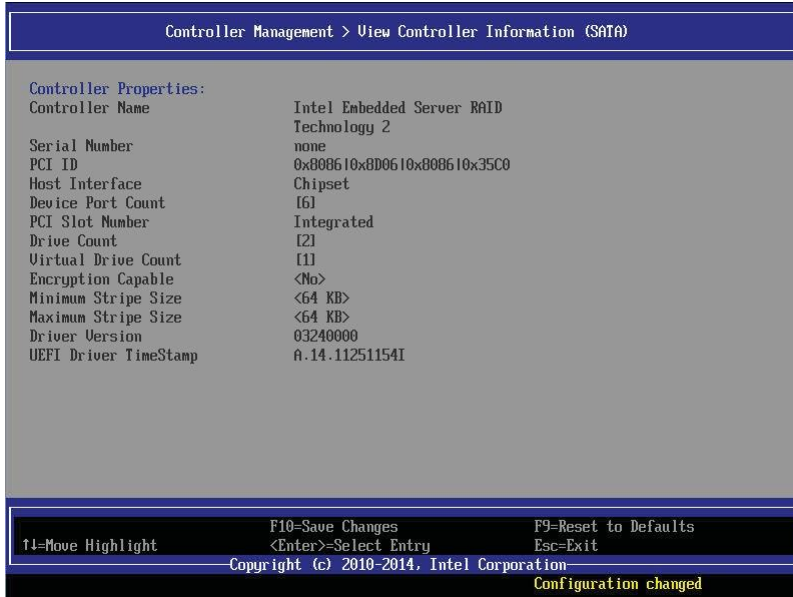


Figure 31. Controller Management – View Controller Information Screen

The information on this screen is read-only. This screen presents basic information, such as the number of virtual drives that are defined on this controller and the number of drives connected to the controller.

The following table defines the controller properties.

Table 3. Controller Properties

Property	Description
Controller Name	Intel® Embedded Server RAID
Serial Number	
PCI ID	The ID number for the Peripheral Component Interconnect (PCI) local bus.
Host Interface	The type of interface used by the computer host system, such as PCI Express* (PCIe*).

Device Port Count	The maximum number of ports supported by the software RAID controller in which devices (such as CD-ROM and disks) can be connected.
PCI Slot Number	The number of the PCI slot in which the selected controller is installed.
Drive Count	The number of drives connected to the selected controller.
Virtual Drive Count	The number of virtual drives configured on the controller currently.
Encryption Capable	Indicates whether the controller offers the ability to encrypt data on the drives. This solution provides data protection in the event of theft or loss of physical drives.
Minimum Stripe Size	The minimum length of the data segments that the controller writes across multiple drives, not including the parity drives. The default minimum stripe size is 64 KB.
Maximum Stripe Size	The maximum length of the data segments that the controller writes across multiple drives, not including the parity drives. The default maximum stripe size is 64 KB.
Driver Version	The driver version of the EFI driver.
UEFI Driver Timestamp	The UEFI driver compilation time stamp.

3.1.2 Changing Controller Properties

You can use the HII Configuration Utility to change the properties for a controller. Perform the following steps to change information for a controller.

1. Highlight **Controller Management** on the **Configuration Options** screen ([Error! Reference source not found.](#)) and press <Enter>.

The **Controller Management** screen appears, as shown in the following figure.



Figure 32. Controller Management Screen

2. Highlight **Change Controller Properties** and press <Enter>.
The **Controller Management > Change Controller Properties** screen appears, as shown in the following figure.



