Seneca

XVAULT XNVR200/300/400
HARDWARE USER GUIDE
V2.0.0

NOTICE: First and most important level of data protection starts with uninterruptable power.

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Page

NOTICE: First and most important level of data protection starts with uninterruptable power. An Uninterruptable Power Source (UPS) is required to protect storage data, cache battery backup is not adequate to the task of data storage protection.

If this xNVR is not protected by an UPS please consult with your account representative or pre-sales engineer for assistance in correctly sizing a UPS to not only protect this xNVR but your entire IT infrastructure.

I. PRODUCT INTRODUCTION

The xVault® xNVR200, xNVR300 and xNVR400 series is Seneca's series of rack mount security and surveillance recording servers. The 200 and 300 series are a single processor recorder family and the 400 series is a dual processor recorder family.

The xVault Unified Storage series is available in five rack mount comfigurations.

2U 4 Bay **2U 8 Bay** **2U 12 Bay** **3U 16 Bay** **4U 24 Bay**

All units support SAS 3g and 6g, SATA-II and III and Solid State Drives. The 2U rack form factor is available in 4, 8 and 12 bay configurations. The 3U supports up to sixteen internal hot swap drives and the 4U supports up to twenty four internal hot swap drives. The xVault xNVR's are optionally expandable externally up to a maximum of 120 drives which is dependent on starting xNVR model.

The xNVR200 group is powered with the Intel® Xeon® processor E3 quad core. The xNVR300 and 400 groups are based on the Intel® Xeon® processor E5 processor. All of the Seneca xNVR recording servers provide ample power to drive outstanding IO and bandwidth, options for more powerful higher core count processors are available to meet VMS demands. Memory options up to 256GB are also configurable. The standard units ship with two 1Gbe network ports with options to support iSCSI or NAS connectivity.

Microsoft Windows graphical user interface allows easy configuration for advance features such as dynamic volume expansion, storage virtualization and same enclosure mixed tier storage support.

	xNVR200	xNVR300	xNVR400
Operating System support	Linux, Windows 7 Professional, Server 2008 R2		
CPU	Intel® Xeon® Processor E3	Intel® Xeon® Processor E5	Dual Intel® Xeon® Processor E5
Max memory	16GB	32GB	64GB
Enhanced graphics	standard	standard	standard
1GbE Camera LAN ports	1	1	1
1GbE Viewing & Management ports	1	1	1
Form Factor	2U 4 Bay, 2U 8 Bay, 2U 12 Bay, 3U 16 Bay, 4U 24 Bay		
SSD OS drives	option	option	option
Mirrored OS	standard	standard	standard
DAS drive expansion	option	standard	standard
Max number of drives	24	24	24
Max standard raw internal capacity	120TB	120TB	120TB
High speed storage	option	option	option
iSCSI/NAS storage support	option	option	option
Redundant Power	standard	standard	standard

II. INTENDED AUDIENCE

The intended audience for this manual and product should have a working knowledge of server hardware, operating systems and be able to configure network interfaces, switches and cameras to requirement.

Server Hardware/OS

- Base server layout concepts and the ability to recognize rear connections necessary for management, network or storage connectivity.
- Know different PCIe slot mechanical and electrical differences and how to apply to proper use.
- Have a working knowledge of RAID concepts and application. Be able to use advanced RAID configuration utilities.
- Familiarity with SATA, SAS and SSD hard drives as well as internal and external cabling requirements.
- Be familiar with network connectivity and configuration of NIC cards with regard to IP addressing, teaming, jumbo frames and MTU size.
- Able to read and do base level interpretation of system logs and error logs.
- Have a working knowledge of how to provide outside access via the Internet for remote technical assistance.

Network Hardware

- Have a clear understanding of LAN/WAN infrastructure and how to plan for additional servers, cameras and network storage when required.

III. BEST PRACTICES

NETWORK SEGREGATION

Camera LAN, Management LAN and VIEWING LAN can coexist in the same sub structure. The video management software should provide "best practice" advice as to if and when the three LAN types should be separate.

Two 1GbE network ports should be used to provide path resiliency whenever possible.
iSCSI/NAS storage should connect to an isolated network dedicated strictly to storage. This separation allows for best performance and protection. The standard xNVR configuration provide two 1GbE ports, a second network interface module with at least two ports should be added if iSCSI or NAS storage is to be implemented.

NETWORK IP ADDRESSING FOR CAMERA, MANAGEMENT & VIEWING LAN

When camera LANs are created without the use of a DHCP server, it is recommended to use one of three non-routed IP address ranges. These ranges are;

10.0.0.0 – 10.255.255.255
172.16.0.0 – 172.31.255.255
192.168.0.0 – 192.168.255.255

Servers, managed switches, directors, viewing stations or clients should consume upper IP addresses in a subnet, leaving lower IP addresses for cameras. This creates a more easily recognized separation between IT hardware and cameras.

Seneca preconfigures standard LAN ports with DHCP disabled and uses starting addresses of 192.168.1.253 and 252 for the NIC ports. All servers ship with the afore mentioned default addresses. When there is more than one server installed, the network ports must be individually configured on each xNVR. The following table is provided for reference only and addresses are not required.

RECOMMENDED XNVR FIXED IP ADDRESSES				
	IP Address port 0	**IP Address port 1**	**Mask**	**Gateway**
1st Server*	192.168.1.253	192.168.1.252	255.255.255.0	192.168.1.1
2nd Server	192.168.1.251	192.168.1.250	255.255.255.0	192.168.1.1
3rd Server	192.168.1.249	192.168.1.248	255.255.255.0	192.168.1.1
4th Server	192.168.1.247	192.168.1.246	255.255.255.0	192.168.1.1
5th Server	192.168.1.245	192.168.1.244	255.255.255.0	192.168.1.1
6th Server	192.168.1.243	192.168.1.242	255.255.255.0	192.168.1.1
7th Server	192.168.1.241	192.16831.240	255.255.255.0	192.168.1.1
8th Server	192.168.1.239	192.168.1.238	255.255.255.0	192.168.1.1
9th Server	192.168.1.237	192.168.1.236	255.255.255.0	192.168.1.1
10th Server	192.168.1.235	192.168.1.234	255.255.255.0	192.168.1.1
More than 10 servers or nodes (xNVRs or management servers) requires a domain control services (server)				

* Default IP Addresses for all xNVR's shipped

IP ADDRESSING iSCSI SAN

Seneca preconfigures the IP SAN address ports. This preconfiguration helps facilitate the connection of xVault USP and xVOS iSCSI storage arrays to the xNVR.

Completely separate networks should be used when implementing an IP SAN. Seneca will always recommend or quote an extra NIC card with a minimum of two 1GbE ports per server when cognoscente of the desire or requirement to support IP SAN storage.

The IP SAN should be isolated from general LAN or Camera LAN traffic either by "VLAN"ing in a switch or with a separate switch. This isolation allows storage to perform as designed and adds a certain level of protection from external attack.

RECOMMENDED XNVR FIXED IP ADDRESSES FOR 1GBE IP (ISCSI) SAN				
	IP Address port 2	**IP Address port 3**	**Mask**	**Gateway**
1st Server*	10.0.10.254	10.0.10.253	255.255.255.0	none
2nd Server	10.0.10.252	10.0.10.251	255.255.255.0	none
3rd Server	10.0.10.250	10.0.10.249	255.255.255.0	none
4th Server	10.0.10.248	10.0.10.247	255.255.255.0	none
5th Server	10.0.10.246	10.0.10.245	255.255.255.0	none
6th Server	10.0.10.244	10.0.10.243	255.255.255.0	none
7th Server	10.0.10.242	10.0.10.241	255.255.255.0	none
8th Server	10.0.10.240	10.0.10.239	255.255.255.0	none
9th Server	10.0.10.238	10.0.10.237	255.255.255.0	none
10th Server	10.0.10.236	10.0.10.235	255.255.255.0	none
More than 10 servers does not require a domain server for the IP SAN storage				

* Default iSCSI IP address for all xNVR's shipped

RAID SET CONFIGURATION CONSIDERATION & INFORMATION

Best RAID5 or RAID6 performance is when the drive count in a RAID set is between 12 and 24 drives. Eight drives in a RAID5/6 should be considered the lowest drive count when IO and transfer rates are above anything but the most basic.

When drive counts in a RAID set are below five, it is highly recommended to use RAID10. If the capacity is low enough a mirrored (RAID1) solution using SSD drives can be considered as a higher performance option without extravagant expense. Please consult with your account representative.

Unless otherwise specified, Seneca's policy is to provide RAID5 when using less that 18 drives in the set. Eighteen to twenty four drives will default to RAID6.

The xNVR series may be optionally configured to support direct attached external storage. This provides better performance than network storage (iSCSI or NAS) at a significantly lower price point.

RAID REBUILD/RECONSTRUCTION PARAMETERS

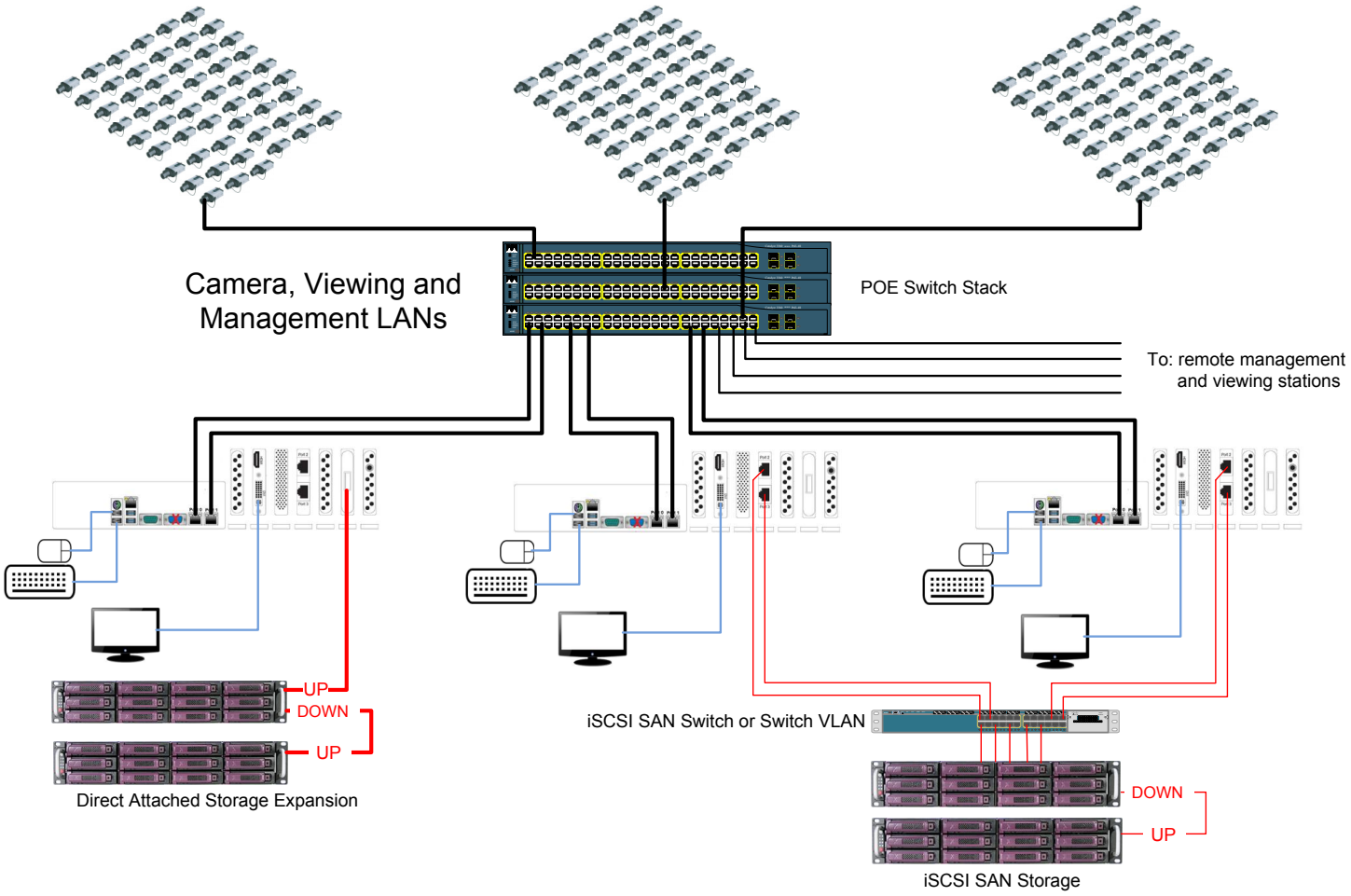
Seneca leaves the rebuild and reconstruction parameters on the RAID controller at a factory default of 30% of total IO and Bandwidth consumption. Customer preference of restore of defective drive versus impact on array performance which can result in frame drops is subjective.

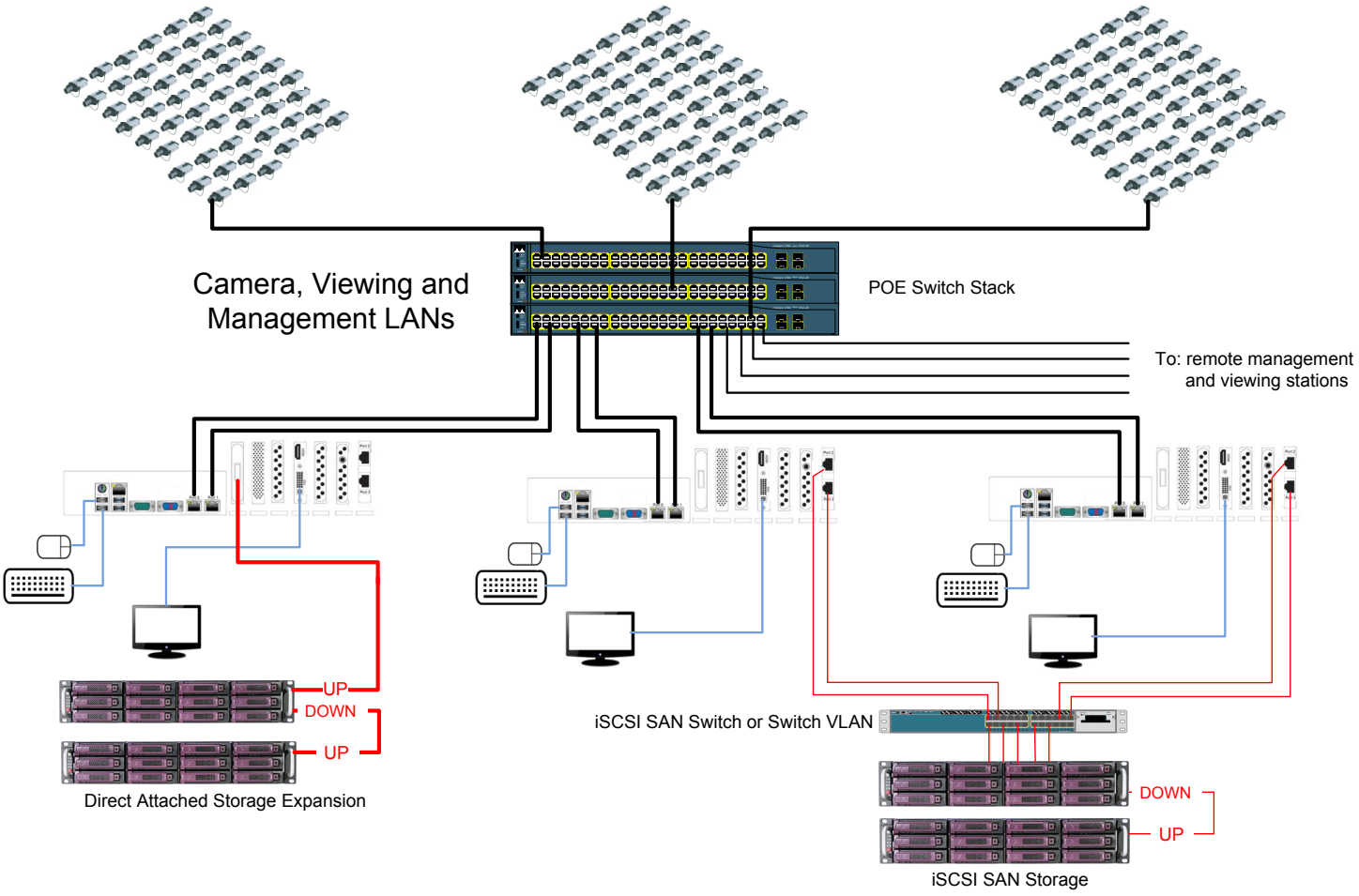
In house testing shows that with Rebuild and Reconstruction rates set to 20%. A replacement drive will rebuild at a rate of no more than 2.22 hours per terabyte for the drive being restored.

