EMC²

Support Procedure

EMC CLARiiON

Recovering a Boot Image on a CX System
Using Recovery Drives or the CLARiiON Utility Partition

CLAR-PSP-078
Rev 03_10_2003

Introduction

This document describes the procedures to recover the boot image for a Storage Processor on a CX series array. It is assumed that there is one working Storage Processor.
This Procedure will cover two methods of recovery;

➢ Using Recovery Drives for arrays running pre-R11 Software
➢ Using The Utility Partition Method for arrays running R11 and later

This procedure is necessary if it is determined that the SP is in an unbootable state, either rebooting continuously or unable to boot the NT operating system from the mirrored pair of boot drives either in slots 0/2 or slots 1/3. This is an "off-line" operation. This is a "data-in-place" operation however, as long as any drive replaced is not a RAID 0. A procedure to determine if the SP is in this state is outside the scope of this document. CLARiiON® TS2 must be involved in the <u>decision</u> to use this procedure and the <u>execution</u> of this procedure.

Important

<u>**CX series Arrays which are running software which predates release 11**</u> software (see definition in next section) can use the recovery procedure detailed below which includes a recovery disk , or it can be recovered by updating the Software on the surviving SP-Boot drives to Release 11 or higher and using the Utility Partition detailed in this document.
<u>**CX Series Arrays already Release 11 software**</u> or higher <u>must use</u> the utility partition method.

Definitions

√ **Primary NT boot disk** – The lesser numbered disk in the NT mirror pair for a particular SP. For SP A, disk 0_0_0, for SP B disk 0_0_1.
√ **Secondary NT boot disk** – The greater numbered disk in the NT mirror pair for a particular SP. For SP A, disk 0_0_2, for SP B disk 0_0_3.
√ **Recovery Disk** – Fibre disk containing a clean copy of NT operating system on which is installed a revision of core software that is NDU-compatible with the software currently on the array.
√ **Pre-Release 11** CX200 – Core SW 02.**03**.x.20.5.xxx. With 6.2 Navisphere Array components
   CX400 - Core SW 02.**02**.x.40.5.xxx   With 6.1 or 6.2 Navisphere Array components
√ CX600 - Core SW 02.**02**.x..60.5.xxx   With 6.1 or 6.2 Navisphere Array components
√ **Release 11 –** Core SW 02.**04**.x.xx.5.xxx with Navisphere 6.4

Part Numbers of Recovery Drives for Arrays running Pre-Release 11 Software

CX-series Array	Kit to Order	Imaged drive within the kit
CX600	**005048187**	005047999
CX400	**005048194**	005048085
CX200	**005048137**	005048188

Part Numbers of Recovery CDs for Arrays running Release 11 or higher Software

CX-series Array	CD Kit to Order
CX600	**068090682**
CX400	**068090681**
CX200	**068090679**

Note: Each recovery CD contains
- Utility Partition for the array type
- Recovery.NDU image
- Recovery .mif image   (*This file will be covered in a later revision of this document*)

Caveats re the use of Disk Drives for recovery

1. Data on non-redundant user LUNs bound on the primary NT mirror disk of the SP being recovered will be lost.
2. Data on redundant user LUNs will NOT be lost; however, these LUs will be double-faulted and therefore shut down during the procedure.
3. The capacity of the recovery drive must be >= the capacity of the drive it is replacing.

4. If a failed drive is being replaced, the replaced drive should be tagged for FA and shipped back via standard process. The Recovery Drive must also be sent back to the factory as a standard returned part. The RECOVERY drive is for ONE-TIME USE. If used a second time in a different system as a recovery drive where an SP could boot from it, database damage will likely occur on that system.

Recovery Drive Procedure

The following examples show this procedure applied to Disk 0 and Disk 2 (Recovering SPA) . This is valid if SP A boot drives are being recovered. If SP B is being recovered, apply the same procedure to Disks 1 and 3.

1. This is an off-line procedure. STOP and PREVENT All I/O to the array
2. Disable write cache.
3. Stop and prevent all I/O to the array.
4. Remove this array from any EMC Control Center Navisphere® Manager Domain.
5. Remove (back-out from fully inserted position) the Storage Processor that will not boot, from its slot in the SPE chassis.

Disk 0	Disk 1	Disk 2	Disk 3
SP A primary	SP B primary	SP A secondary	SP B secondary
SP A **SPB**		**REMOVED** **running**	

Figure 1

6. Remove all Hot Spares that are in the READY state (not currently being used). There is no need for a Hot spare to be invoked during this OFF-LINE operation

7. Mark/label the first four drives in the Chassis as drives 0,1,2 and 3.

8. Pull the primary NT boot disk and "back-out" secondary NT boot disk for the non-booting SP.

9. If the drives pulled in the previous 2 steps are part of the same raid group pull another disk in the same RAID group. If the drives pulled in the previous step are part of different RAID groups, pull a second drive in each Raid group which the boot drive pair are members of. *The goal is to double fault any LUNs which these boot drives are involved, causing no unnecessary time-consuming rebuilds of LUNs to occur until the end of this procedure.*

10. Install the recovery disk into the Primary NT boot drive slot (see figure 1). The PSM & database will begin to rebuild to the inserted recovery disk, copying from one of the drives in slots 0 or 1

Note: If the primary NT boot disk has non-redundant LUNs bound on it, but the secondary has redundant LUNs, replace the secondary NT mirror disk with the recovery disk (instead of replacing the primary). This will avoid unnecessary data loss.

Recovery Disk	**Disk 1** SP B primary	REMOVED \backed-out	**Disk 3** SP B secondary
SP A **SPB**		**REMOVED** **running**	

Figure 2

11. When activity has completed on the Recovery drive, re-insert the Storage Processor previously removed.
    - √ NT will boot
    - √ The software will be upgraded on the Recovery Disk (this will most likely cause the SP to reboot a second or a third time)

Wait for all reboots to complete. Watch the BOOT LED on the Air Dam of the SP. The Amber light next to the LAN Connector must be off.

Recovery Disk	**Disk 1** SP B primary	REMOVED/backed-out	**Disk 3** SP B secondary
SP A **SPB**		**installed** **running**	

12. **Insert the original secondary NT boot disk**. The PSM, Flare database and the NT boot mirror will be rebuilt to the secondary, copying from the recovery drive to the drive just re-inserted. Events will be generated in NT's system event log at the start and completion of the rebuild of the NT boot mirror. Note that the vault will rebuild to the primary NT boot Disk when the Secondary disk is installed.

Recovery Disk	**Disk 1** SP B primary	**Disk 2** SP A secondary	**Disk 3** SP B secondary
SPA running **SPB running**			

Figure 4

13. Remove the recovery disk from the array. Clearly mark the recovery disk as having been SPENT on a return tag and check off the "USED" block on the label that is located on the handle of the drive and return the recovery disk to manufacturing. **Recovery disks <u>can not</u> be reused**. **Reusing a recovery disk can result in home-wrecker issues that can leave an array unbootable or cause loss of user data.**

14. Insert a replacement drive into the slot that was occupied by the recovery disk. This drive should be replaced even if there is no evidence of hardware failure. It is required for an in-depth fault analysis. The NT boot mirror, Flare database, PSM, and vault will rebuild to the inserted disk.

15. Insert any other drives that were removed because they were part of the same raid groups(s). DO NOT re-insert hot spares yet. When the Raid groups(s) involved have a full complement of drives, User LUNs will begin to rebuild to the single drive that was replaced in step 14.

16. Reinsert any hot spares after "rebuilds" have begun to the replaced drive. Note that if hot spares are re-inserted before this time, rebuilds will begin on them. This is not required or desired.

Utility Partition Method (all CX systems running Release 11 or greater)

The Utility Partition on a CX series array is a special section on each Boot Drive, which is available to the alternate storage processor to boot from. The mirrored Utility Partition on drives 0 & 2 is available for SPB to boot from. Because of this, the Utility Partition must be on all 4 boot drives. All Arrays from the factory (coincidental with release 11 of core SW) have a Utility Partition installed. In addition, they will have a recovery image loaded on the repository which is on drive 5. If drive 5 is ever replaced, the recovery image must be reloaded. See the figure below.

