

**Jacobo Vargas
Scott Carroll
Karyn Corneli
David Dilling
Shawn D Mohr
J L Parker
Pat Reuvers**

Converting Hardware Management Console (HMC) 7042-CR6 or 7042-CR7 Models to RAID1

Introduction

This IBM® Redpaper™ publication describes how to set up RAID1 on your hardware management console (HMC), model 7042-CR6 or 7042-CR7 hardware appliance. During the migration, you perform a standard, from the beginning, HMC installation and restoration of your data.

The procedures in this paper are supported only on HMC machines, models 7042-CR6 and 7042-CR7. When the procedure differs between models, this paper indicates to which model the instructions apply.

This paper is intended for IT professionals, such as IBM clients, IBM Business Partners, information architects, business intelligence administrators, and database administrators.

Before you begin

Before you begin, complete the following premigration steps to close all serviceable events:

1. Check for open service events and verify that all serviceable events, which are reported against each host (managed server), are repaired.
2. Close the serviceable events.

Preparing for the RAID1 conversion

In preparation for the conversion, back up your existing HMC data, as follows.

Backing up your existing HMC data

Save upgrade data to use for a restore operation, and create a profile backup as an additional precaution for saving your configuration.

Use the following procedure:

1. Expand **Systems Management** and select **Servers**.
2. Select the first managed system by select the check box in next to the server name.
3. Under Tasks, expand **Configuration**, and then expand **Manage Partition Data**.
4. Select **Backup**.
5. In the Profile Data Backup pane, type a name for the backup file, and click **OK**.
A pop-up pane confirms that the profile data was backed up.
6. Click **OK**.
7. Repeat steps 1 - 6 for each additional system managed by this HMC.
After you have a partition data backup for each managed system, proceed to step 8
8. Prepare media to use for the Save Upgrade Data task; you need either a DVD-RAM, or a USB flash drive:
 - a. DVD-RAM:
Insert a formatted DVD-RAM media into the DVD drive.

Attention: You may use the same DVD-RAM that was used to back up HMC data; any existing backup will *not* be overwritten. In contrast, if the DVD-RAM you are using has not been formatted previously, format it by selecting **Format Media**, **Format DVD-RAM**, and then click **OK**. Select **Backup/restore**, then click **Format**. The format operation will *delete all existing data*.

- b. USB flash drive (available if HMC is currently V7.3.5 or later):
Plug the flash drive into a USB port on the front of the HMC.

The flash drive must be formatted FAT32, and cannot be partitioned or protected by password. Wait until you hear three beeps (approximately one minute) for the HMC to detect the flash drive.
9. Select **HMC Management**.
10. Select **Save Upgrade Data**.
11. Select media type (DVD or USB flash drive), click **Next**, and then click **Finish**.
12. Wait for the Save Upgrade Data task to complete.
If the task fails, contact your next level of support before proceeding.
If the task is successful, use the following optional procedure to verify the data:
 - a. Open a restricted shell terminal as follows:
 - i. Select **HMC Management**.
 - ii. Select **Open restricted Shell Terminal**.

- b. Mount the media:
 - i. Run the `lsmediadev` command to determine the mount point.
 In the following example, the CD/DVD mount point is `/media/cdrom`; the USB flash drive is `/media/sda1`:


```
device=/dev/cdrom,mount_point=/media/cdrom,type=1,description=CD/DVD
device=/dev/fd0,mount_point=/media/floppy,type=2,description=internal
diskette drive
device=/dev/hda,type=6,description=internal hard disk drive
device=/dev/sda1,mount_point=/media/sda1,type=3,description=USB flash
memory device
```
 - ii. Run the `mount <mount point>` command (using our example, this is `mount /media/cdrom` for the CD/DVD; `mount /media/sda1` for the USB flash drive).
- c. Run the `ls -l <mount point>` command using the same mount point as in step b.
- d. Verify that there are five `.tar` files with the following names:


```
ACMSaveData.tar
RSCTSaveUpgrade.tar
SaveCCFWUpgradeData.tar
SaveHSCSystemUpgradeData.tar
SaveProfileDataUpgrade.tar
```

 If any of these `.tar` files is missing, contact your next level of support
- e. Issue the `umount <mount point>` command by using the same mount point as in step b.