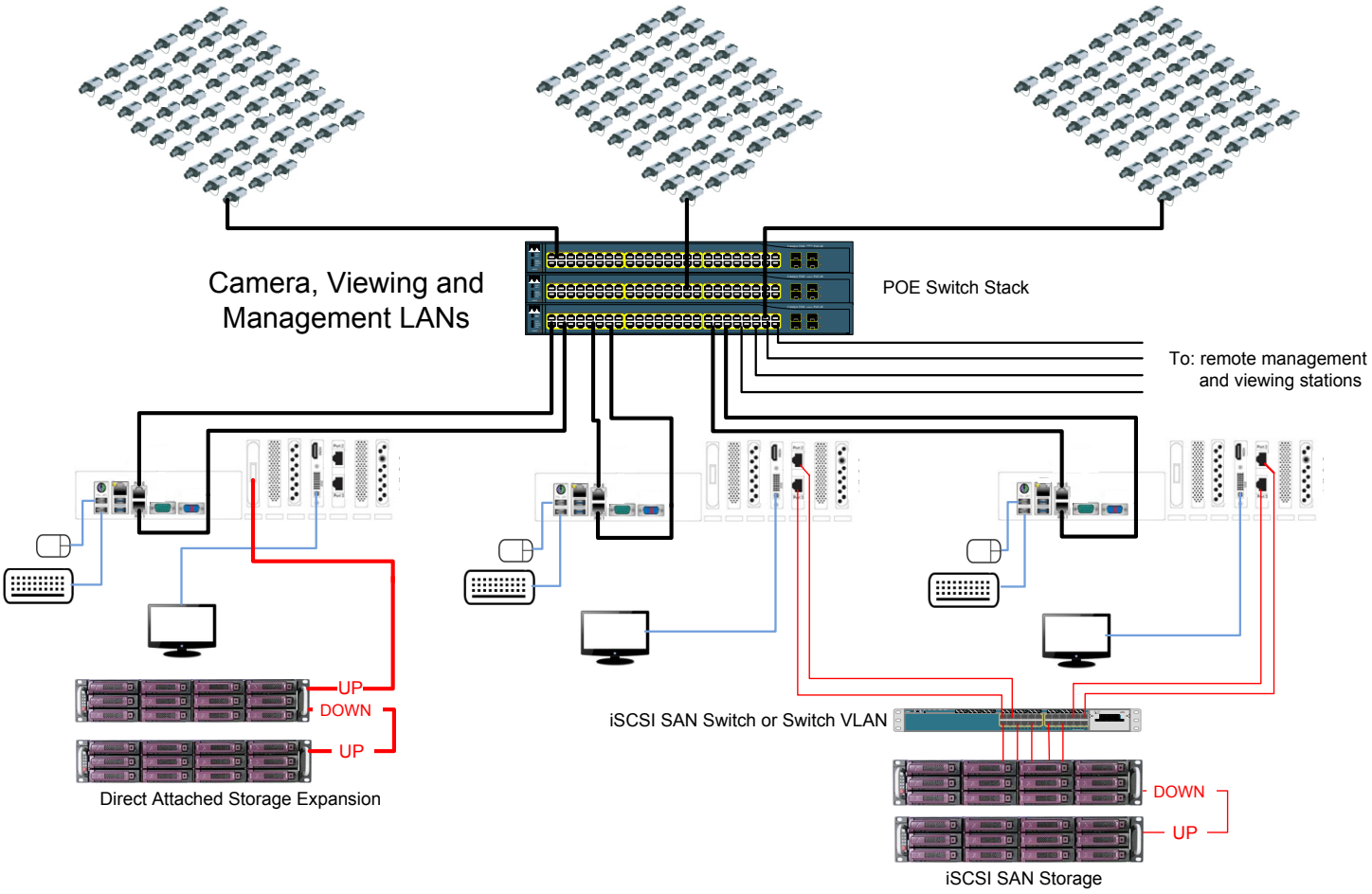
APPROXIMATE RAID MEMBER REBUILD TIME	
Drive Size	Four or Eight Drive RAID Set
1TB	2.22 hours
2TB	4.44 hours
3TB	6.66 hours
4TB	8.88 hours
5TB	11.1 hours
6TB	13.32 hours

IV. BASIC ARCHITECTURE AND CONNECTION POINT DIAGRAM

xNVR200




Camera, Viewing and Management LANs
POE Switch Stack
To: remote management and viewing stations
UP
DOWN
UP
Direct Attached Storage Expansion
iSCSI SAN Switch or Switch VLAN
DOWN
UP
iSCSI SAN Storage


Camera, Viewing and Management LANs
POE Switch Stack
To: remote management and viewing stations
UP
DOWN
UP
Direct Attached Storage Expansion
iSCSI SAN Switch or Switch VLAN
DOWN
UP
iSCSI SAN Storage

V. GETTING STARTED

A. Drive Enclosure Slots And Trays

Operating System (OS) drives are not front side hot swap accessible. 2U enclosures have the operating system disk mounted internally. 3U and 4U drives are rear mounted and hot swappable. The operating system drive may or may not come as a mirrored pair, this is dependent on standard configuration and option availability.

Removable drives are installed beginning with SLOT 1 and continuing sequentially until all drive bays are filled. Drives installed from the factory will be in groups of performance. Meaning, Solid State Drives will be installed first, followed by 15k RPM drives, followed by 10k RPM drives then 7200 RPM drives. Future addition of drives does not require reordering drives; it is advised that additional drives be added in order of performance. SSD and 7200 RPM drives are available with SATA interfaces, never mix SAS and SATA drives in the same RAID set or group.

xNVR 2U 4 BAY

xNVR 2U 8 BAY

xNVR 2U 12 BAY

xNVR 3U 16 BAY

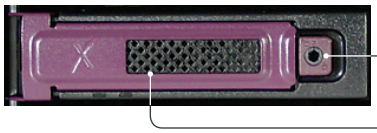
xNVR 4U 24 BAY

i. DRIVE TRAY IDENTIFICATION

All drive trays shipped from the factory will have a slot number ID affixed to the top front. Trays will be labeled whether drives are installed or not.

ii. REMOVING DRIVE TRAY

Press "Lever Release Button". The tray "Extraction/Insertion Lever" will pop out on the right side. Gently rotate the lever outward and at the same time cradle the drive tray underneath with your free hand. When the drive lever is fully extended, slide the drive tray out of the enclosure.



iii. INSERTING DRIVE TRAY

Match tray number to enclosure slot number. With the lever fully extended, slowly slide the tray into the slot until lever engages enclosure. Gently push drive lever in, the tray should slide into the enclosure without significant force on the lever or tray. Push lever in until the lever release button locks, there should be a distinct "click" when this happens. If the lever does not move in at corresponding rate as the tray slides into the enclosure, STOP! Pull the tray back out and try again. When the tray is correctly installed it should be flush with all other trays in the enclosure.

NEVER move the tray in fast or force the lever to close. Damage will occur to the tray and possibly to the drive connector.

B. CABLING & CONNECTION

XNVR video recorder appliances come in three form factors but all use common components and cabling points. There are only six main cabling groups;

- Power
- Monitor/Keyboard/Mouse
- Camera/Viewing/Management Network
- iSCSI/NAS Network (option)
- RAID Expansion Port (option on some models)

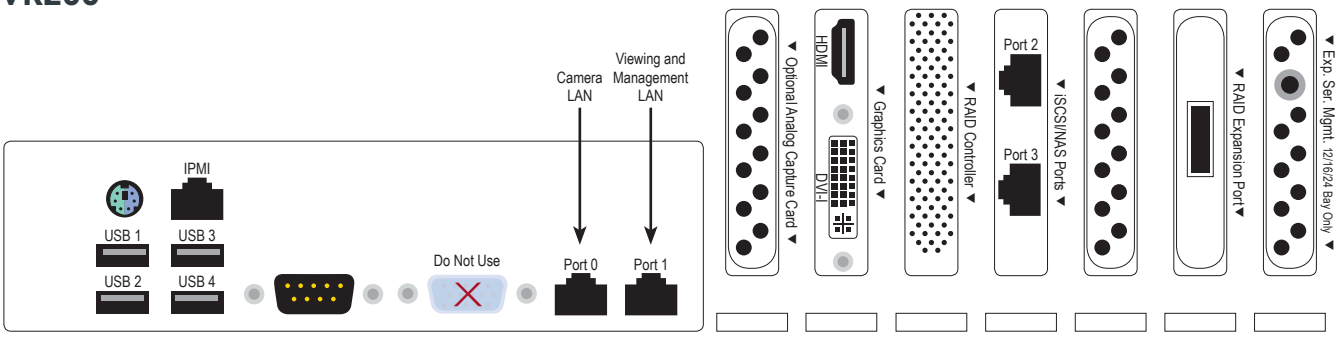
POWER CORDS

All xVault storage appliances come with redundant hot swap power supplies. Each power supply requires its own power cord. The power cords supplied are standard 115VAC machine cords. Care should be taken to always route AC power cords away from cables that transmit data.

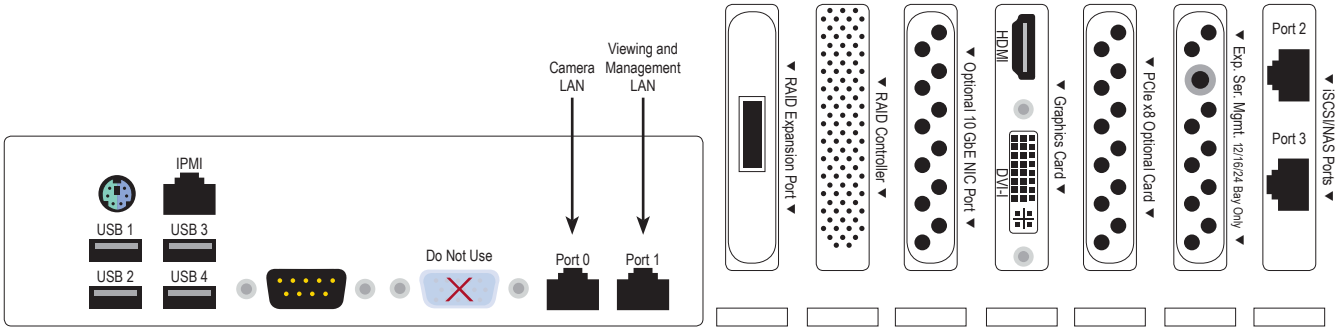
It is also recommended that each power cord have a separate electrical path back to the facility service entrance. Meaning each power cord should be connected to separate circuit breakers. It is also prudent to have at least one of the power cords connected to an uninterruptable power source.

REAR SIGNAL CABLE LOCATIONS

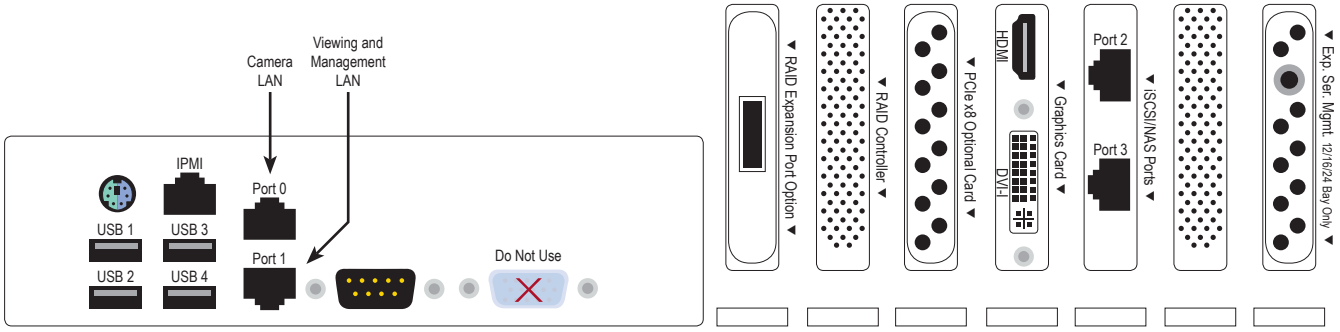
xNVR200



xNVR300



xNVR400



NOTE: 2U depicted, 3U, and 4U have same connector and option locations, only the height of the PCIe cards is different.

MONITOR, KEYBOARD & MOUSE CONNECTIONS

A single video monitor may be connected to the HDMI OR DVI connector but not both. The two denoted USB ports are used for keyboard and mouse connection. These ports are KVM compatible.

CAMERA/VIEWING/MANAGEMENT NETWORK CONNECTIONS

The xNVRs use standard Cat 6 cabling. The xNVR's come standard with two 10/100/1000 802.11 network ports. The ports ship from the factory with the following fixed IP addresses;

	IP ADDRESS	MASK	GATEWAY
Port 0	192.168.1.253	255.255.255.0	192.168.1.1
Port 1	192.168.1.252	255.255.255.0	192.168.1.1

NOTE: Each xNVR on the network must have a unique IP address.

ISCSI/NAS NETWORK CONNECTIONS

iSCSI and NAS connections use standard Cat6 cabling. The xNVR can be optionally equipped to support iSCSI/NAS external storage appliances. iSCSI IP SAN storage requires the SAN be isolated for any other LAN or WAN. As such separate 1GbE ports are supplied to support the IP SAN. It is highly recommended to use fixed non-routable IP addresses to support the IP SAN. For customer convenience, the ports have the following default settings.

	IP ADDRESS	MASK	GATEWAY
Port 2	10.0.10.254	255.255.255.0	blank
Port 3	10.0.10.253	255.255.255.0	blank

NOTE: Each IP SAN member on the storage area network must have a unique IP address.

RAID EXPANSION PORT CONNECTION

The xNVR can be optionally equipped with the ability to expand using direct attached storage enclosures. Up to four external drive enclosures are supported. The interconnect cable used is an industry standard SFF-8088 to SFF-8088 cable. External chassis supplied by Seneca come with the cable to connect to the xNVR.

C. REMOTE ACCESS TO THE MANAGEMENT GUI

All xNVRs have the ability to be remotely accessed for management. This is accomplished by using the Remote Desktop Connection services. Any PC or Desktop running a Microsoft Operating System that is connected to the same subnet or directly connected to a Camera/Viewing/Management Port 0 can remotely access the xNVR

Open the PC/laptop Remote Desktop Connection and enter the xNVR IP address as shipped from the factory.

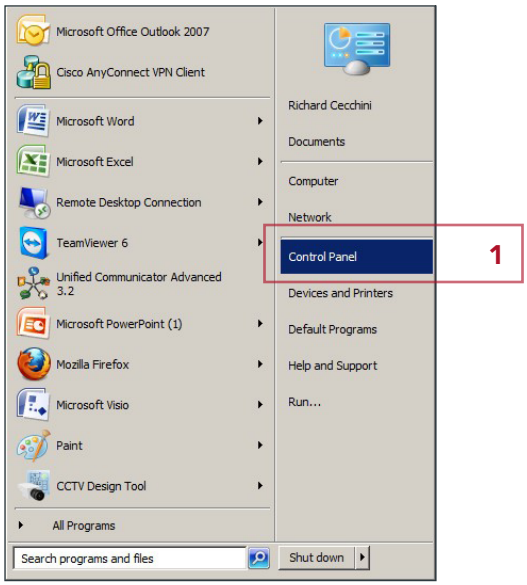
You will be prompted for the username and password of the system. Upon successful entry the standard OS window will appear and navigation can proceed as if using a directly attached monitor and keyboard.

D. CHANGING CAMERA/VIEWING/MANAGEMENT PORT IP ADDRESSES

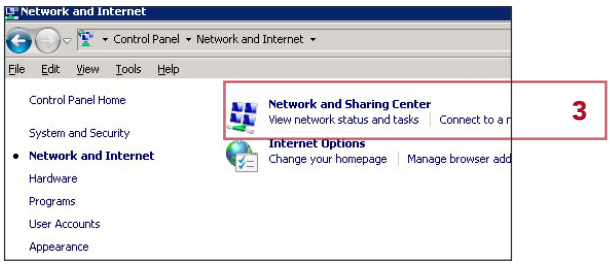
Port attributes are accessed as follows;

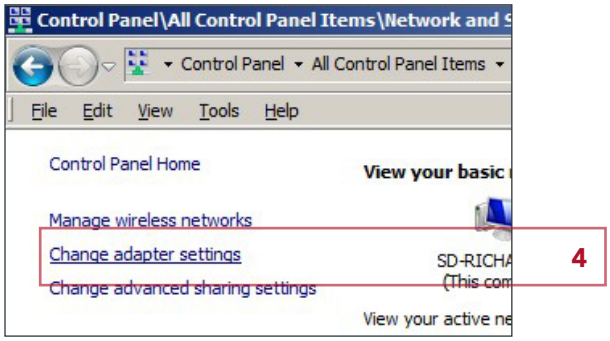
Click on **Start** button located on the bottom left corner of the display.

1. Click on **Control Panel**
2. Click on **Network and Internet**

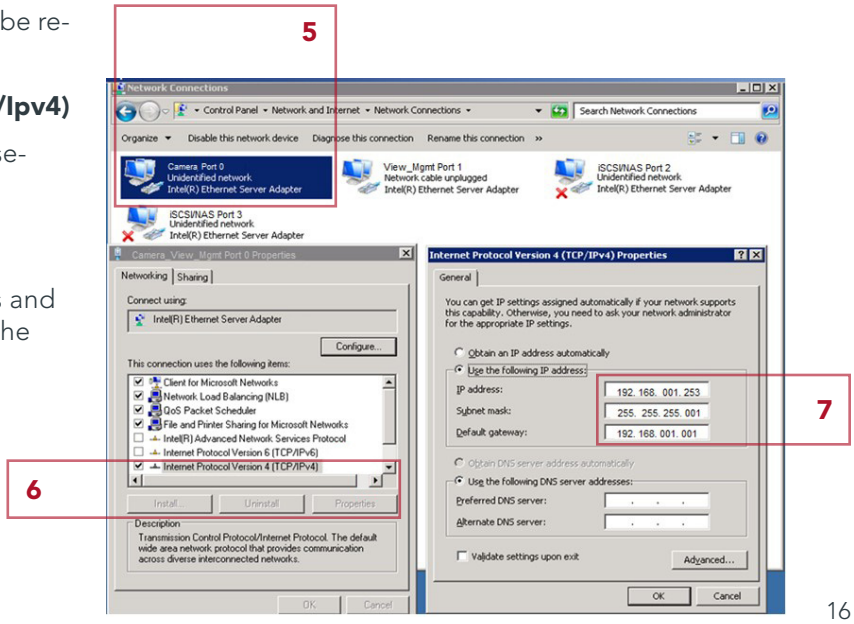


3. Click on **Network and Sharing Center**
4. Click on **Change Adaptor Settings**





5. Select the Camera or View_Mgmt port to be re-viewed or changed
6. Select **Internet Protocol Version 4 (TCP/Ipv4)**
7. Review or change IP information for the selected port.



NOTE: Each Port must have a unique IP Address and the same mask. Setting or features must be set the same for each port.

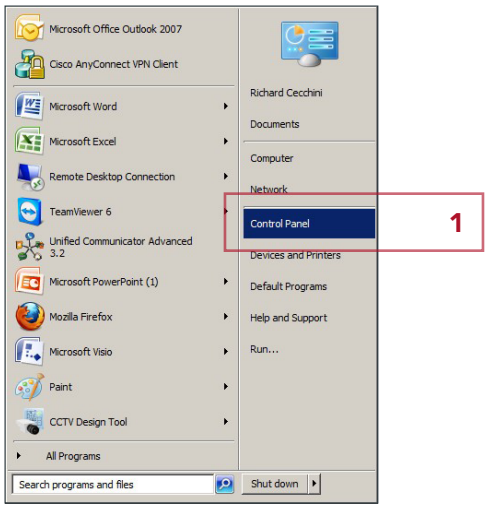
E. CHANGING iSCSI/NAS PORT ATTRIBUTES

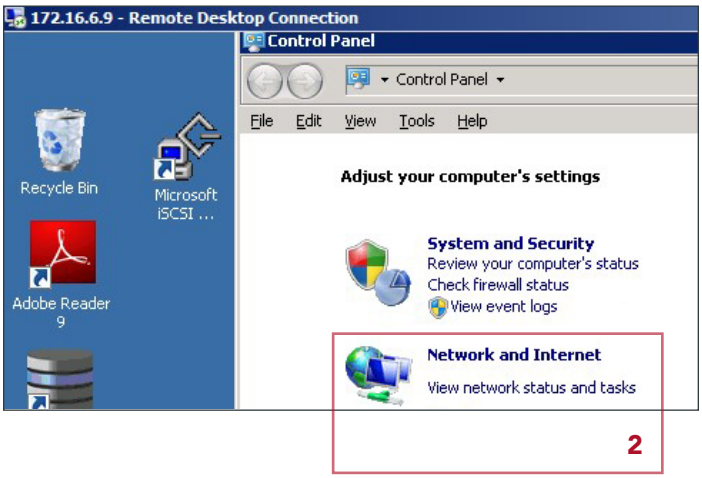
For iSCSI implementation it is highly recommend to leave the iSCSI ports at the factory shipped static IP port addresses.

NIC port attributes are accessed as follows;

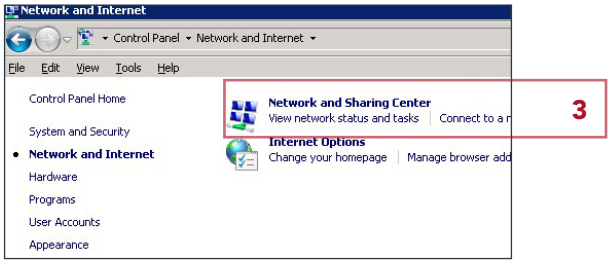
Click on **Start** button located on bottom left corner of display.