Note: There are Unique Utility Partition and Recovery images for each of the CX Series (CX200, CX400, CX600) These images are posted on the Global Services WEB and the CLARiiON Service Partners WEB Pages. They are also available via CD that can be ordered from EMC Service Logistics;

CX-series Array	CD to Order
CX600	**068090682**
CX400	**068090681**
CX200	**068090679**

Note: Each recovery CD contains
- Utility Partition for the array type
- Recovery.NDU image
- Recovery .mif image

Locations of Core Boot Partitions, Utility Partitions, and Image Repository on CX Series Arrays

0_0_0	0_0_1	0_0_2	0_0_3	0_0_4
Flare/NT Boot Partition SPA Primary	Flare/NT Boot Partition SPB Primary	Flare/NT Boot Partition SPA Secondary	Flare/NT Boot Partition SPB Secondary	Image Repository
Utility Partition SPB Primary	Utility Partition SPA Primary	Utility Partition SPB Secondary	Utility Partition SPA Secondary	

Three Scenarios are likely, leading to the need for this procedure

Scenario 1 - The array is running pre release 11 software, it has suffered the loss of the boot image of one SP. This array could use a recovery drive as documented above (recommended) or use the Utility partition as documented below.

Scenario 2 - The array is running Release 11 or higher, the boot image of one SP is bad but the Utility partition or Recovery images are not loaded.

* Unfortunately, at this time there is no way to tell if the Utility Partition or Recovery Image are loaded without trying the procedure.

Scenario 3 - The Array is running Release 11 or higher and the Utility partition and the recovery image are loaded.

Procedure:

Scenario 1 – Update via Disruptive NDU (with one working SP, any update is disruptive) all array based Software to the Current revision (Release 11 or higher) via one NDU. Load the Utility partition and recovery image from the Recovery CD for the array type, via a second rebootless NDU. (The NDU of the Utility partition or recovery image is rebootless.) Once these files are loaded, follow the procedure in Scenario 3 below. Performing an NDU on an array with one Failed SP is disruptive to any attached server and also requires that the Array SW Update is done while in engineering mode. When in engineering mode, right click the array icon, find the engineering mode selection, and the software installation option. Once updated, go to scenario 3 below.

Scenario 2 – If the utility partition or the recovery Image is not found you must load them. If attempting a utility partition boot as described in scenario 3 does not indicate a boot is occurring, load the utility partition and recovery image from the Recovery CD for the array type. The NDU of the Utility partition or recovery image is rebootless. You can NDU the Utility partition and recovery image on an array with one Failed SP. It will be disruptive to any attached server and requires that the Array SW Update is done while in engineering mode. When in engineering mode, right click the array icon, find the engineering mode selection, and the software installation option. Once updated, go to scenario 3 below. If the NDU which includes the "recovery image: fails with a message similar to "attempt to store image to persistent storage failed", NDU the Utility partition alone if not already loaded. The recovery image can then be loaded via the FTP Method in Appendix A.

Scenario 3 – The boot drives for one of the SPs must be re-imaged and the Utility partition and recovery image is already loaded.

1. Connect a serial cable from a Windows server/desktop/laptop. The cable connects from a Comm port on the computer to the Serial Port on SPA.

2. The Comm Port on the computer should be set to;

> 9600 baud
>
> 8-bit
>
> No parity
>
> 1 stop-bit,
>
> No flow control.

3. Open a hyper-terminal Session with the port characteristics described above.

4. Insert/reset the Storage Processor that is being re-imaged.

5. The Storage Processor will begin its boot sequence running BIOS and POST Tests. While monitoring the power-up sequence of the Storage Processor be prepared to interrupt this process by hitting the *Esc Key* on your keyboard at anytime during the printout of this string of Alpha characters as noted in the figure below.
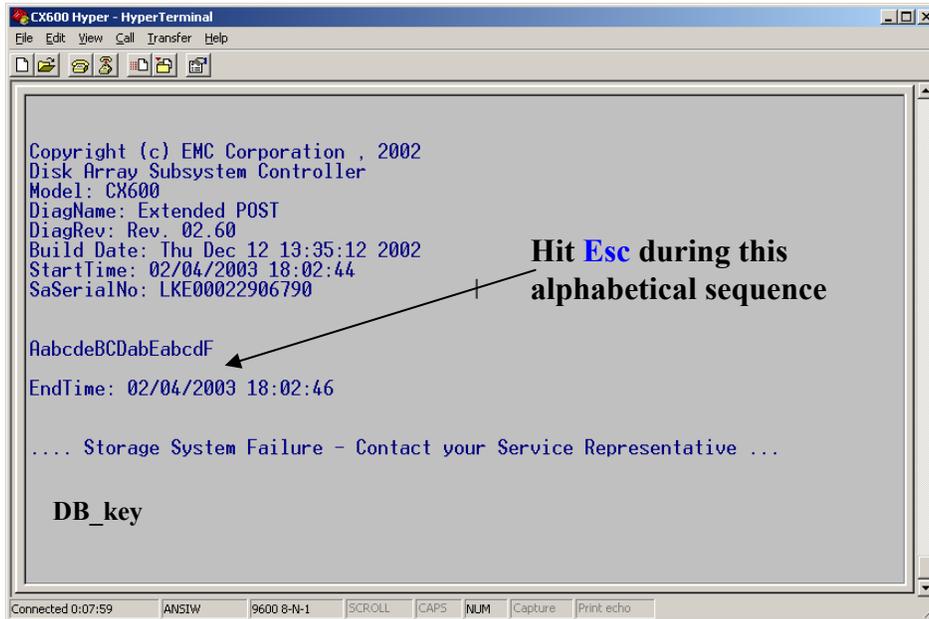
6. Following the printout of the text "Call your service Representative" type the characters **_DB_key_** followed by an "enter" on the keyboard. It is case sensitive

7. This will display the Diagnostic Menu a screen similar to the following figure

8. Select the **Image Sub-Menu** (item 33 in this example)
    Note : The menu options and numbers will likely vary from product to product or revision to revision but "Image Sub-Menu" will always be available

9. The Image Submenu will be displayed as shown below**. Select "Utility Partition Boot**". This means the SP you are attached to will boot from the Utility partition of that alternate SP's boot drives. The

reason for this is to provide an operating system that will allow the system to perform the tasks associated with system recovery.

10. You should then see the screen below. Press enter to continue to the Clariion Utility Toolkit Main Menu. If this screen does not appear, the Utility Partition for this SP is not bootable. At this point, we have two options: 1) Attempt to boot the peer SP to its Utility Partition, or 2) Go to Scenario 2 at the beginning of this section, and install a Utility Partition Image and a Recovery Image via NDU.

11. Select **"Install Images"** from the below screen**.** This will bring you to the "Select Images" install screen.

```
CX600 Hyper - HyperTerminal                                          _ □ ×
File  Edit  View  Call  Transfer  Help

==============================================================================
CLARiiON Utility Toolkit Main Menu
==============================================================================
1) About the Utility Toolkit
2) Reset Storage Processor
3) Wizard Sub-Menu
4) Image Repository Sub-Menu
5) Plugin Sub-Menu
6) Enable LAN Service Port
7) Enable Engineering Mode
8) Install Images

Enter Option: _



Connected 0:45:22      ANSIW      9600 8-N-1   SCROLL   CAPS   NUM   Capture   Print echo
```