Note: The Save Upgrade Data task saves to the hard drive on the HMC and the DVD-RAM or USB flash drive. The Save Upgrade Data task on the media is used only to recover from an unexpected error under the direction of support personnel.

The Save Upgrade Data task is now complete.

- f. Remove the DVD-RAM or USB flash drive, and insert V7.7.6 recovery media MH01326 volume 1 into the DVD-RAM drive.
 You can now proceed to installing the additional drive and setting up the Integrated Mirror (RAID1) volume, (described in “Configuring RAID1 on the 7042-CR6”).

Configuring RAID1 on the 7042-CR6

This section applies to HMC model 7042-CR6 only. Instructions follow for installing a second physical drive, deleting an Integrated Striping (IS) volume (RAID0), and setting up the Integrated Management (IM) volume (RAID1).

To configure RAID1 on the 7042-CR7, see “Configuring RAID1 on the 7042-CR7” on page 6.

Installing the second physical drive

Before setting up your RAID1 volume on the HMC, perform the miscellaneous equipment specification (MES) upgrade to add the second disk for mirroring. Any model 7042-CR6 that was previously used as an SDMC will already have two disks installed. If your 7042-CR6 was an SDMC appliance that was converted to an HMC appliance, skip this task and go to “Deleting an Integrated Striping (IS) volume (RAID0) for previous SDMC installations” on page 4.

To install the physical drive, complete the following steps:

1. From the HMC GUI, click **HMC Management**, click **Shutdown or Restart**, select the **Shutdown HMC** radio button, and then click **OK**.
2. Remove the filler panel from the empty drive bay, for example, <bay number 0?>.
3. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
4. Install the hard disk drive in <drive bay 1> drive bay:
 - a. Make sure that the tray handle is in the open (unlocked) position.
 - b. Align the drive assembly with the guide rails in the bay.
 - c. Gently push the drive assembly into the bay until the drive stops.

Deleting an Integrated Striping (IS) volume (RAID0) for previous SDMC installations

If your 7042-CR6 was converted from SDMC, it will already have two disk drives configured as an IS or RAID0 volume. We need to delete this volume before configuring the Integrated Management (IM) or RAID1 volume.

To delete the IM volume, complete the following steps:

1. Power on the HMC appliance.
2. After the selection pane opens during the restart operation, press F1 key to go to Setup.
3. Select **System Settings**.
4. Select **Adapters and UEFI Drivers**.

Compile the List of Drivers menu: If this menu is shown, press the Enter key.

5. Select the **LSI Logic Fusion MPT SAS Driver**.
6. From the LSI Logic MPT Setup Utility menu, select the **SAS1064e** driver.
7. Select **RAID Properties** in the SAS1064E Adapter Properties pane.
8. Select **Manage Array** in the View Array pane.
9. Select **Delete Array** in the Manage Array pane.
10. Select **Y** to delete the array and exit to the Adapter Properties pane.

Setting up the Integrated Management (IM) volume (RAID1)

This task guides you through the HMC BIOS to configure the LSI Logic Fusion Adapter for RAID1. If you just completed deleting an Integrated Striping volume for previous SDMC installations, you might be in the Adapter Properties pane of the LSI Logic MPT Setup Utility and can skip to step 7.

1. Power on the HMC appliance.
2. After the selection pane opens during the restart operation, press F1 to go to Setup.
3. Select **System Settings**.
4. Select **Adapters and UEFI Drivers**.

Compile List of Drivers menu: If this menu is shown, press the Enter key.

5. Select the **LSI Logic Fusion MPT SAS Driver**.
6. From the LSI Logic MPT Setup Utility menu, select the **SAS1064e** driver.
7. Select **RAID Properties** in the SAS1064E Adapter Properties pane.
8. Select **Create IM Volume** on the Select New Array Type pane.

Ensure correct installation: This step lists the two hard disk drives (HDDs) that are installed in the HMC appliance. Check for the HDD listings and ensure that the two HDDs are correctly installed.

9. Use the arrow keys to move to the **RAID DISK** column, and press the Spacebar to toggle the value to **Yes** for each HDD that is listed; set the RAID DISK column value to **Yes**.

