# ArrayMasStor

## J Series

## USER'S MANUAL

P/N A208067

Revision 1.3e

# Foreword

Thank you for purchasing ADTX's ArrayMasStor J Series subsystem.

This manual describes the operation, functions, and specifications of the ArrayMasStor J Series. Please read the manual before using this product.

### *Safety Notice*

Throughout this manual the following symbols are used to highlight safety notice.

| | |
|---|---|
| ⚠ **WARNING** | **Indicates a potentially hazardous situation, which could result in death or serious injury to the user or severe damage to the product.** |
| ⚠ **CAUTION** | **Indicates a potentially hazardous situation, which could result in serious injury to the user or damage to the product.** |
| ***IMPORTANT !*** | **Indicates an important information, which could result in erroneous operation to the product.** |


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## ⚠ WARNING

- The AC power cord must be connected to a grounded outlet. Unless a short-circuit, electrical shock or fire may occur.
- Do not use the ArrayMasStor in hot, humid or dusty environments. Use under conditions may result in a short circuit, electrical shock or fire.
- The ArrayMasStor's cover must be securely attached to the chassis. If the cover is not properly installed, ventilation could be impaired and this may cause a short circuit, electrical shock or fire.
- Do not block the ventilation opens. Without proper ventilation, the ArrayMasStor will malfunction or fail.
- Use the supplied AC power cord unless a short circuit, electrical shock or fire may occur.

## ⚠ CAUTION

- Rapid temperature changes may cause condensation of humidity to form on the ArrayMasStor. Do not use the subsystem where it will not evaporate.
- Do not install the ArrayMasStor near electronic components with strong electromagnetic fields, such as televisions or loud speakers.
- Turn off the power before moving, connecting or disconnecting the ArrayMasStor. This will prevent vibrations or mechanical shocks from damaging the hard disk drives (HDD) and other internal components.
- Do not remove the drive unit during normal operation, as this may cause damage, malfunction or data loss. The drive unit should be removed when they have failed and need to be replaced.
- Use the appropriate SCSI host card for ArrayMasStor in accordance with single-ended or low voltage differential (LVD) SCSI interface. Using the wrong card may damage the subsystem or cause a malfunction to occur.
- Only use the approved replacement drive unit in the ArrayMasStor. Please see Appendix D for a list of approved replacement parts.

- Don't turn on and off continually in an instant. Leave at least 15 seconds after the power is turned on or off. This may avoid damage or malfunction. The HDD requires about 15 seconds to completely stop after turning off the ArrayMasStor.

- Insert to push the drive unit firmly. A loose connection may damage the ArrayMasStor or cause it to malfunction.

- Do not turn the ArrayMasStor off by unplugging the AC power cord from the rear panel. This may result in data loss. The ArrayMasStor's firmware is designed to detect the status of the power switch and synchronize the data in the cache and the drives before shutdown. To control the power from the AC line, send a 'synchronize cache'[1] command from the host computer to the ArrayMasStor.

- When unplugging the AC power cord, leave one minute further before plugging it again. This may prevent fuse damage.

## *IMPORTANT !*

- For optimum performance, the total length of the SCSI bus should be as short as possible. For a single-ended SCSI card, the total cable length must be less than 1.5 m.

- A maximum of two host computers can be connected to the ArrayMasStor in a dual host configuration.

- Set the ArrayMasStor's UNIX[2] C/H/S mode before connecting it to the operating systems shown below. Changing the UNIX C/H/S mode after installation may cause data loss.

  | | |
  |---|---|
  | Solaris[3](SPARC) | 2.X |
  | IRIX[4] | 5.X |

- The backlight on the liquid crystal display (LCD) turns off automatically when the operation buttons are not used for a period of time. The backlight will turn on when the operation button is pressed. The backlight will stay on when a drive fails, when the ArrayMasStor is in data reconstruction mode, and during data initialization.

---

[1] A SCSI command which ensures that logical blocks in the cache have their most recent data value recorded in the drives.

[2] UNIX has two known standards, *System V* by AT&T and *BSD4.x* by Berkeley University.

[3] Solaris™ and Spark™ is a Trademark of SUN Microsystems.

[4] IRIX ™ is a Trademark of Silicon Graphics Inc.

- Strongly recommended that up to two ArrayMasStors be connected to the same bus in the single-ended SCSI.

- Strongly recommended that data be regularly backed up. In RAID levels 1 and 5, the ArrayMasStor will be operative when a drive fails. However, if two or more drives fail, all of the data may not be recoverable. And, if any other parts of the ArrayMasStor malfunction, there is possibility of data loss.

- Strongly recommended that the surface verification check implement before dynamic data reallocation.

- Strongly recommended that an interruptible power supply (UPS) be used with the ArrayMasStor to avoid data loss when the power line is unstable and power outrage happens.

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# 1 Introduction to the ArrayMasStor J Series

**The ArrayMasStor J Series** is a compact, high performance, redundant array of independent disks. The subsystem includes up to four hard disk drives (HDD) and offers high availability and an excellent data transfer rate. The subsystem is easy to install and use, and has a unique interoperability feature that allows it to work through a simple SCSI interface and be recognized as a single drive by a host computer.

## *1.1 Features*

**The ArrayMasStor J Series**

- Stores a large capacity data securely with excellent performance and data availability.
- Allows a failed drive to replace without interrupting system operation. Data reconstruction starts automatically upon drive replacement.
- Starts data reconstruction onto the spare drive starts immediately when a drive fails. (hot spare mode)
- Improves write performance with large-capacity cache buffer.
- Appears as a single drive on the SCSI bus. The 'daisy chained' SCSI connection can be extended extremely a large storage capacity.
- Supports the standard SCSI-3 interface.
- Provides dynamic data reallocation and background surface verification for maximum system availability.
- Allows mixed RAID levels within the one product.
- Simultaneously handle multiple SCSI adapter cards in one or more host computers with multi-initiator feature.

## *1.2 About RAID levels*

The ArrayMasStor J Series supports three RAID levels, so you can choose the optimal level for your application. The default setting is RAID Level 5 if at least 3 hard disk drives are online. The default setting is RAID Level 1 if 2 hard disk drives are online. In the following examples, four drives are assumed to be online.

| | |
|---|---|
| ***IMPORTANT !*** | All stored data will be erased when the RAID level is changed. Back-up data before changing the RAID level. |

### 1.2.1 RAID Level 0

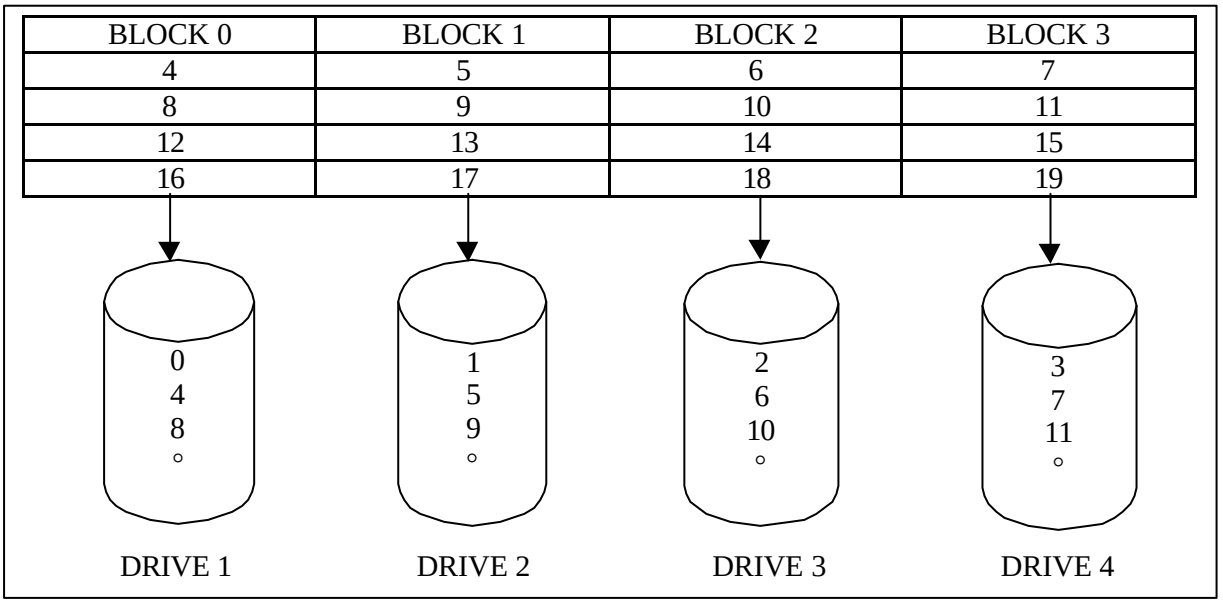
In this level data is striped over all of the drives in the array. This provides the maximum storage capacity, since the entire array is used solely for data storage, and the ArrayMasStor's input/output performance is maximized because of the drives' parallel processing ability.

| | |
|---|---|
| ***IMPORTANT !*** | In RAID Level 0, there is no data redundancy. Data will be lost if a drive fails. |

The effective storage capacity of this RAID level is as follows:

**(Effective storage capacity) = (Capacity of one drive) x (Number of drives)**

This RAID level is suitable for applications that require high performance and the largest available storage capacity, without the need for data protection.



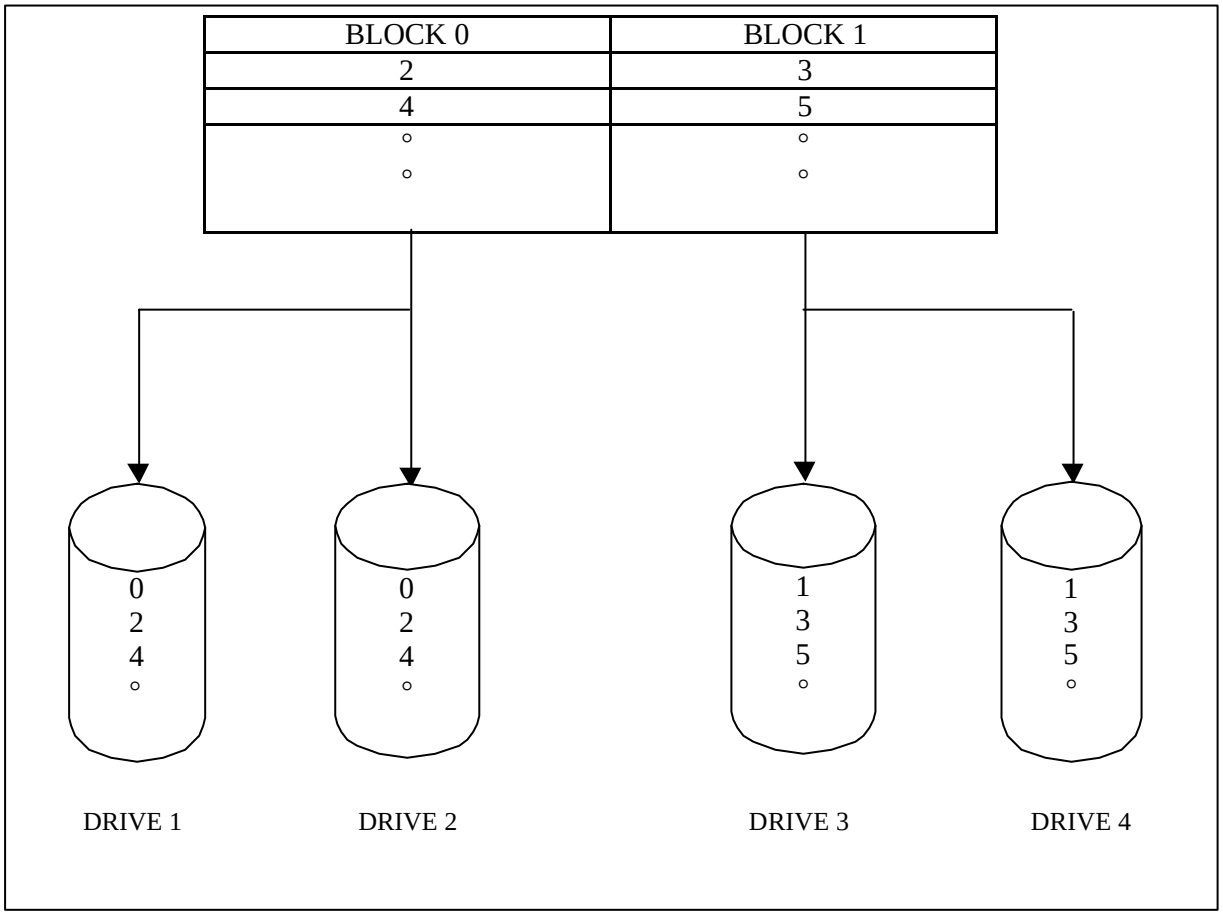
### 1.2.2 RAID Level 1

In RAID Level 1, which is also called mirroring mode, the same data is written to a pair of drives. As a result, if one drive fails, data can still be retrieved from the mirrored drive. The effective storage capacity of the ArrayMasStor in RAID Level 1 is smaller than in RAID levels 0 or 5. However, random write performance of small data blocks improves considerably. In addition, there is no performance degradation when one of the drives actually fails.

The effective storage capacity of this RAID level is as follows:

**(Effective storage capacity) = (Capacity of one drive x Number of drives) ¸ 2**

This RAID level is best for applications that access small data blocks in a random write pattern.