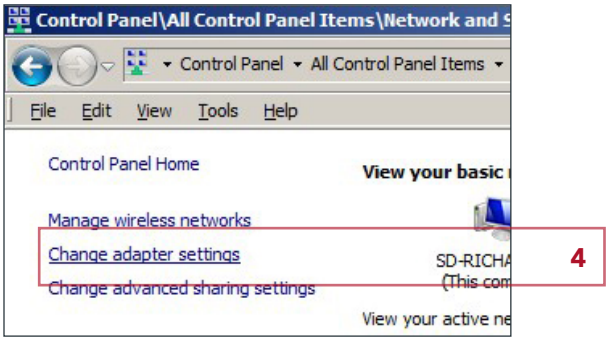
1. Click on **Control Panel**
2. Click on **Network and Internet**



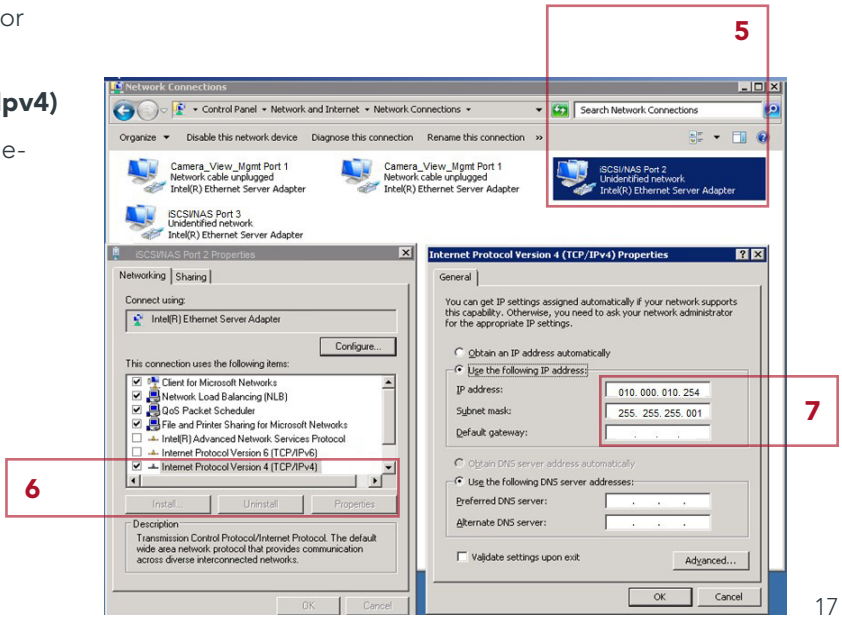


3. Click on **Network and Sharing Center**
4. Click on **Change Adaptor Settings**





5. Select the **iSCSI/NAS** port to be reviewed or changed
6. Select **Internet Protocol Version 4 (TCP/Ipv4)**
7. Review or change IP information for the selected port.



F. DEFAULT USERNAME AND PASWORD

The system ships with two default users. Both share the same password and can be changed per policy.

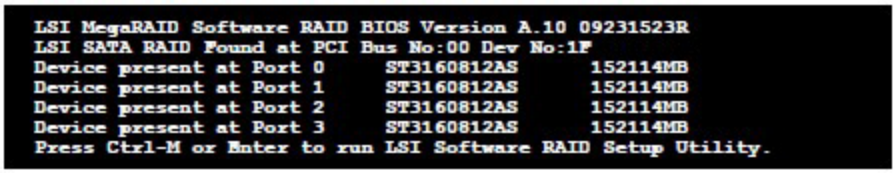
Username: **Administrator** Password: **P@ssw0rd**

Username: **NVR_Service** Password: **P@ssw0rd**

VI. RAID MANAGEMENT

The intent of this section is to provide guidance in the creation and expansion of RAID sets within the xNVR and direct attached expansion chassis.

The xNVR200, 300 and 400 families connect the OS drive to the embedded motherboard RAID controller. The VMS application(s) also reside on the OS drive. Depending on appliance purchased and options selected the OS drive may consist of a mirrored pair. In the cases where the OS drive is mirrored it is recommended that base management functions be done using the BIOS RAID controller tools. The BIOS RAID controller tools are accessed by simultaneously hitting the Ctrl and M keys during power up while the following screen is displayed on the console monitor.



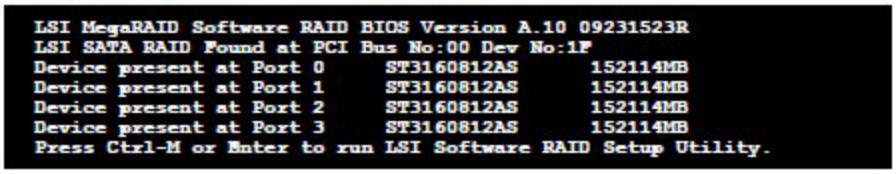
It is recommended that the BIOS tools only be used for OS drive mirror set creation and rebuild/restore of a defective drive. To this end only creation and rebuild/restore will be covered in this manual. All other functions, including rebuild/restore, can be done via the MegaRAID Software Manager (MSM) which can be found and launched from the Windows operating system desktop. Instruction for use of the MSM can also be found in this manual.

The xNVR200, 300 and 400 families with 8 or more disk bays are supplied with a PCIe RAID controller. This PCIe RAID controller maintains the array(s) that contain the video stream data and archives. Since the arrays can only be accessed while an operating system is intact and operational and because control of the arrays is easier using the MegaRAID Software Manager (MSM) software, only the MSM will be covered by this manual for PCIe based disks and arrays.

USING BIOS CONTROL FOR MIRRORED DRIVE SETS ONLY

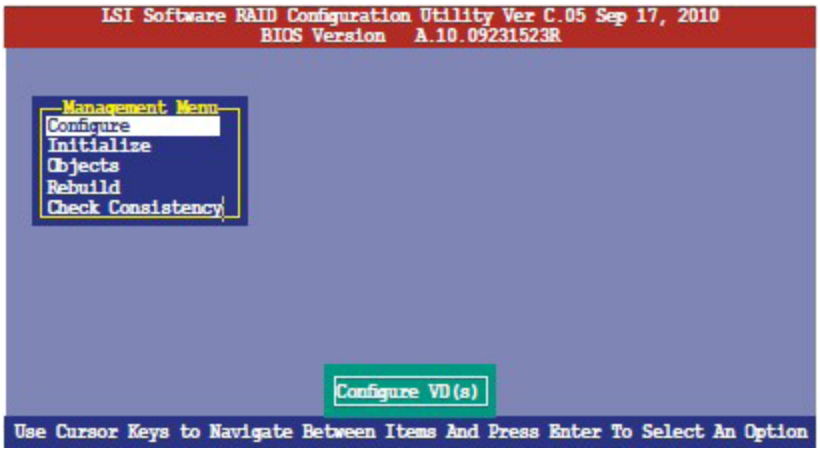
A. ENTERING BIOS RAID CONTROL MENU

1. Power up system
2. During power up self-test wait for the following screen to appear. Immediately and simultaneously press the **Ctrl** and **M** keys to enter the BIOS RAID routine.



When the following screen appears, the BIOS RAID control has successfully been entered.

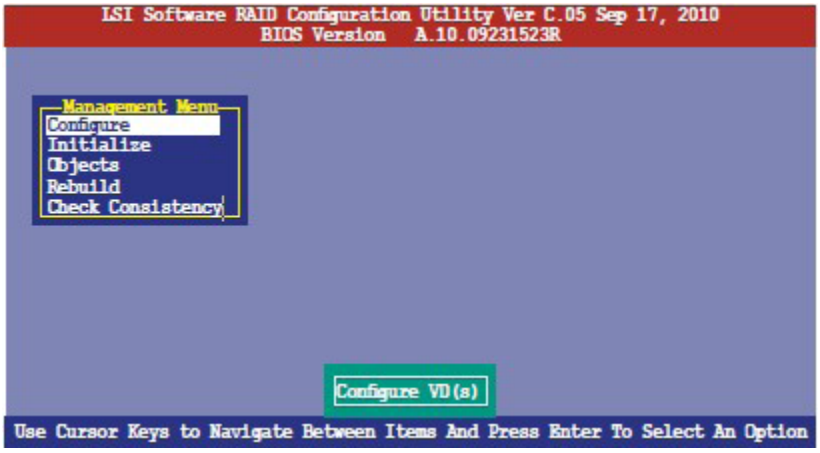
NOTE: DO NOT select Ctrl and H, this is not the OS drive RAID control screen. Major damage to existing video can occur.



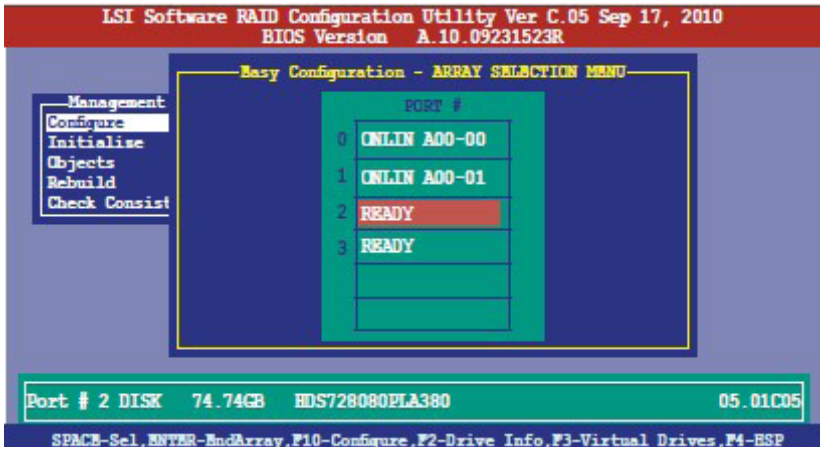
B. CREATING A MIRRORED OS DRIVE PAIR

REMEMBER the system ships from Seneca with the operating system installed. This section is only provided in the event recovery from a catastrophic event that destroyed the entire mirrored disk pair is required.

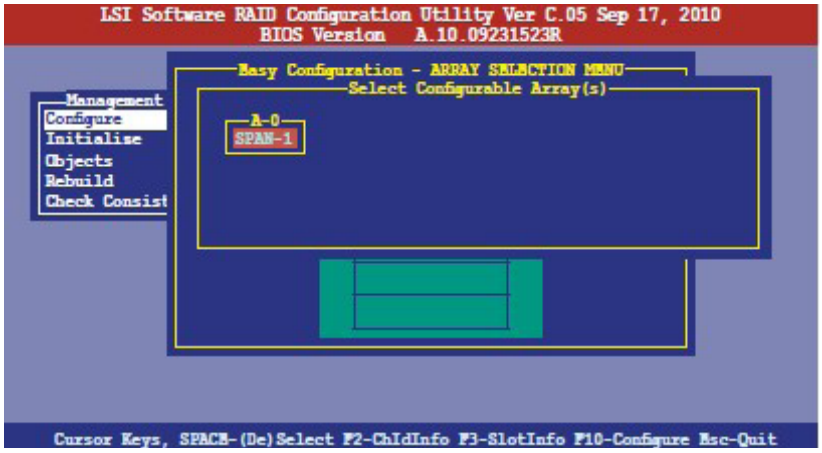
1. From the management screen select **Configure** and **Easy Configuration**



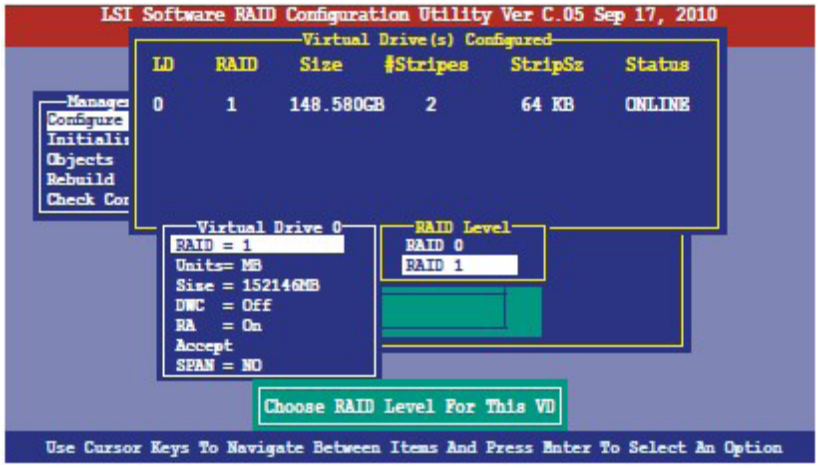
2. From the **ARRAY SELECTION MENU** use the **up** and **down** arrows to select the two drives for the mirror set. Use the space key to lock the desired drives.



3. Press **F10** and then the **space** key to select the array

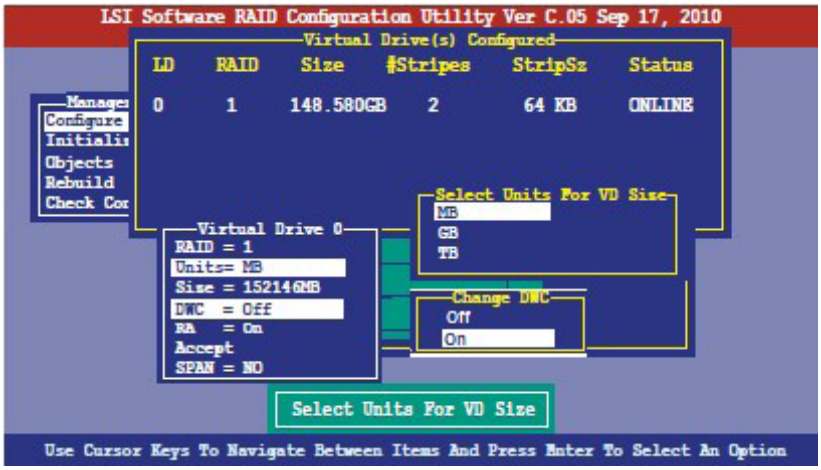


4. Press F10 again, then select RAID and then RAID 1 from the menu. Press **enter**

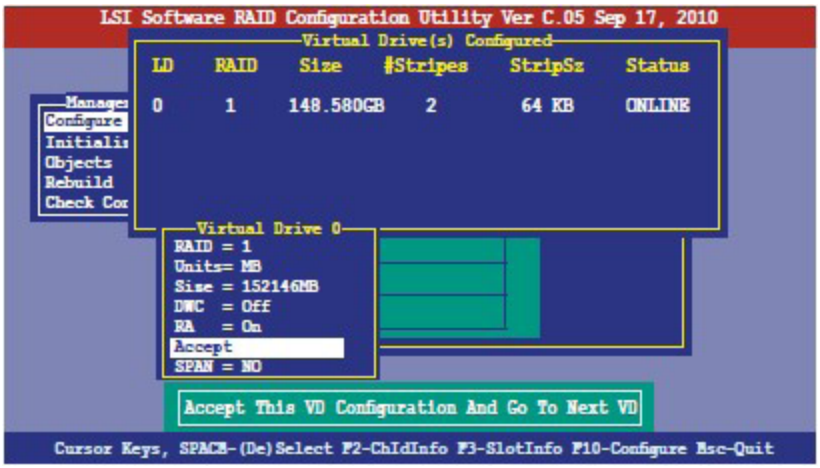


5. Navigate to **Units**, hit **enter** and make selection and hit **enter**. Navigate to **DWC** and select **On** and hit **enter**. This will enable write back cache for the OS disk and VMS application

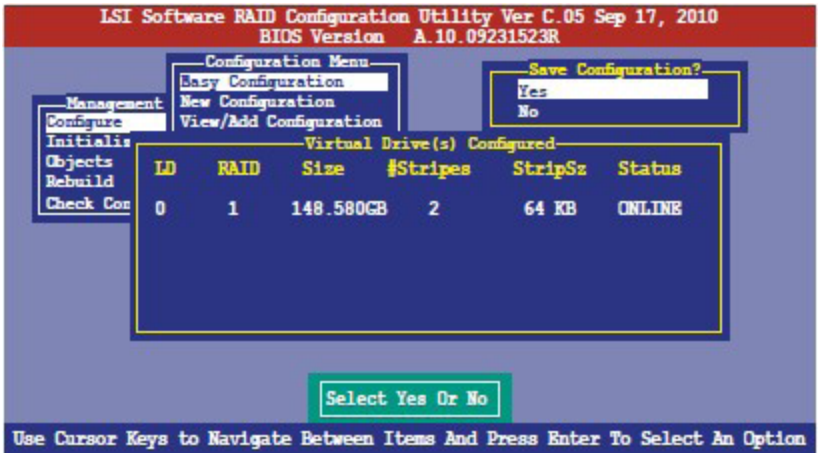
   NOTE: It is extremely important to protect drive data that is write back caches with an uninterruptable power source



6. When finished with above configuration, navigate to **Accept** and press **enter**

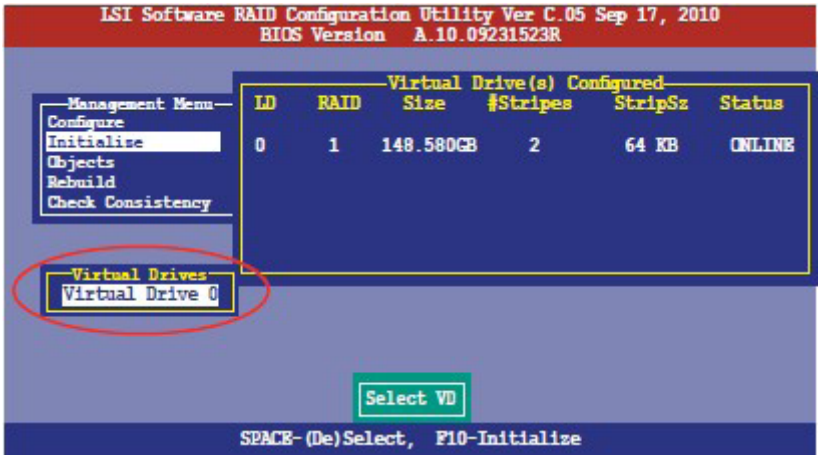


7. Press **esc,** select **Yes** and hit **enter**

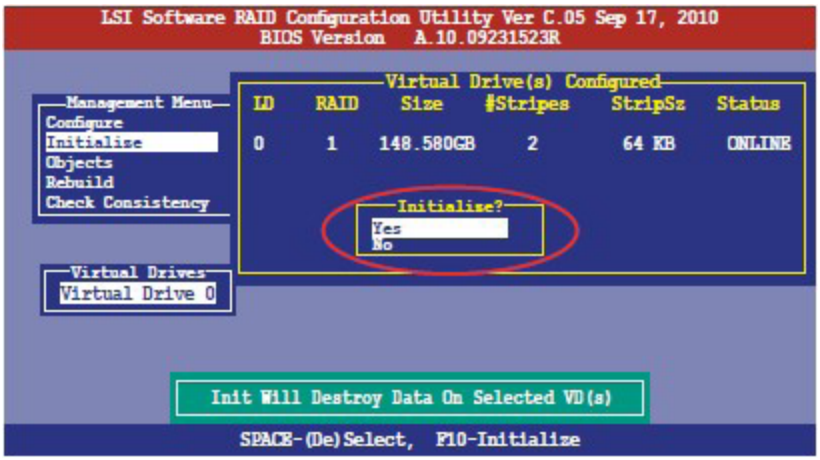


INITIALIZE DRIVE

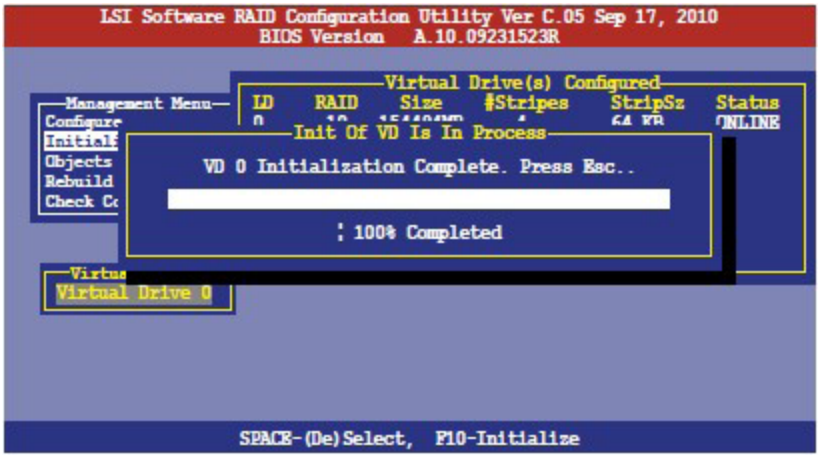
8. From the **Management Menu** select **Initialize** and then the **Virtual Drive** where the RAID1 set was just created.