Notes:

- ▶ The order in which you carry out the next step dictates the primary and secondary drives in the RAID volume.
- ▶ When toggling the first selection, you will be asked to delete or migrate existing data. The SAS1064E adapter does not support migration, so select **D – Overwrite existing data** here

10. From the Create and Save New Array menu, select **Save Changes**.
11. Exit the menu and press Enter.
12. Press Esc to exit **LSI MPT setup utility**.
13. Press Esc to exit the previous menu.
14. Select **Exit the Configuration Utility** and **Restart**.
15. Press Enter when prompted to stop the controller: The action required is Stop Controller YES(Enter) / NO (Esc).
16. Press Esc three times to exit setup.
17. Press the Y key to exit setup completely.

Configuring RAID1 on the 7042-CR7

This section applies only to HMC model 7042-CR7. Instructions follow for installing a second physical drive, deleting the pre-existing RAID0 virtual drive, and setting up the RAID1 virtual drive.

To configure RAID1 on the 7042-CR6, see “Configuring RAID1 on the 7042-CR6” on page 3.

Installing the second physical drive

Before setting up your RAID1 volume on the HMC, perform the MES upgrade to add the second disk for mirroring.

To install the physical drive, complete the following steps:

1. From the HMC GUI, click **HMC Management**, click **Shutdown or Restart**, select the **Shutdown HMC** radio button, and then click **OK**.
2. Remove the filler panel from the empty drive bay <bay number 1>.
3. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
4. Install the hard disk drive in <bay number 1> drive bay:
 - a. Make sure that the tray handle is in the open (unlocked) position.
 - b. Align the drive assembly with the guide rails in the bay.
 - c. Gently push the drive assembly into the bay until the drive stops.

Deleting the pre-existing RAID0 virtual drive

If your 7042-CR7 was previously installed with HMC code, it will already have a defined virtual drive set up as a RAID0 volume. We need to delete this volume before creating the RAID1 volume.

To delete the original virtual drive, complete the following steps:

1. Power on the HMC appliance.
2. After the selection pane opens during the restart operation, press F1 to go to the Setup Utility.
3. Select **System Settings**.
4. Select **Storage**.
5. Select the **LSI MegaRAID <ServeRAID M5110> Configuration Utility**.
6. Select **Virtual Drive Management**.
7. Select **Select Virtual Drive Operations**.