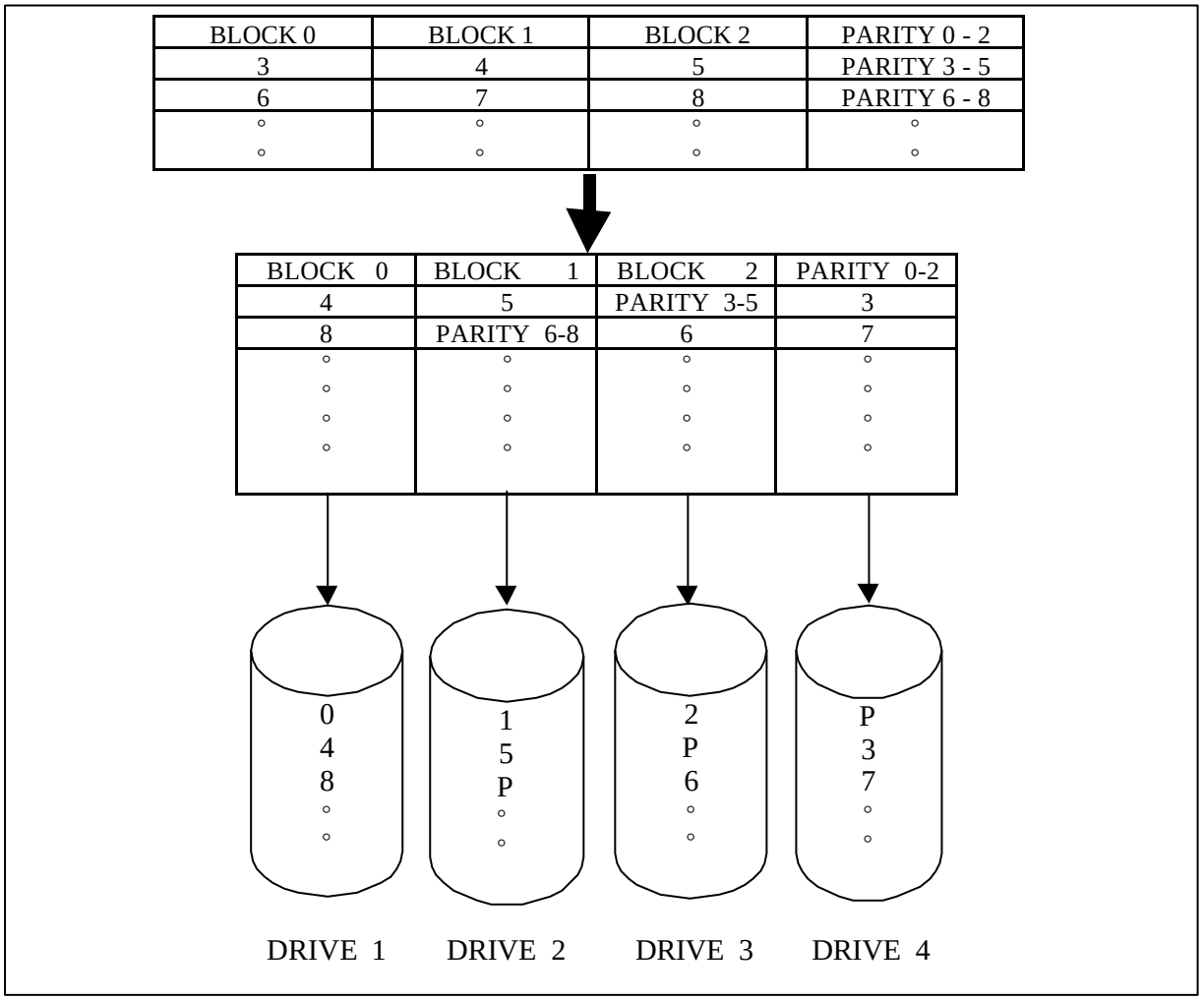
### 1.2.3 RAID Level 5

In RAID Level 5, parity data is generated and stored on the equivalent of one drive. If one drive fails, the lost data can be reconstructed using data recorded on the other drives and the parity data. Parity data is written on all of the drives in order to avoid performance degradation due to the intensive access requirements that would result from using a single or specific parity drive.

The effective storage capacity of this RAID level is as follows:

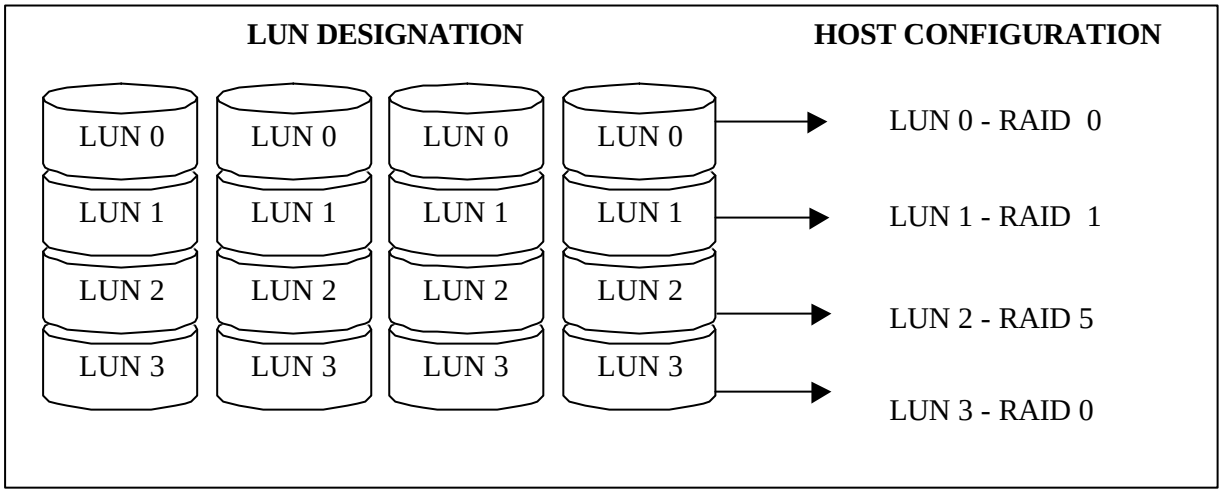
**(Effective storage capacity) = (Capacity of one drive) x (Number of drives - 1)**

This RAID level is most appropriate when data protection is the primary consideration.



## *1.3 Mixed RAID Levels*

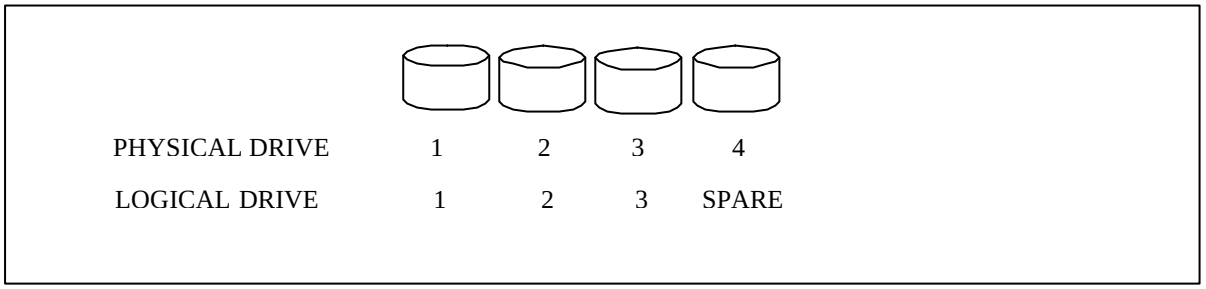
The ArrayMasStor supports mixed RAID levels. This means that the ArrayMasStor can be configured to handle multiple logical units (LU), and that a different RAID level can be assigned to each LU. The ArrayMasStor can support up to seven separate LU (0 – 6) and separate RAID levels. A sample configuration is shown below:



## *1.4 Hot Spare Feature*

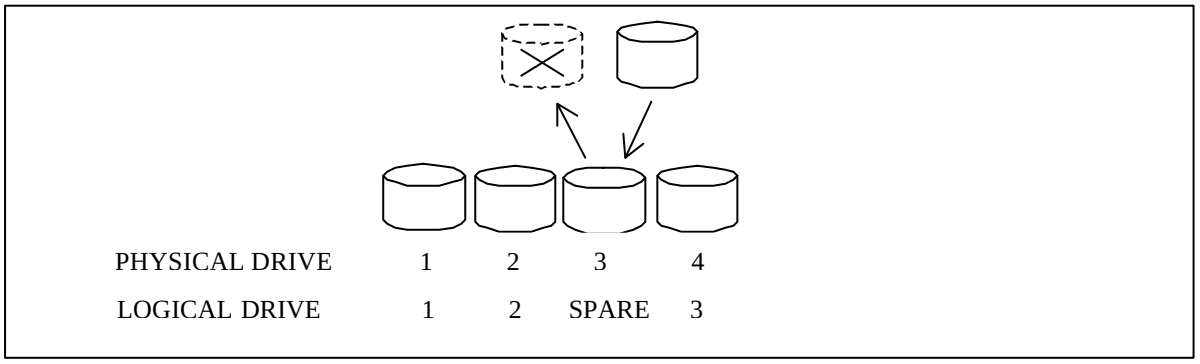
When the hot spare feature is activated, background data recovery onto the spare drive starts immediately after the failure of an on-line drive. This feature reduces the effective storage capacity of the ArrayMasStor, since one drive is reserved as a hot spare. However, the hot spare feature improves the ArrayMasStor's reliability and its ability to protect data. After the data recovery process is complete, the ArrayMasStor is redundant (fault tolerant) again.

In the following example, there are four drives in the ArrayMasStor. The hot spare feature is only available when more than three drives are used.




When one of the on-line drives fails, the data recorded on the failed drive is re-generated and written onto the spare drive. After the data recovery process is complete, the spare drive takes the place of failed drive. For example, if drive #3 fails, the hot spare drive (physical drive #4) becomes logical drive #3.

When the failed drive is replaced, the replacement drive becomes the spare drive.



## 1.5 Write Back Cache Function

When used in RAID Level 5, the write operation for small data blocks causes a data bottleneck. This is because, before it can write the new data, the ArrayMasStor must read the old data and parity, which are needed to generate the new parity[5]. This phenomenon, which is called the write penalty, impairs performance when the host computer accesses the ArrayMasStor in a random write pattern.

The ArrayMasStor uses a large buffer as a write-back cache to compensate for the write penalty problem. When data is acquired into the cache buffer by a 'write' command issued by the host computer, the ArrayMasStor returns a 'complete' command to the host computer. The ArrayMasStor gathers the small amounts of write data to the cache buffer and writes this data onto the drives at one time.

When shutting down the ArrayMasStor using the power switch on the front panel, the ArrayMasStor's firmware detects the power switch status, flushes the data in the cache to the drives, and then turns off the power. When powering down from the AC line, a 'synchronize cache' command must be sent from the host computer to the ArrayMasStor before the power is turned off. Failure to use the 'synchronize cache' command can result in data loss.

| | |
|---|---|
| ***IMPORTANT !*** | Push Power Switch to turn off except for emergency. Turning off by pulling out Power Line Cord may cause data loss in the cache buffer. |

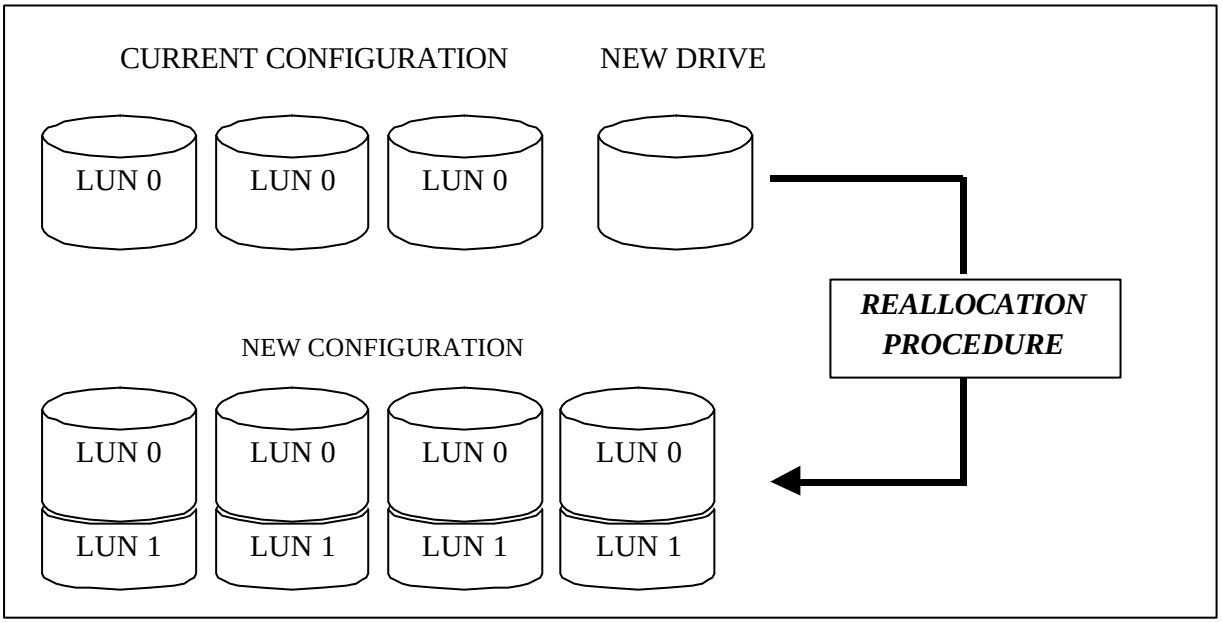
Plugging AC power cord can't be POWER-ON condition of ArrayMasStor J series.

| | |
|---|---|
| ***IMPORTANT !*** | Strongly recommended that an interruptible power supply (UPS) be used to avoid data loss when the power line is unstable and power outrage happens. |

[5] This is called "Read Modify Write".

## *1.6 Dynamic Data Reallocation*

The ArrayMasStor J Series supports dynamic data reallocation, which allows the expansion of the ArrayMasStor's capacity by adding new drives without data loss. The additional storage capacity is assigned a new LUN.




The original data is reallocated to suitable locations, and the parity data (for RAID Level 5) is automatically regenerated. For RAID Level 1, the mirror data is written alongside the original data and the original drive information is re-striped over the new drives. RAID Level 0 also offers this feature, but there is no data redundancy when the re-stripping or reallocation procedure is executed.

Increasing the number of drives allows the same total storage capacity to be accessed faster, because four (rather than three) drives are concurrently accessing the 40 MB of data in each LUN. Each new LUN is treated as an individual drive by the host computer, and is easily configured from the operating system for immediate use.

| | |
|---|---|
| ***IMPORTANT !*** | Strongly recommended that the surface verification check implement before dynamic data reallocation. |

| | |
|---|---|
| ***IMPORTANT !*** | ArrayMasStor won't permit to access from the host computer while carrying out dynamic data reallocation. |

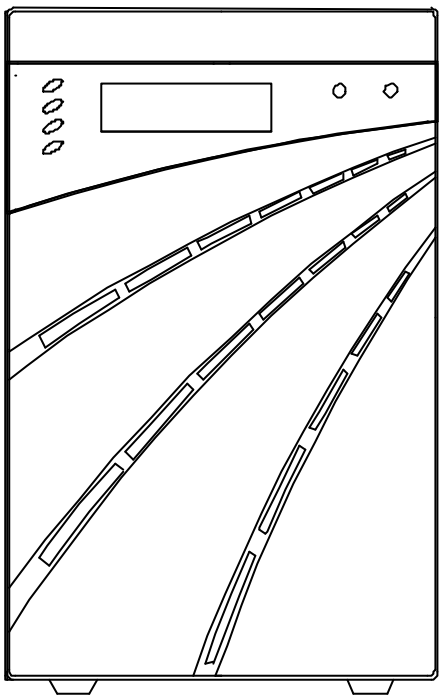
## *1.7 Multi-Initiator*

The ArrayMasStor has a multi-initiator feature that allows it to handle multiple SCSI adapter cards from one or more host computers. When multiple SCSI adapter cards (initiators) are connected to the ArrayMasStor, each initiator can access the ArrayMasStor sequentially.