Figure 33. Controller Management – Change Controller Properties Screen

3. Change the controller properties as desired.
The following table defines these controller properties.

Table 4. Changing Controller Properties

Property	Use	Description
Set Factory Defaults	Use the arrow keys to move the cursor to this property and press <Enter>. On the Confirm screen, select Yes to confirm your selection.	Resets factory default values for all of the controller properties.
Set Boot Devices		Selects the virtual drive to use as the boot device.
Rebuild Rate	Use the arrow keys to move the cursor to this property. Press the plus key (+) to increase the rate or press the minus key (-) to decrease the rate.	The percentage of central processing unit (CPU) resources devoted to rebuilding data onto a new drive after a drive in a storage configuration has failed. The default value is 30 percent.
Background Initialization (BGI) Rate	Use the arrow keys to move the cursor to this property. Press the plus key (+) to increase the rate or press the minus key (-) to decrease the rate.	Background initialization is a check for media errors on the drives when you create a virtual drive. It is an automatic operation that starts five minutes after you create the virtual drive. This check ensures that striped data segments are the same on all of the drives in the drive group. The default value is 30 percent.
Consistency Check Rate	Use the arrow keys to move the cursor to this property. Press the plus key (+) to increase the rate or press the minus key (-) to decrease the rate.	A consistency check is an operation that verifies that all stripes in a virtual drive with a redundant RAID level are consistent and that it automatically fixes any errors. The consistency check rate is the rate at which consistency check operations are run on a computer system. The default value is 30 percent.
Disk Coercion	Use the arrow keys to move the cursor to this property. Press the plus key (+) to set the value to 128 MB , 1 GB or None .	Drive coercion is a tool for forcing drives of varying capacities to the same capacity so they can be used in a drive group. The coercion mode options are None, 128MB-way, and 1GB-way. The number you choose depends on how much the drives from various vendors vary in their actual size.

Property	Use	Description
Disk WC	Use the arrow keys to Enable or Disable .	You can disable the Disk Write Cache option when you create a virtual drive, but you can enable this option later using the configuration utilities. <ul style="list-style-type: none"> When the Disk Write Cache is On, a write transaction is considered complete when all the data has been written to the disk cache. When Disk Write Cache is Off, the write transaction is complete only when the data has been written to the disk.
Read Ahead	Use the arrow keys to Enable or Disable .	When Disk Read Ahead is On , extra data is read sequentially ahead of the data that is actually requested, and this extra data is stored in cache memory. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly. This setting speeds up read operations for sequential data, but there is little improvement when accessing random data.
Auto Rebuild	Use the arrow keys to Enable or Disable .	Auto-rebuild allows a failed drive to be replaced and the data automatically rebuilt by <i>hot-swapping</i> the drive in the same drive bay. The RAID drive group continues to handle requests while the rebuild occurs.
Auto Resume	Use the arrow keys to Enable or Disable .	When enabled, you can stop a consistency check, rebuild, or initialization, and resume it later where it left off, instead of aborting it and starting over.

4. Highlight **Apply Changes** and press <Enter> to register your changes. Your changes are registered and the controller properties are changed.

3.1.3 Clearing Configurations

Perform the following steps to clear all existing configurations on the controller.

1. Highlight **Controller Management** on the **Configuration Options** screen (**Error! Reference source not found.**) and press <Enter>.
2. Highlight **Clear Configuration** on the **Controller Management** screen (**Error! Reference source not found.**) and press <Enter>.
3. Highlight **Yes** to confirm your selection on the **Confirm** screen. This action clears the existing configurations.

3.2 Managing Virtual Drives

You can use the **Virtual Drive Management** screen to create virtual drive configurations, view and change the virtual drive properties, delete virtual drives, initialize drives, and perform other tasks related to the virtual drives.

Note: You cannot create a configuration across SATA and sSATA controllers.

3.2.1 Configuring Virtual Drives

This section provides detailed instructions to configure drive groups and virtual drives with the HII Configuration Utility. Use drives with the same capacity when you create a storage configuration. If you use drives with different capacities in the same drive group, the CU limits each drive to the capacity of the smallest drive.

The number of physical drives in a specific array determines the possible RAID levels that you can implement with the array.

- RAID 0 requires from one to eight physical drives.
- RAID 1 requires two physical drives.
- RAID 5 required three to eight physical drives.
- RAID 10 requires four, six, or eight physical drives.

Note: The stripe size is read-only. You cannot change the settings for this property.

Follow these steps to access the **Virtual Drive Management** screen and create a virtual drive configuration.