9. Press **F10** to bring up **Initialize** confirmation and select **Yes** then press **enter**

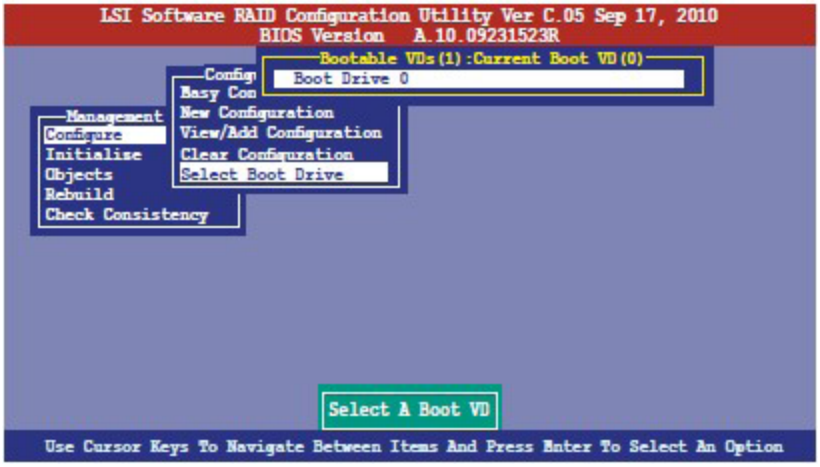


10. Virtual drive initialization will begin and progress will be indicated by the bar. When initialization is complete press esc. **Do not press esc until after the initialization is complete**



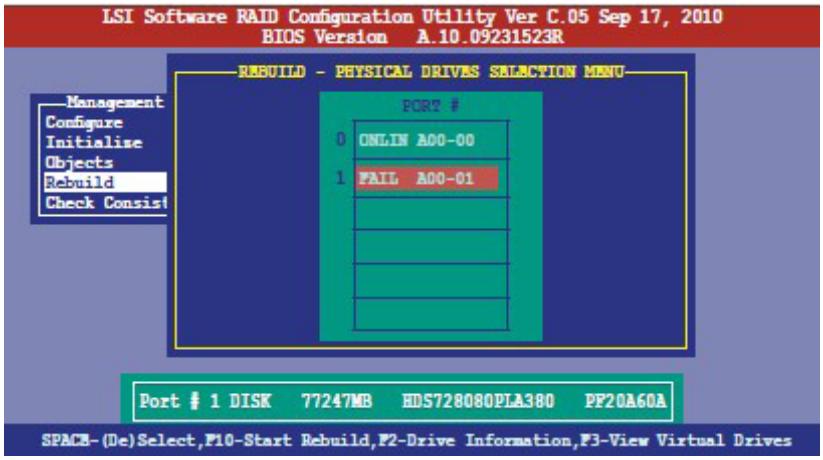
11. From the **Management Menu** screen, select **Configure,** select **Select Boot Drive** and then select the mirrored drive pair created and initialized by pressing **enter.** Press any key to continue. Press the system reset button or power fail the system

    After RAID set creation, initialization and boot select is complete, the drive virtual drive (RAID1 mirror set) will appear in the boot BIOS for selection as a target. Restore OS and applications to virtual drive and boot system.

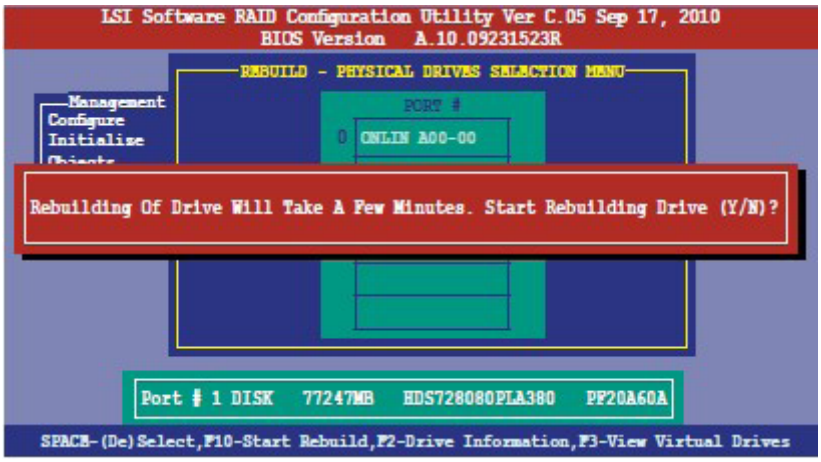


C. BIOS LEVEL BAD DRIVE REBUILD/RESTORE

1. Enter the Management Menu via Ctrl and M as described earlier in this manual.
2. Select Rebuild. Identify the defective drive. If the bad drive is installed in an internal fixed position as is the case with the 4 bay, 8 bay, and 12 bay configurations, power down the system and replace the defective drive, power up and return to this screen display. If the OS drive is hot swap removable, then replace the defective drive.



3. Select the defective drive position and hit **space.** Press **F10.** When prompted select **Y** to start the rebuild/restore to the replacement drive. After the rebuild is complete, press any key to continue.

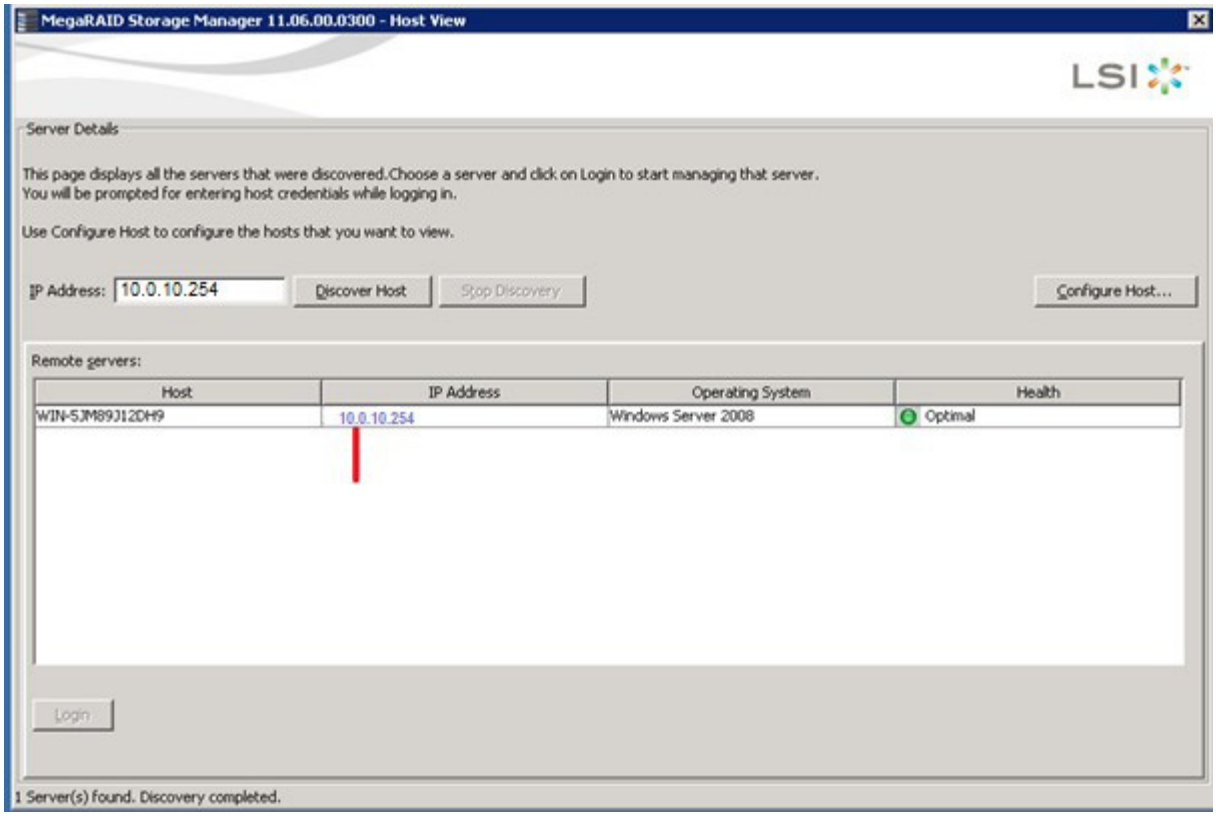


USING MegaRAID STORAGE MANAGER

A. ACCESSING RAID MANAGER

Select **MegaRAID Storage Manager** icon on desktop.

1. Click on IP Address hyperlink of the system to be managed.



2. Log on using the same administrative username and password as used to login into the xNVR

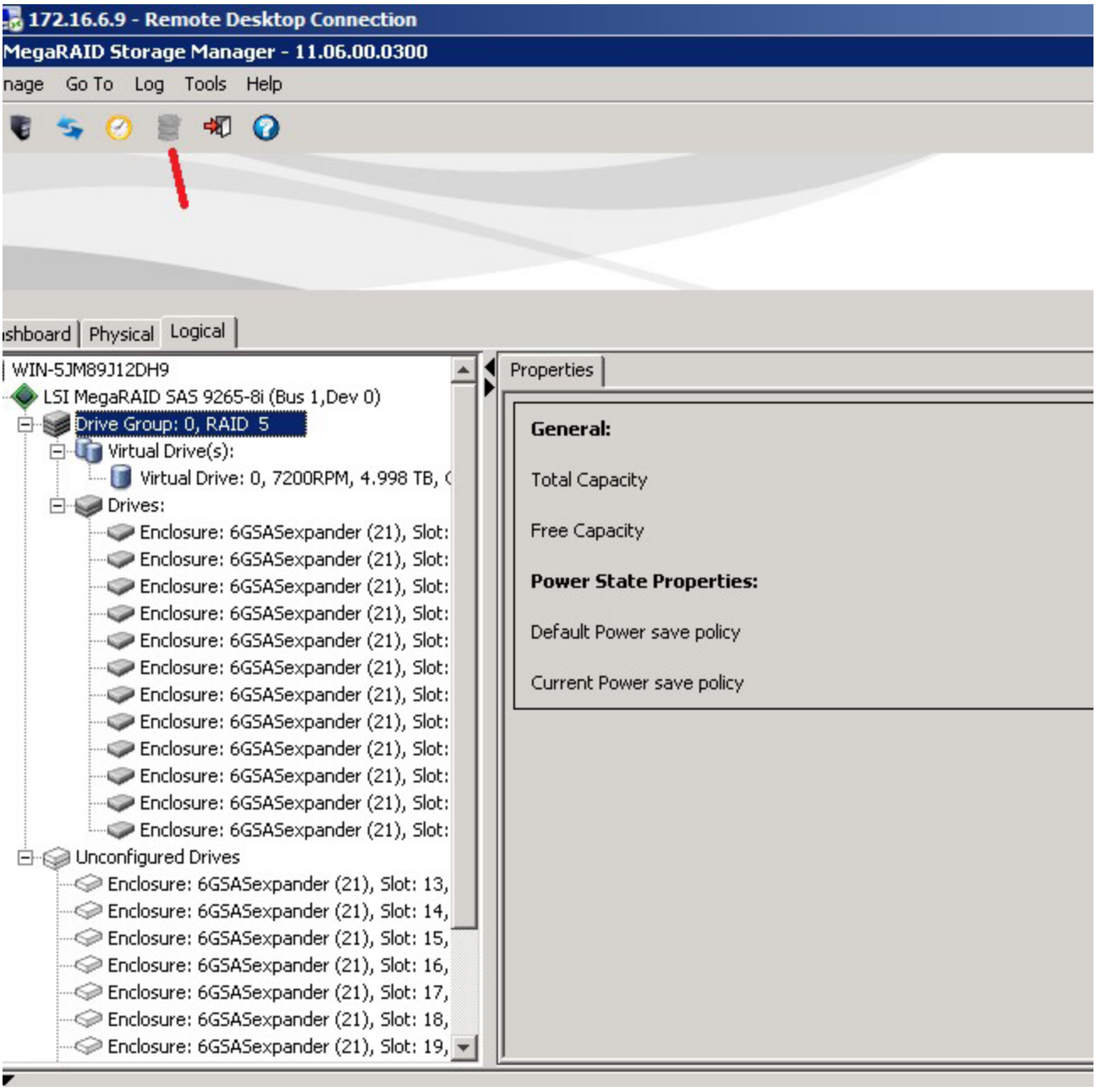
   The RAID Controller Management Utility screen will now display.

B. CREATE A RAID SET

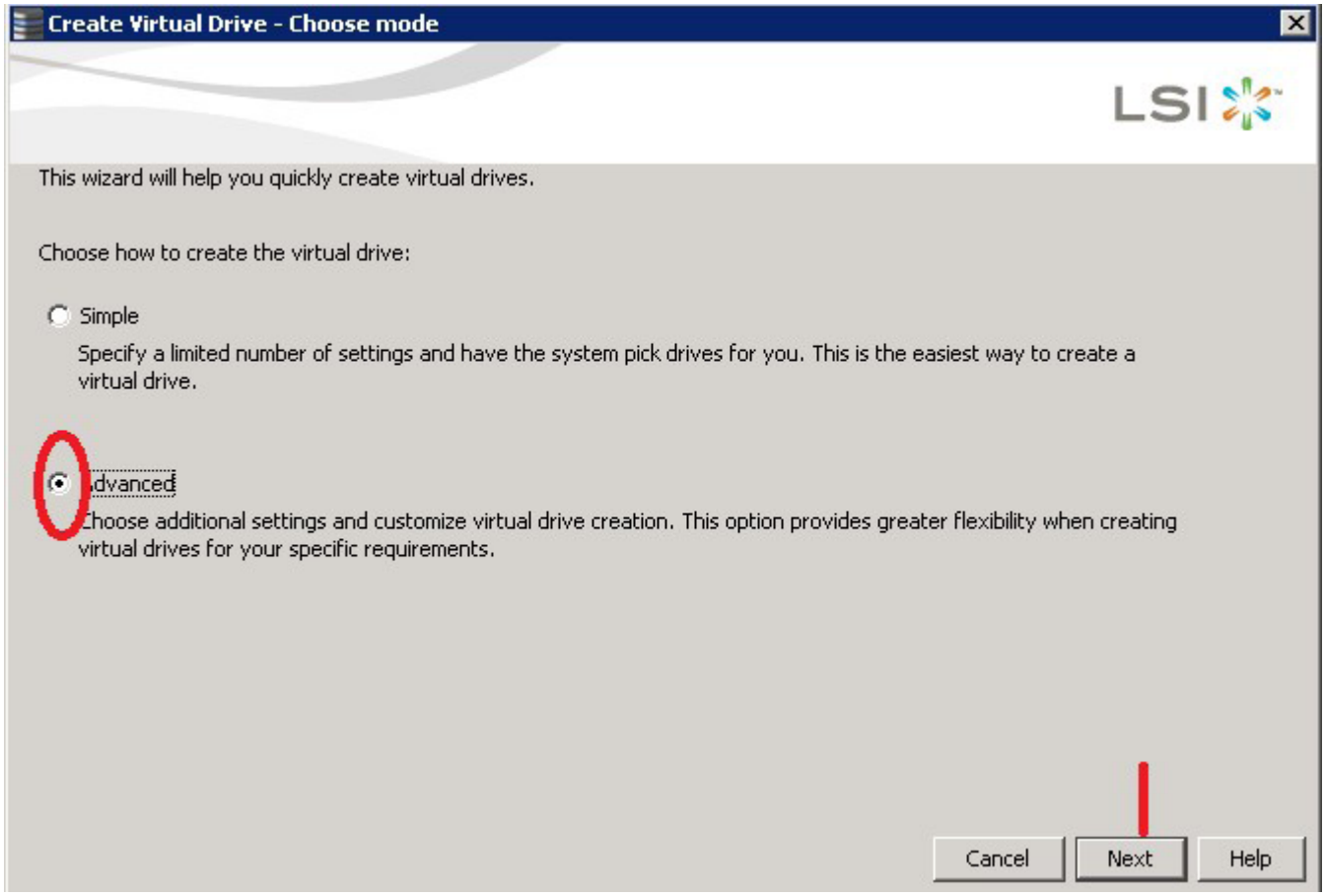
All xNVR's ship from the factory with RAID sets built per customer specification. This chapter is provided in the event a new RAID set is to be built or a previously built RAID set is purposely destroyed to create a different RAID set.

This process involves creating a "Drive Group", a virtual drive as it relates on to this RAID controller, Selecting the drives to be in the virtual drive (RAID Set) and RAID set attributes, initializing the virtual drive (RAID set), assigning a volume type, formatting the drive at an OS level and assigning a drive letter for the OS.

1. Select **Create a Virtual Disk** or stacked volume icon illustrated below.



2. Select **Create A Virtual Drive,** check **Advanced** and click on **Next**



3. Select "RAID Level from drop down. In this case RAID5 has been selected. The selection will vary depending on requirements or preference.
4. **Do not** select a **Security Method. Do not Select Power Save Mode.**
5. Highlight a single unconfigured drive and click on add to add to drive group.

   CAUTION: Select only the same part number drive for a single drive group (RAID set). Mixing of different drive part numbers, different drive interfaces, drive speeds (15k 10k or 7200 RPM) or capacities may result in poor performance or unreliable operation. You can use the slide bar to view complete drive information.
6. Continue selecting drives until desired number of drives for the RAID set is complete.