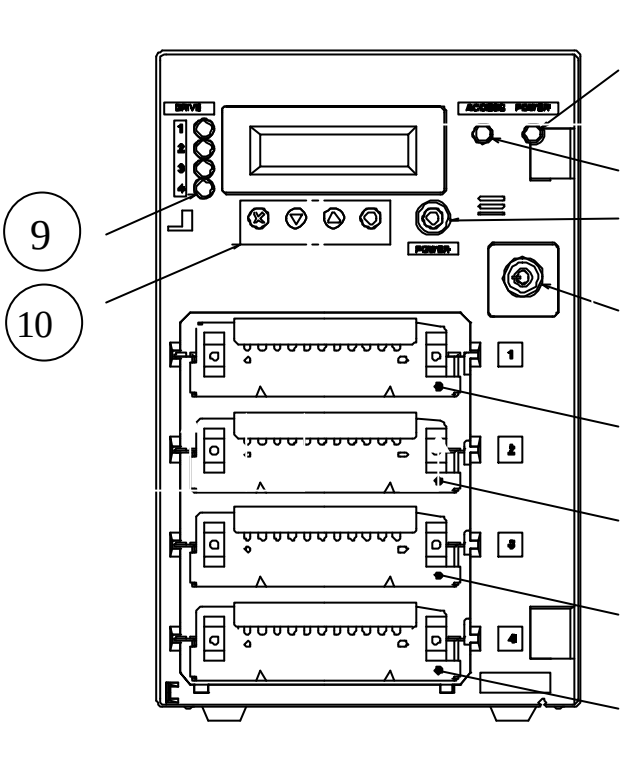
# 2 Naming Convention

## *2.1 Front view*

Front cover

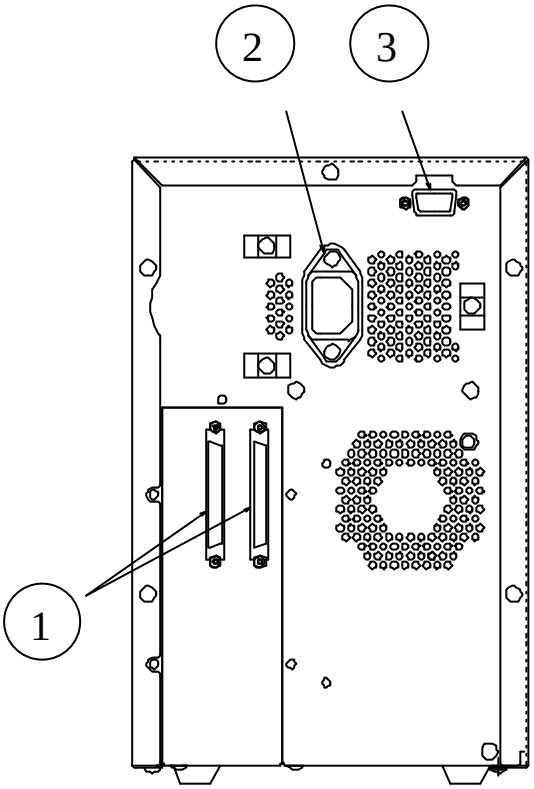


## Removal of Front cover




1. Power LED
2. Host Access LED
3. Power switch
4. Drive lock
5. Drive unit #1
6. Drive unit #2
7. Drive unit #3
8. Drive unit #4
9. Drive access LED
10. Operation buttons

## *2.2 Rear view*




1. SCSI connector
2. Power cord receptacle
3. RS-232C connector
   (for serial interface )

# 3 Installing the ArrayMasStor J Series

First, position the ArrayMasStor J series in stable manner and attach the supplied Front cover.
Then, follow these instructions to connect the ArrayMasStor to a host computer.
Default settings are listed in Appendix C.

| | |
|---|---|
| ⚠ **CAUTION** | Never carry the ArrayMasStor with holding the Front cover or the handle of Drive unit. |

| | |
|---|---|
| ⚠ **CAUTION** | Be sure to attach the Front cover and to let it closed. |

## *3.1 Connecting the Power Line Cord*

Plug the supplied AC power cord to the receptacle and outlet. The ArrayMasStor uses a 100V~240VAC universal power supply with automatic voltage detection.

| | |
|---|---|
| ⚠ **CAUTION** | Plugging AC power cord won't be POWER-ON condition of ArrayMasStor J series. |

## *3.2 Connecting the SCSI Cable*

Use a SCSI cable, meeting SCSI-2 or SCSI-3 specifications, to connect the ArrayMasStor to the host computer's SCSI interface. If the ArrayMasStor is located at the end of the SCSI bus, attach a SCSI terminator to the unused SCSI connectors on the back of the ArrayMasStor.

| | |
|---|---|
| ***IMPORTANT !*** | For optimum performance, the total length of the SCSI bus should be as short as possible. For a single-ended SCSI card, the total cable length must be less than 1.5 m. |

## *3.3 Turning the Power On*

Pressing the power switch for more than 1 second can turn on the ArrayMasStor. Before switching on the power, check that all drive units are inserted firmly. And switch on the ArrayMasStor before turning on the host computer.

## 3.4 Setting the Password

The ArrayMasStor has a default password that is used to change the configuration (see Appendix C). The procedure for changing the password can be found in section 4.8.1., Entering the Password.

## 3.5 Setting the Time & Date

The clock values in the configuration menu are set to a default value. To change the clock value, use the CHANGE CONFIG menu and follow the procedure in section 4.8.2, Changing the Date and Time Setting. Before using the ArrayMasStor, set the internal clock to the local time. The correct local time is required for proper operation of the background surface verify function.

## 3.6 Setting the SCSI ID

The SCSI ID should be set before starting the host computer. See section 4.8.3, Changing the SCSI ID for information about changing the SCSI ID. The ArrayMasStor must be restarted before changes to the SCSI ID will take effect.

## 3.7 Setting the Spare Mode and Reconfiguring the LUN

All data will be erased when the spare mode or the LUN settings are changed. As a result, changes to these settings must be made before creating partitions or formatting the storage area. For information about setting the spare mode, see section 4.10.1, Add Drive as Hot Spare Drive. After setting the spare mode and the LUN configuration, restart the ArrayMasStor. The new settings will take effect after the initialization process is completed.

The spare mode does not need to be set if the default settings are used.

## 3.8 Formatting

Before using, the ArrayMasStor must be partitioned or formatted so that they will work with the host computer's operating system. Partitioning and formatting instructions can be found in your operating system manuals. In some cases, BIOS, file systems, or operating systems place limitations on the capacity of a single partition. If this occurs, divide the usable area of the ArrayMasStor into partitions that conform to the capacity limitations. In general, the format operation provided by some of device drivers and diagnostic programs is not needed in order to be able to use the ArrayMasStor.

## 3.9 Connection to a Macintosh[6]

The following limitations apply when connecting the ArrayMasStor to a Macintosh computer:

- Supported Machines
  CPU : 68040 or Power PC

[6] Macintosh is a trademark of Apple Computer, Inc.

OS : System 7.1 or above

- The drive formatter provided with Apple computers only recognizes drives supplied by Apple Computer. In order to format the ArrayMasStor for use with a Macintosh, a hard disk formatter from a third party is necessary. The Hard Disk Tool kit by FWB is recommended.
- The ArrayMasStor does not support blind transfer. Please set the transfer mode to non-blind transfer.
- Each partition has a maximum capacity of 2GB on a system 7.0 and 4GB on a system 7.5. If the ArrayMasStor's capacity exceeds these limitations, the entire storage capacity should be divided into several smaller partitions.

## *3.10 Connection to the UNIX Systems*

- The UNIX C/H/S mode must be set before the ArrayMasStor is connected to the following operating systems:

| | |
|---|---|
| Solaris (SPARC) | 2.X |
| IRIX | 5.X |

- The configuration file in Sun OS (Solaris 2.5.1/2.6) must be edited to use the LUN.

Example (To set two LUNs to the ArrayMasStor J Series at SCSI ID 0)

**SPARC station5 Turbo 170M**
File name to edit : /kernel/dev/sd.conf

| Before Edit | After Edit |
|---|---|
| name="sd" class="scsi" | name="sd" class="scsi' |
| target=0 lun=0; | target=0 lun=0; |
| : | **name="sd" class="scsi"** |
| : | **target=0 lun=1;** |
| : | : |
| name="sd" class="scsi" | name="sd" class="scsi" |
| target=15 lun=0; | target=15 lun=0; |

**PC-AT (for Intel) Adaptec AHA-2940UW**
filename to edit : /kernel/dev/cmdk.conf

| Before Edit | After Edit |
|---|---|
| name="cmdk" class="scsi" | name="cmdk" class="scsi" |
| target=0 lun=0; | target=0 lun=0; |
| : | **name="cmdk" class="scsi"** |
| : | **target=0 lun=1;** |
| : | : |
| name="cmdk" class="scsi" | name="cmdk" class="scsi" |
| target=15 lun=0; | target=15 lun=0; |

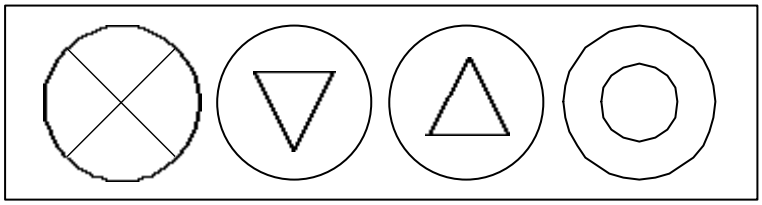
After editing the configuration file, re-boot the system with the boot option "-r".
If the file is change correctly, the new LUN will appear on the ArrayMasStor's display when it is restarted.

# 4 ArrayMasStor J Series Operations

The ArrayMasStor‘s status is displayed on the operation panel. By selecting menus using the operation buttons, you can review the ArrayMasStor’s status information, or make changes to the ArrayMasStor’s configuration.

## *4.1 Operation Buttons*

There are four operation buttons. The up and down buttons scroll from one menu item to the next. The select button is used to activate the menu item shown on the display. The Cancel button returns the display to the previous menu.

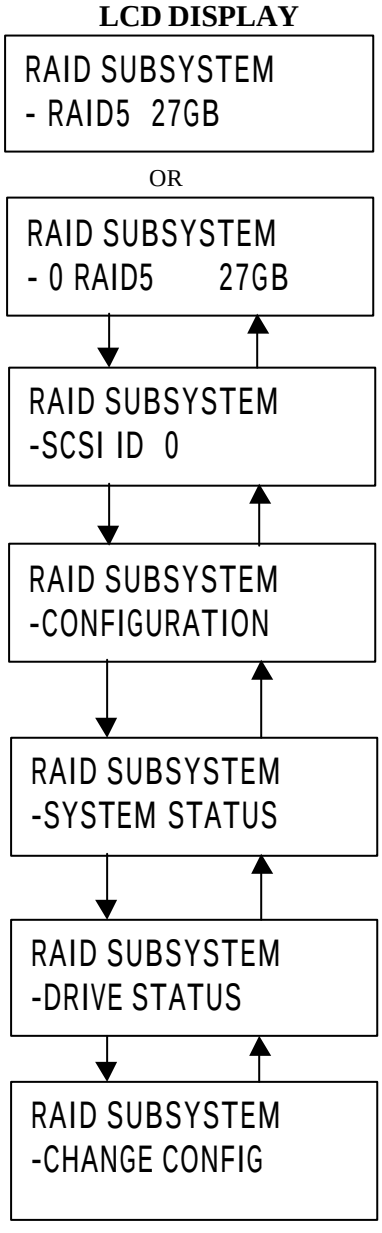


**Cancel** **Down** **Up** **Select**

## *4.2 Status Display (Main Menu)*

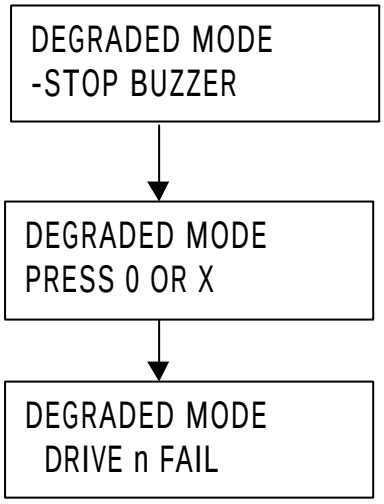
### 4.2.1 Normal Mode

When the ArrayMasStor is functioning normally, the SCSI ID, RAID level and the ArrayMasStor's capacity are displayed. To change the menu, press the up or down button. Press the select button to choose a menu item.



### 4.2.2 Degraded Mode (drive failure)

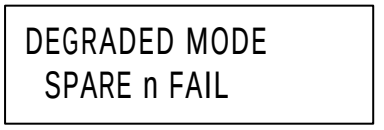
When a drive fails, the physical number of the defective drive is displayed on the operation panel and the status indicator next to the failed drive turns red. If the buzzer is switched on, it will beep. If a drive fails, it should be replaced as soon as possible.



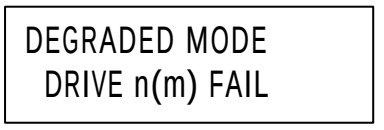

This display indicates that the subsystem is in degraded mode, which means that one of the drives has failed. When the buzzer mode is switched on, the buzzer beeps and STOP BUZZER appears on the display.

To turn the buzzer off, press the select button. When the buzzer mode is off, this is replaced by the DRIVE n FAIL display as shown in the next figure.

This is the final display for degraded mode.



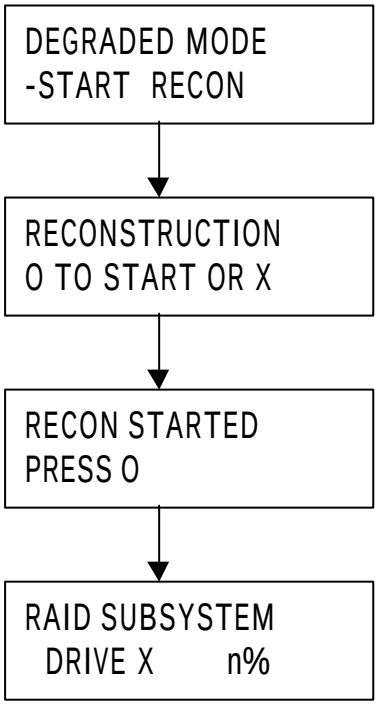

If a spare drive fails, the system goes to degraded mode, the drive number is displayed.




If a data drive and a spare drive fail simultaneously, the drive numbers are displayed, where n is the main drive and m is the spare drive.

### 4.2.3 Drive Replacement

When auto reconstruction mode is turned on, data reconstruction starts automatically after a failed drive is replaced. When auto reconstruction mode is turned off, a menu to start reconstruction is displayed after the failed drive is replaced, and data reconstruction must be initiated manually. The following example assumes that a drive has failed and auto reconstruction mode is turned off.




The display indicates that the failed drive has been replaced. Press the select button to start data reconstruction.