8. Select **Delete Virtual Drive** as shown in Figure 1.

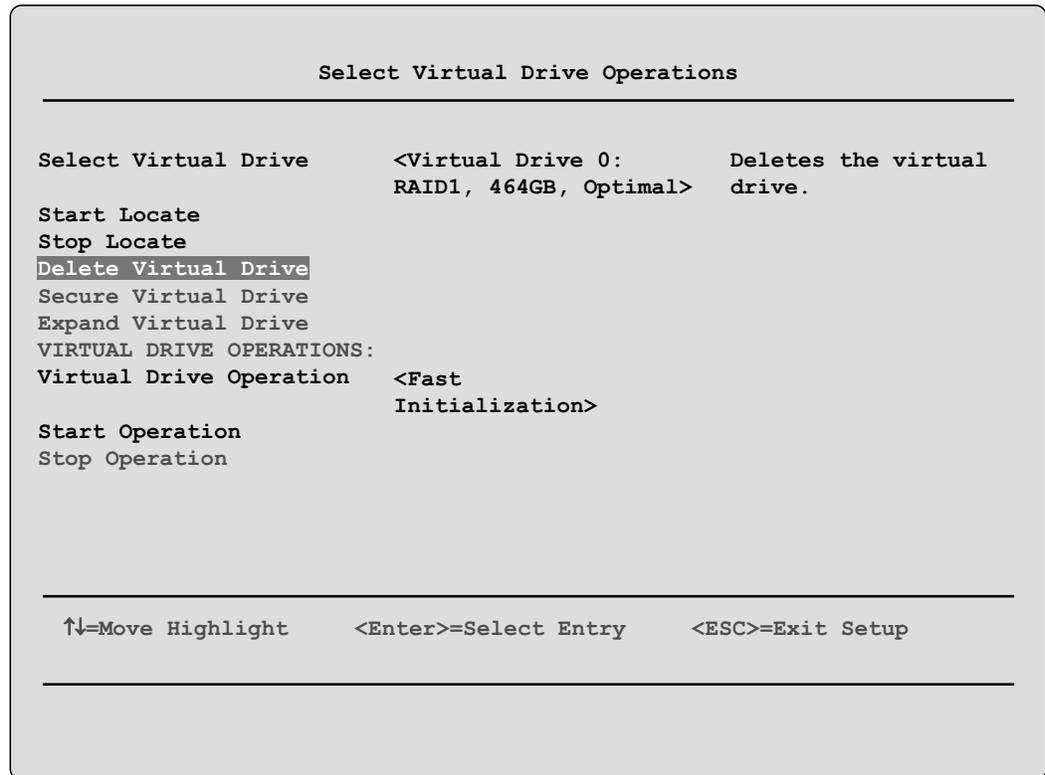


Figure 1 Select Virtual Drive Operations pane: Deleting a virtual drive

9. Select **Confirm** and press the Spacebar to toggle the check box.
10. Select **Yes**.
11. Select **OK**.
12. Exit the Select Virtual Drive Operations pane (press Esc).
13. Exit the Virtual Drive Management pane (press Esc).

Setting up the RAID1 virtual drive

This task guides you through the creation of a RAID1 virtual drive. If you just completed deleting the pre-existing RAID0 virtual drive, you might already be viewing the Configuration Options pane of the LSI MegaRAID Configuration Utility and can skip to step 7.

1. Power on the HMC appliance.
2. After the selection pane opens during the restart operation, press F1 to go to Setup Utility.
3. Select **System Settings**.
4. Select **Storage**.
5. Select the **LSI MegaRAID <ServeRAID M5110> Configuration Utility**.
6. Select **Virtual Drive Management**.
7. Select **Create Configuration**.

8. Select **Select RAID Level** and select **RAID1**, as shown in Figure 2.

The screenshot shows a terminal window titled "Create Configuration". It contains several configuration options and their current values. The "Select RAID Level" option is highlighted with a blue box, and "RAID1" is selected within its menu. The "Select Drives From" option is set to "<Unconfigured Capacity>". The "Virtual Drive Size Unit" is set to "<GB>". The "Strip Size" is set to "<128 KB>". The "Read Policy" is set to "<Adaptive>". The "Write Policy" is set to "<WBack>". The "I/O Policy" is set to "<Direct>". The "Access Policy" is set to "<Read/Write>". A legend at the bottom indicates that the arrow keys are used for moving the highlight, the Enter key is used for completing an entry, and the Esc key is used for exiting.

```

Create Configuration

Save Configuration
Select RAID Level      <RAID0>
Secure Virtual Drive   [ ]
Select Drives From    <Unconfigured
                       Capacity>

Select Drives
CONFIGURE VIRTUAL DRIVE PARAMETERS
Virtual Drive Name     -
Virtual Drive Size Unit <GB>
Strip Size             <128 KB>
Read Policy            <Adaptive>
Write Policy           <WBack>
I/O Policy             <Direct>
Access Policy          <Read/Write>

RAID0
RAID1

RAID 0 -- uses drive striping to provide high data throughput, especially for large files in an

↑↓=Move Highlight    <Enter>=Complete Entry    Esc=Exit