12. **Select the proper recovery image to install**. This will bring you to the Confirm Image Installation screen. Be sure to select an image appropriate for the current release of Base on the working SP. Verify that the image is for the correct platform (CX200, CX400, CX600, etc). If an appropriate image is not listed, an image must be acquired via NDU.

```
CX600 Hyper - HyperTerminal                                          _ □ ×
File  Edit  View  Call  Transfer  Help

==============================================================================
Select Images to Install
==============================================================================
1) SAN_Image-02.04.0.60.4.004.mif
2) UtilityPartition-02.04.0.60.3.868.mif

Enter comma separated list of options: _



Connected 0:46:47      ANSIW      9600 8-N-1   SCROLL   CAPS   NUM   Capture   Print echo
```
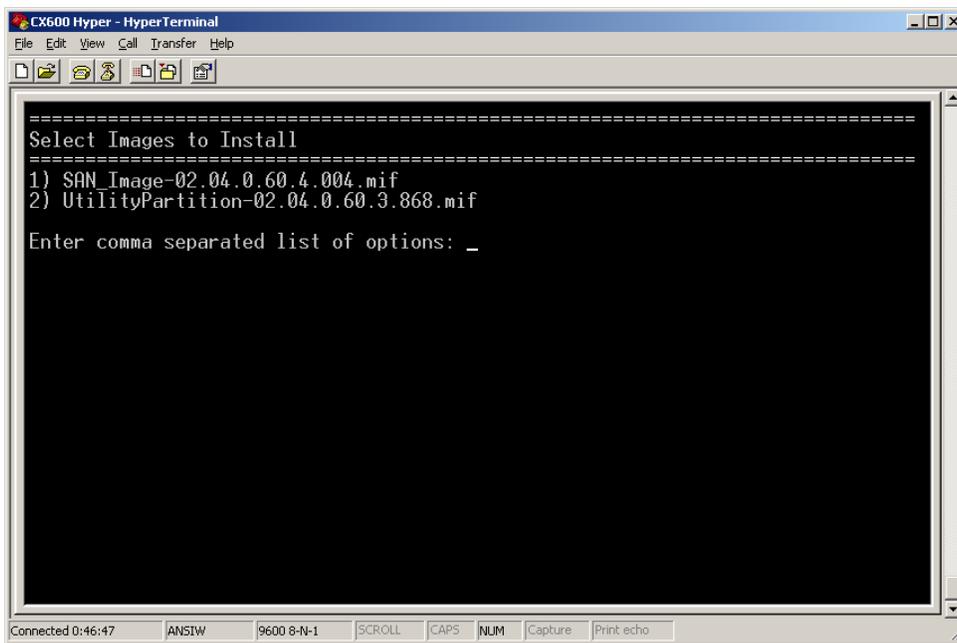
13. **Type y if the image selection is correct.** This will then bring you to the "Select Storage Processors to install images for" screen.

```
CX600 Hyper - HyperTerminal                                          _|□|×|
File  Edit  View  Call  Transfer  Help
 D|☞| ☎|☟| □|🖰| ☞|

==============================================================================
Confirm Image Installation
==============================================================================

   SAN_Image-02.04.0.60.4.004.mif

Are you sure you want to install these images? [y/N] : _




                                    |




Connected 0:47:13    ANSIW     9600 8-N-1     SCROLL   CAPS  NUM  Capture   Print echo
```
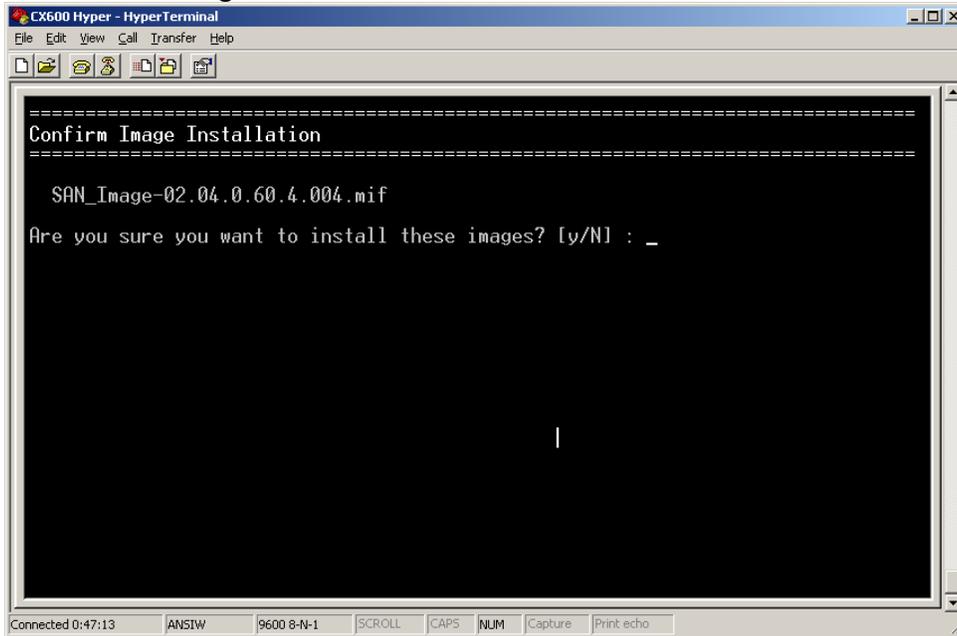
14. **Select the number of the SP in need of the recovery image**. In this example we are recovering SPB image. Select this SP (SPB) only. When SPB is selected, the SPB NT boot Image on drive 1 & 3 will be replaced. If you choose to re-image both SPs, the "other" SP you are not currently connected to via the serial cable must be removed form it's slot. An appropriate warning will be issued by the software if this is the case.

```
CX600 Hyper - HyperTerminal                                          _|□|×|
File  Edit  View  Call  Transfer  Help
 D|☞| ☎|☟| □|🖰| ☞|

==============================================================================
Select Storage Processors to install images for
==============================================================================
1) This SP (SP B)
2) Peer SP (SP A)
3) Both SP's

Enter Option: _








Connected 0:47:27    ANSIW     9600 8-N-1     SCROLL   CAPS  NUM  Capture   Print echo
```