1. Highlight **Virtual Drive Management** on the **Configuration Options** screen (**Error! Reference source not found.**) and press <Enter>.

The **Virtual Drive Management** screen appears, as shown in the following figure.

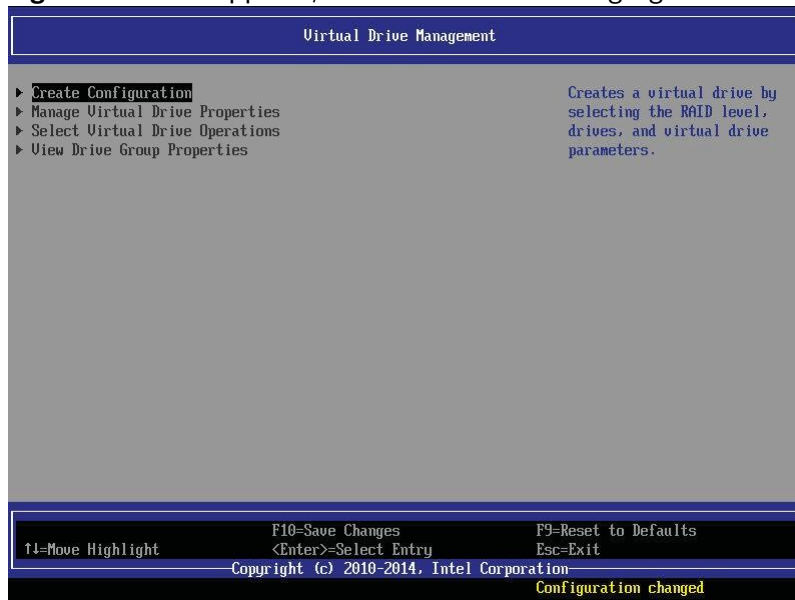


Figure 34. Virtual Drive Management Screen

2. Highlight **Create Configuration** and press <Enter>.

The **Virtual Drive Management > Create Configuration** screen appears, as shown in the following figure.



Figure 35. Virtual Drive Management – Create Configuration Screen

3. Use the arrow keys to select any highlighted fields (one at a time) that you want to change the setting for and press <Enter>.
4. Select the setting for each property that you want to change from the default.
You can change the settings for the following fields on this screen.

Table 5. Virtual Drive Management Property Settings

Property	Description
Select RAID Level	The possible RAID levels for the virtual drive. See Section 1.2, RAID Overview, on page 4, for more information about the RAID levels.
Select Drives From	The sources that you can use to select drives for the virtual drive. The options are Unconfigured Capacity and Free Capacity .
Select Drives	Select this button and a screen appears that lists Unconfigured Good drives or free capacity, which depend on the value you selected in the Select Drive From field.
Virtual Drive Name	Enter the name of the virtual drive.
Virtual Drive Size	Enter the capacity of the virtual drive. Normally, this value is the full capacity of the drive. You can specify a smaller capacity if you want to create other virtual drives on the same drive group.
Virtual Drive Size Unit	Enter the unit of capacity you want to use for the virtual drive. The options are MB , GB , and TB .
Stripe Size	A stripe consists of the data segments that the RAID controller writes across multiple drives, not including parity drives. The default is 64 KB . This setting is read-only.
Disk WC	You can disable the Disk Write Cache option when you create a virtual drive, but you can enable this option later using the configuration utilities. <ul style="list-style-type: none"> • When the Disk Write Cache is On, a write transaction is considered to be complete when all the data has been written to the disk cache. • When Disk Write Cache is Off, the write transaction is complete only when the data has been written to the disk.
Read Ahead	When disk Read Ahead is On , extra data is read sequentially ahead of the data that is actually requested, and this extra data is stored in cache memory. If the additional read-ahead data is then requested, it can be read faster from the cache than from the disk directly. This setting speeds up reads for sequential data, but there is little improvement when accessing random data.
Disable Background Initialization	Use this option to select the amount of system resources dedicated to background initialization of virtual drives connected to the selected controller.

3.2.2 Managing Virtual Drive Properties

After you create a virtual drive, you can use the **Virtual Drive Management** screen to change the name of the virtual drive.