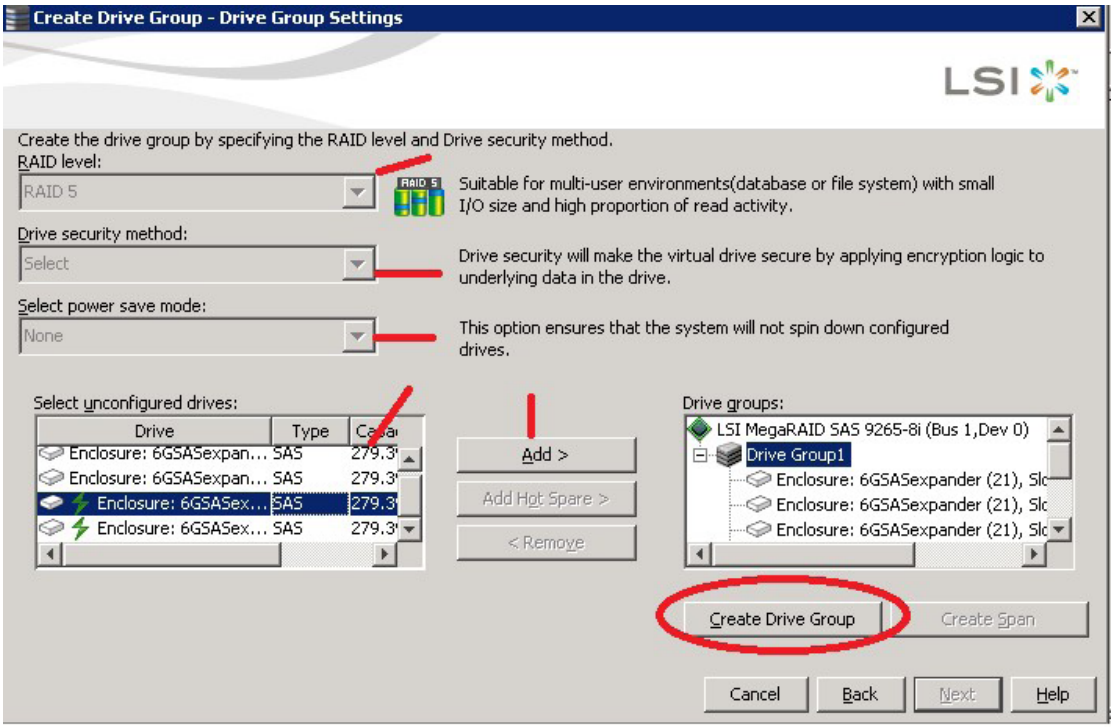
   NOTE 1: The total number of drives includes the parity drives for RAID5 and RAID6.

   NOTE 2: This creation process is only true for RAID0, 1, 5 and 6.

   NOTE 3: The selection of drives is for the RAID set only. It does not include hot or global spares. That is done in a separate process.

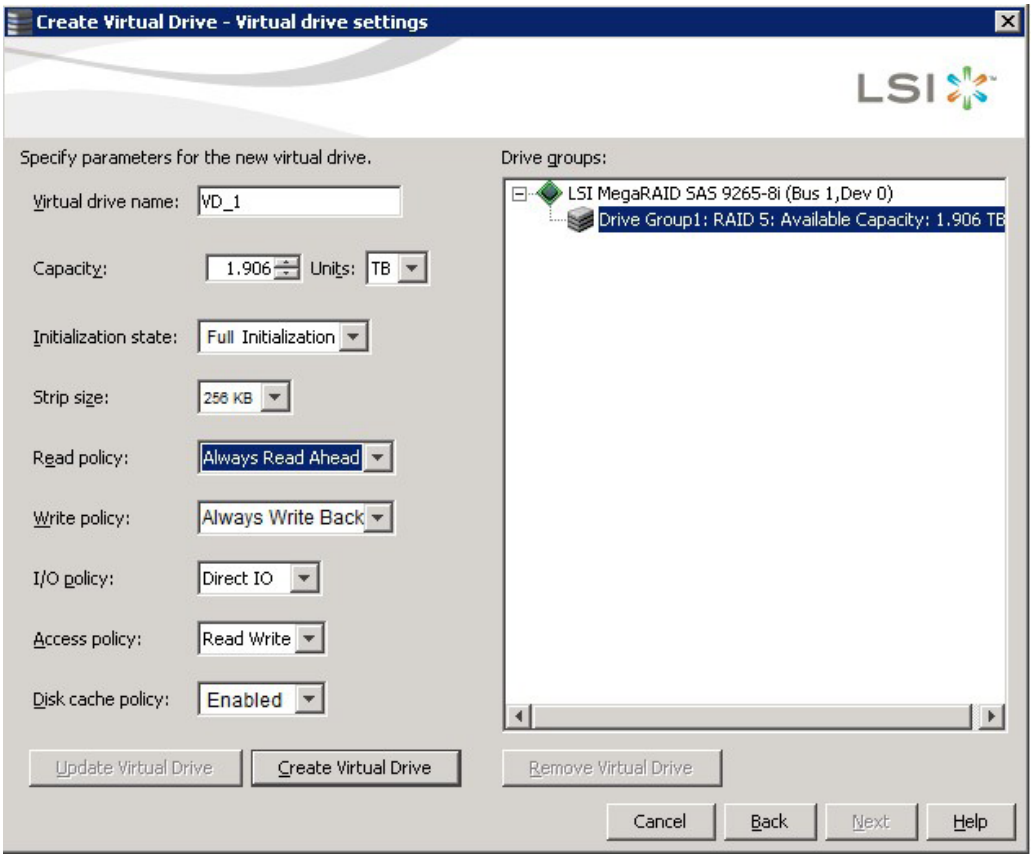
   NOTE 4: The maximum number of drives that can be selected in a single RAID set is 32.

7. When drive selection is complete, click on **Create Drive Group** then click on **Next.**



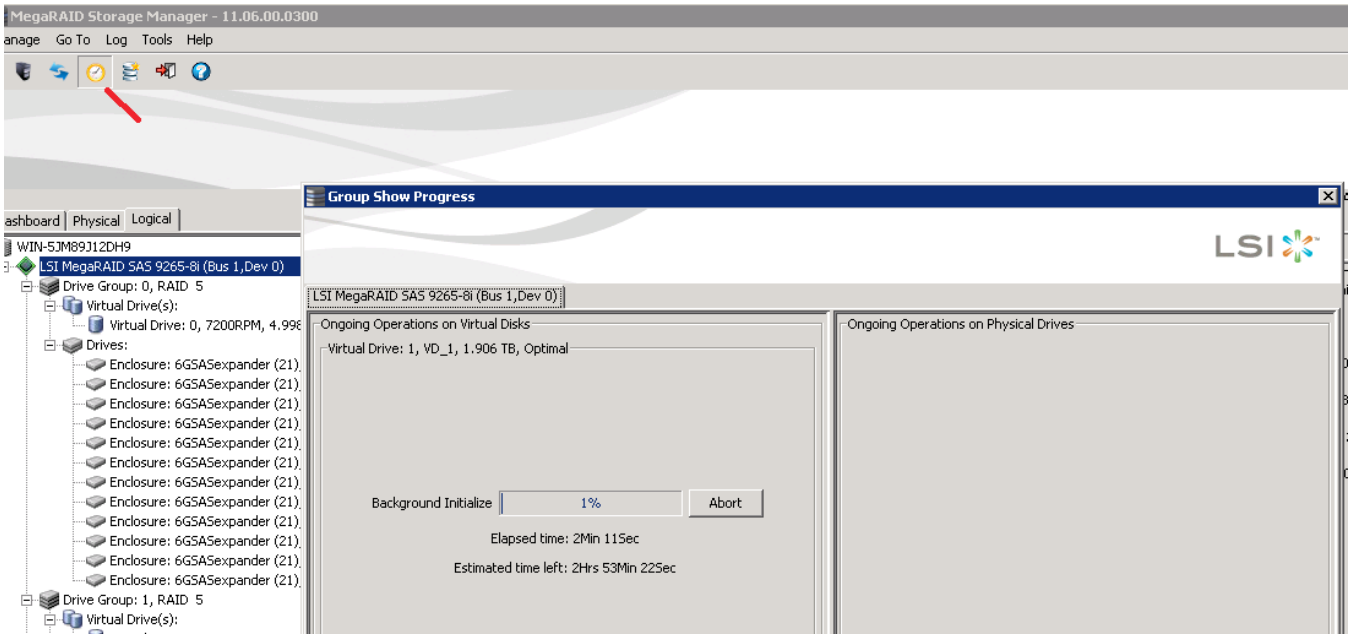
8. Select a **Virtual Drive** name. The default naming convention starting at **VD_0** and continuing with **VD_1, VD_2...** should suffice.
9. The default capacity reflects the total capacity of the virtual drive being created. This should be default. Smaller capacities can be created later when iSCSI volumes are being created for host assignment later.
10. Select **No Initialization** when it is desired to recover an intact RAID set or create a new RAID set with back ground initialization (BGI) Select Fast Initialization when a new RAID set is to be created and instant use RAID set is desired. Select **Full Initialization** for the fastest RAID set creation. Use of the RAID set is not possible until the RAID Set has been completely initialized under **Full Initializaton. RECOMMENDED:** Full Initialization
11. A stripe size of **256KB** is a best selection for general IT purposes.
12. Select **Always Read Ahead**
13. Select **Write Back with BBU.** This select will guarantee cache data integrity in the event of unexpected shutdown, loss of power or non-operational cache battery backup.
14. Select **Direct IO** for IO policy
15. Select an Access Policy of **Read Write**
16. Disk Cache Policy should be **Enabled**
17. Click on **Create Virtual Drive**
18. A warning displayed to double check settings. Review and click **OK**

19. Click on **Next**



20. The next screen will review the RAID set policies selected. Review carefully, if there is a wrong setting, click **Back** and correct. Otherwise click on **Finish** to proceed.
21. The initialization process will begin. Monitor the initialization process by clicking on the clock icon on the main screen.

    RAID set initialization for hard disks takes approximately 60 minutes per terabyte.



22. Upon completion of RAID set virtualization you may exit the MegaRAID Storage Manager.

    PRODUCTIVITY HINT: It is not necessary to wait for one RAID set to initialize before creating a new Disk/RAID Set. The MegaRAID Storage Manager will also allow the return to modify Disk Groups while other Disk Group/ RAID Sets are initializing.

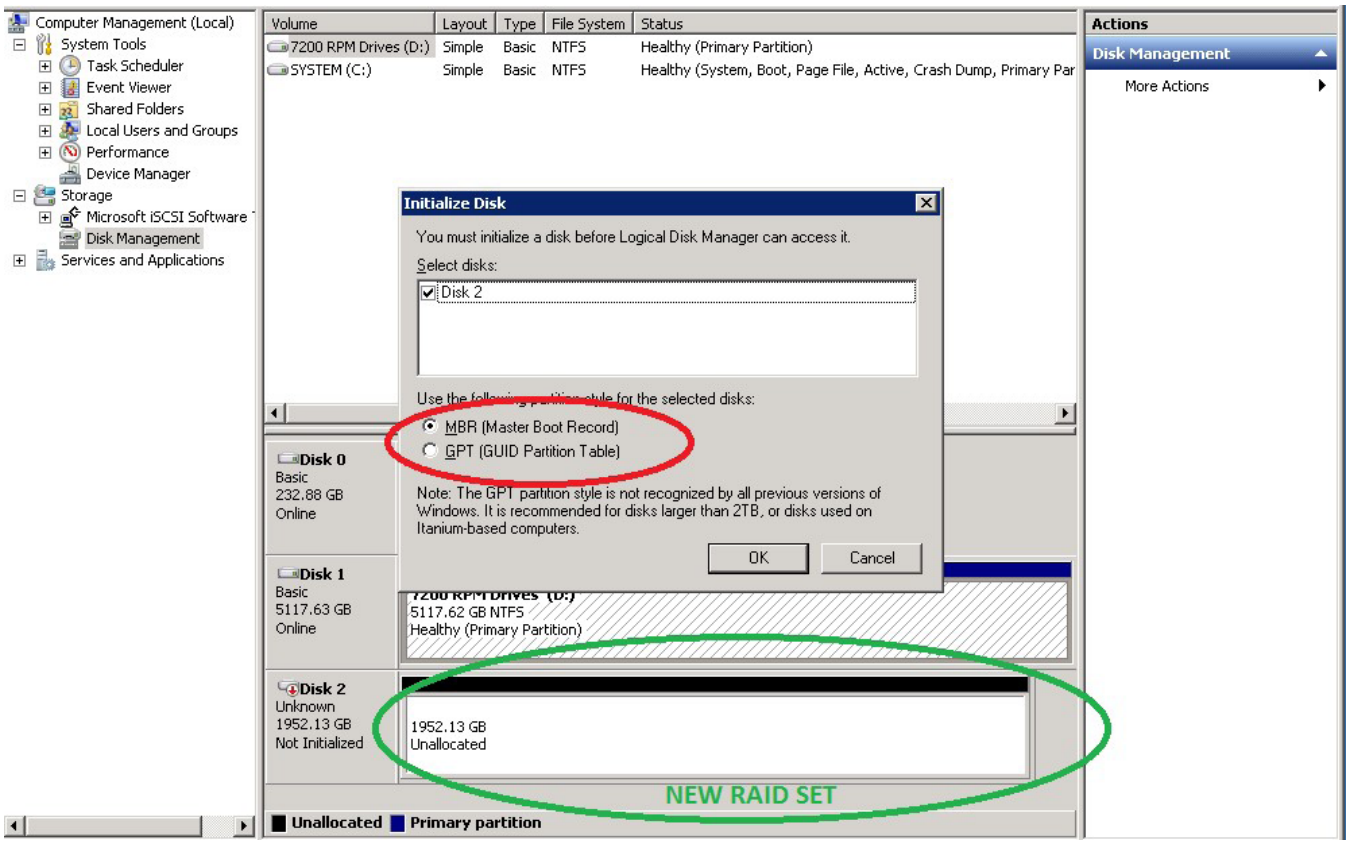
C. MOUNTING A RAID SET TO THE xNVR

Windows 7 and Windows Server 2008 R2

After a RAID set is created and initialized it must then be mounted to the storage server operating system. This entails four operations;

- Selection of partition style (MBR or GUID Partition GPT)
- Creation of disk type—Simple Disk is the default
- Assignment of Drive Letter
- Quick format of disk

1. Click on **Start** button
2. Click on **Administrative Tools**
3. Click on **Computer Management**
4. Click on **Disk Management**



5. Select partition type MBR or GPT.

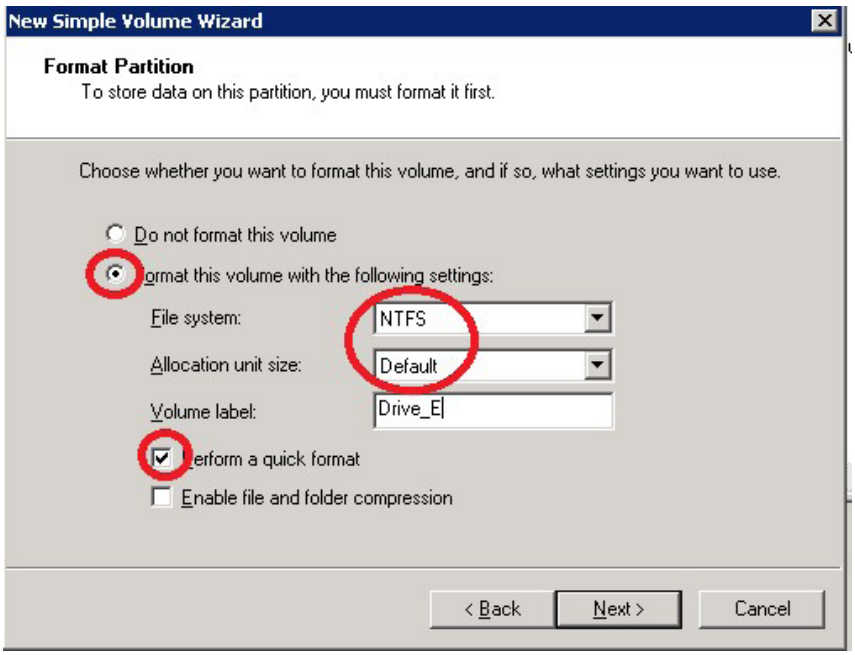
   Choice Help:

   a. If partition is larger than 2TB than select **GPT**

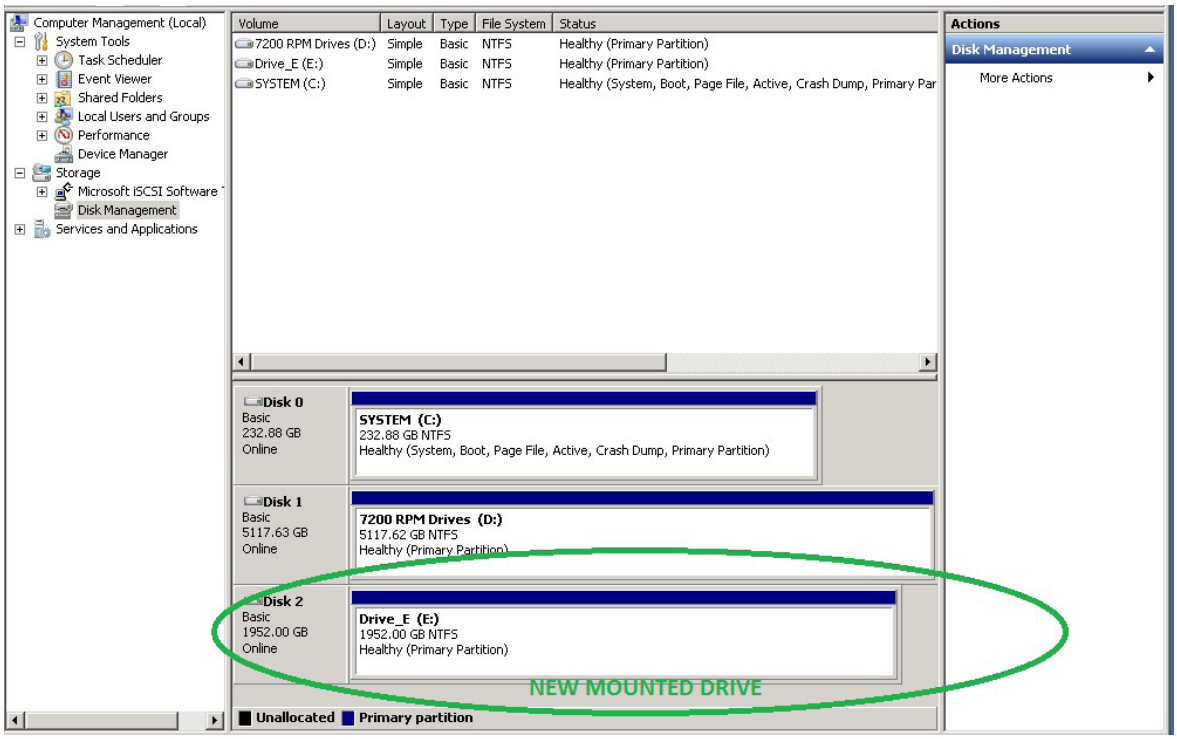
   b. If partition is to be used as a boot partition for iSCSI, it must be smaller than 2TB and have a MBR partition style.