11
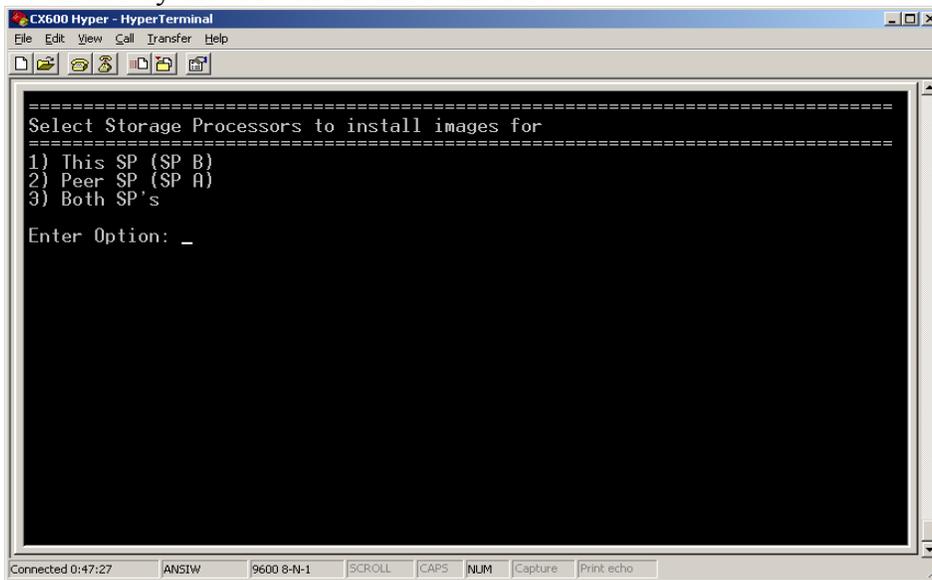
15. The Image will begin to copy to the Boot drives of the Target SP.
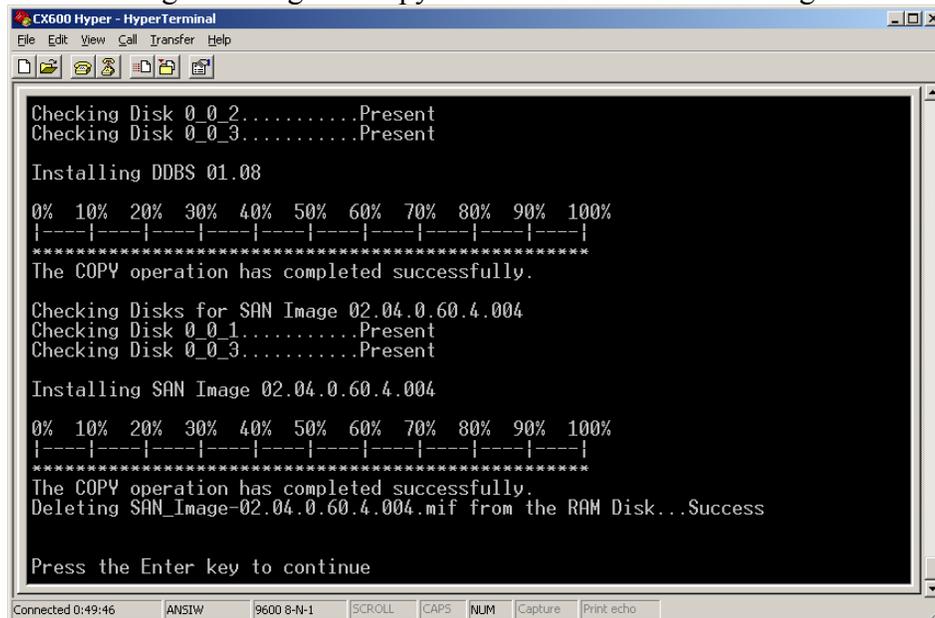
16. Check to see that the operation has completed successfully. Press Enter to continue. This will bring you back to the CLARiiON Utility Toolkit Main Menu. See below
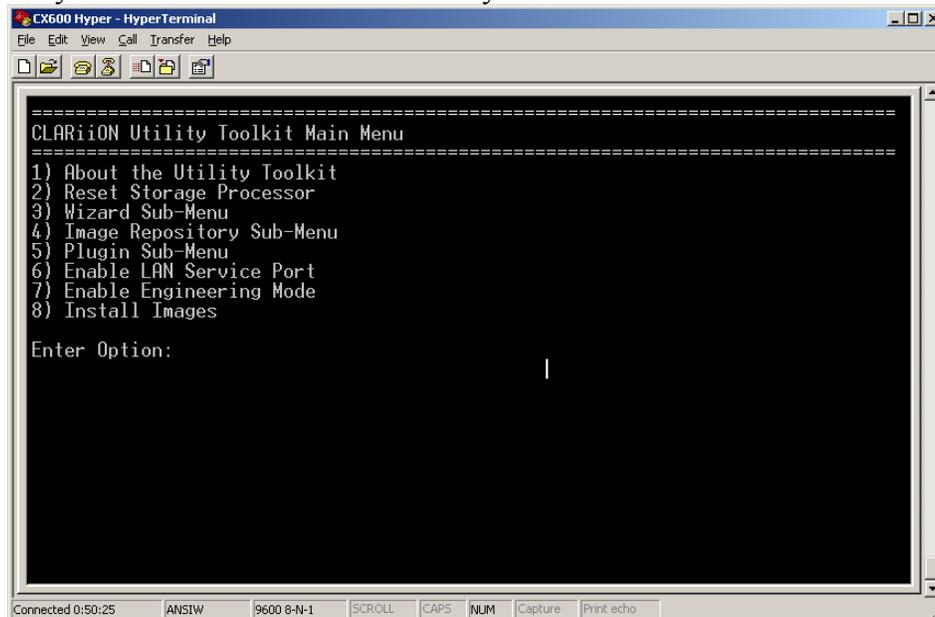
17. Select **Reset Storage Processor.** The SP boots from the NT image just loaded. It will always reboot at least one more time to retrieve the real code from the PSM.

When the Storage Processor has completed its reboot, the Amber LED on the air-dam of the SP should be off, and the Storage processor will be manageable via Navisphere

Appendix A

The following procedure can be done to load the Recovery image to an array if the Utility partition is already loaded but the Recovery image is not loaded or fails to load via NDU with an error message similar to "attempt to store image to persistent storage failed" .

See page 7 for hyperterminal connection requirements.

1. Insert/reset the Storage Processor that is being re-imaged.

2. The Storage Processor will begin its boot sequence running BIOS and POST Tests. While monitoring the power-up sequence of the Storage Processor be prepared to interrupt this process by hitting the *Esc Key* on your keyboard at anytime during the printout of this string of Alpha characters as noted in the figure below.
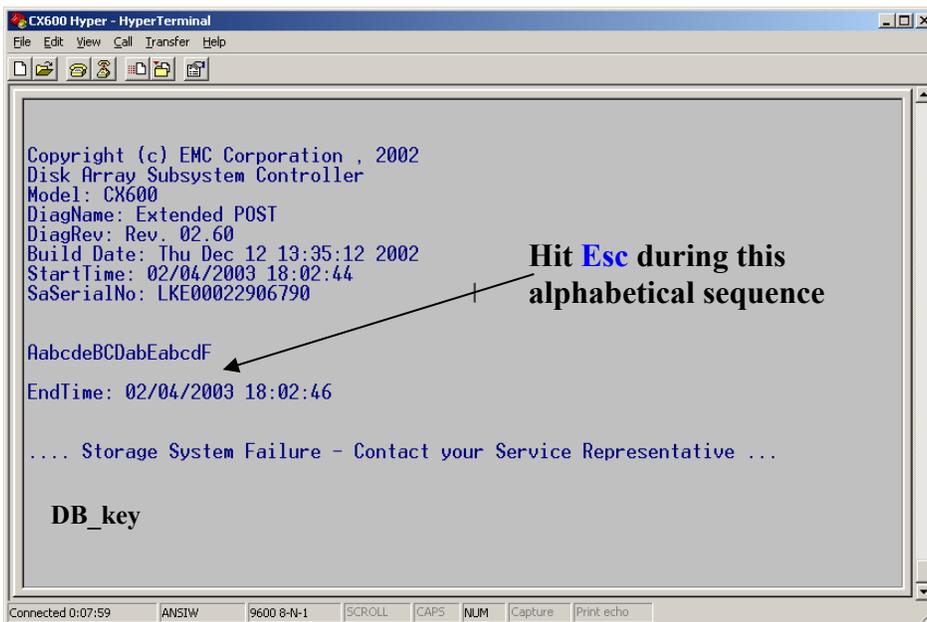
3. Following the printout of the text "Call your service Representative" type the characters *DB_key* followed by an "enter" on the keyboard. It is case sensitive

4. This will display the Diagnostic Menu a screen similar to the following figure

5. Select the **Image Sub-Menu** (item 33 in this example)
   Note : The menu options and numbers will likely vary from product to product or revision to revision but "Image Sub-Menu" will always be available
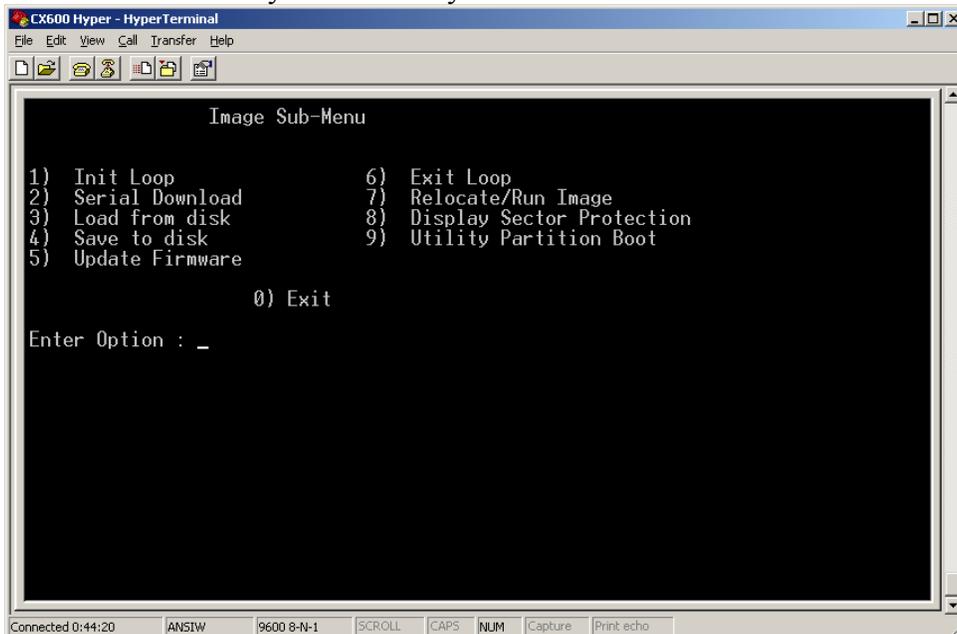
6. The Image Submenu will be displayed as shown below**. Select "Utility Partition Boot**". This means the SP you are attached to will boot from the Utility partition of that alternate SP's boot drives. The reason for this is to provide an operating system that will allow the system to perform the tasks associated with system recovery.