Note: You can change only the virtual drive name for the virtual drive that is selected.

The other virtual drive properties are read-only.

Perform the following steps to access the virtual drive properties screen and change the name of the virtual drive.

1. Highlight **Virtual Drive Management** on the **Configuration Options** screen (Figure 30) and press <Enter>. The **Virtual Drive Management** screen appears, as shown in the following figure.

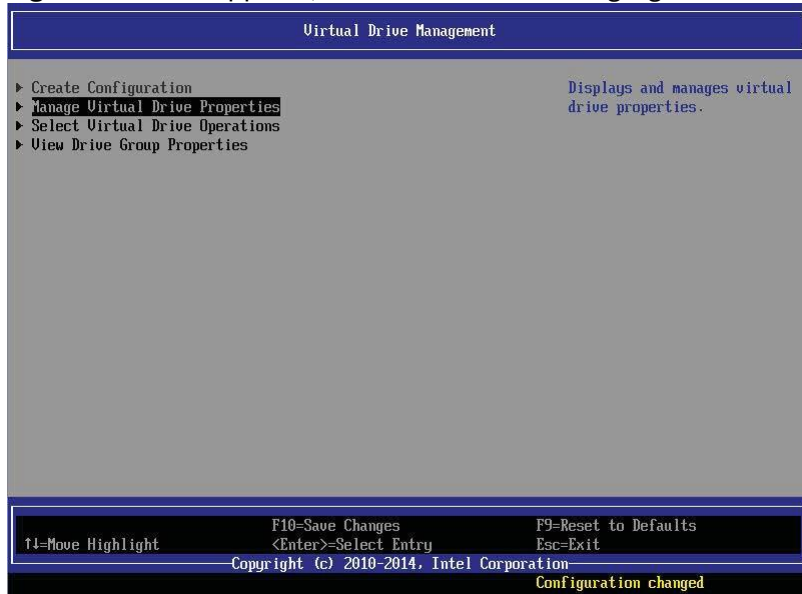


Figure 36. Virtual Drive Management Screen

2. Highlight **Manage Virtual Drive Properties** and press <Enter>.

The **Virtual Drive Management > Manage Virtual Drive Properties** screen appears, as shown in the following figure.



Figure 37. Virtual Drive Management – Manage Virtual Drive Properties Screen

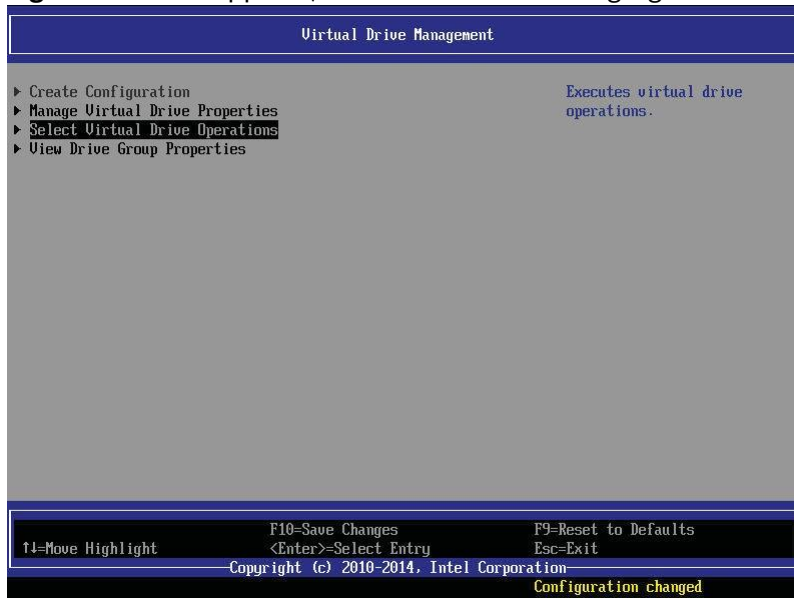
3. Highlight the **Virtual Drive Name** field and press <Enter>.
4. Enter a different name for the virtual drive and press <Enter>.
5. Highlight **Apply Changes** and press <Enter> to make the selected change. The name of the virtual drive is changed.