```

Figure 2 Create Configuration pane: Selecting the RAID level

9. Select **Select Drives**.

10. Verify that both drives are listed and select **Check All** as shown in Figure 3.

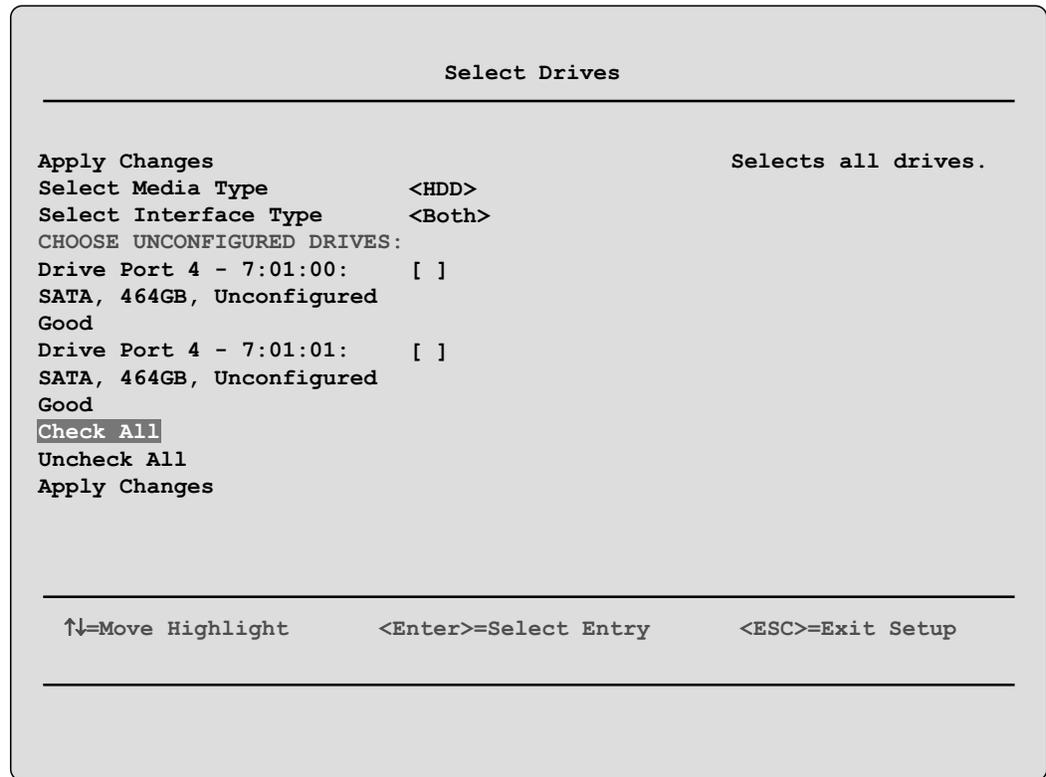


Figure 3 Select Drives pane: Selecting the drives

11. Select **Apply Changes**.

12. Select **OK** at the Success pane.

13. Select **Save Configuration** as shown in Figure 4.

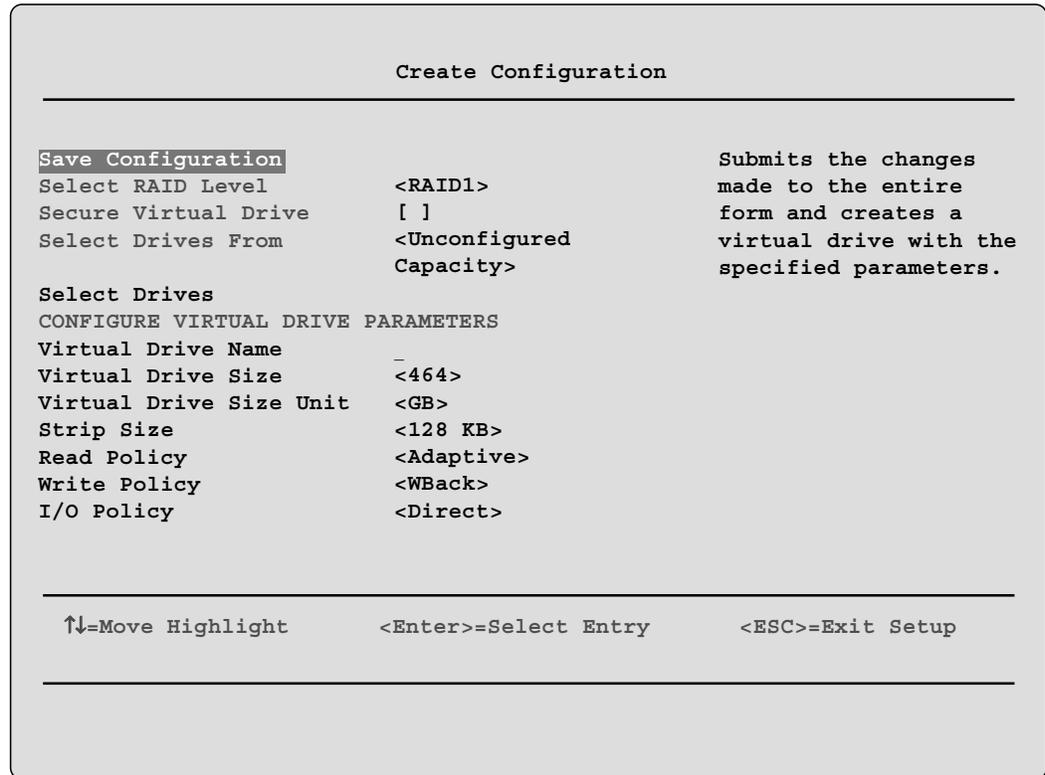


Figure 4 Create Configuration pane: Saving the configuration

14. At the Warning pane, select **Confirm** and press the Spacebar to toggle the check box.

15. Select **Yes**.

16. Select **OK** at the Success pane.

A message indicates that additional virtual drives cannot be created because of insufficient capacity. The reason is because all available drives have now been allocated to the new virtual drive.

17. Press the Esc key to close the message.