7. You should then see the screen below. Press enter to continue to the Clariion Utility Toolkit Main Menu. If this screen does not appear, the Utility Partition for this SP is not bootable. At this point, we have two options: 1) Attempt to boot the peer SP to its Utility Partition, or 2) Go to Scenario 2 at the beginning of this section, and install a Utility Partition Image and a Recovery Image via NDU.

```
CX600 Hyper - HyperTerminal
File   Edit   View   Call   Transfer   Help

SPID........................Running
FCDMTL......................Running
NTMIRROR....................Running
ASIDC.......................Running
ASIRAMDISK..................Running
ICA.........................Running
Connecting to ICA...........Success
SP Type.....................CX600
SP ID.......................B
Checking Disk 4.............Present
Searching for Image RepositoryFound Volume
Sizing Image Repository.......1024 MB
Checking Image Repository.....Done
Sizing RAM Disk...............381 MB
Checking LAN Port State.......Not Started
Checking LAN Port Config......Not Found
Starting FTP Server...........Success
Loading Plugins...............Done
Checking for Upgrade Wizard...Not Found

EndTime: 02/11/03 23:51:54

Press the Enter key to continue

Connected 0:45:09    ANSIW    9600 8-N-1    SCROLL   CAPS   NUM   Capture   Print echo
```

8. Select Enable LAN Service Port from the following menu
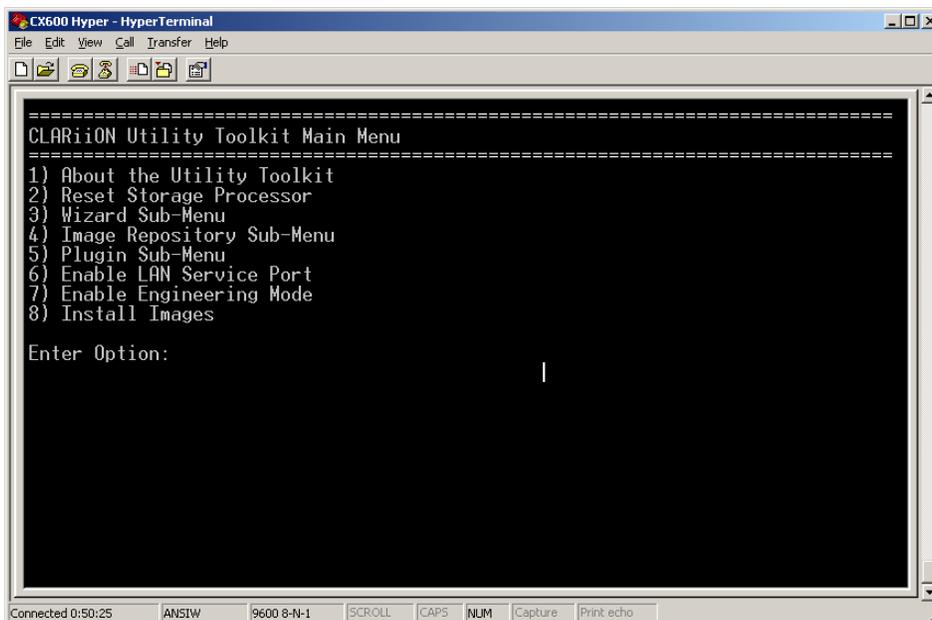
```
CX600 Hyper - HyperTerminal
File   Edit   View   Call   Transfer   Help

================================================================================
CLARiiON Utility Toolkit Main Menu
================================================================================

1) About the Utility Toolkit
2) Reset Storage Processor
3) Wizard Sub-Menu
4) Image Repository Sub-Menu
5) Plugin Sub-Menu
6) Enable LAN Service Port
7) Enable Engineering Mode
8) Install Images

Enter Option:

Connected 0:50:25    ANSIW    9600 8-N-1    SCROLL   CAPS   NUM   Capture   Print echo
```

9. Enter the characteristics of the LAN Port of the surviving SP which you must use to push the Recovery image to the array
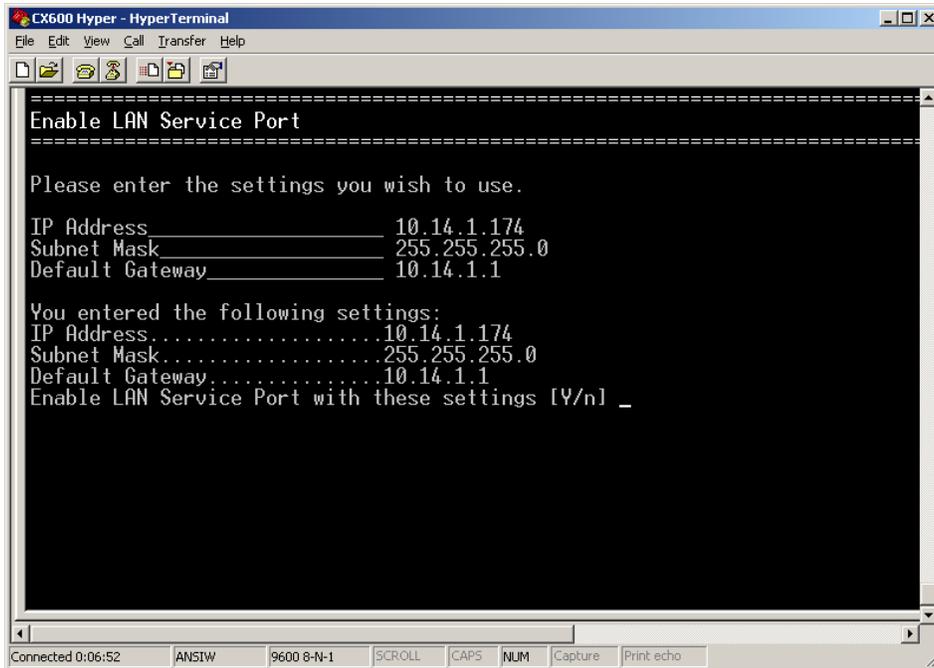