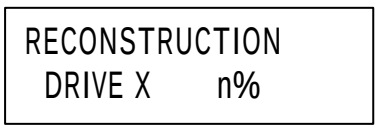
To confirm the start of data reconstruction, press the select button. If the cancel button is pressed, the display returns to the main menu without starting reconstruction.

Press the select button to confirm.

The display indicates that data reconstruction has started, and indicates the drive that is being reconstructed, and the progress (in percent) of the reconstruction process. When data reconstruction is complete, the display returns to the main menu.

The display indicates that reconstruction has finished with spare drive configuration. After the failed spare drive is being replaced, the display returns to the main menu.

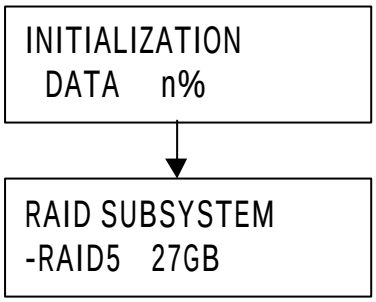
### 4.2.4 Data Reconstruction




The target drive for data reconstruction and progress (in percent) of the reconstruction are displayed.

### 4.2.5 Data Initialization

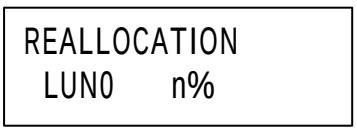
When the RAID level or spare drive settings are changed, data initialization is necessary to ensure the consistency of the parity or mirror data. After changing the RAID level or spare drive settings, the ArrayMasStor should be turned off. After restarting the ArrayMasStor, data initialization starts automatically. Another method to start data initialization is to select the INITIALIZE option from the operation panel after the ArrayMasStor fails. The time required for data initialization depends on the configuration and storage capacity of the ArrayMasStor.




During the data initialization, the progress (in percent) is displayed. When initialization is in progress, the ArrayMasStor will not accept SCSI commands from the host computer.

When data initialization is complete, the operation panel returns to the main menu and the ArrayMasStor accepts SCSI commands from the host computer.

### 4.2.6 Data Reallocation




During dynamic data reallocation, the progress (in percent) is displayed. When dynamic data reallocation is in progress, the ArrayMasStor will not accept SCSI commands from the host computer.

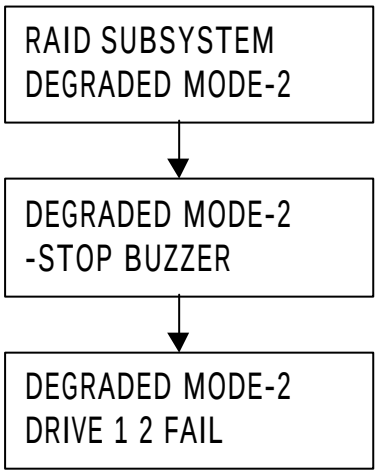
### 4.2.7 Double Fault (Failure of two or more drives)

When two or more drives fail, data stored on the ArrayMasStor cannot be reconstructed and some or all of the data will be permanently lost. To avoid double fault, failed drives should be replaced as soon as possible.

There are two ways to return to the normal mode.

a) Replace only the first failed drive by following the procedures in section 4.2.8, Forced Data Reconstruction.

b) During system halt, replace the failed drives by following the procedures in section 4.2.9, System Halt.




The display indicates that the ArrayMasStor is in degraded mode 2, which means that two or more drives have failed.

This menu turns off the buzzer. Pressing the select button advances the display to the stop buzzer menu.

The display indicates the physical numbers of the failed drives.

| | |
|---|---|
| ***IMPORTANT !*** | When two or more drives fail, some or all of the data will be erased. If a drive fails, replace it as soon as possible |

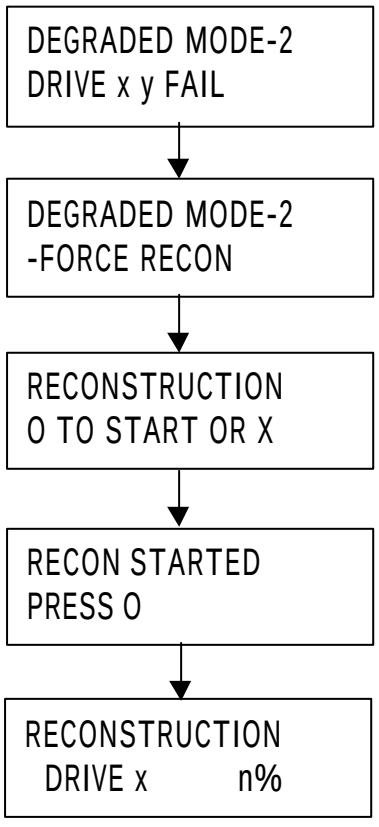
### 4.2.8 Forced Data Reconstruction

Normally, when two drives fail, it is necessary to save the remaining data onto back-up media (e.g. tape) and replace the failed drives. If back-up media are unavailable, the ArrayMasStor allows users to perform forced data reconstruction. During forced data reconstruction, the ArrayMasStor detects the unrecoverable read errors in the source drives, skips the damaged sector and continues to reconstruct from the next sector, until the last sector has been reconstructed. The data in the sector or sectors with unrecoverable errors are either damaged or lost.

When two drives fail, DRIVE X Y FAIL appears on LCD display, where X is the physical number of the first failed drive. Replace the first failed drive (X) before replacing the second failed drive (Y).

(**Note**: If the second failed drive (Y) is replaced before the first failed drive (X), the ArrayMasStor enters system halt mode and the host computer cannot access the data in the ArrayMasStor. If this happens, swap drives X and Y and then restart the ArrayMasStor.)

After replacing the first failed drive, FORCE RECON appears on the display. This menu appears when the source drive failed during normal reconstruction mode, without replacement of the first failed drive. Press the select button to start forced data reconstruction. When the data reconstruction is complete, the ArrayMasStor enters degrade mode (when only one failed drive is left), or degrade mode-2 (when more than one failed drives are left), except spare drive.




The display indicates that two drives have failed. Replace the first failed drive (x), before replacing the second failed drive (y).

The display indicates that the first failed drive has been replaced. Press the select button to start forced data reconstruction.

Press the select button again to confirm the start of force data reconstruction. If the cancel button is pressed, the display returns to the main menu and reconstruction is cancelled.

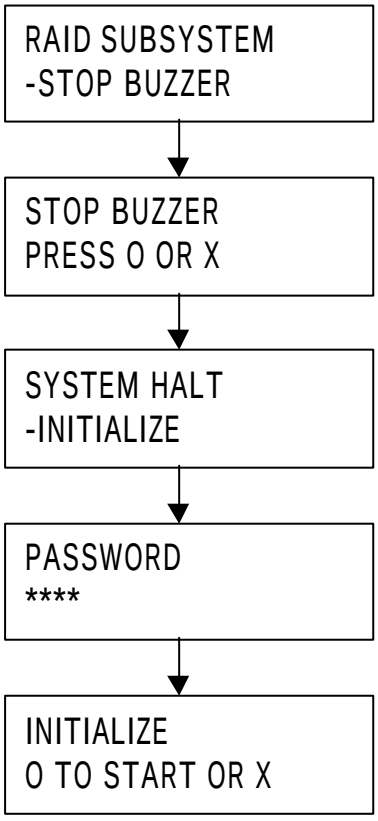
Press the select button again to confirm the start of forced data reconstruction.

The display indicates the forced data reconstruction has started, and indicates the drive that is being reconstructed, and the progress (in percent) of the reconstruction process. When forced data reconstruction is complete, the display returns to degraded mode or degraded mode-2 menu.

### 4.2.9 System Halt

When an unrecoverable error occurs (due to the replacement of two or more drives, or to the failure of the RAID controller board), the ArrayMasStor enters system halt mode. In system halt mode, the ArrayMasStor prevents further data corruption by rejecting SCSI commands from host computer. If a system halt occurs for reasons other than those stated above, contact your service representative for assistance.

| | |
|---|---|
| ***IMPORTANT !*** | During initialization all user data is erased. |




The display indicates that the ArrayMasStor has entered system halt. If the buzzer is switched on, it will beep. To stop the buzzer, press the select button.

To turn off the buzzer, press the select button again. If the cancel button is pressed, the display returns to the previous menu without turning off the buzzer.

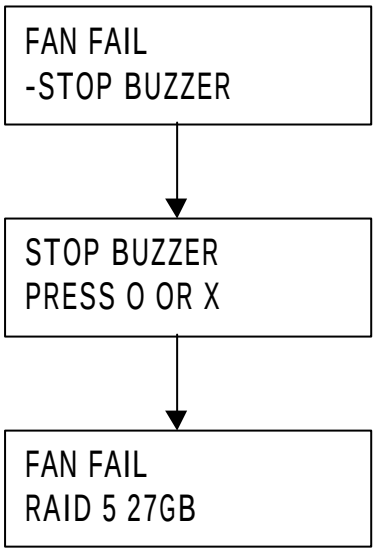
Initialization erases all error information on the drives and returns the system to normal mode. However, during initialization all data is erased.

A password is necessary to start initialization. For instruction on how to enter the password, see section 4.9.1, Entering the Password. Press the cancel button to return the display to the previous menu.

Press the select button again to confirm. Press the cancel button to return the display to the previous menu and abort the initialization process.

### 4.2.10 Fan Failure

The ArrayMasStor is equipped with one fan that dissipates the heat generated by the drives. Without the fan, the drive may fail due to lack of ventilation. If the fan fails, contact your service representative for assistance.




The display indicates that the fan has failed. If the buzzer is switched on, it will beep. To stop the buzzer, press the select button.

To turn off the buzzer, press the select button again. If the cancel button is pressed, the display returns to the previous menu without turning off the buzzer.

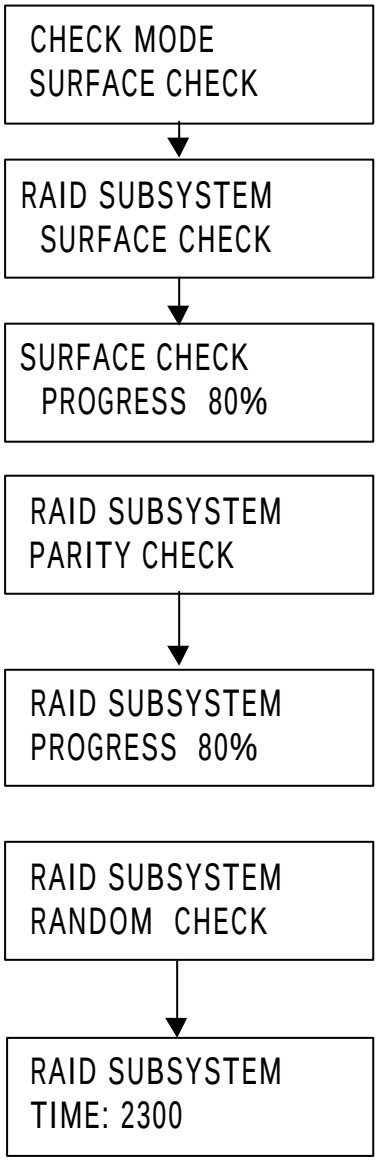
The display returns to the main menu, the FAN FAIL appears, along with the ArrayMasStor's RAID level and total storage capacity.

### 4.2.11 Surface Check

The Surface Check function prevents a double fault from occurring when an error correcting code (ECC) fault is encountered while the ArrayMasStor is operating in degraded mode. This function is not available in RAID Level 0, because the data are not redundant. In RAID Levels 1 and 5, the surface check scans the drives for ECC faults and fixes these errors by overwriting them with correct data generated from the mirror or parity data. The ArrayMasStor uses three selectable methods to check data:

Surface check: This scans the entire data area for ECC faults and reconstructs and overwrites errors.
Parity regeneration: In RAID Level 5, this regenerates each parity block and rewrites it to the drives.
Random Check: This scans random storage areas for ECC faults and fixes the errors.

All of these tests should be performed periodically to ensure data and parity consistency.




From the Change Configuration menu, use the up or down button to choose the SURFACE CHECK option.

After selecting the SURFACE CHECK option, the ArrayMasStor immediately checks the entire data storage area.

During the procedure, the progress of the scan is displayed in percent. When the scan is complete, the display returns to the main menu.

Choose the PARITY CHECK option from the CHECK MODE menu to start the parity regeneration process. This process begins with the surface check procedure and is followed by the parity regeneration procedure. This option is only available if one of the LUNs is set to RAID Level 5.

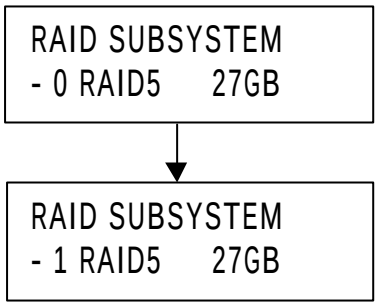
During the procedure, the progress of the scan is displayed in percent. When the scan is complete, the display returns to the main menu.

Choosing RANDOM CHECK from the SURFACE CHECK menu starts the random check procedure.

When random check option is selected, the start time for the check appears on the display.

## 4.3 LUN Configuration

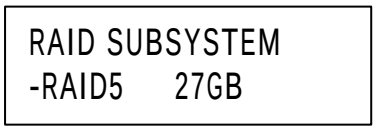
The LUN is shown through the Operation Panel.



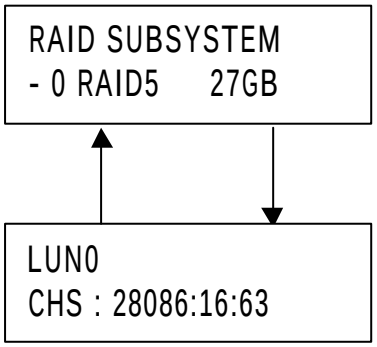

The information of LUN 0 is shown on the display. Press the up or down buttons to display other LUN information for multi-LUN configuration case.

The information of LUN 1 is shown on the display by pressing the down button.

## 4.4 CHS Information



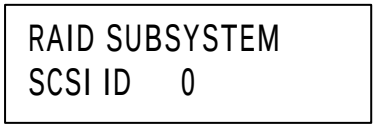

In single LUN configuration, the RAID level and the capacity information are shown on the display.




In multi-LUN configuration, the LUN number, RAID level, and capacity information are shown on the display. Pressing the select button will show the CHS information.

Press the select button to display the CHS information of LUN 0.

## 4.5 SCSI ID Configuration




SCSI ID can be configured from the main menu. Press the up or down buttons to select the SCSI ID number.

## *4.6 Display System Configuration*

| |
|---|
| RAID SUBSYSTEM<br>-CONFIGURATION |

From the main menu, use the up or down button to display the configuration menu. Press the select button to choose the configuration menu, and then use the up or down button to select the items to be displayed.

### 4.6.1 Number of Drives

| |
|---|
| CONFIGURATION<br>4 DRIVES ONLINE |

This displays the number of drives installed in the ArrayMasStor.