3.2.3 Selecting Virtual Drive Operations

You can use the **Virtual Drive Management** screen to select and launch operations related to the virtual drive properties.

Perform the following steps to access the virtual drive operations screen and carry out operations for the virtual drive properties.

1. Highlight Select Virtual Drive Operations on the Configuration Options screen (Figure 30) and press <Enter>. The **Virtual Drive Management** screen appears, as shown in the following figure.

**Figure 38. Virtual Drive Management Screen**

The Virtual Drive Management > Select Virtual Drive Operations screen appears, as shown in the following figure.

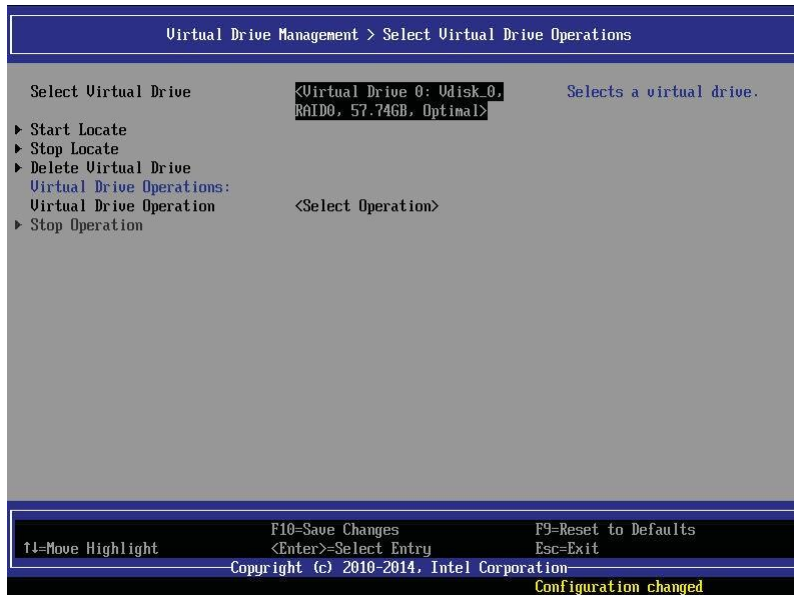


Figure 39. Virtual Drive Management – Select Virtual Drive Operations Screen

- Highlight **Select Operation** and press <Enter>. The **Select Operation** screen appears, as shown in the following figure.

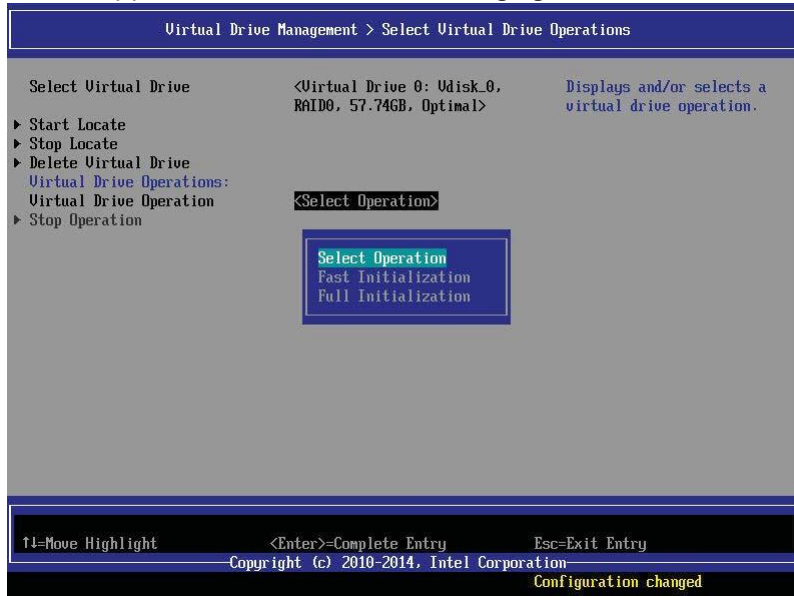


Figure 40. Select Operation Screen

- Highlight the operation you want to carry out and press <Enter>.