10. Select Y at the following menu
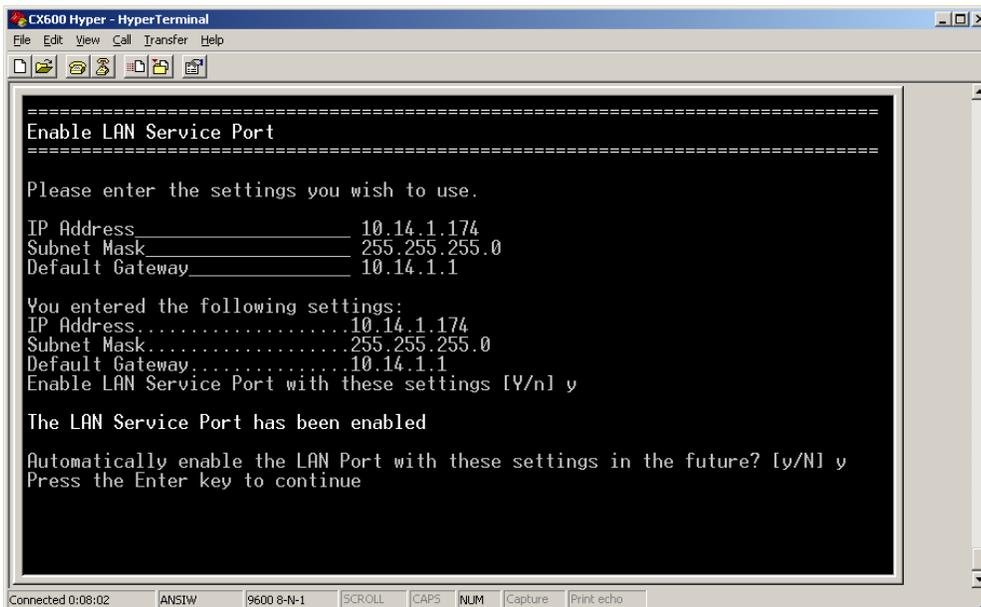
11. After you answer Y from the previous Window, Open a browser or FTP Client software package. Type in the LAN address of the Surviving SP. In the example below it is <u>ftp://10.14.1.174</u>. A Login window will open as displayed below. The Username is clariion, the password is clariion!
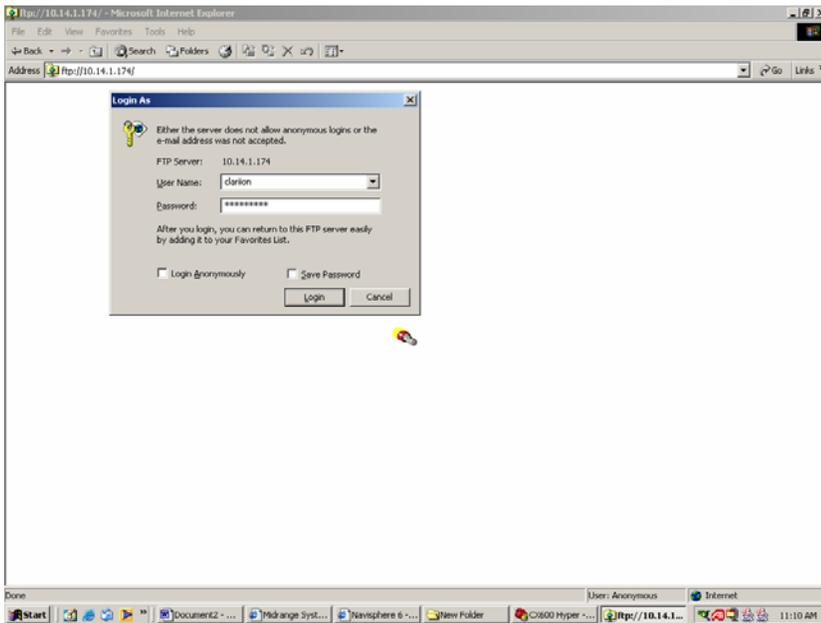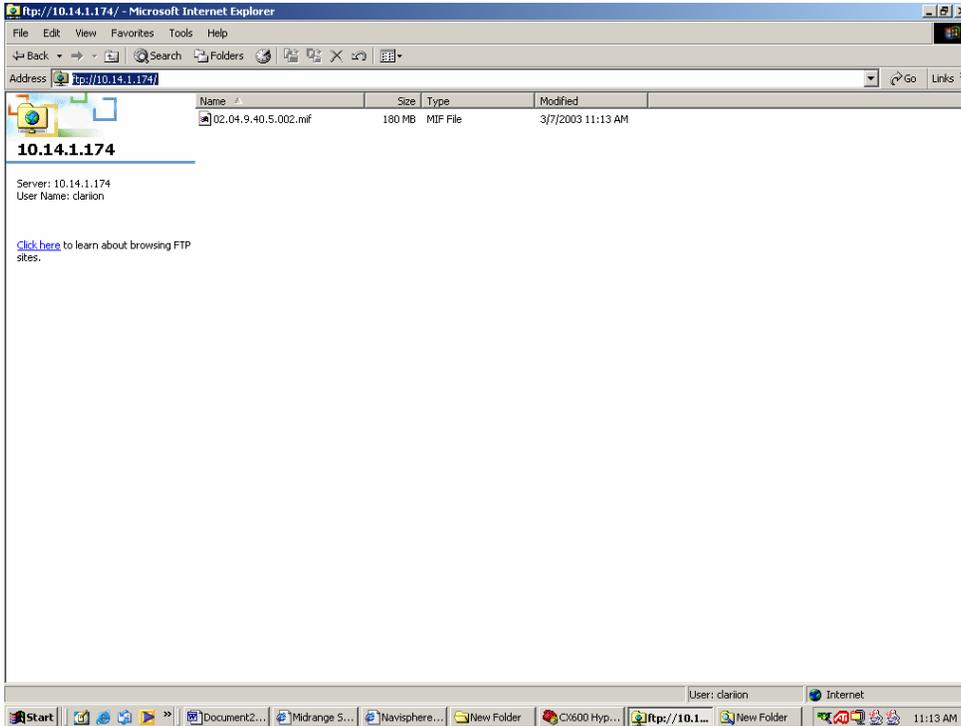

12. Open a Windows Explorer window, **Drag and drop or move/copy the Recovery .mif file** from the CD noted earlier in this document to the large FTP window just opened.

Recovering a Boot Image on a CX Series Array
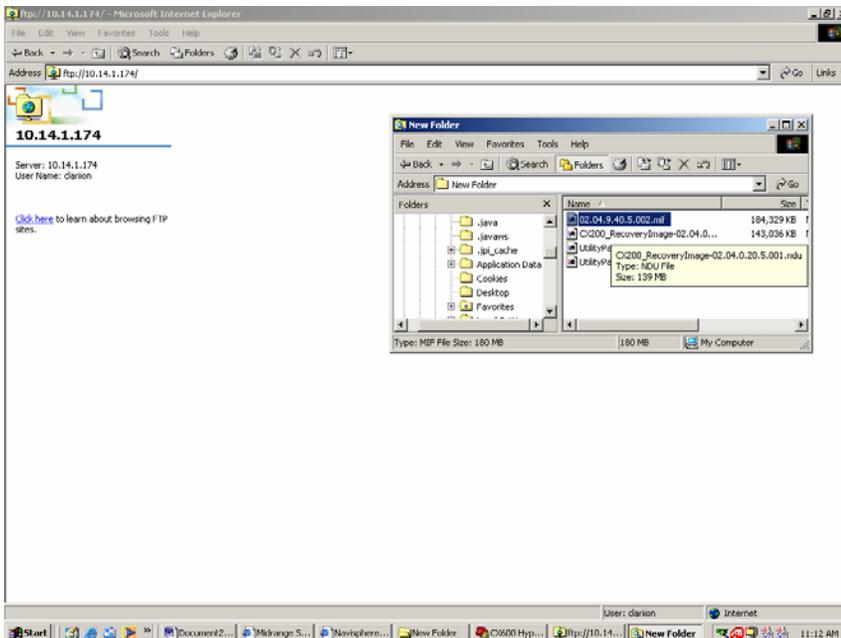
  Recovering a Boot Image on a CX Series Array
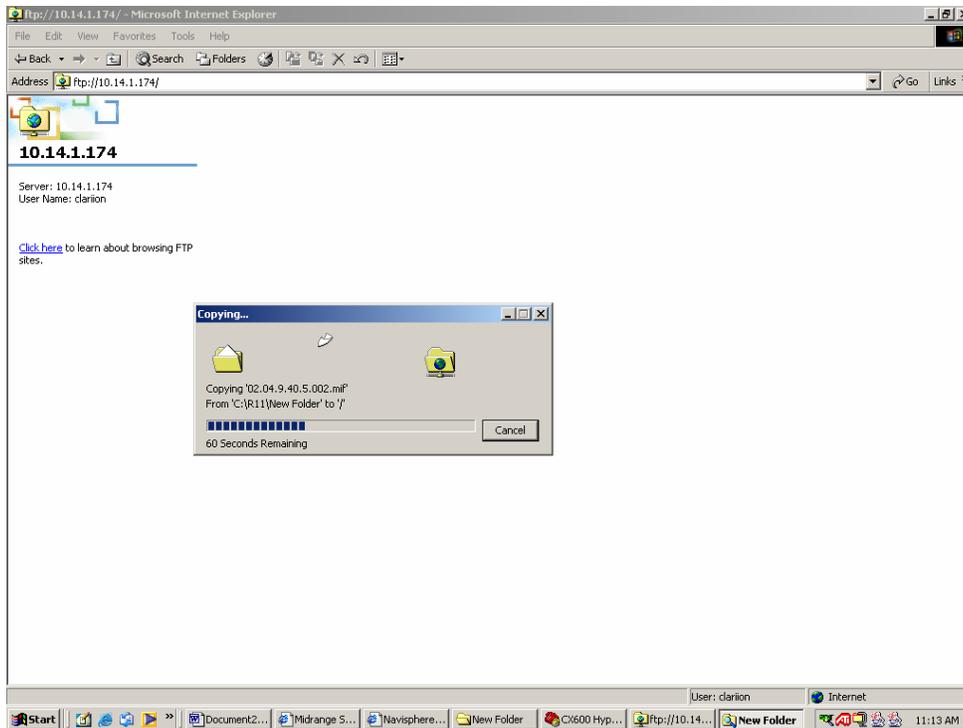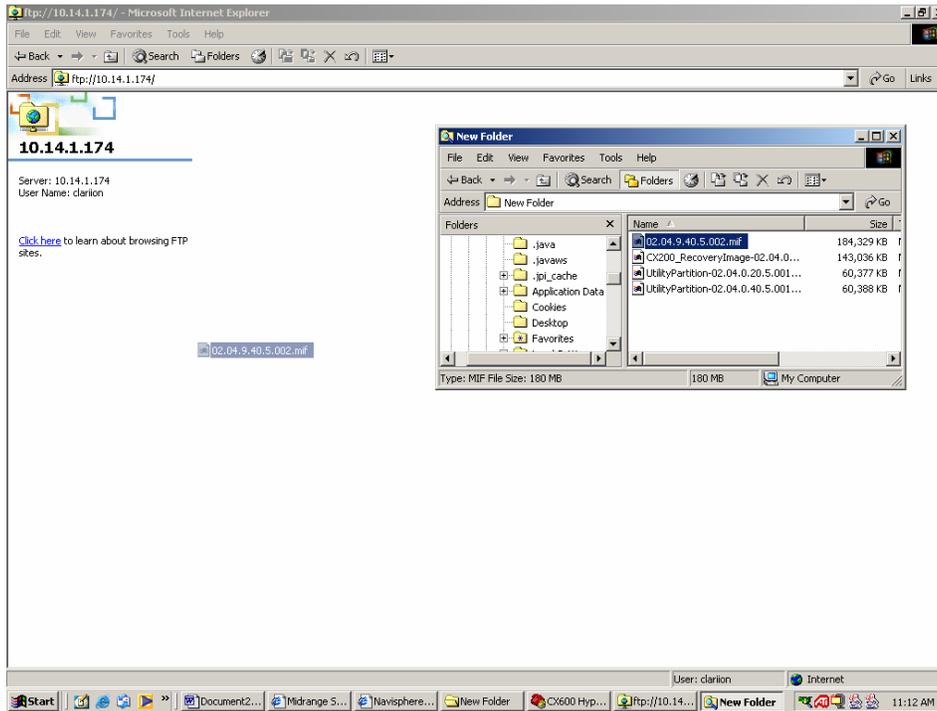
Recovering a Boot Image on a CX Series Array