### 4.6.2 Hot Spare Drive

| |
|---|
| CONFIGURATION<br>NO SPARE DRIVE |

When a spare drive is installed and configured, SPARE ASSIGNED appears. If the spare drive is not installed and configured, NO SPARE DRIVE appears.

### 4.6.3 Buzzer Mode

| |
|---|
| CONFIGURATION<br>BUZZER ON |

The on/off status of the buzzer is displayed. When the buzzer is on, it beeps when a failure occurs.

### 4.6.4 Automatic Reconstruction Mode

| |
|---|
| CONFIGURATION<br>AUTO RECON ON |

When automatic reconstruction mode is turned on, data reconstruction starts automatically when a replacement drive is installed. If both the hot spare drive and auto reconstruction mode are enabled, data reconstruction on the spare drives starts automatically after a drive fails. When automatic reconstruction mode is turned off, after a failed drive has been replaced, DRIVE REPLACED – START RECON appears on the display. Data reconstruction can now be started (see section 4.2.4, Data Reconstruction).

### 4.6.5 Write Cache Mode

| CONFIGURATION<br>WRITE CACHE ON |
|---|

The Write Cache Mode controls the ArrayMasStor's controller card and drive cache. Disabling the write cache mode bypasses the drive cache and causes data to be written directly to the drives. This degrades the ArrayMasStor's performance.

### 4.6.6 AIX Error Notice Mode

| CONFIGURATION<br>ERR NOTICE OFF |
|---|

If the ArrayMasStor is used with an RS/6000 machine that uses AIX operating system, the AIX error notice mode should be turned on. This will allow the ArrayMasStor to receive logged data through the AIX "errpt" command. If the ArrayMasStor is used with a non-AIX operating system, the AIX error notice mode should be turned off.

| ***IMPORTANT !*** | Turn off the AIX error notice mode when using the ArrayMasStor with non-AIX operating system. Failure to do so may cause the ArrayMasStor to malfunction. |
|---|---|

### 4.6.7 UNIX C/H/S Mode

| CONFIGURATION<br>UNIX C/H/S OFF |
|---|

The UNIX C/H/S status is displayed. When the ArrayMasStor is used with host computers using the UNIX operating system, the C/H/S mode should be turned on.

### 4.6.8 Ultra SCSI Mode

| CONFIGURATION<br>ULTRA SCSI ON |
|---|

When the ultra SCSI mode is turned on, a maximum data transfer rate of 40MB/second can be achieved. If it is turned off, the maximum transfer rate is 20MB/s.

### 4.6.9 Initiator Mode

| CONFIGURATION<br>INITIATOR OFF |
|---|

When the initiator mode is turned on, the ArrayMasStor can copy its data to another storage device, such as a SCSI drive or another ArrayMasStor. The new storage device must have a capacity that is equal to or greater than the ArrayMasStor's.

### 4.6.10 Background Surface Check

| CONFIGURATION<br>PERIODIC CHK ON |
|---|

When the background surface check is turned on, the ArrayMasStor automatically performs surface checks. The default setting is on, with checks starting at 00:00 each Sunday. The execution time is 60 minutes and, for proper operation, the ArrayMasStor's internal clock must be set to the correct local time.

| CONFIGURATION<br>WEEKLY (SUN) |
|---|

The check interval (weekly each Sunday) is displayed. The ArrayMasStor supports three user-selectable intervals: once, twice and three times per week.

| CONFIGURATION<br>00:00 (60 MIN) |
|---|

The start time (00:00) and execution time (60 minutes) are displayed.

### 4.6.11 DPO/FUA Bit

| CONFIGURATION<br>DPO/FUA BIT OFF |
|---|

The DPO/FUA (disable page out/force unit access) is used only when the host computer's operating system issues the FUA command for every read/write command. Use of this command[7] degrades the ArrayMasStor's performance. To prevent this from happening, the DPO/FUA bit should be turned off.

| ***IMPORTANT !*** | Only turn on the DPO/FUA bit if your operating system uses the force unit accesses command with its read and writes operations. For additional information, see your operating system manual. |
|---|---|

[7] When a FUA read/write command is sent to the ArrayMasStor, the cache is bypassed and the read and write operations are sent directly to the drives. This results in impaired performance.

## *4.7 System Status*

| RAID SUBSYSTEM<br>-SYSTEM STATUS |
|---|

From the main menu, use the up or down button to display SYSTEM STATUS. Then press the select button to access the system status menu. Press the up or down button to access the following information.

### 4.7.1 System Status

| SYSTEM STATUS<br>XXXXXXXXXXXX |
|---|

The system status is displayed. System status has the following meanings.

| **STATUS** | **DESCRIPTION** |
|---|---|
| NORMAL MODE | The ArrayMasStor is operating without errors. |
| DEGRADED MODE | One of the drives has failed. Replace the failed drive as soon as possible. |
| RECONSTRUCTION | Data reconstruction is in progress. |
| REPLACED | A failed drive has been replaced. Reconstruction has not started because the auto reconstruction mode is turned off. Use the operation buttons to start data reconstruction. |
| DEGRADE MODE-2 | Two or more drives have failed. Save all data onto backup media and replace the failed drives. |
| RECONSTRUCTION-2 | Forced data reconstruction is in progress. If a sector of the source drive cannot be read, data reconstruction skips that sector and proceeds to the next sector. |
| REALLOCATION | Data reallocation is in process. In reallocation mode, ArrayMasStor ignores commands from the host computer. |
| INITIALIZING | Data initialization is in process because the RAID level or spare setting has been changed. During initialization, ArrayMasStor ignores commands from the host computer. |
| SYSTEM HALT | Two drives have failed, an unrecoverable error has occurred or drives have been replaced incorrectly. |

### 4.7.2 Serial Number

| |
|---|
| SYSTEM STATUS<br>S/N: XXXXXXXX |

The ArrayMasStor's serial number is displayed.

### 4.7.3 Microcode Revision

| |
|---|
| SYSTEM STATUS<br>MICRO: JXXX |

This menu displays the version number of the microcode.

### 4.7.4 System Status Code

| |
|---|
| SYSTEM STATUS<br>CODE: XXXXXXX |

The first four digits of the system status code are displayed. For additional information about system status codes, see section 4.7.1, System Status.

| |
|---|
| SYSTEM STATUS<br>MORE: XXXXXXX |

The last four digits of the system status code are displayed.

### 4.7.5 System Status Time and Date

| |
|---|
| SYSTEM STATUS<br>TIME: 10:10 |

Displays the time.

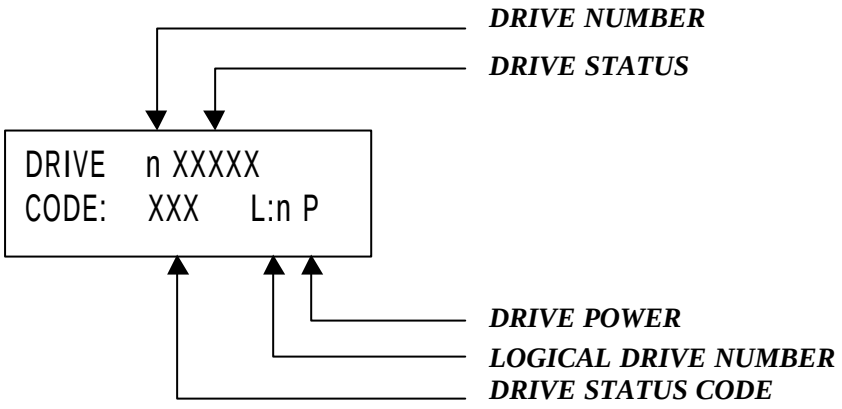
| |
|---|
| SYSTEM STATUS<br>1999 06/30 (WED) |

Displays the day and date.

## *4.8 Drive Status*

```
RAID SUBSYSTEM
-DRIVE STATUS
```

From the main menu, use the up or down button to display DRIVE STATUS. Then press the select button to access the drive status menu. Press the up or down button to choose the desired drive. Press the cancel button to return the display to the main menu.

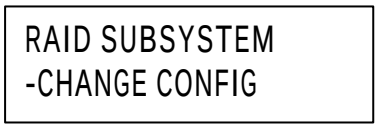



| | |
|---|---|
| DRIVE NUMBER | Physical location of the drive |
| DRIVE STATUS | Status of the drive. (See next table for details.) |
| DRIVE POWER | 1 means that drive is powered on. 0 means power off. |
| LOGICAL DRIVE NUMBER | Usually corresponds to the physical drive number. However, after data reconstruction on a spare drive, the logical drive numbers of the failed and spare drives are swapped. In this case, the logical drive number will be different from the physical number. |

**DRIVE STATUS AND STATUS CODE**

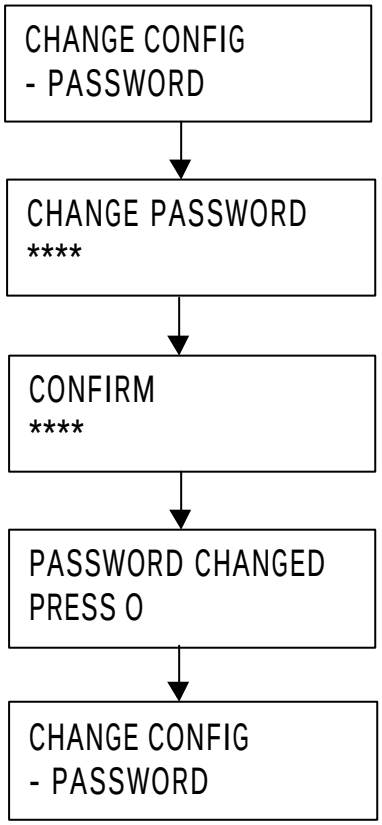
| **DRIVE STATUS** | **STATUS CODE** | **Meaning** |
|---|---|---|
| ON-LINE | 000 | The drive is operating normally. |
| FAIL | 010 | The drive has failed and should be replaced as soon as possible. |
| NO DMA33 | 010 | The drive does not support Ultra DMA 33MB. It should be replaced with a drive that supports Ultra DMA 33MB. |
| Too Small | 010 | The drive is smaller than other drives in the ArrayMasStor. |
| RECONST | 022 | Data reconstruction is in progress. |
| REPLACED | 002 | The failed drive was replaced, but data reconstruction has not started because auto reconstruction mode is turned off. |
| MISSING | 011 | The drive has been removed. |
| SPARE | 300 | The drive is reserved as a spare. |
| BLANK | 101 | There is no drive in this location. |
| EXTRA | 100 | A drive is installed but is not recognized by the firmware. |

## *4.9 Changing System Configuration*




From the main menu, use the up or down button to display CHANGE CONFIG. Press the select button to access the change configuration menu.

### 4.9.1 Entering the Password




Press the select button to change the password configuration.

Use the up or down button to display the correct digit, then press the select button to enter the digit. Repeat this procedure until all four digits are entered. See Appendix C for the default password.

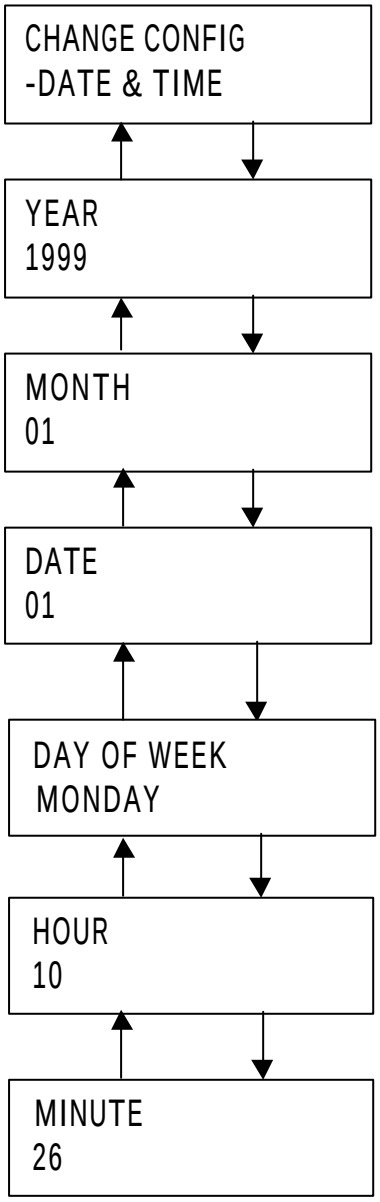
Confirm the password by entering the four-digit number.

Press the Select button to confirm.

The main menu is displayed after configuring the password.

### 4.9.2 Changing the Date and Time Setting

The ArrayMasStor's system clock has been set before shipment. It is usually not necessary to reconfigure the date and time setting.




Press the select button to change the date and time setting.

Choose the parameter to be changed (date: year, month, date, day of week; time: hour, minute) by pressing the select button.

Use the up or down button to choose a new value. Press the select button to enter the new value.

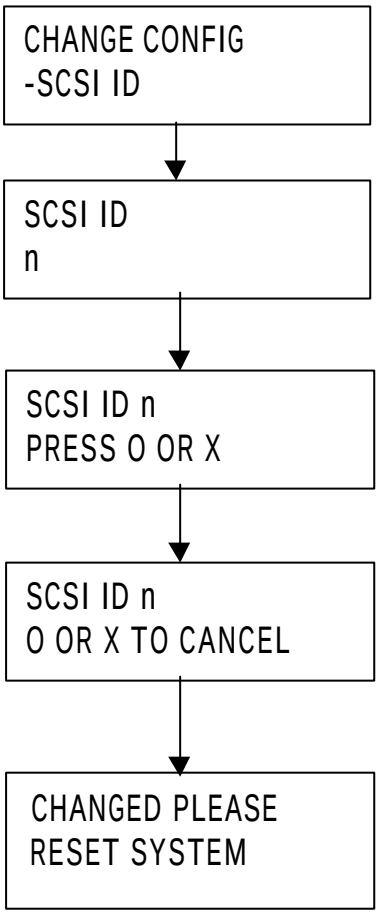
Use the up or down button to choose a new value. Press the select button to enter the new value.

Use the up or down button to choose a new value. Press the select button to enter the new value.

Use the up or down button to choose a new value. Press the select button to enter the new value.

Use the up or down button to choose a new value. Press the select button to enter the new value. Press cancel button to return to the change configuration menu.

### 4.9.3 Changing the SCSI ID




From the change configuration menu, use the up or down button to display SCSI ID. Press the select button to access the SCSI ID menu.

The SCSI ID menu is now displayed. Use the up or down button to choose a new SCSI ID and press the select button to confirm. Press the cancel button to return the display to the change configuration menu without changing the SCSI ID.

Press the select button again to confirm.