The Virtual Drive Management pane does not refresh after the creation of the virtual drive, and, as a result, all operations are displayed but are not available (disabled). The next step addresses this issue.

18. Exit back to the Configuration Options pane by pressing the Esc key.

19. Select **Virtual Drive Management**.

20. Select **Select Virtual Drive Operations**.

21. Verify that the Virtual Drive Operation is set to Fast Initialization and select **Start Operation** as shown in Figure 5.

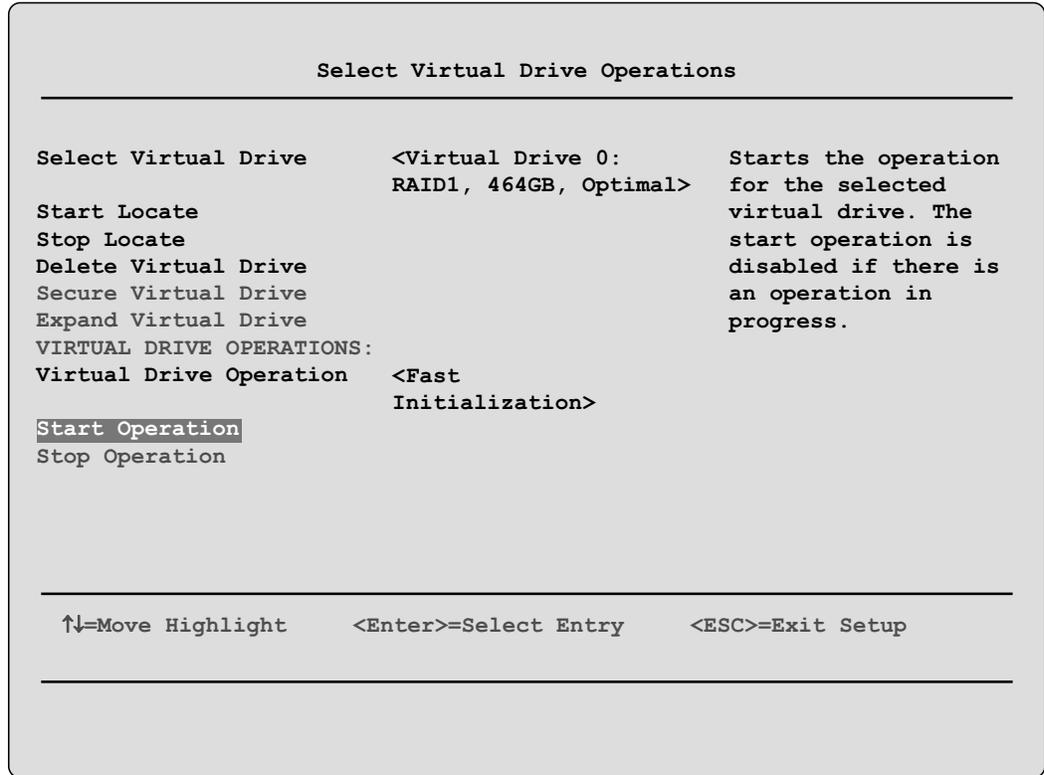


Figure 5 Select Virtual Drive Operations pane: Starting the operation

22. At the Warning pane, select **Confirm** and press the Spacebar to toggle the check box.

23. Select **Yes**.

24. Select **OK** at the Success pane.

25. The operation completes quickly, and you can exit the setup utility by pressing the Esc key until you reach the exit confirmation panel, as shown in Figure 6.