   NOTE: In this example, **GPT** style will be selected

6. Right click on **unallocated storage** and select **New Simple Volume**
7. Click **Next** on the first screen of the **Welcome To The New Simple Volume Wizard**
8. Specify the maximum capacity on the **Specify Volume Size** screen. Later we will be able to create smaller volumes to present to server hosts.
9. On **Assign Drive Letter Or Path** screen, select appropriate drive letter and click on Next
10. Select the red circled defaults. On the **Volume Label** make selection that means something to the recorder server appliance. The simple reinforcement of the actual letter. If the underlying RAID set is special make note in the name; "Drive_E 15k" or "SQL"
11. Click on **Next** after selections are made and data entered.
12. Review selections, if correct click on **Finish,** if changes are to be made click on **Back.**



After a brief "formatting" status flash the new drive will return as a Healthy Partition

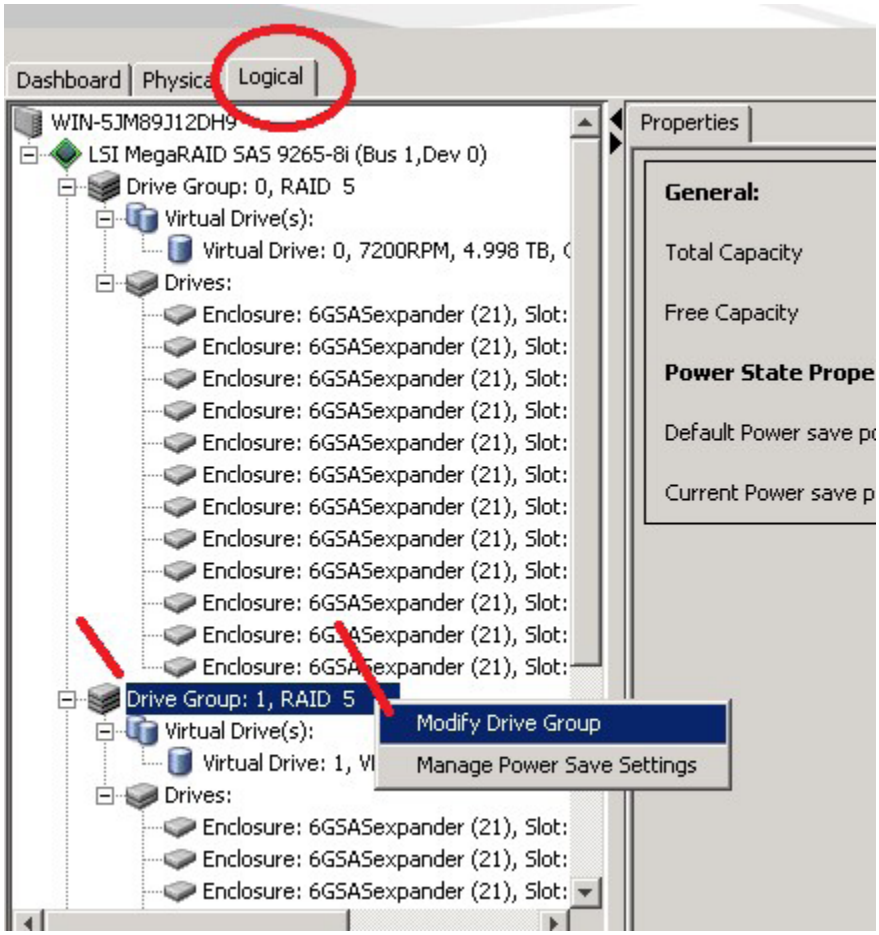


D. EXPANDING A RAID SET

This is not a recommended procedure. Expansion of a RAID set impacts online performance tremendously. Expanding a RAID set while video data is being written to the array greatly extends the expansion process and puts present data recoverability in peril.

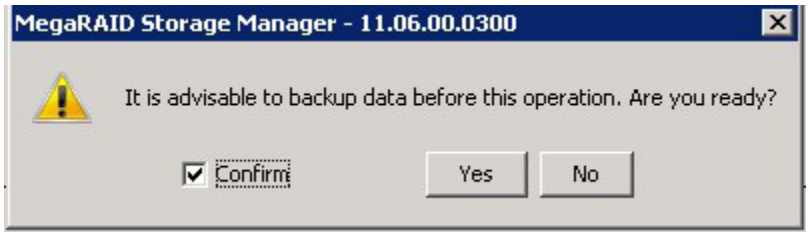
1. Open MegaRAID Storage Manager

2. Click on Logical tab. Right click on Drive Group that will be expanded. Click on **Modify Drive Group.**

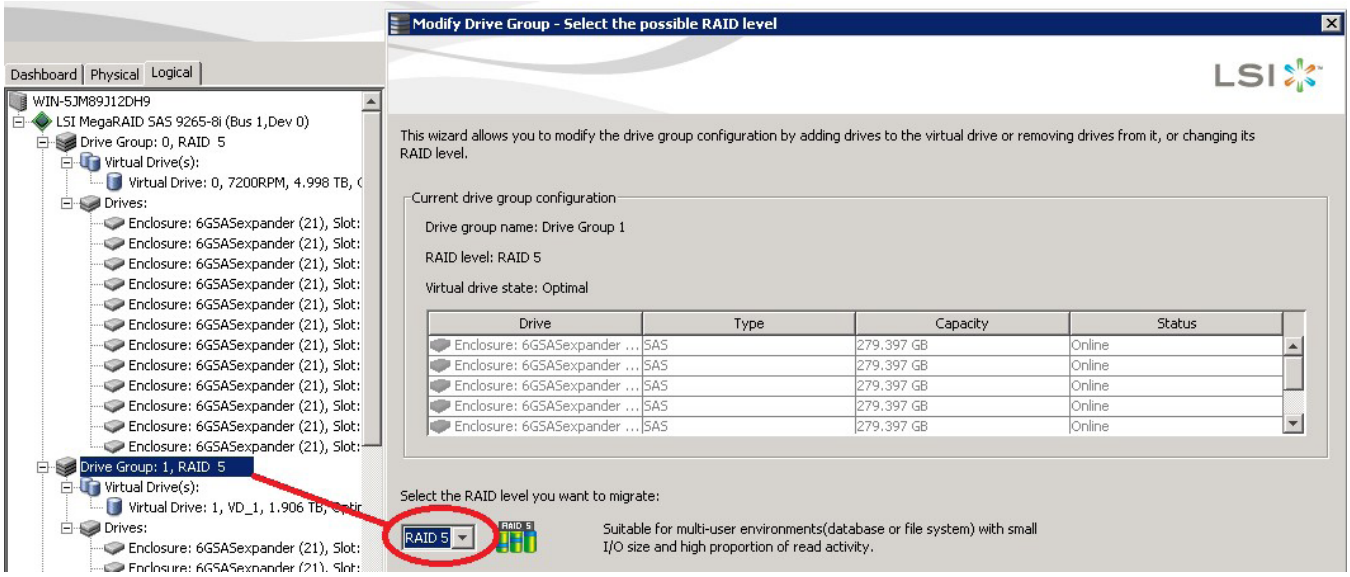


3. Check confirm box and click on **Yes**

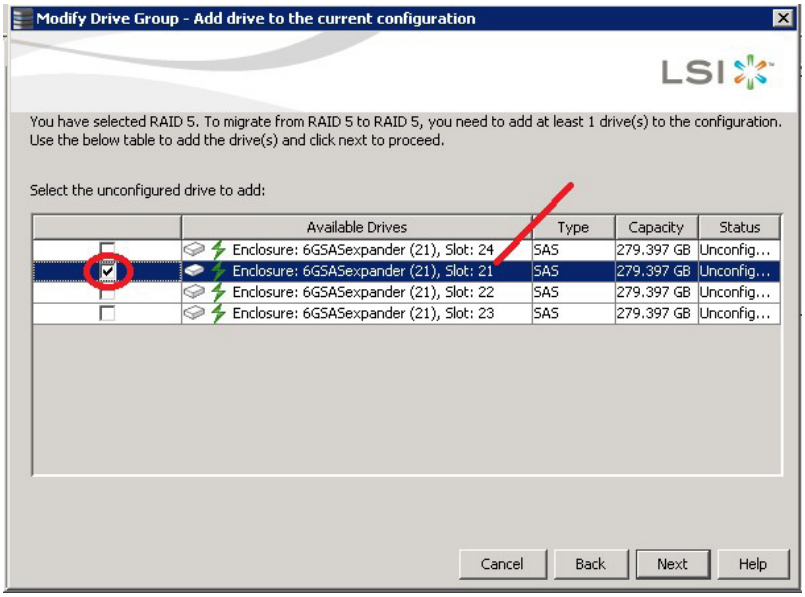
ALERT: Expanding a RAID set may cause irrecoverable data loss. It is advised to backup the drive before proceeding.



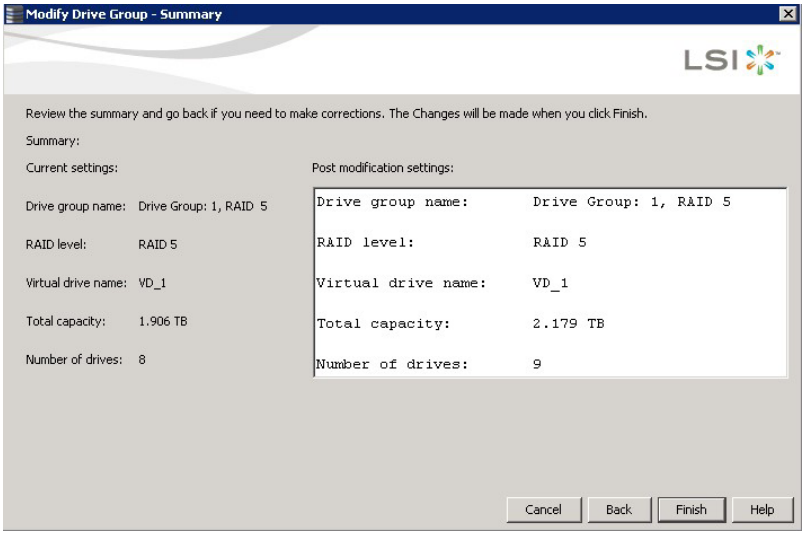
4. Take care to match the RAID set type field to match the Drive Group being expanded.



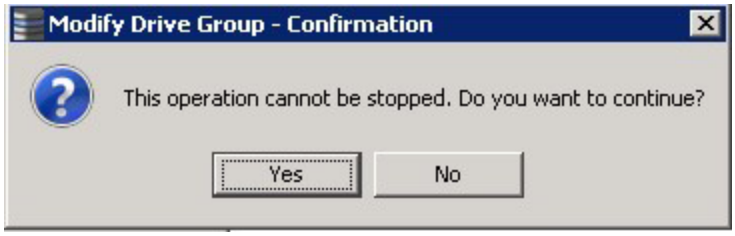
5. Select the same drive size that is next in the physical sequence drive slot. This example has a Slot 21 drive being added to RAID Group 1 that ended at slot 20. Click on **Next**



6. Review and click on **Finish** if information is correct. Click on **Back** if changes are necessary.



7. The system will issue a confirmation request one more time. Click **Yes** to continue.



CAUTION: The expansion of a RAID set, even if only a single drive will take as long if not longer than the initial RAID build. It is Seneca's recommendation that RAID expansions only be done at a one, two or three drive count with NO data activity from the system. A new RAID set should be considered as an alternative for four or more drives.

E. CONFIGURING REBUILD, RECONSTRUCTION and BGI RATES

1. Open MegaRAID Storage Manager

2. Right click on RAID controller holding the array. Select **Set Adjustable Task Rates.** Change tasks percentages. Percentages represent a portion of total array performance. So a Rebuild Rate of 50% will detract 50% of the arrays available performance to process video streams. In turn the RAID set will rebuild faster than if set to 10%.

REBUILD & RECONSTRUCTION RATE

This is the rate at which a replacement drive will rebuild as a percentage of total IO and bandwidth available to the array. A lower percentage will take longer for the replacement drive to fully restore. However this slower rebuild rate will be less likely to impact video stream writes. A higher percentage will complete the replace drive restore faster but create a stronger possibility of lost video and would be presented as missed frames.

Rebuild and Reconstruction rates should be set at the same percentage.

PATROL RATE

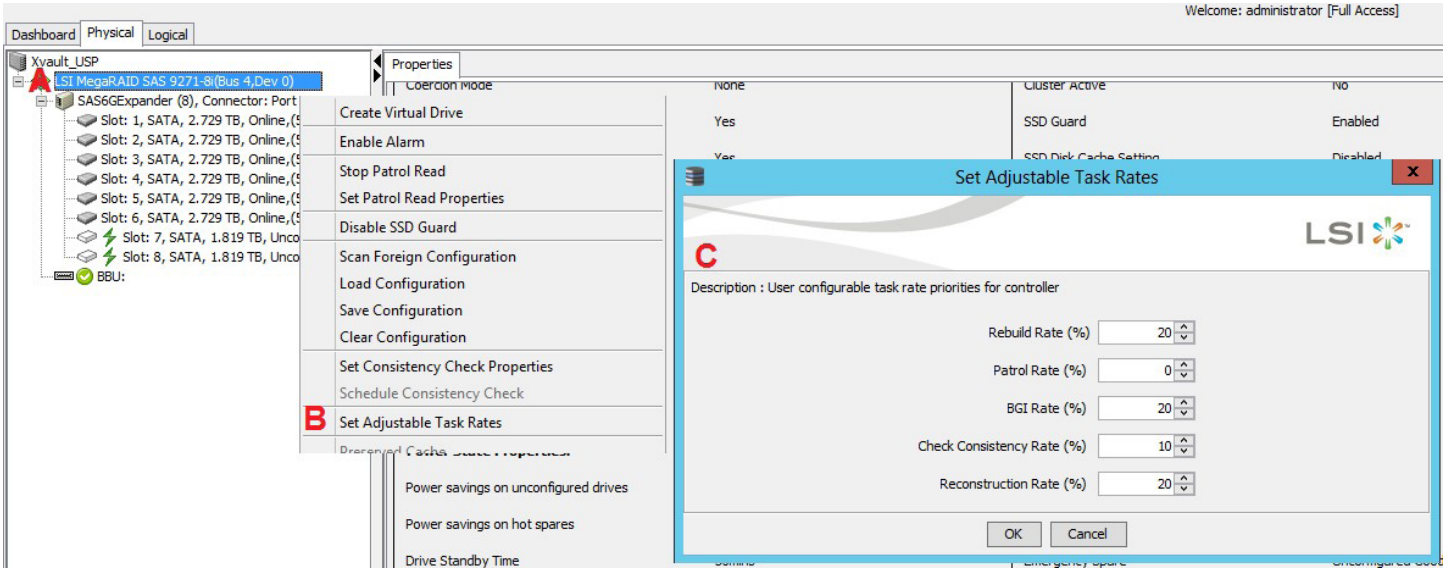
Patrol is a function of the RAID controller to check RAID set integrity. Patrol Reads do impact the arrays performance. There is another RAID set integrity check called "Check Consistency". Leaving "Check Consistency" in place and reducing Patrols to zero will suffice in maintaining array integrity.

BGI RATE

Is the rate at which a new RAID set will initialize while other IO operations are in place. Setting this value to an extreme low may be tempting. But consider if a RAID set would take 12 hours to initialize without any external IO, it would take 60 hours to initialize with a setting of 20% and consistent external IO influence.

CHECK CONSISTENCY RATE

Check Consistency is a RAID controller data integrity check function. It is not advisable to completely stop consistency checks or to reduce to below 10%.



VII. CONFIGURING ALERTS

The xNVR series has the ability to send out RAID array status alerts via email. The ability to transmit alerts requires an in-management subnet SMTP server or to be routed to the SMTP server. Please consult with the network administrator for SMTP network information and access.

The alerts subsystem supports four levels of alert. **Fatal** which is the catastrophic failure of a component within the RAID subsystem. **Critical** alerts are flagged when the subsystem cannot sustain another failure without high probably of going down. **Warnings** are issued when non-critical errors are detected/recorded. **Informational** alerts are issued when there are changes in configuration, login or orderly processes occurring such as system shutdown or startup.

Each of the alert levels are notification configurable. There are four methods that an alert can be delivered; Supported operating **System Log,** system monitor **Pop Up, MSM Log** and/or **Email.**

ALERT TRIGGERS

ALERT	2U 4 Bay	2U 8 Bay	2U 12 Bay	3U 16 Bay	4U 24 Bay
Chassis Fan Failure			X	X	X
Power Supply Failure (redundant configurations only)			X	X	X
Thermal			X	X	X
Drive Failure and Unordinary Status	X	X	X	X	X
RAID Set Integrity Issues	X	X	X	X	X
Any Array or Array Controller Status Change			configurable	configurable	configurable

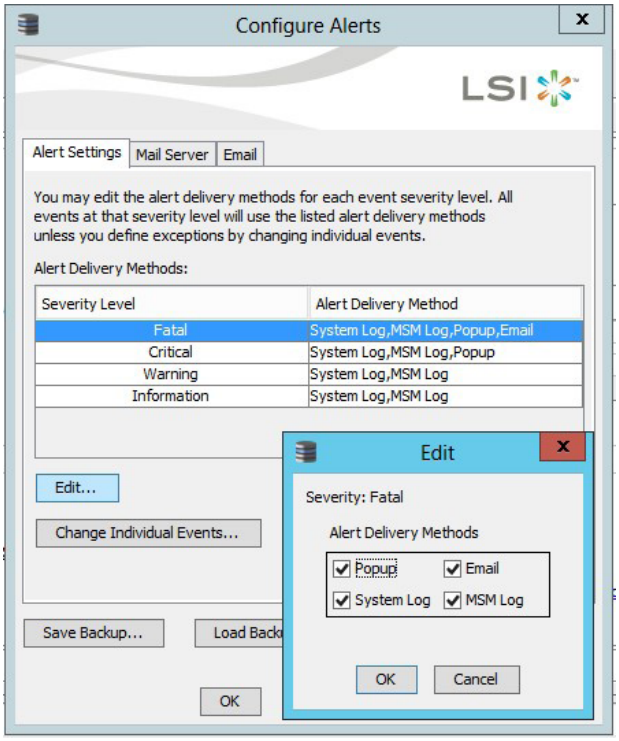
In addition to basic alert level conveyance via four vehicles, specific Individual Events can have the delivery method changed.

External expansion chassis with 2U 12 Bay, 3U 16 Bay or 4U 24 Bay configuration will also report same xNVR alert triggers via email.