Table 6. Select Virtual Drive Operation Properties

Property	Description
Select Virtual Drive	Select the virtual drive you want to carry out operations on. The screen displays the virtual drive number, virtual drive name, RAID level, virtual drive capacity, and virtual drive status.
Virtual Drive Operation	Select Fast Initialization or Full Initialization to initialize this virtual drive. A fast initialization quickly writes 0s to the first and last 10-MB regions of the new virtual drive and then completes the initialization in the background. A slow initialization is not complete until the entire virtual drive has been initialized with 0s. It is seldom necessary to use this option, because the virtual drive was initialized when you created it. Note: If you have redundant virtual drives, you have the option to perform the Make Data Consistent operation.

- Highlight **Start Operation** and press <Enter>. The confirmation screen appears.

Note: The **Start Operation** option and the **Stop Operation** option toggle based on the current status of the operation. For example, after you start an operation, the **Start Operation** field is no longer highlighted, and the **Stop Operation** field is highlighted.

- Highlight **Yes** and press <Enter> to confirm that you want to carry out the operations.

Note: After you choose an operation and select **Start Operation**, the progress bar appears, showing zero percent. To see the change in percentages, return to the previous page and then access this page again.

3.2.4 Viewing Drive Group Properties

You can use the **Virtual Drive Management** screen to access the **View Drive Group Properties** screen and view the properties. The drive group contains the drives that are used to create the virtual drive.

Perform the following steps to access the **View Drive Group Properties** screen and view the drive group properties.

1. Highlight **Drive Management** on the **Configuration Options** screen (Figure 30) and press <Enter>. The **Virtual Drive Management** screen appears, as shown in the following figure.



Figure 41. Virtual Drive Management Screen

2. Select **View Drive Properties** and press <Enter>.

The Virtual Drive Management > View Drive Group Properties screen appears, as shown in the following figure.



Figure 42. Virtual Drive Management > View Drive Group Properties Screen

The screen displays the drive group number, drive group name, RAID level, virtual drive capacity, and virtual drive status.

3. Highlight the drive group and press <Enter>.

The drive group properties and any free capacity appear in the list, as shown in the following figure.

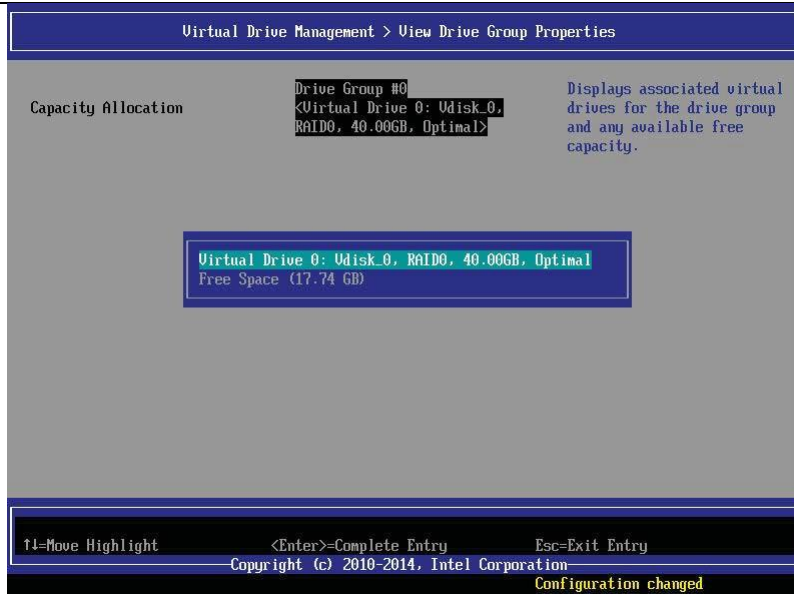


Figure 43. Drive Group Properties Screen and Free Space

3.3 Managing Drives

You can use the **Drive Management** screen to view and change the physical drive properties of the drives in a drive group.