13. When the File is loaded to the FTP Window (actually loaded to a temporary area known as the RAM Disk) go back to the Hyperterminal Window which is still open. **Select Install Images**
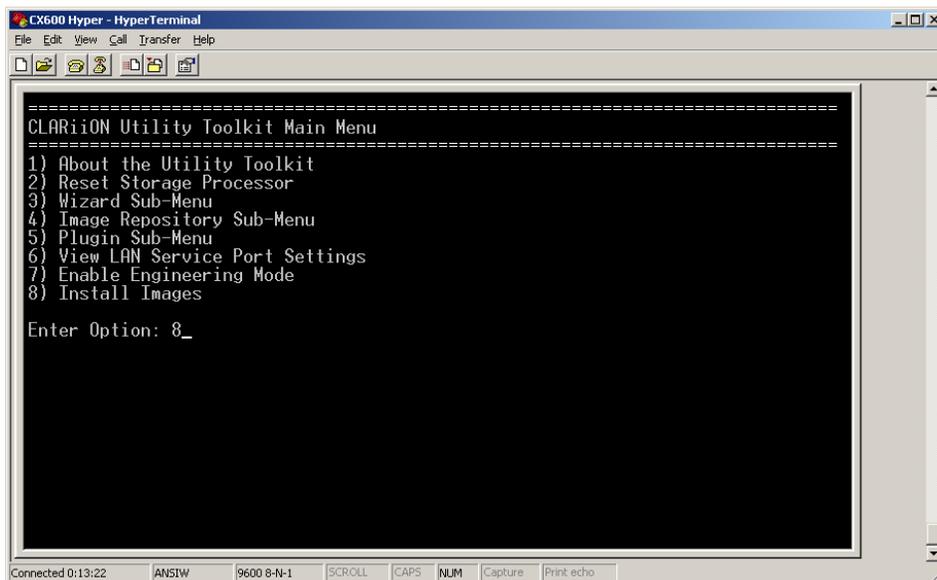
14. Select the image you just loaded via FTP
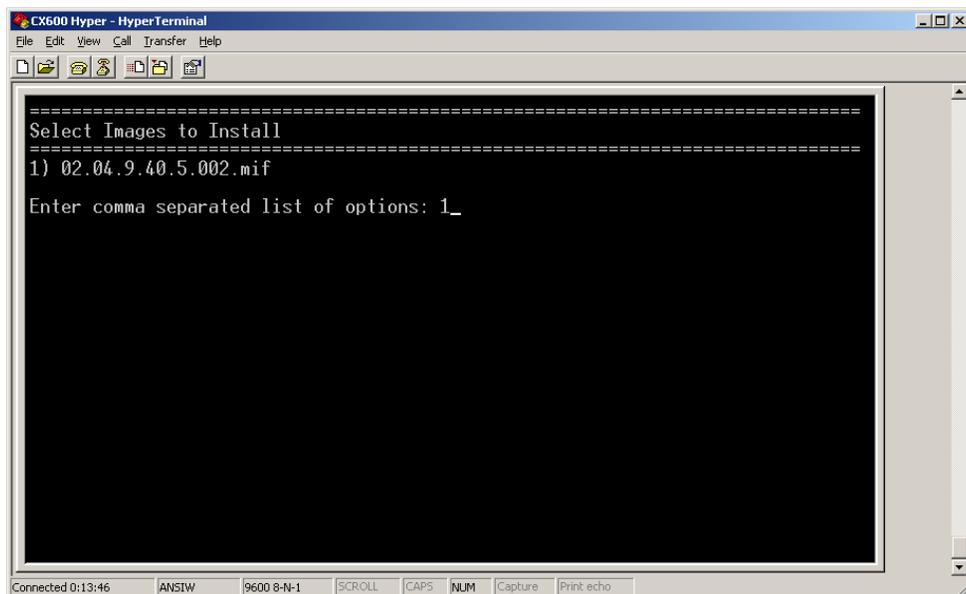
15. Confirm your selection
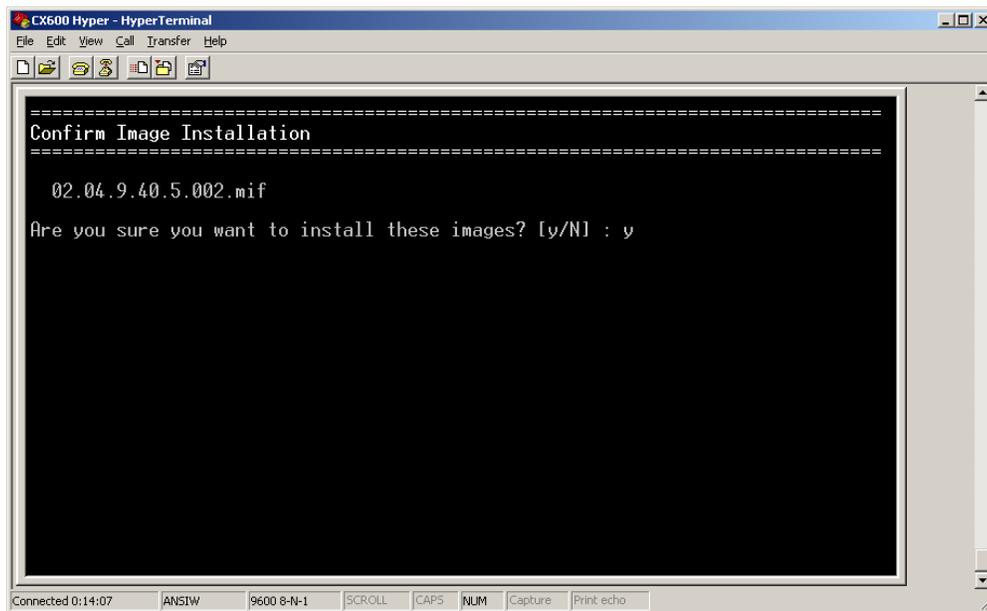
16. Select the SP you want to recover. It will be THIS SP, since that is the SP you are physically connected to via a serial cable

```
========================================================================
Select Storage Processors to install images for
========================================================================
1) This SP (SP A)
2) Peer SP (SP B)
3) Both SP's

Enter Option: 3
```