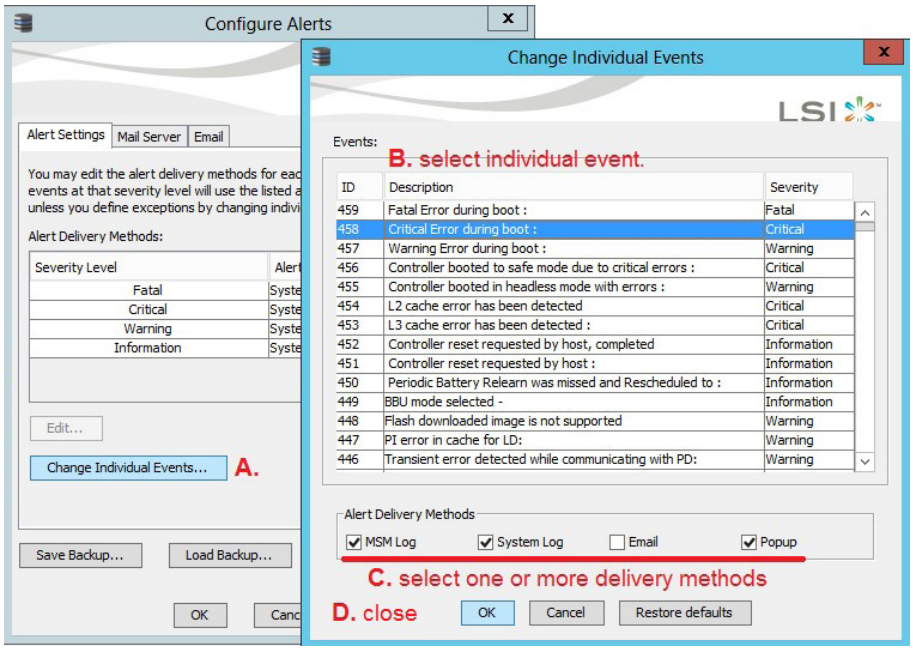
SETTING ALERT LEVELS AND DELIVERY METHOD

Login to MegaRAID Storage Manager from desktop. Username and Password must come from an account with administrative privileges.

Click Alert Settings. The selection of any of the Severity Levels will bring up the alert method configuration window. Any or all selection can be used for four different severity levels. Best practice would be to leave at default levels.

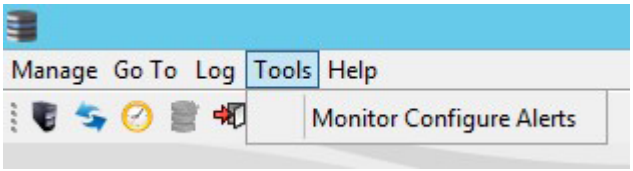


From The alerts tab screen it is also possible to drill down on notification method for individual alerts by selecting Change **Individual Events ...,** selecting individual event, then delivery method(s) and closing.



CONFIGURING SMTP MAIL SERVER AND EMAIL RECIPIENT

Login to MegaRAID Storage Manager from desktop. Username and Password must come from an account with administrative privileges.



Select **Tools** and then **Monitor Configure Alerts**

Select **Mail Server** tab and enter information

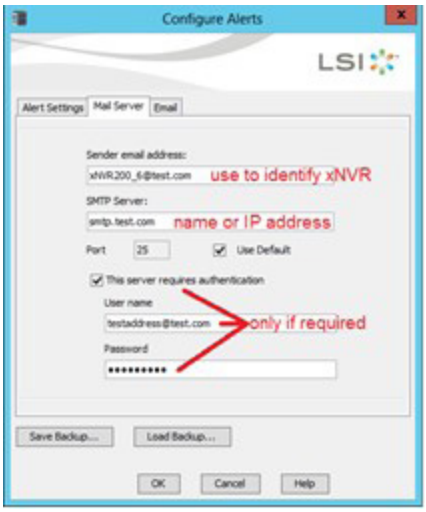
Sender email address can be used to reflect identity of xNVR sending alert

- Characters preceding "@" can be Alpha Numeric, the only special character allowed is "_"
- Characters after "@" can be Alpha Numeric only, no special characters
- The format must subscribe to email format and only use the ".com" suffix

SMTP Server may be entered as a URL or IP Address

IP SMTP standard **Port** is 25. This may be changed by deselecting **Use Default**

Authentication is supported by checking **This server requires authentication** and filling in appropriate **User Name and Password**



Select **Email** tab and enter recipient information

New recipient email address should use standard email address format. Click **Add** to enter in stored table.

Test will send a brief email message to all recipients in the email table. Use the control to ensure all recipients email addresses are valid and the SMTP configuration is correct.

Use **Save Backup** to guarantee all Configure Alerts settings are saved. The Save Backup feature allows for multiple and different setting to be saved. If only one configuration is use the MSM will hold that configuration until changed.

Load Backup allows the loading of different previously save alerts to be restored. It would be considered a best practice to save all alert configurations.

Click **OK** to set alert configuration information.

VIII. SUPPORT

The xNVR video recording appliances come standard with a 3 year Next Business Day onsite warranty. Included with the warranty is advance replace of FRU parts, 8 AM to 6PM technical phone support Monday through Friday and 24x7 problem logging.

INFORMATION NEEDED BEFORE CALLING FOR SUPPORT

1. Model Number
2. Serial number of unit (located on top front left cover of enclosure)
3. Contact Information (company name, contact, phone, email)
4. Description of problem (including any pop up information)
5. History or timeline of problem or use

ADDITIONAL HELPFUL INFORMATION

6. Operating system log information
7. MegaRAID log information

Normal Business Hours

Monday through Friday 8AM–6PM Eastern
800-227-3432 #5
CustomerCare@senecadata.com

Outside Normal Business Hours

888-227-9994

Next Business Day ("NBD") Onsite support is defined as; Onsite support personnel will be dispatched in coordination with replacement parts arriving onsite to arrive the next business day after initial call log.

A best effort is made to accomplish a next business day time frame. However there are unmitigated circumstances where NBD service cannot be provided. Some reasons are, but not limited to; calls logged after shipping cut off times, calls logged after business hours, weather or catastrophe related events, unusual parts outages.

CALL RESPONSE EXAMPLES

		Tech & Parts Arrive
Call logged M-F 8AM-3PM Eastern	Call and troubleshooting before done shipping cutoff	NBD
Call logged Friday 4PM Eastern	Likely miss of shipping cutoff	Arrive Tuesday
Call logged Monday 6:01 PM Eastern	After business hours	Arrive Wednesday
Call logged on weekend	After business hours	Arrive Tuesday
Call logged on Labor Day	Not considered normal business hours	Arrive Wednesday
Call logged day after Thanksgiving	Seneca holiday	Arrive Tuesday

New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving and the following day, Christmas Eve and Christmas Day are not considered business days. In addition Seneca may designate an additional two floating holidays which are also not considered business days. Please consult the Seneca website for current year's holidays.

APPENDIX A

Specifications

	2U 4 Bay	2U 8 Bay
Form Factor	2U	
Camera Viewing Mgmt Interfaces	Two 1Gbe ports	
iSCSI/NAS Interface (option)	Two to four 1GbE Ports	
10Gbe Support[1] (option)	Dual SFP+, Dual RJ45 Cat6a or Single CXA4 Options	
Maximum Internal Drives	Four 3.5" Drives	Eight 3.5" Drives
Externally Expandable (option)	Up to 52 drives	Up to 56 drives
Drive Compatibility	SAS 3g, SAS 6g, SATA-I, SATA-II and SATA-III (6g)	
RAID Level Support	0, 1, 10, 5, 6, 50, 60 & JBOD	
Video Cache Backup Hold Time	30 days	
Total Expanded Raw Capacity (option)	208TB	224TB
Practical Max. Single Volume Size	Windows 64TB / Linux 32TB	
Separate OS & Application Disks	Yes	
Mirrored OS drive option	Yes	
Drive Level Encryption for Array (option)	Yes – Industry term applied is "At Rest Drive Encryption"	

Dimensions (w x h x d)	19 x 3.5 x 22.7 in. / 482.6 x 88.8 x 575.4 mm	19 x 5.25 x 27.5 in. /482.6 x 133.35 x 700
Weight	33lb / 15kg with power supply and rails 40lbs / 18kg with drives	70lb / 31.7kg with power supply and rails 95lbs / 43kg with drives
Power	Single 460 watt or Dual Load balance hot swap redundant 650 watts 80+ efficiency rating	Dual Load balance hot swap redundant 800 watts 80+ efficiency rating
AC Input VAC Frequency	100VAC – 240VAC 47 – 63 Hz	100VAC – 240VAC 47 – 63 Hz
BTU /hr.	1570 for 460w, 2217 of 650w	2730
Operating / Non-Operating Temp	00C to 400C / 00C to 500C	00C to 400C / 00C to 500C
Operating & Non-Operating Humidity	5 to 90% non-condensing	5 to 90% non-condensing

Warranty	3 year onsite NBD for hardware & software with 24x7 phone support

1 Requires removal of graphics viewing option.

Specifications subject to change without notice.

	2U 12 Bay	3U 16 Bay	4U 24 Bay
Form Factor	2U	3U	4U
Camera Viewing Mgmt Interfaces	Two 1GbE – RJ45, Port 0 for Camera LAN Port 1 for Viewing and Management		
iSCSI/NAS Interface (option)	Two to four 1GbE Ports		
10Gbe Support[1] (option)	Dual SFP+, Dual RJ45 Cat6a or Single CXA4 Options		
Maximum Internal Drives	Twelve 3.5" Drives	Sixteen 3.5" Drives	Twenty Four 3.5" Drives
Externally Expandable	Up to 60 drives	Up to 80 drives	Up to 120
Drive Compatibility	SAS 3g, SAS 6g, SATA-I, SATA-II and SATA-III (6g)		
RAID Level Support	0, 1, 10, 5, 6, 50, 60 & JBOD		
Video Cache Backup Hold Time	30 days		
Total Expanded Raw Capacity	240TB	320TB	480TB
Practical Max. Single Volume Size	Windows 64TB / Linux 32TB		
Separate OS & Application Disks	Yes		
Mirrored OS drive option	Yes		
Drive Level Encryption for Array (option)	Yes – Industry term applied is "At Rest Drive Encryption"		

Dimensions (w x h x d)	19 x 3.5 x 27.5 in 482.6 x 88.8 x 700 mm	19 x 5.25 x 27.5 in. 482.6 x 133.35 x 700	19 x 7 x 27.5 in. 482.6 x 178 x 700
Weight	58.7lb / 27.7kg w/PS and rails 77lbs / 35kg with drives	70lbs / 31.7kg w/PS and rails 95lbs / 43kg with drives	77lbs / 35kg w/PS and rails 118lbs / 53.5kg with drives
Power	Dual Load balance hot swap redundant 650 watts 80+ efficiency rating	Dual Load balance hot swap redundant 800 watts 80+ efficiency rating	Dual Load balance hot swap redundant 1010 watts 80+ efficiency rating
AC Input VAC Frequency	100VAC – 240VAC 47 – 63 Hz	100VAC – 240VAC 47 – 63 Hz	100VAC – 240VAC 47 – 63 Hz
BTU /hr	2218	2730	3446
Operating / Non-Operating Temp	00C to 400C / 00C to 500C	00C to 400C / 00C to 500C	00C to 400C / 00C to 500C
Operating & Non-Operating Humidity	5 to 90% non-condensing	5 to 90% non-condensing	5 to 90% non-condensing

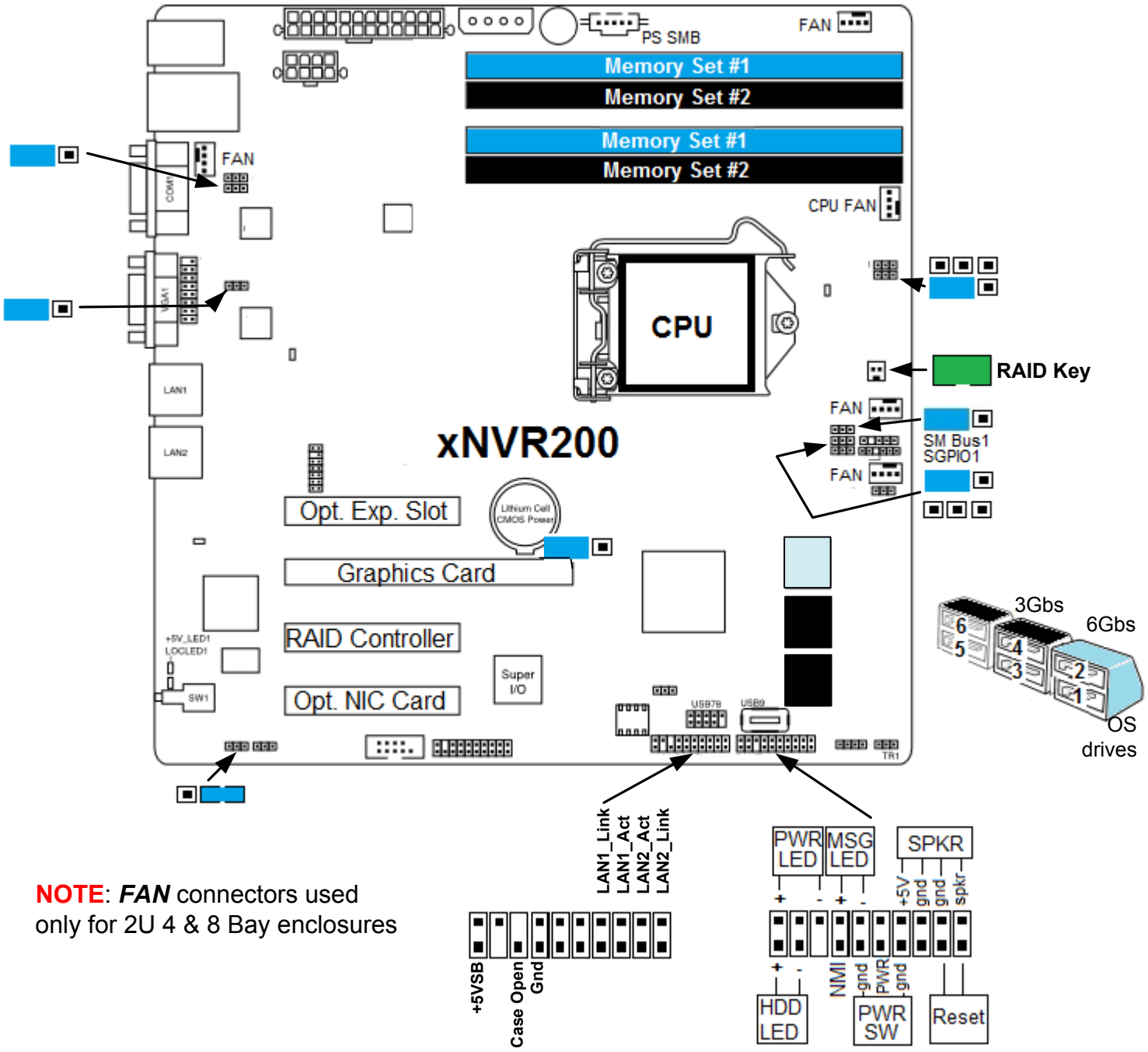
Warranty	3 year onsite NBD for hardware & software with 24x7 phone support

1 Requires removal of graphics viewing option.

Specifications subject to change without notice.