3.3.1 Viewing Drive Properties

Perform the following steps to access the **View Drive Properties** screen and view the values for the properties.

1. Highlight **Drive Management** on the **Configuration Options** screen ([Error! Reference source not found.](#)) and press <Enter>.

The **Drive Management** screen appears, as shown in the following figure.



Figure 44. Drive Management Screen

2. Highlight **View Drive Properties** and press <Enter>.

The **Drive Management > View Drive Properties** screen appears, as shown in the following figure. This screen contains additional options that you can scroll down to view. The following figure shows the first options. You

can scroll down to display the additional options.



Figure 45. Drive Management – View Drive Properties Screen

You can highlight the **Associated Virtual Drive** field on the second **View Drive Properties** screen, and press <Enter> to view the properties. However, you cannot change the values in this field. The following table shows the drive properties and their values.

Table 7. Drive Properties

Property	Value
Select Drive	The drive number, drive slot, drive type, drive capacity, and drive status of the selected drive.
Drive ID	The ID and the drive slot of the selected drive.
State	The state of the selected drive, such as <i>Online</i> , <i>Offline</i> , or <i>Unconfigured Good</i> .
Coerced Size (MB)	The capacity to which the selected drive has been coerced to make it compatible with other drives that are nominally the same capacity
Device Type	Indicates the type of device selected, such as a drive, tape, or CD/DVD-ROM.
Connected Port	Indicates the port to which the selected drive is connected.
Media Errors	Indicates the number of media errors on the drive. Media errors are physical defects on the drive.
Predicted Fail Count	Indicates the predicted number of drive failures.
Available Size (MB)	Indicates the free capacity of the selected drive.
Used Space (MB)	Indicates the configured space of the selected drive in MB.
Disk Protocol	Indicates the type of drive selected, such as SATA.
Negotiated Drive Transfer Speed	Indicates the negotiated link speed for the data transfer to or from the selected drive.
Number of Connections	Indicates the number of devices connected.
Associated Virtual Drive	Indicates the virtual drive number, virtual drive name, RAID level, virtual drive capacity, and virtual drive status.
Revision	The firmware revision of the drive.

3.3.2 Selecting Drive Operations

Perform the following steps to access the drive operations screen and carry out the operations.

1. Highlight **Drive Management** on the **Configuration Options** screen ([Error! Reference source not found.](#)) and press <Enter>.

The **Drive Management** screen appears, as shown in the following figure.

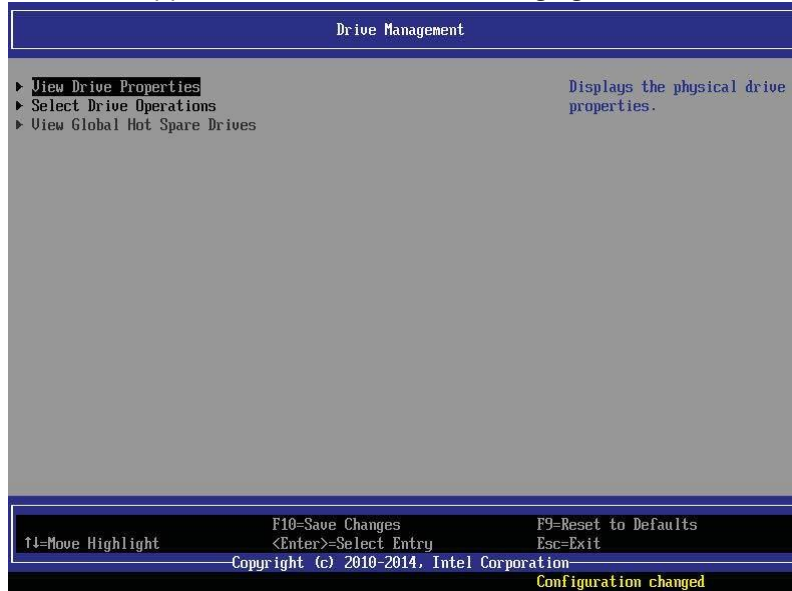


Figure 46. Drive Management Screen

2. Highlight **Select Drive Operations** and press <Enter>.

The **Drive Management > Select Drive Operations** screen appears, as shown in the following figure.