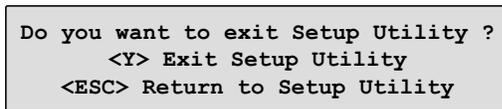


Figure 6 Exiting the setup utility

26. Press the Y key to exit the Setup Utility.

27. Proceed to the next section (“Downloading and installing HMC, service pack, and recovery media files” on page 12).

Downloading and installing HMC, service pack, and recovery media files

If you have the Recovery Media for the HMC V7R760, proceed to “Installing the HMC and service pack files” on page 12. Otherwise, to download the HMC recovery media, service pack (SP) files and fixes, use the steps in the following sections.

Downloading the HMC recovery media, service pack files, and fixes

To download the HMC .iso images, recovery media, and the latest SP files and fixes, complete the following steps:

1. Open a browser and navigate to IBM Fix Central:
<http://www.ibm.com/support/fixcentral/options>
2. Select the following information:
 - a. For the Product Group: **Systems**
 - b. For Systems: **Power**
 - c. For the Product: **Firmware, SDMC, and HMC**
3. For the Machine type-model: Select the machine type and model for one of the systems to be managed by the HMC.
4. Click **Continue**.
5. Click the radio button for the **HMC Firmware** option, and click **Continue**.
6. For the HMC firmware release levels, select at least the minimum, supported release of V7.R7.6.0.
7. From the HMC Package Selection, select the **Recovery Image, latest service pack, and available fixes**.
8. Log in with your IBM ID to download the files.

Unknown password: If the password is unknown, reset the password by using the instructions at:

http://www-912.ibm.com/s_dir/slkbase.NSF/DocNumber/362731655

Installing the HMC and service pack files

You can use the recovery DVD to reinstall the HMC. After you reinstall the HMC machine code, and if you had optionally created a backup to recover critical console information, you can restore that profile data now.

To reinstall the HMC machine code, you must be a member of one of the following roles:

- ▶ Super administrator
- ▶ Operator
- ▶ Service representative

To reinstall the HMC machine code, complete the following: steps

1. Shut down and power off the HMC. For full details, visit the following location:
<http://pic.dhe.ibm.com/infocenter/powersys/v3r1m5/topic/p7eav/areavreboot.htm>
2. Insert the recovery media into the DVD drive.

3. Power on the HMC (it will boot from the media). The Backup/Upgrade/Restore/Install pane opens.
4. Select the **Install** option, and click **Next**.
5. Select **Install from media**, and then click **Next**.
6. After the first DVD completes the installation, follow the on-screen instructions to remove the disk media from the DVD drive and press any key to reboot the HMC.
7. When prompted to install the additional media, select **1 - Install additional software from media**.
8. After installing the additional software, select **2 - Restore Upgrade Data from DVD-RAM media**.
9. When the restore is completed, install the service pack and fixes that were obtained in “Downloading the HMC recovery media, service pack files, and fixes” on page 12 (instructions for each service pack and fix are available from IBM Fix Central at <http://www.ibm.com/support/fixcentral/options>)

The team who wrote this paper

This paper was produced by a team of specialists from around the world working at the International Technical Support Organization (ITSO), Poughkeepsie Center.

Jacobo Vargas is an HMC Product Engineer in the United States. Jacobo has 12 years of experience in the field of systems software development and support. Jacobo holds a BS degree in Electrical Engineering from the University of Puerto Rico at Mayagüez. His areas of expertise include IBM Tivoli® Storage Manager, IBM AIX®, HMC, and SDMC. Jacobo has written extensively about AIX and HMC topics.

Scott Carroll is a Firmware Engineering Professional and the Systems Management on Power Program Manager in Austin, Texas, in the United States. Scott authored and contributed to many IBM Redbooks, IBM Redpapers™ publications, and white papers on a wide range of topics.