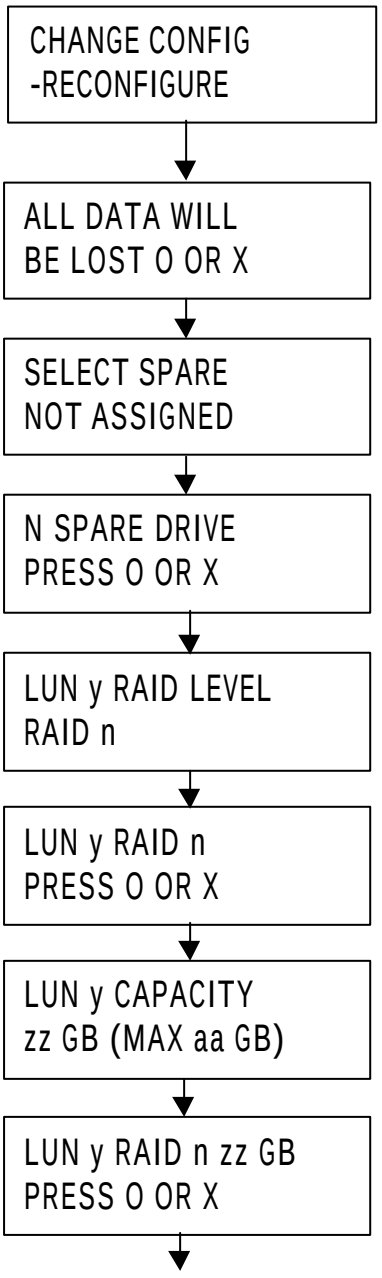
Press the cancel button to return the display to change configuration menu without changing the SCSI ID.

The new SCSI ID will take effect when the ArrayMasStor is restarted.

### 4.9.4 Reconfigure

Using reconfigure, it is possible to alter the number of LUN to be configured, assign individual RAID levels to each LUN, and set the capacity (in reference to the ArrayMasStor's total capacity) for each RAID Level.

| | |
|---|---|
| ***IMPORTANT !*** | The reconfigure function will erase all of the data stored on the ArrayMasStor. Strongly recommended that data be regularly backed up. |




From the Change Configuration menu, use the up or down button to display RECONFIGURE. Press the select button to access reconfigure menu.

Reconfiguring the ArrayMasStor will start the data initialization process, which will erase all of the data stored on the ArrayMasStor. To confirm, press the select button. Pressing the cancel button aborts the change.

Use the up or down button to display spare assignment.

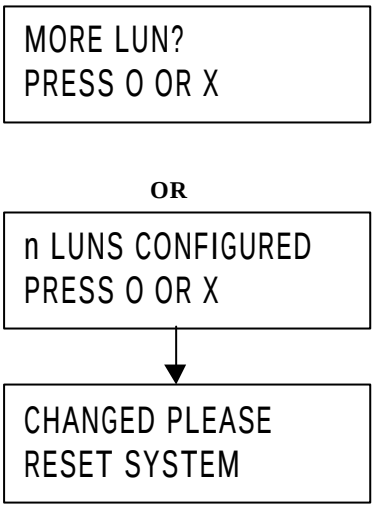
Press the select button to assign a single spare drive.

Use the up button to select the desired RAID level for the first available LUN.
Then press the select button to enter the new setting.

Press select button to confirm.

Enter the desired storage capacity of the LUN. The maximum size for the selected RAID level is also displayed. If all of the capacity is not used, the remaining capacity can be assigned to another LUN.

Press select button to confirm.



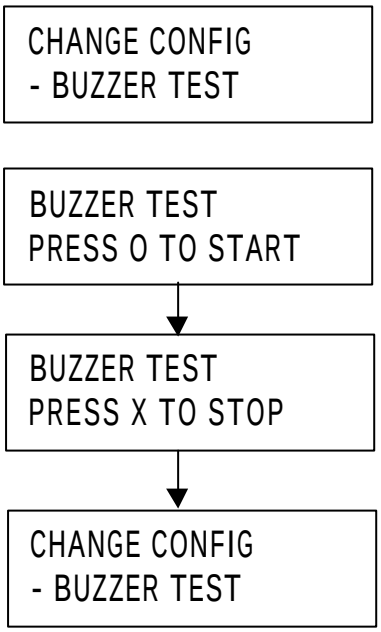

Press the select button to configure additional LUN for multiple-LUN configuration.

This displays the total number of LUN configured. Press the select button to confirm.

The changes will take effect after the ArrayMasStor is restarted.

### 4.9.5 Buzzer Test

The Buzzer can be tested through the operator panel display under the 'CHANGE CONFIG' option.




From the change configuration menu, use the up or down button to display BUZZER TEST. Press the select button to choose this item.

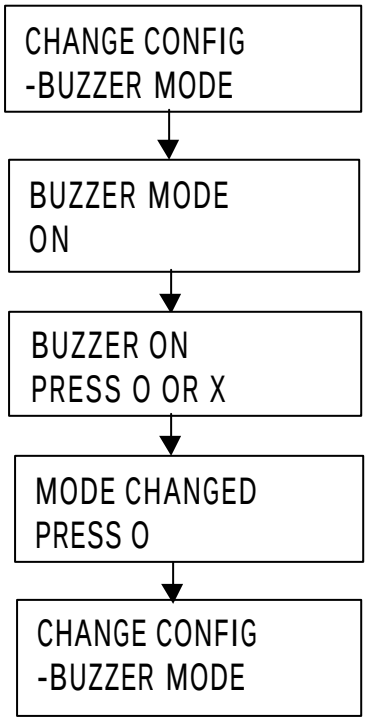
Press the select button to start the buzzer test.

Press the cancel button to stop the buzzer test.

The display returns to the main menu after the buzzer test is complete.

### 4.9.6 Changing the Buzzer Mode

When the buzzer mode is switched on, the buzzer will beep if there is a failure. When the buzzer mode is switched off, it will not sound if a failure occurs.




From the change configuration menu, use the up or down button to display BUZZER MODE. Press the select button to choose this item.

Use the up or down button to choose ON or OFF, and press the select button to accept the change.

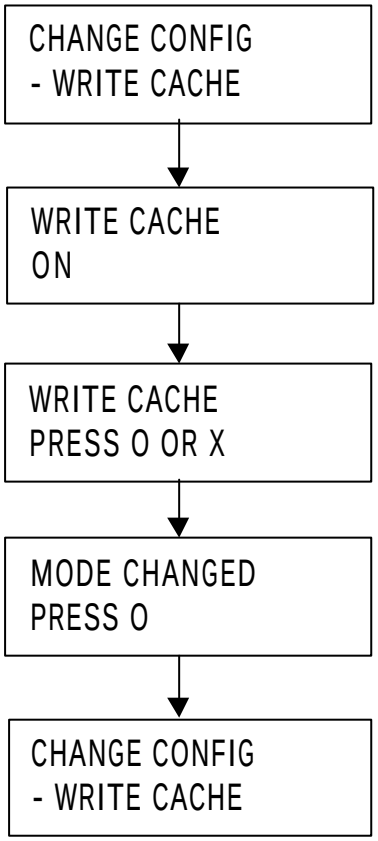
Press the select button to confirm the change, or press the cancel button to abort the change and return the display to the previous menu.

MODE CHANGED appears to confirm that the change has been made. Press the select button to return to the change configuration menu.

The buzzer setting has now been changed. Press the cancel button to return to the main menu.

### 4.9.7 Configuring the Write Cache Mode

The write cache mode turns the ArrayMasStor's cache on and off. When the write cache mode is switched on, the ArrayMasStor's speed and input/output performance are enhanced. Disabling the write cache bypasses the drive cache and degrades the ArrayMasStor's performance.




From the change configuration menu, use the up or down button to display WRITE CACHE. Press the select button to access this menu.

Use the up or down button to choose ON or OFF, and press the select button to enable or disable the write cache mode.

To confirm the change, press the select button, or press the cancel button to return the display to the previous menu without changing the write cache mode.

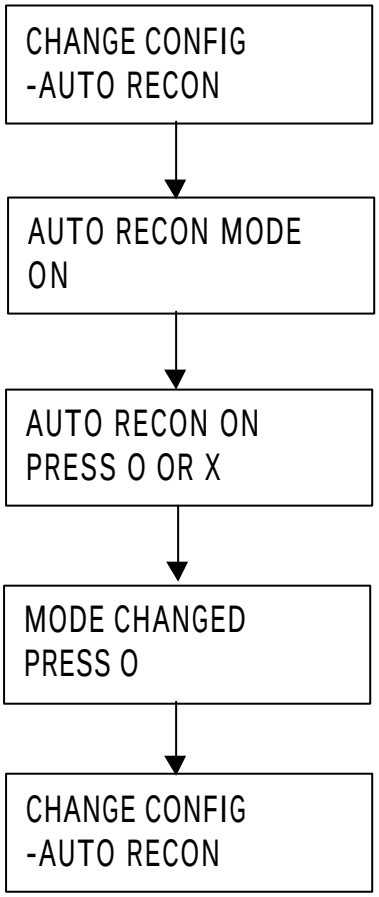
MODE CHANGED appears to confirm that the changed has been made. Press the select button to return to the change configuration menu.

The write cache mode has now been changed. Press the cancel button to return to main menu.

### 4.9.8 Changing the Automatic Reconstruction Mode

When automatic reconstruction mode is switched on, data reconstruction starts automatically after a drive is replaced. If a hot spare drive is configured and a drive fails, auto reconstruction and data reconstruction on the spare drive start automatically.

When automatic reconstruction mode is turned off, data reconstruction must be initiated manually. For information on manually initiating data reconstruction, see section 4.2.4, Data Reconstruction.




From the change configuration menu, use the up or down button to display AUTO RECON. Press the select button to access this menu.

Choose ON or OFF by using the up or down button. Then press the select button to enable or disable automatic reconstruction.

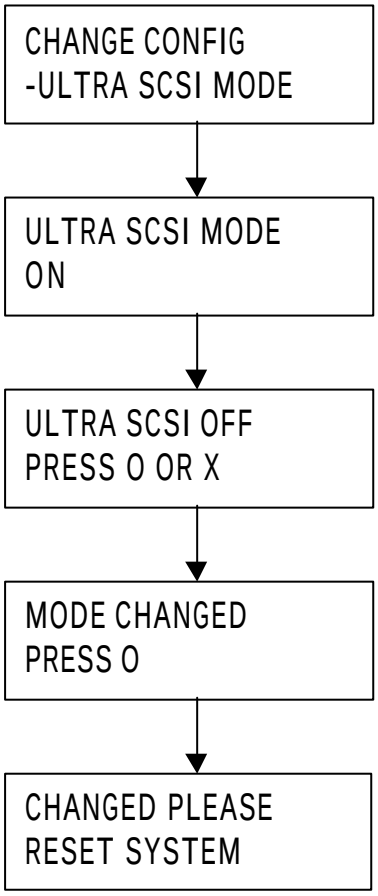
To confirm the change, press the select button, or press the cancel button to return the display to the previous menu without changing the automatic reconstruction mode.

MODE CHANGED appears to confirm that the change has been made. Press the select button to accept the change.

The automatic reconstruction mode setting has now been changed and the display returns to the change configuration menu. Press the cancel button to return to the main menu.

### 4.9.9 Maximum SCSI Transfer Rate

A maximum transfer rate of 40MB/second (SCSI-3) is supported between the ArrayMasStor and the host computer. However, some host computers cannot handle the SCSI-3 transfer rate or experience problems with long or poor quality cables. These problems can often be corrected by switching off the ultra SCSI mode.




From the change configuration menu, use the up or down button to display ULTRA SCSI MODE. Press the select button to access this menu.

Use the up or down button to choose ON or OFF, and press the select button to enable or disable the ultra SCSI mode.

Press the select button to confirm the change, or press the cancel button to return the display to the previous menu without changing the ultra SCSI mode.

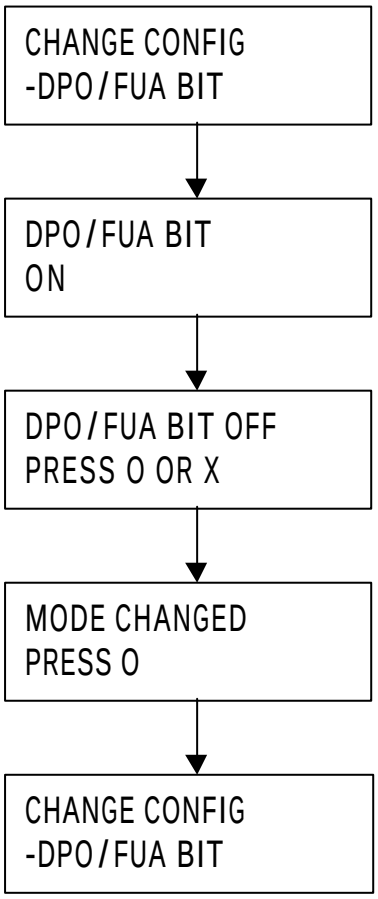
MODE CHANGED appears to confirm that the changed has been made. Press the select button to confirm the change.

The changes will take effect when the ArrayMasStor is restarted.

### 4.9.10 DPO/FUA Bit

The DPO/FUA (disable page out/force unit access) is used only when the host computer's operating system issues the FUA command for every read/write command. Use of this command[8] degrades the ArrayMasStor's performance. To prevent this from happening, the DPO/FUA bit should be turned off.

| | |
|---|---|
| ***IMPORTANT !*** | Only switch on the DPO/FUA bit if your operating system uses the force unit access command with its read/write operations. For additional information, see your operating system manual. |




From the change configuration menu, use the up or down button to display DPO/FUA BIT. Press the select button to access this menu.

Use the up or down button to choose ON or OFF, or press the select button to enable or disable the DPO/FUA bit.

Press the select button to confirm the change, or press the cancel button to return the display to the previous menu without changing the DPO/FUA bit.

MODE CHANGED appears to confirm that the change has been made. Press the select button to return to the change configuration menu..

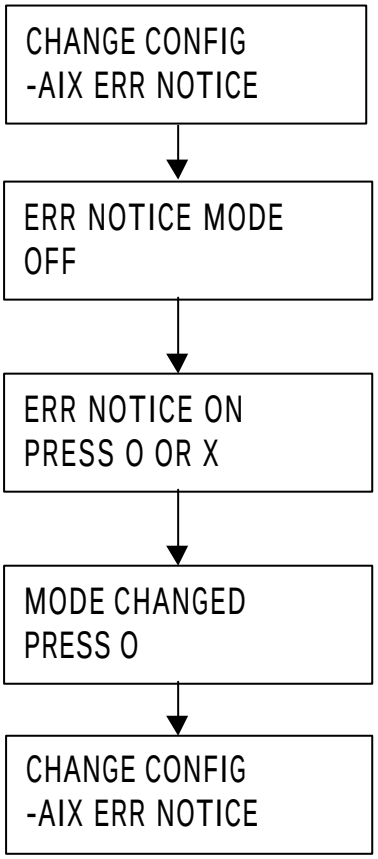
The DPO/FUA bit setting has now been changed. Press the cancel button to return to the main menu.