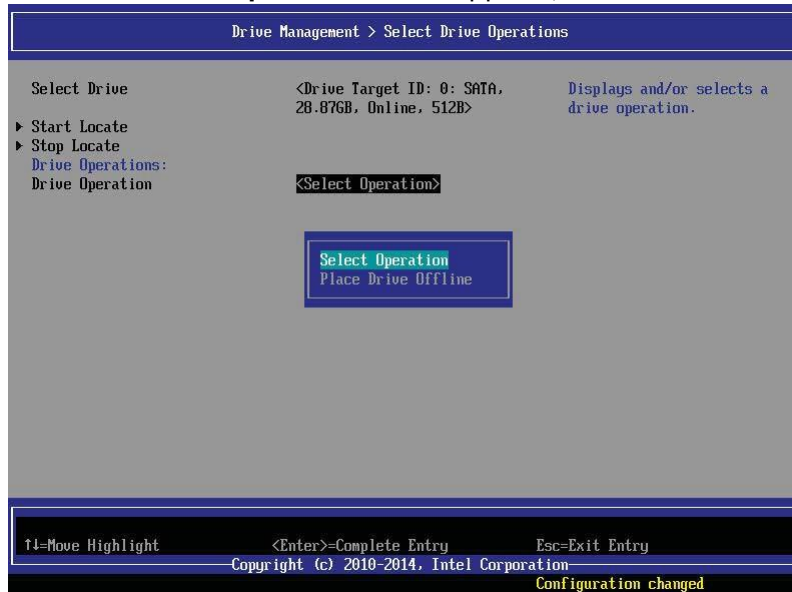


Figure 47. Drive Management – Select Drive Operations

3. Highlight an operation and press <Enter>.

The following table defines the drive operations.

Table 8. Drive Operation Settings

Property	Value
Select Drive	Select the drive on which you want to carry out operations. The screen displays the drive number, slot number, drive type, drive capacity, and drive status.

Drive Operation	Make a drive offline or online. The options are Place Drive Offline and Place Drive Online . Note: If a good drive is part of a redundant drive group with a hot spare, and you force that drive offline, the data on the drive rebuilds to the hot spare drive. The drive you forced offline goes into the <i>Unconfigured Good</i> state.
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4. Highlight **Start Operation** and press <Enter>. The confirmation screen appears.
5. Highlight **Yes** and press <Enter>.
The controller performs the selected operations.

3.4 UDK2010 Support

The HII Configuration Utility works with both EDK I (EDK 1.06) and EDK II (UDK2010). The EDK is the Intel implementation of the EFI Specification and EDK II (UDK2010) is a cross-platform firmware development environment for the UEFI.

Glossary

A

AHCI

Advanced Host Controller Interface

B

BBS

BIOS Boot Specification

BBU

Battery Backup Unit

BGI

Background Initialization

BGI is used in RAID 5 configurations only.

BIOS

Basic Input/Output System

C

CLI

Command Line Interface

CT

Command Tool

CU

Configuration Utility

D

DHP

Driver Health Protocol

DUD

Driver Update Diskette

H

HBA

Host Bus Adapter

HII

Human Interface Infrastructure

I

I/O

Input/Output

N

NVRAM

Nonvolatile Random Access Memory

O

OS

Operating System

P

PCI

Peripheral Component Interconnect

PCIe

PCI Express

PMM

Post Memory Management

POST

Power-On Self-Test

R

RAID

Redundant Array of Independent Disks

RHEL

Red Hat Enterprise Linux

S

SAS

Serial SCSI

SATA

Serial Advanced Technology Attachment

SBBM

Soft Bad Block Management

SCSI

Small Computer System Interface

SLES

SuSE Linux Enterprise Server

SSD

Solid State Drive

SuSE

Gesellschaft für Software-und Systementwicklung MBH

U

UEFI

Unified Extensible Firmware Interface