17. Confirm your selection
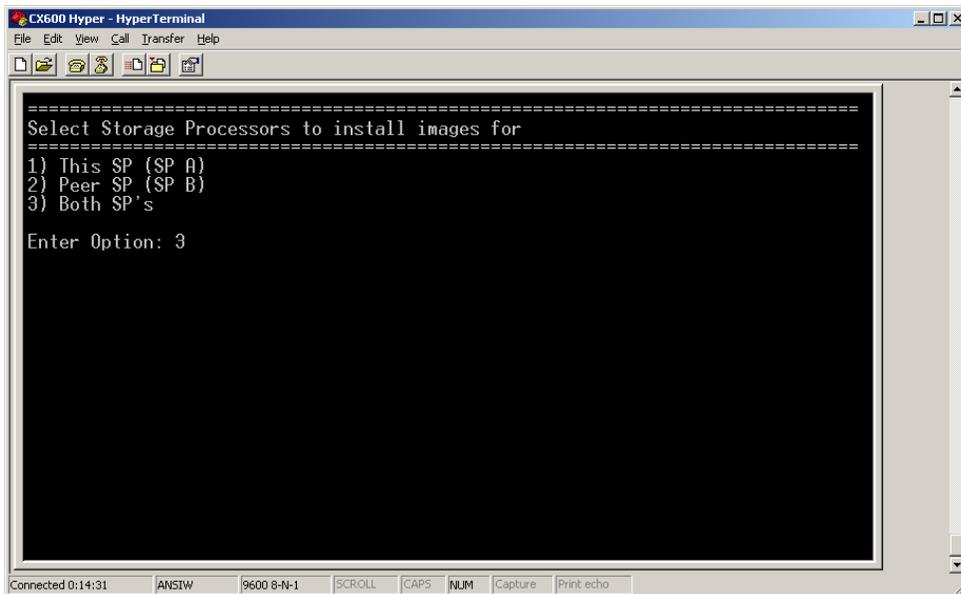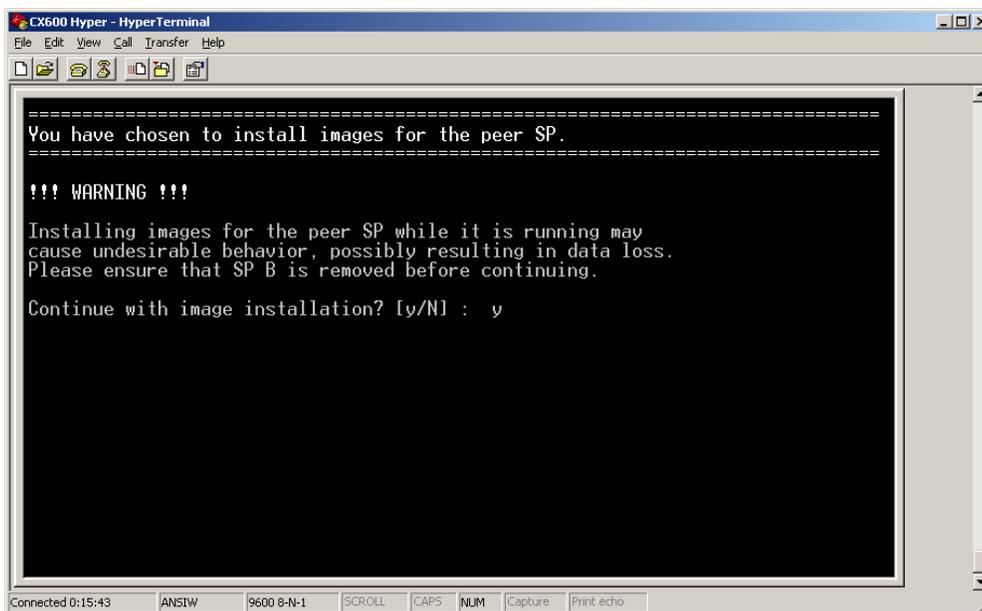
```
========================================================================
You have chosen to install images for the peer SP.
========================================================================

!!! WARNING !!!

Installing images for the peer SP while it is running may
cause undesirable behavior, possibly resulting in data loss.
Please ensure that SP B is removed before continuing.

Continue with image installation? [y/N] :  y
```

18. The following Window will open and the file will load. The progress can be tracked at the bottom %
    indicator. When 100% is completed. Press Y to continue.
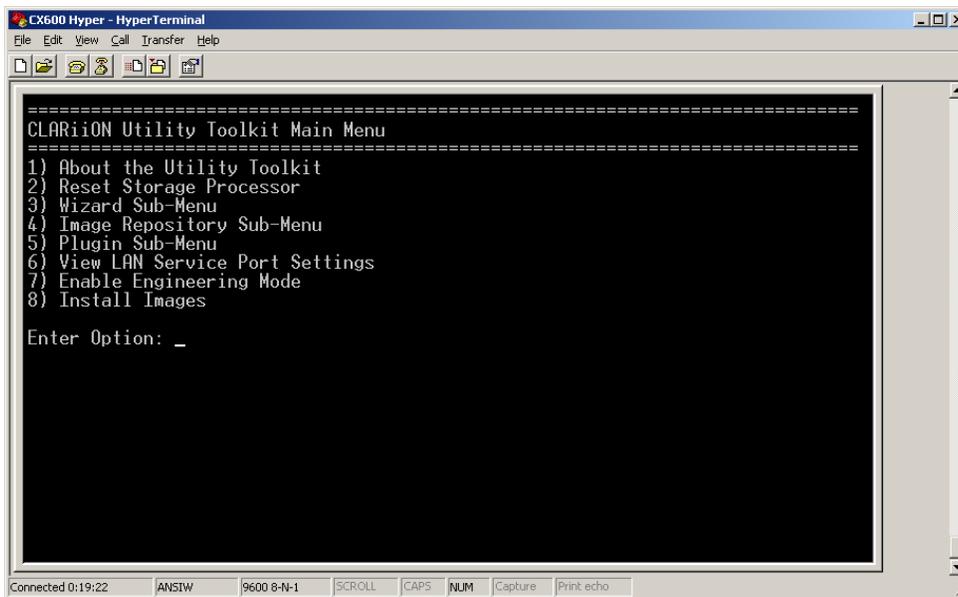

19. At the next menu option you have the option to load the Image you just FTP'd, into the Repository
    for permanent holding. The repository is a reserved area on drive 4 that can hold recovery images for
    as long as the drive is not replaced. You also have the option of Resetting the Storage Processor so
    the new Image just loaded will boot. It is highly recommended that you first choose option 4 below.
    This will bring you to the following Screen. Select "Copy files from RAM disk to the Image
    Repository. When the image is copied you will return to the window following this window.

20. At the next menu option select Reset Storage Processor.

21. The Newly re-imaged SP Will boot, and reboot up to 3 more times before the Boot LED on the SP goes out and Stays OUT.

END