Karyn Corneli is an HMC and SDMC Product Engineer in the United States. Karyn has 11 years of experience with the HMC product. Karyn has worked at IBM for 15 years. Karyn holds a BS degree in Management Information Systems from the University of Arizona, Tucson. Her areas of expertise include ADSTAR Distributed Storage Manager (ADSM), IBM Tivoli Storage Manager, SP, IBM AIX, the HMC, and the SDMC. Karyn has written extensively about HMC topics.

David Dilling is a Senior Software Engineer in the United States. David has 29 years of experience in IBM. He holds a BS degree in Computer and Electrical Engineering from the University of Cincinnati. David's areas of expertise include the HMC, SDMC, IBM i, and IBM PowerVM®. He has written many IBM support documents for those areas.

Shawn D Mohr is a Senior Software Engineer in the United States. He has 11 years of experience in IBM. He holds a BS degree in Management Information Systems from Iowa State University. His areas of expertise include the HMC, SDMC, and IBM i. Shawn has written many IBM support documents for those areas.

J L Parker is an IBM Power Systems™ Product Manager in the United States. He has 10 years of experience in IBM. He holds a BS degree in English from Utah State University. JL's areas of expertise include the HMC, SDMC, AIX, and PowerVM.

Pat Reuvers is a Process Engineer in the United States. He has 29 years of experience in IBM. He holds a BS degree in Mechanical Engineering from the University of Notre Dame and an MS degree in Manufacturing Engineering from Rensselaer Polytechnic Institute. Pat's areas of expertise include all phases of manufacturing new product introduction and production in the areas of operation, including order logistics, build, test, packaging, scheduling, planning, and procurement.

Thank you to the following people for their contributions to this project:

- ▶ Scott Vetter, Executive Project Manager - ITSO Redbooks Systems Team Lead
- ▶ Karen Lawrence, ITSO Technical Writer
- ▶ Linda Robinson, IBM Redbooks Graphics Specialist
- ▶ Diane Sherman, ITSO Editor

Now you can become a published author, too!

Here's an opportunity to spotlight your skills, grow your career, and become a published author—all at the same time! Join an ITSO residency project and help write a book in your area of expertise, while honing your experience using leading-edge technologies. Your efforts will help to increase product acceptance and customer satisfaction, as you expand your network of technical contacts and relationships. Residencies run from two to six weeks in length, and you can participate either in person or as a remote resident working from your home base.

Find out more about the residency program, browse the residency index, and apply online at:

ibm.com/redbooks/residencies.html

Stay connected to IBM Redbooks

- ▶ Find us on Facebook:
<http://www.facebook.com/IBMRedbooks>
- ▶ Follow us on Twitter:
<http://twitter.com/ibmredbooks>
- ▶ Look for us on LinkedIn:
<http://www.linkedin.com/groups?home=&gid=2130806>
- ▶ Explore new Redbooks publications, residencies, and workshops with the IBM Redbooks weekly newsletter:
<https://www.redbooks.ibm.com/Redbooks.nsf/subscribe?OpenForm>
- ▶ Stay current on recent Redbooks publications with RSS Feeds:
<http://www.redbooks.ibm.com/rss.html>

Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785 U.S.A.

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

© Copyright International Business Machines Corporation 2012. All rights reserved.

Note to U.S. Government Users Restricted Rights -- Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

This document REDP-4909-00 was created or updated on October 25, 2012.



Send us your comments in one of the following ways:

- ▶ Use the online **Contact us** review Redbooks form found at:
ibm.com/redbooks
- ▶ Send your comments in an email to:
redbooks@us.ibm.com
- ▶ Mail your comments to:
IBM Corporation, International Technical Support Organization
Dept. HYTD Mail Station P099
2455 South Road
Poughkeepsie, NY 12601-5400 U.S.A.



Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. These and other IBM trademarked terms are marked on their first occurrence in this information with the appropriate symbol (® or ™), indicating US registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at <http://www.ibm.com/legal/copytrade.shtml>

The following terms are trademarks of the International Business Machines Corporation in the United States, other countries, or both:

AIX®

IBM®

Power Systems™

PowerVM®

Redbooks®

Redpaper™

Redpapers™

Redbooks (logo) ®

Tivoli®

The following terms are trademarks of other companies:

Other company, product, or service names may be trademarks or service marks of others.