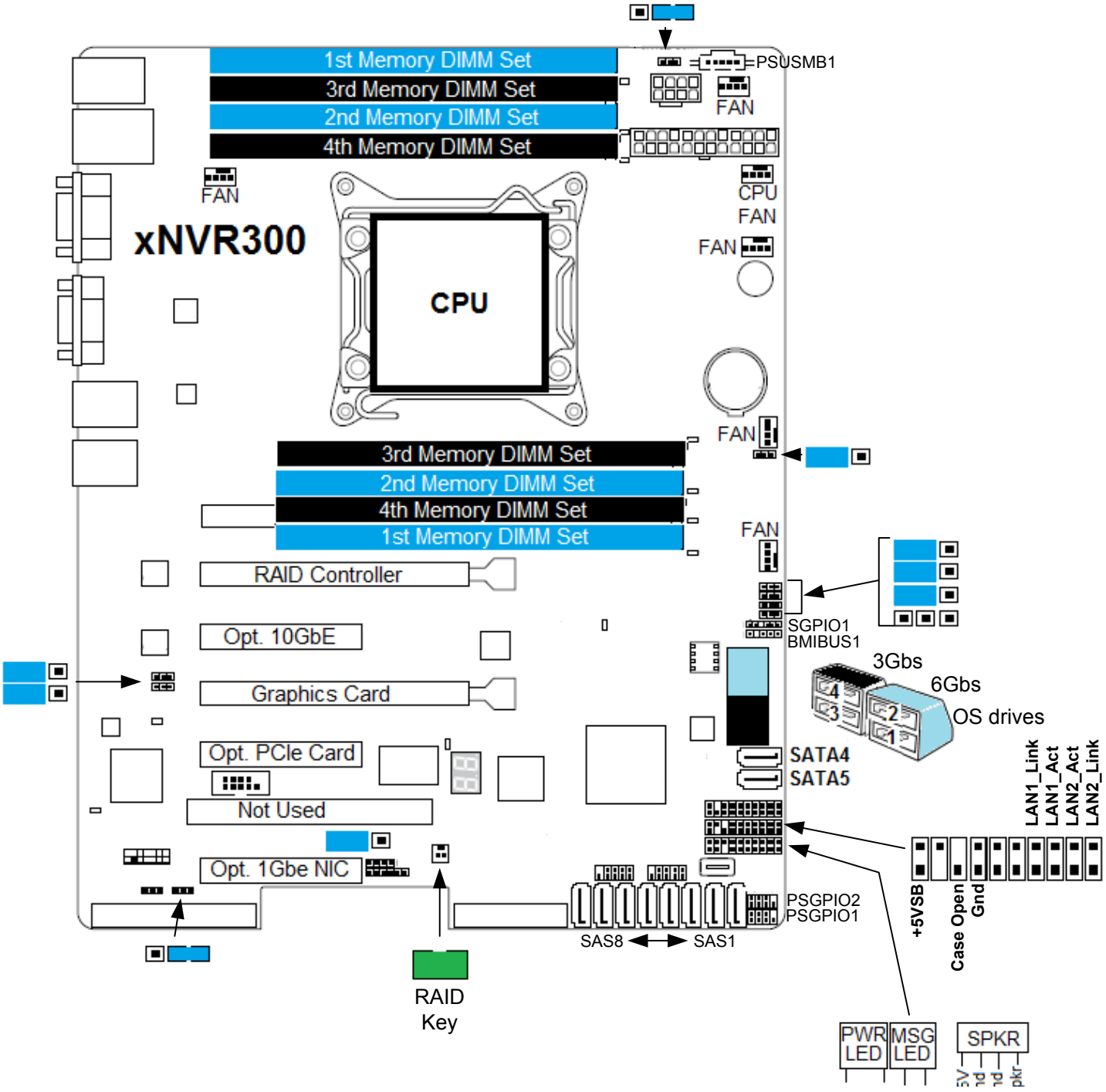
APPENDIX B

Main Board Jumpers and Wiring xNVR200

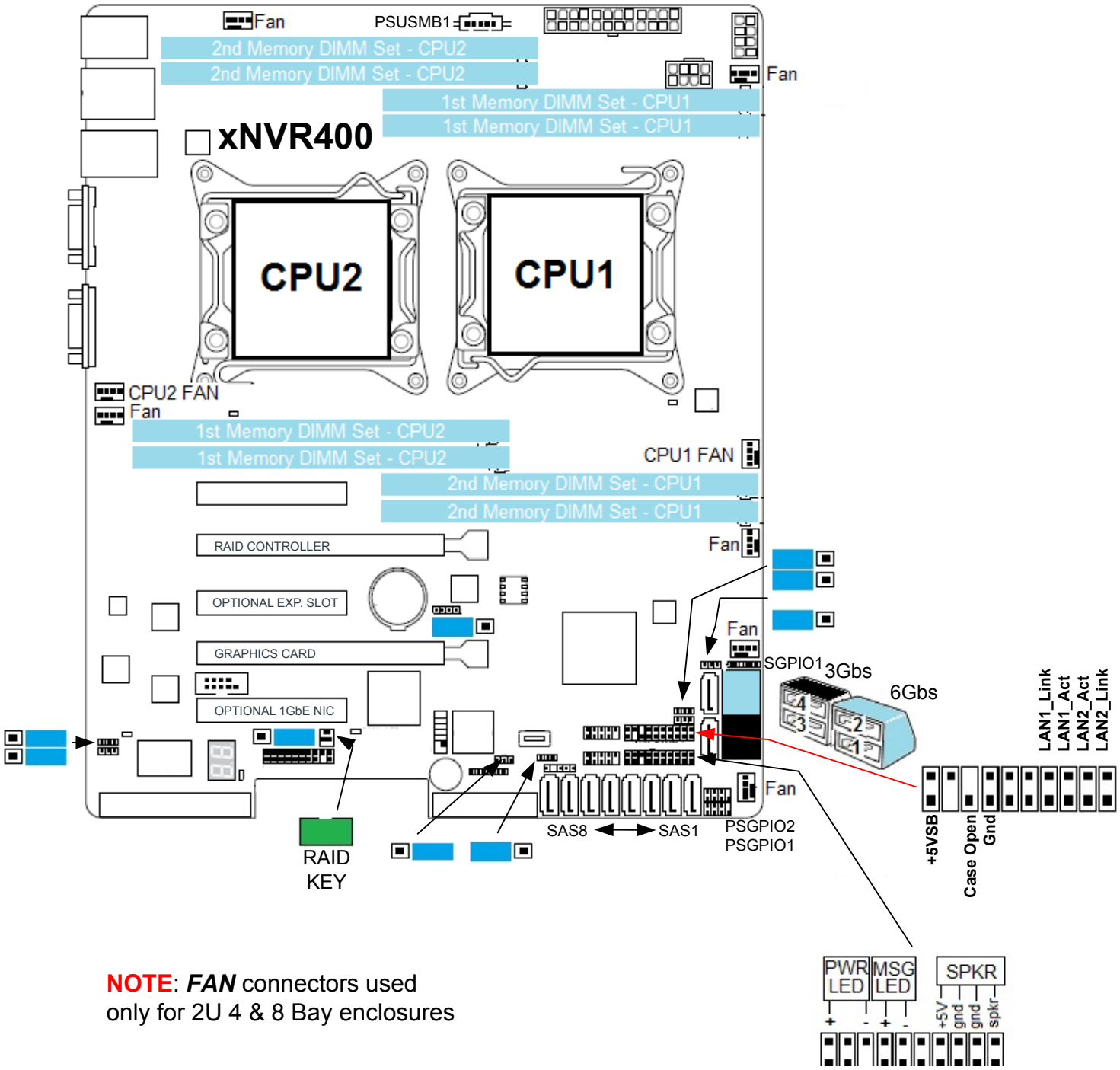


NOTE: ***FAN*** connectors used only for 2U 4 & 8 Bay enclosures

Main Board Jumpers and Wiring xNVR300



Main Board Jumpers and Wiring xNVR400



NOTE: ***FAN*** connectors used only for 2U 4 & 8 Bay enclosures

APPENDIX C

Revisions & BIOS Settings

xNVR200 Revisions

Item	Location Found	Minimum Revision
Main Board	BIOS – First Screen	
Array Controller 9271-4i (2U-4 Bay) 9271-8i (2U 8 Bay – 4U 24 Bay)	MegaRAID Storage Manager & Power Up BIOS display	**FW Package** 23.18.0.0014 MR 5.8 **Web BIOS** 6.1-68-e_68-Rel **Firmware** 3.290.15-2935

xNVR200 BIOS Settings

All default with following exceptions.

ADVANCED

SATA Mode Selection	RAID
S.M.A.R.T. Status Check	Disabled
ACPI Settings	
Enable Hibernation	Disabled
Onboard LAN Configuration	
Intel i210 LAN1 OpROM	Disabled
Intel i210 LAN2 OpROM	Disabled

BOOT

Setup Prompt Timeout	5
Full Screen Logo	Disabled
Boot Options Priorities	
Boot Option #1	P0: Harddisk
Boot Option #2	P4: Optical
Boot Option #3	Disabled

MONITOR

Fan Speed Control	High Speed Mode

xNVR300 Revisions

Item	Location Found	Minimum Revision
Main Board	BIOS – First Screen	
Array Controller 9271-4i (2U-4 Bay) 9271-8i (2U 8 Bay – 4U 24 Bay)	MegaRAID Storage Manager & Power Up BIOS display	**FW Package** 23.18.0.0014 MR 5.8 **Web BIOS** 6.1-68-e_68-Rel **Firmware** 3.290.15-2935

xNVR300 BIOS Settings

All default with following exceptions.

ADVANCED

SATA Mode Selection	RAID
S.M.A.R.T. Status Check	Disabled
ACPI Settings	
Enable Hibernation	Disabled
Onboard LAN Configuration	
Intel i210 LAN1 OpROM	Disabled
Intel i210 LAN2 OpROM	Disabled

BOOT

Setup Prompt Timeout	5
Full Screen Logo	Disabled
Boot Options Priorities	
Boot Option #1	P0: Harddisk
Boot Option #2	P4: Optical
Boot Option #3	Disabled

MONITOR

Fan Speed Control	High Speed Mode

xNVR400 Revisions

Item	Location Found	Minimum Revision
Main Board	BIOS – First Screen	
Array Controller 9271-4i (2U-4 Bay) 9271-8i (2U 8 Bay – 4U 24 Bay)	MegaRAID Storage Manager & Power Up BIOS display	**FW Package** 23.18.0.0014 MR 5.8 **Web BIOS** 6.1-68-e_68-Rel **Firmware** 3.290.15-2935

xNVR400 BIOS Settings

All default with following exceptions.

ADVANCED

SATA Mode Selection	RAID
S.M.A.R.T. Status Check	Disabled
ACPI Settings	
Enable Hibernation	Disabled
Onboard LAN Configuration	
Intel i210 LAN1 OpROM	Disabled
Intel i210 LAN2 OpROM	Disabled

BOOT

Setup Prompt Timeout	5
Full Screen Logo	Disabled
Boot Options Priorities	
Boot Option #1	P0: Harddisk
Boot Option #2	P4: Optical
Boot Option #3	Disabled

MONITOR

Fan Speed Control	High Speed Mode

APPENDIX D

Field Replaceable Unit (FRU) Parts

xNVR200

Group	Part Number		Description
	2U-4 Bay	2U-8 Bay	
Enclosure	HDT-D1S-R	HDT-G-SD-A1	Drive Tray
	FAN-8025-SU-350-3103	FAN-8038-MO-RSC-2EH	Hot Swap Fan Module
	FAN-4028-SU-350-9203		
	PSU-2S510E-ZR	N/A	Non Redundant Single Power Supply
	PSU-SR500E-ZR	PSM-2R800EH-Z2EG2	Redundant Power Supply
	PSM-SR500E-Z-R		Power distribution bd. & harness
	LSR-26R	SLR-ST2837-430-DS	Slide Rail Kit
	N/A	BKP-SA2C-04H35G-0	Drive Midplane
	XC-230-SA10-AR	N/A	Three Drive frame and backplane
	XC-110-SA10-0-R	N/A	Single drive frame
	5220-0000-2		2.5" to 3.5" Adapter frame
Electronics	P9D-MV		Motherboard
	BX80637E31225V2 BX80637E31245V2 BX80637E31275V2		E3-1225 v2 CPU E3-1245 v2 CPU E3-1275 v2 CPU
	P0033-01		95w low profile cooler
	AVF7256U61F9333G3AK2 AVF7251U64F9333G3AK2 AVF721GU67F9333AK2		4GB Memory Set 2x2 8GB Memory Set 2x4 16GB Memory Set 2x8
	01G-P3-2625-KR VCG84DMS1D3SXPB-CG		EVGA Geforce GT 620 PNY CG 8400GS
	LSI00328 9271-4i	LSI003300 9271-8i	RAID Controller
	LSi00297		CacheVault
	OEM-VRC7016L		Analog Capture Card
	E1G42ETBLK		Two x 1GbE PCIe v2 gen2 NIC
	E1G44HTBLK		Four x 1Gbe PCIe v2 gen2 NIC

Group	Part Number			Description
	2U-12 Bay	3U-16 Bay	4U-24 Bay	
Enclosure	HDT-G-SD-A1			Drive Tray
	FAN-8038-2UG-MOR	FAN-12038-3UG-MOR		Hot Swap Fan Module
	PSM-2R800EH-Z2EG2	PSU-2R800EH-Z3EG2	PSU-2RA10EH-Z4EG2	Power Supply
	SLR-TL28-TW-AR			Slide Rail Kit
	BKP-SAS6-12EGS-A1	BKP-SAS6-16EGS-A1	BKP-SAS6-24EGS-A1	Drive Midplane
	BKP-SAS6-E28M-A1		BKP-SAS6-E36M-A1	Midplane Expander Module
	5220-0000-2			2.5" to 3.5" Adapter frame
Electronics	S1200BTSR			Motherboard
	BX80637E31225V2 BX80637E31245V2 BX80637E31275V2			E3-1220 v2 CPU E3-1245 v2 CPU E3-1275 v2 CPU
	AVF7256U61F9333G3AK2 AVF7251U64F9333G3AK2 AVF721GU67F9333AK2			4GB Memory Set 2x2 8GB Memory Set 2x4 16GB Memory Set 2x8
	LSI00328 9271-4i	LSI003300 9271-8i		RAID Controller
	LSi00297			RAID CacheVault Cache Protection
	OEM-VRC7016L			Analog Capture Card
	01G-P3-2625-KR VCG84DMS1D3SXPB-CG			EVGA Geforce GT 620 PNY CG 8400GS
	E1G42ETBLK			Two x 1GbE PCIe v2 gen2 NIC
	E1G44HTBLK			Four x 1Gbe PCIe v2 gen2 NIC

xNVR300

Group	Part Number				Description
	2U-4 Bay	2U-8 Bay			
Enclosure	HDT-D1S-R	HDT-G-SD-A1			Drive Tray
	FAN-8025-SU-350-3103 FAN-4028-SU-350-9203	FAN-8038-MO-RSC-2EH			Hot Swap Fan Module
	PSU-2S510E-ZR	N/A			Non Redundant Single Power Supply
	PSU-SR500E-ZR	PSM-2R800EH-Z2EG2			Redundant Power Supply
	PSM-SR500E-Z-R				Power distribution bd. & harness
	LSR-26R	SLR-ST2837-430-DS			Slide Rail Kit
	N/A	BKP-SA2C-04H35G-0			Drive Midplane
	XC-230-SA10-AR	N/A			Three Drive frame and backplane
	XC-110-SA10-0-R	N/A			Single drive frame
	5220-0000-2				2.5" to 3.5" Adapter frame
Electronics	Z9PA-D8				Motherboard
	BX80621E52603 BX80621E52609 BX80621E52620 BX80621E52630 BX80621E52640	E5-2603 1.8GHz CPU E5-2609 2.4GHz CPU E5-2620 2.0GHz CPU E5-2630 2.3GHz CPU E5-2640 2.5GHz CPU	BX80621E52650 BX80621E52660 BX80621E52670 BX80621E52680 BX80621E52690		E5-2650 2.0GHz CPU E5-2660 2.2GHz CPU E5-2670 2.6GHz CPU E5-2680 2.7GHz CPU E5-2690 2.9GHz CPU
	BXSTS200C				Heatsink/Fan Assembly
	AVF7256R61F9333G1APK AVF7251R62F9333G4AK2 AVF721R84F9333AK2				8GB Memory Set 4x2 16GB Memory Set 4x4 32GB Memory Set 4x8
	01G-P3-2625-KR VCG84DMS1D3SXPB-CG				EVGA Geforce GT 620 PNY CG 8400GS
	LSI00328 9271-4i	LSI003300 9271-8i			RAID Controller
	LSi00297				CacheVault
	varies				OS Disk
	E1G42ETBLK				Two x 1GbE PCIe v2 gen2 NIC
	E1G44HTBLK				Four x 1Gbe PCIe v2 gen2 NIC

Group	Part Number			Description
	2U-12 Bay	3U-16 Bay	4U-24 Bay	
Enclosure	HDT-G-SD-A1			Drive Tray
	FAN-8038-2UG-MOR	FAN-12038-3UG-MOR		Hot Swap Fan Module
	PSM-2R800EH-Z2EG2	PSU-2R800EH-Z3EG2	PSU-2RA10EH-Z4EG2	Power Supply
	SLR-TL28-TW-AR			Slide Rail Kit
	BKP-SAS6-12EGS-A1	BKP-SAS6-16EGS-A1	BKP-SAS6-24EGS-A1	Drive Midplane
	BKP-SAS6-E28M-A1		BKP-SAS6-E36M-A1	Midplane Expander Module
	5220-0000-2			2.5" to 3.5" Adapter frame
Electronics	Z9PA-D8			Motherboard
	BX80621E52603 BX80621E52609 BX80621E52620 BX80621E52630 BX80621E52640	E5-2603 1.8GHz CPU E5-2609 2.4GHz CPU E5-2620 2.0GHz CPU E5-2630 2.3GHz CPU E5-2640 2.5GHz CPU	BX80621E52650 BX80621E52660 BX80621E52670 BX80621E52680 BX80621E52690	E5-2650 2.0GHz CPU E5-2660 2.2GHz CPU E5-2670 2.6GHz CPU E5-2680 2.7GHz CPU E5-2690 2.9GHz CPU
	BXSTS200C			Heatsink/Fan Assembly
	AVF7256R61F9333G1APK AVF7251R62F9333G4AK2 AVF721R84F9333AK2			8GB Memory Set 4x2 16GB Memory Set 4x4 32GB Memory Set 4x8
	LSI00328 9271-4i	LSI003300 9271-8i		RAID Controller
	LSi00297			RAID CacheVault Cache Protection
	01G-P3-2625-KR VCG84DMS1D3SXPB-CG			EVGA Geforce GT 620 PNY CG 8400GS
	E1G42ETBLK			Two x 1GbE PCIe v2 gen2 NIC
	E1G44HTBLK			Four x 1Gbe PCIe v2 gen2 NIC

xNVR400

Group	Part Number				Description
	2U-4 Bay	2U-8 Bay			
Enclosure	HDT-D1S-R	HDT-G-SD-A1			Drive Tray
	FAN-8025-SU-350-3103 FAN-4028-SU-350-9203	FAN-8038-MO-RSC-2EH			Hot Swap Fan Module
	PSU-2S510E-ZR	N/A			Non Redundant Single Power Supply
	PSU-SR500E-ZR	PSM-2R800EH-Z2EG2			Redundant Power Supply
	PSM-SR500E-Z-R				Power distribution bd. & harness
	LSR-26R	SLR-ST2837-430-DS			Slide Rail Kit
	N/A	BKP-SA2C-04H35G-0			Drive Midplane
	XC-230-SA10-AR	N/A			Three Drive frame and backplane
	XC-110-SA10-0-R	N/A			Single drive frame
	5220-0000-2				2.5" to 3.5" Adapter frame
Electronics	Z9PA-U8				Motherboard
	BX80621E52603 BX80621E52609 BX80621E52620 BX80621E52630 BX80621E52640	E5-2603 1.8GHz CPU E5-2609 2.4GHz CPU E5-2620 2.0GHz CPU E5-2630 2.3GHz CPU E5-2640 2.5GHz CPU	BX80621E52650 BX80621E52660 BX80621E52670 BX80621E52680 BX80621E52690		E5-2650 2.0GHz CPU E5-2660 2.2GHz CPU E5-2670 2.6GHz CPU E5-2680 2.7GHz CPU E5-2690 2.9GHz CPU
	BXSTS200C				Heat sink for LGA2011
	AVF7256R61F9333G1APK AVF7251R62F9333G4AK2 AVF721R84F9333AK2				8GB Memory Set 4x2 16GB Memory Set 4x4 32GB Memory Set 4x8
	01G-P3-2625-KR VCG84DMS1D3SXPB-CG				EVGA Geforce GT 620 PNY CG 8400GS
	LSI00328 9271-4i	LSI003300 9271-8i			RAID Controller
	LSi00297				CacheVault
	varies				OS Disk
	E1G42ETBLK				Two x 1GbE PCIe v2 gen2 NIC
	E1G44HTBLK				Four x 1Gbe PCIe v2 gen2 NIC

Group	Part Number			Description
	2U-12 Bay	3U-16 Bay	4U-24 Bay	
Enclosure	HDT-G-SD-A1			Drive Tray
	FAN-8038-2UG-MOR	FAN-12038-3UG-MOR		Hot Swap Fan Module
	PSM-2R800EH-Z2EG2	PSU-2R800EH-Z3EG2	PSU-2RA10EH-Z4EG2	Power Supply
	SLR-TL28-TW-AR			Slide Rail Kit
	BKP-SAS6-12EGS-A1	BKP-SAS6-16EGS-A1	BKP-SAS6-24EGS-A1	Drive Midplane
	BKP-SAS6-E28M-A1		BKP-SAS6-E36M-A1	Midplane Expander Module
	5220-0000-2			2.5" to 3.5" Adapter frame
Electronics	Z9PA-U8			Motherboard
	BX80621E52603 BX80621E52609 BX80621E52620 BX80621E52630 BX80621E52640	E5-2603 1.8GHz CPU E5-2609 2.4GHz CPU E5-2620 2.0GHz CPU E5-2630 2.3GHz CPU E5-2640 2.5GHz CPU	BX80621E52650 BX80621E52660 BX80621E52670 BX80621E52680 BX80621E52690	E5-2650 2.0GHz CPU E5-2660 2.2GHz CPU E5-2670 2.6GHz CPU E5-2680 2.7GHz CPU E5-2690 2.9GHz CPU
	BXSTS200C			Heatsink/Fan Assembly
	AVF7256R61F9333G1APK AVF7251R62F9333G4AK2 AVF721R84F9333AK2			8GB Memory Set 4x2 16GB Memory Set 4x4 32GB Memory Set 4x8
	LSI00328 9271-4i	LSI003300 9271-8i		RAID Controller
	LSi00297			RAID CacheVault Cache Protection
	01G-P3-2625-KR			EVGA Geforce GT 620
	VCG84DMS1D3SXPB-CG			PNY CG 8400GS
	E1G42ETBLK			Two x 1GbE PCIe v2 gen2 NIC
	E1G44HTBLK			Four x 1Gbe PCIe v2 gen2 NIC

NOTES

NOTES