[8] When a FUA read/write command is sent to the ArrayMasStor, the cache is bypassed and the read and write operations are sent directly to the drives. This results in impaired performance.

### 4.9.11 Changing the AIX Error Notice Mode

The AIX error notice mode is turned on for host systems such as the IBM RS-6000 computer, which use the AIX operating system. This function allows the operating system to access logged data on the status of the ArrayMasStor. When other operating systems are used with the ArrayMasStor, this mode should be turned off.

| | |
|---|---|
| ***IMPORTANT !*** | Set off 'AIX error notice mode' when using the ArrayMasStor with non-AIX operating systems. Setting on this mode may halt the system or cause a malfunction to occur. |




From the change configuration menu, use the up or down button to display AIX ERR NOTICE. Press the select button to access this menu.

Choose ON or OFF by using the up or down button. Then press the select button to enable or disable the AIX error notice mode.

To confirm the change, press the select button. Press the cancel button to return to the previous menu without changing the AIX error notice mode.

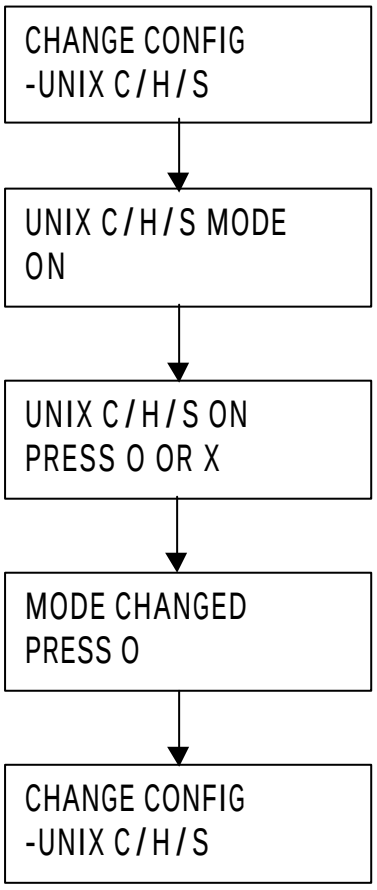
MODE CHANGED appears to confirm that the change has been made. Press the select button to return to the change configuration menu.

The AIX error notice setting has now been changed. Press the cancel button to return to main menu.

### 4.9.12 Changing the UNIX C/H/S Mode

The UNIX C/H/S mode corrects errors encountered with UNIX operating systems that incorrectly recognize the total capacity of the ArrayMasStor. This error causes the operating system to recognize a storage capacity of less than the actual 53.94 GB that is available in RAID Level 5. To access the full capacity of the ArrayMasStor in a UNIX environment, set this mode on.

| | |
|---|---|
| ***IMPORTANT !*** | Back-up all data on the ArrayMasStor before changing the UNIX C/H/S mode. Changing this mode might result in data loss. |




From the change configuration menu, use the up or down button to display UNIX C/H/S. Press the select button to access this menu.

Use the up or down button to choose ON or OFF, and then press the select button to enable or disable the UNIX C/H/S mode.

To confirm the change, press the select button, or press the cancel button to return the display to the previous menu without changing the UNIX C/H/S mode.

MODE CHANGED appears to confirm that the change has been made. Press the select button to return to the change configuration menu.

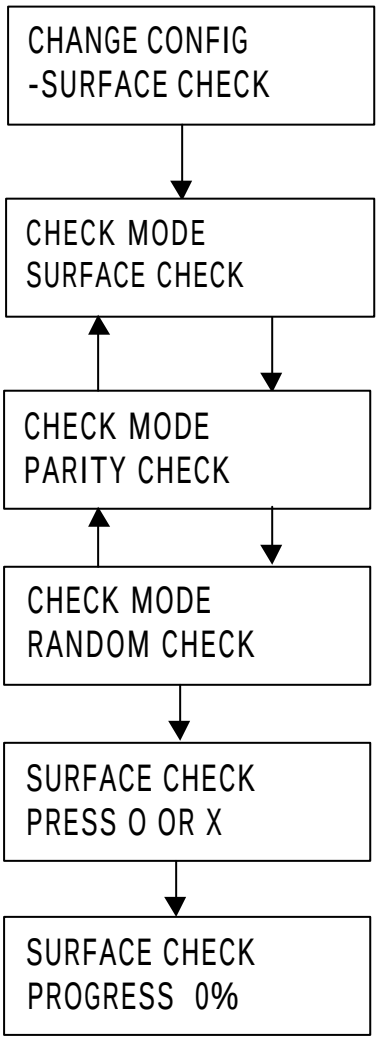
The UNIX C/H/S setting has now been changed. Press the cancel button to return to main menu.

### 4.9.13 Performing Surface Check

The surface check function, which is only available in RAID levels 1 and 5, prevents double faults from occurring when an error correcting code (ECC) fault is encountered while the ArrayMasStor is operating in degraded mode. The ArrayMasStor has a function that corrects ECC faults by overwriting the area containing the fault. The ArrayMasStor uses three methods to check data.

- Surface check: This scans the entire data area for ECC faults and reconstructs and overwrites errors
- Parity regeneration: In RAID Level 5, this regenerates each parity-block and rewrites it to the drives
- Random check: This scans random storage areas for ECC faults and fixes the errors.

| | |
|---|---|
| ***IMPORTANT !*** | Strongly recommended that these checks implement to ensure data and parity consistency. |




From the change configuration menu, use the up or down button to display SURFACE CHECK. Press the select button to access this menu.

Use the up or down button to display the desired mode, then press the select button to confirm. Pressing the cancel button returns the display to the previous menu.

Use up or down button to choose parity check method. Press the select button to confirm.

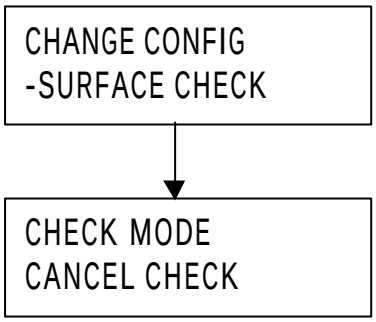
Use up or down button to choose random check method. Press the select button to confirm.

Press the select button to confirm, or press the cancel button to return to the display to the previous menu.

The selected check mode starts and its progress is shown in percent. When the check is completed, the display returns to the main menu.

### 4.9.14 Stopping Surface Check

An ongoing Surface check, Parity regeneration, or Random check can be stopped under the 'CHANGE CONFIG' Menu.



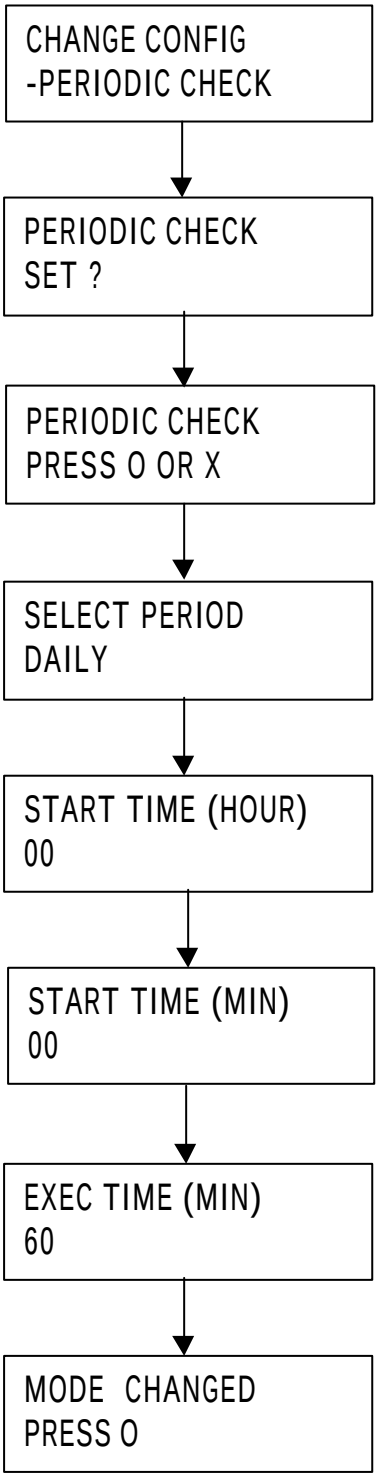

From the change configuration menu, use the up or down button to display SURFACE CHECK. Press the select button to choose this item.




Press the select button to stop the surface check. The display return to the main menu after the select button is pressed.

### 4.9.15 Background Surface Check

Using its internal clock, the ArrayMasStor can perform daily, weekly, or monthly automatic background surface check. The default setting for this function is on, with surface checks starting automatically at 00:00 each Sunday. The surface check normally takes 60 minutes to execute. The ArrayMasStor's internal clock must be set to the local time for this function to operate properly. (See section 4.8.2, Changing the Date and Time Setting)




From the change configuration menu, use the up or down button to display PERIODIC CHECK. Press the select button to access this menu.

Press the select button to confirm, or press the cancel button to return to the display to the previous menu.

Press the select button to confirm, or press the cancel button to return to the display to the previous menu.

Use the up or down button to set the interval for the background surface check.

Use the up or down button to set the start time (hour) for the background surface check.

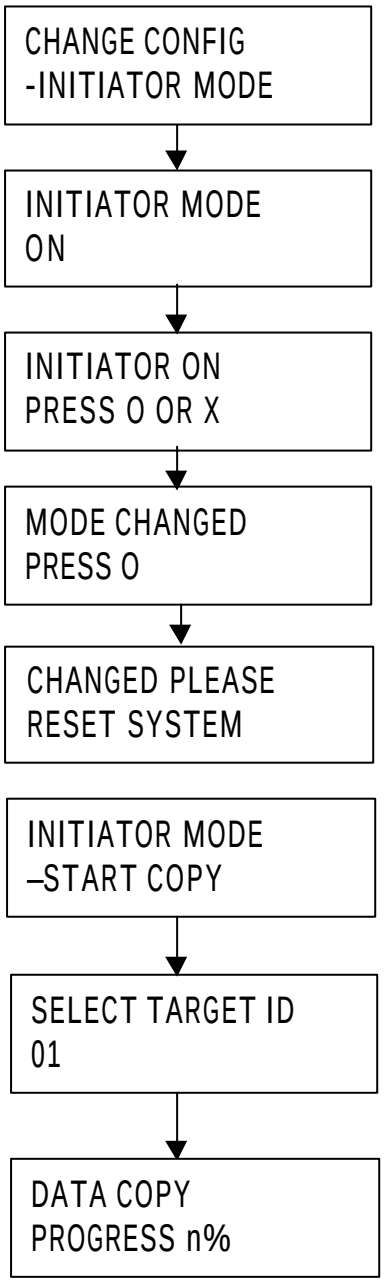
Use the up or down button to set the start time (min) for the background surface check.

Use the up or down button to set the execution time, or duration of the background surface check.

Press the select button to confirm the change. The display then returns to the main menu.

### 4.9.16 Setting Initiator Mode

The ArrayMasStor J Series supports initiator mode, which allows the ArrayMasStor to copy all of its data to another SCSI drive or ArrayMasStor with an equal or larger capacity.




From the change configuration menu, use the up or down button to display INITIATOR MODE. Press the select button to access this menu.

Use the up or down button to choose ON or OFF, and press the select button to enable or disable the initiator mode.

Press the select button to confirm the change, or press the cancel button to return to the previous menu without changing the initiator mode.

MODE CHANGED appears to confirm that the change has been made. Press the select button to confirm the change.

The changes will take effect when the ArrayMasStor is restarted.

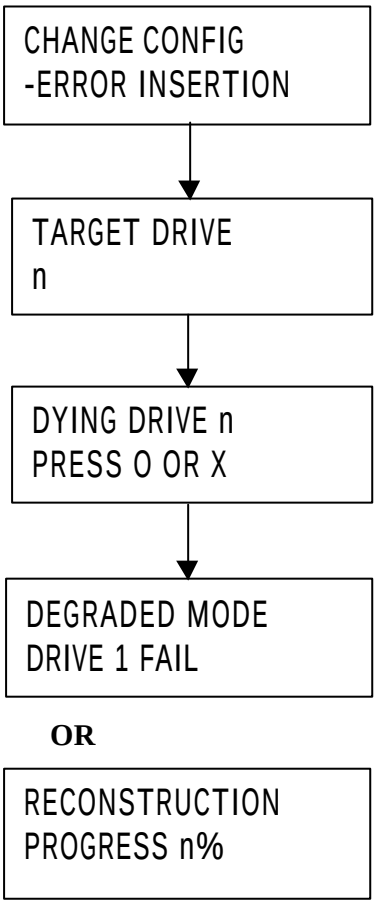
After the ArrayMasStor is restarted, it acts as the initiator (host). Press the select button to begin copying data.

Press the up or down button to display the target SCSI ID. Press the select button to confirm the target SCSI ID.

While in initiator mode, the ArrayMasStor will copy all of its data to the target SCSI ID and display the copying progress in percent. When the data has been copied, initiator mode should be switched off using the procedure shown above.

### 4.9.17 Error Insertion

The error insertion function tests the ArrayMasStor by simulating the failure of one drive and causing the ArrayMasStor to enter degraded mode. This function does not cause data loss and is not available when one of the drives has failed.




From the change configuration menu, use the up or down button to display ERROR INSERTION. Press the select button to access this menu.

Use the up or down button to choose the drive number that will be used in the simulated failure. Press the select button to confirm the choice of drive. The hot spare drive cannot be used as the target drive for the simulated failure.

The selected drive number will be displayed. Press the select button to confirm.

The selected drive's status changes from normal to fail.

When hot spare drive is configured and Automatic Reconstruction mode is on, data reconstruction on the spare drive will start automatically.

### 4.9.18 Displaying the System Trace Data

System trace data contains information about the ArrayMasStor's operating status.

From the change configuration menu, use the up or down button to display SYSTEM TRACE. Press the select button to access this menu. Press the up or down button to scroll through the system trace data that is shown on the display. Press the cancel button to return the display to the previous menu.

### 4.9.19 Erasing the System Trace Data

This function, which deletes the system trace data, should only be performed on the advice of qualified service personnel.

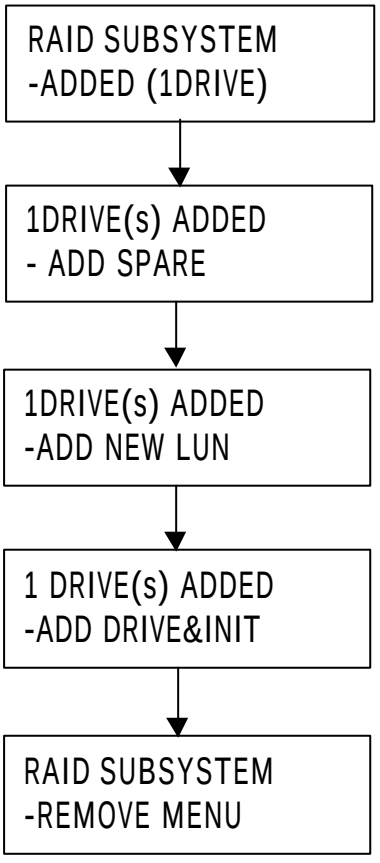
From the change configuration menu, use the up or down button to display CLEAR TRACE. Press the select button to erase the system trace data. Press the cancel button to returns the display to the previous menu.

## *4.10 Adding Drive Units*

Adding a drive unit can increase the capacity of an ArrayMasStor configured with one, two or three units. If the ArrayMasStor is turned off, the new drive unit can be installed in normal system status. The ArrayMasStor will enter 'system halt mode' when new drive units are added.

There are three ways to increase the capacity of ArrayMasStor.

1. Adding Unit as Hot Spare Drive
2. Adding Unit as Data Drive
3. Adding Unit as New LUN




This menu appears when a drive is added into the ArrayMasStor.

This menu appears when a spare drive has not been assigned and only one drive is added. To make the new drive a hot spare drive, press the up or down button to display this menu and then press the select button.

To assign the capacity of additional drives as new LUN, press the up or down button to display this menu and then press the select button.

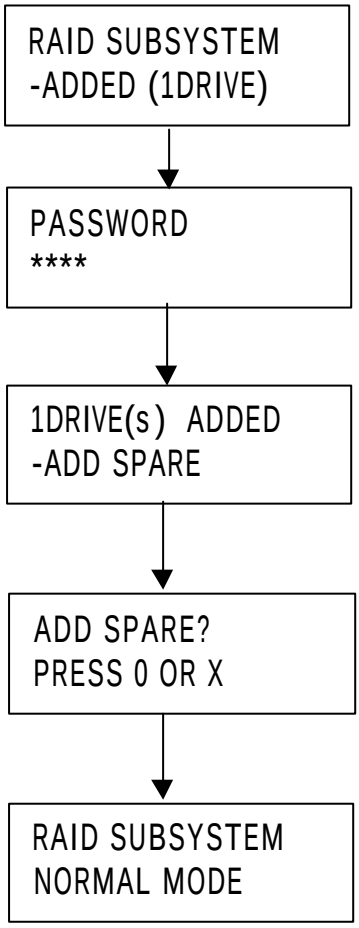
To initialize the original drives and add a new drive, press the up or down button to display this menu and then press the select button.

This display is shown to remove a menu. You may remove ADDED (1DRIVE) option by pressing the select button. However, ADDED (1DRIVE) option will be shown again after restarting the ArrayMasStor.

| | |
|---|---|
| ***IMPORTANT !*** | Insert a new drive on the vacant slot below the last online drive unit. Unless 'INVALID DRIVE LOCATION' message will be displayed. |

### 4.10.1 Adding Unit as Hot Spare Drive

After adding a drive in a three-drive system in which a spare has not been assigned, the following menu will appear. Initialization will not occur if the new drive is assigned as a spare drive.




This menu appears when a drive is added into the ArrayMasStor.

A password is necessary to change the ArrayMasStor's configuration. For instructions on how to enter the password, refer to section 4.8.1, Entering the Password.

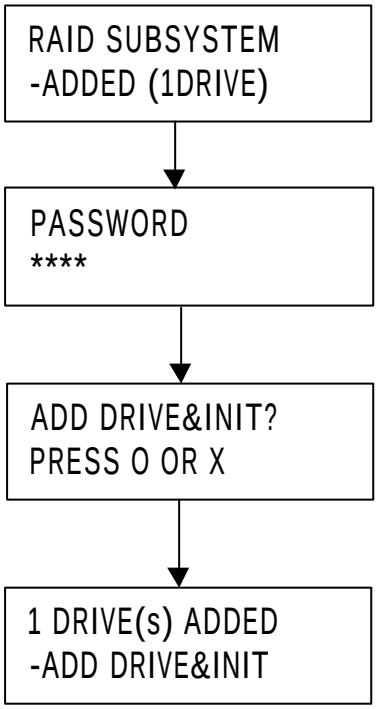
To assign the new drive as a spare drive, press the select button.

Press the select button again to confirm. Pressing the cancel button returns the display to the previous menu, and the spare drive will not be assigned.

The system goes to normal mode after this operation.

### 4.10.2 Adding Unit as Data Drive

System initialization is required when adding a new drive as a data drive in a current ArrayMasStor configuration. Adding a data drive is possible when a spare drive is already assigned and one or two drives are added into the system.




This menu appears when a drive is added into the ArrayMasStor.

A password is necessary to change the ArrayMasStor's configuration. For instructions on how to enter the password, refer to section 4.8.1, Entering the Password.

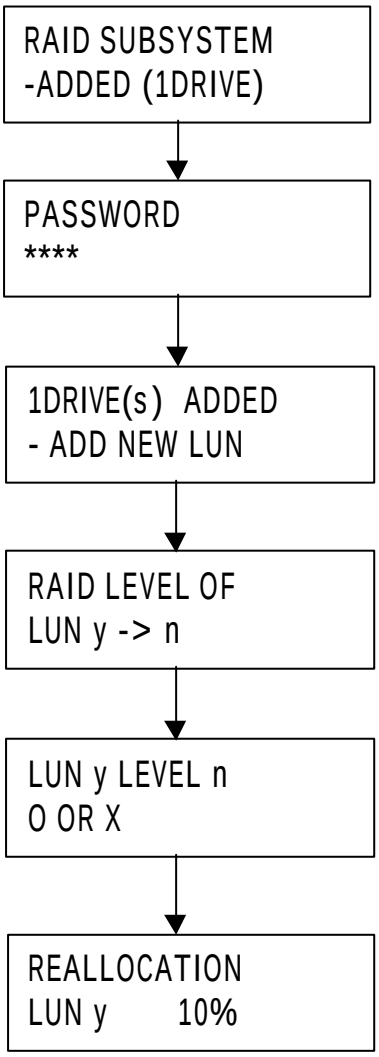
To assign the new drive as data drive, press the select button.

Once confirmed the ArrayMasStor is ready to be reconfigured. Refer section 4.8.4, Reconfigure for instructions.

| | |
|---|---|
| ***IMPORTANT !*** | During initialization all user data is erased. Strongly recommended that data be backed up before initialization. |

### 4.10.3 Adding Unit as New LUN

When a new drive is assigned as a new LUN, the original data are reassigned to suitable locations, and the new parity data (in RAID Level 5) are regenerated using dynamic data reallocation. There is no need to backup data to increase the capacity of the ArrayMasStor, but backing-up is strongly recommended to prevent the loss of data that may occur during dynamic data reallocation. The host computer cannot access the ArrayMasStor while dynamic data reallocation is in process.




This menu appears when a drive is added into the ArrayMasStor.

A password is necessary to change the ArrayMasStor's configuration. For instructions on how to enter the password, refer to section 4.8.1, Entering the Password.

To assign the new drive as a new LUN, press the select button.

The display shows the RAID level (n) of the new LUN.

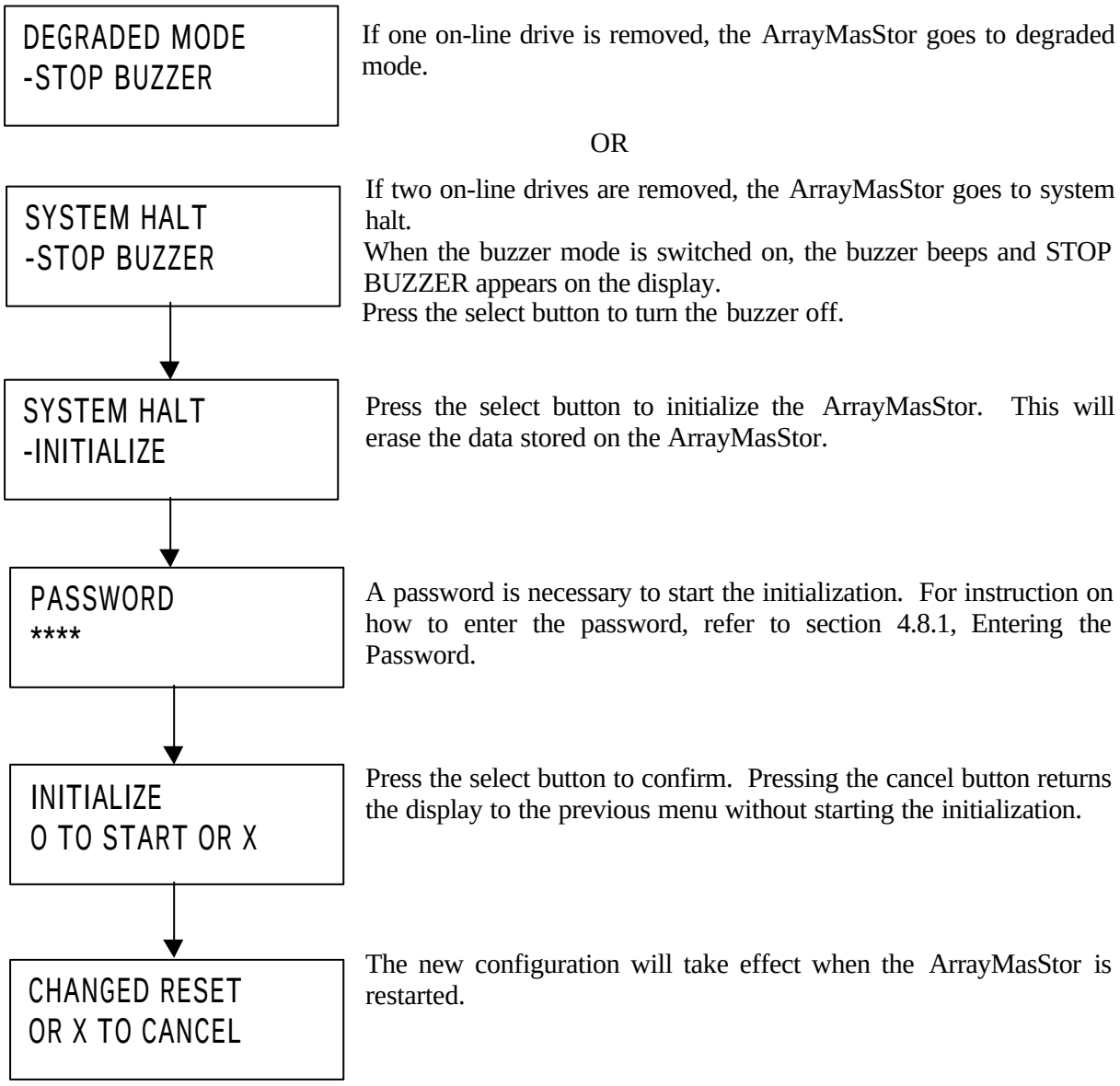
Press the select button to confirm. Pressing the cancel button returns the display to the previous menu without changing the configuration.

The display indicates that reallocation has started, and indicates the LUN that is being reallocated, and the progress (in percent) of the reallocation process.

## *4.11 Removing On-line Drives*

The remove on-line drive function decreases the number of active drives in the ArrayMasStor. In RAID Level 5, the minimum number of drives is three.

| | |
|---|---|
| ***IMPORTANT !*** | Removing an on-line drive unit will start the data initialization process. This will erase all of data on the ArrayMasStor. Strongly recommended that data be backed up before removing unit. |



# 5 Troubleshooting

## Drive Failure

When a drive fails, the number of the failed drive is displayed on the operation panel (RAID 0/1/5) and its status indicator turns red(RAID 1/5). The ArrayMasStor can be recovered by replacing it with a new drive unit while the power is even on.

**Note: When replacing the failed dive unit, prepare a new drive unit in Appendix D.**

| | |
|---|---|
| ***IMPORTANT !*** | Do not touch internal components of the ArrayMasStor while the power is on. |

(Procedure)

1. Check the number of the failed drive unit displayed on the panel
2. Open the front cover.
3. Unlock with the supplied key.
4. Hold the handle of Drive Unit to pull the unit out.
5. Insert to push a new drive unit firmly.
6. Lock with the key.

**Note:**

- **When the automatic reconstruction mode is on, data reconstruction will start immediately after the ArrayMasStor recognize a new drive unit.**
- **When the mode is off, the panel will display "DRIVE REPLACED - START RECON". Then, press the select button to start data reconstruction process.**
- **If "DRIVE FAIL" is still displayed, check unit's connection.**

## Other Failures

If replacing the new drive unit doesn't solve any troubles, contact your sales representative.

# Appendix A Specifications

| | AXRS-J092S | AXRS-J093S | AXRS-J094S | AXRS-J182S | AXRS-J183S | AXRS-J184S |
|---|---|---|---|---|---|---|
| **RAID 0 capacity** | 17.18GB | 25.76GB | 35.42GB | 34.35GB | 53.14GB | 71.93GB |
| **RAID 1 capacity** | 8.58GB | 12.88GB | 17.71GB | 17.18GB | 26.57GB | 35.96GB |
| **RAID 5 capacity** | N/A | 17.18GB | 26.57GB | N/A | 35.42GB | 53.94GB |
| **RAID level** | 0,1 [1] | 0,1,5 [2] | 0,1,5 | 0,1 [1] | 0,1,5 [2] | 0,1,5 |
| **Host interface** | SCSI-3 (Single Ended/ LVD) | | | | | |
| **Max. transfer rate** | 40MB/s | | | | | |
| **Cache buffer** | 16MB | | | | | |
| **Max. number of drives** | 2 | 3 | 4 | 2 | 3 | 4 |
| **HDD Capacity** | 9GB | | | 18GB | | |
| **Average seek time** | 8.5msec(Read)/9.5msec(Write) | | | | | |
| **Rotational speed** | 7200rpm | | | | | |

| | All Models |
|---|---|
| **Size (WxHxD)** | 170 x 265 x 290 mm |
| **Weight** | 7.5 kg (4 hard disks included) |
| **Environment** | 5 - 35 Degree Celsius |
| **Power** | 100 ~ 240 V AC (50/60Hz) |
| **Current** | 0.7 A (100V) |

Capacity refers to the approximate storage capacity when used in RAID levels 0,1 and 5, without a spare drive.
The actual capacity depends on the operating system, the number of drives and the configuration.
The specifications or physical appearance of the ArrayMasStor may change without prior notice.

[1] If a new drive is added, the subsystem can be configured to support RAID Level 5.

[2] If a spare drive is assigned, only RAID levels 0 and 1 can be configured.

# Appendix B Accessories

The ArrayMasStor is shipped with following accessories.

- SCSI terminator
  ArrayMasStor J Series (P/N: A208078)
- Drive lock/key (2 pieces.) (P/N: A200213)
- ArrayMasStor J Series User's Manual (This booklet) (P/N: A208067)

# Appendix C Default Configuration

The ArrayMasStor's default configuration is as follows.

| | DEFAULT VALUE |
|---|---|
| SCSI ID | 0 |
| Number of LUN | 1 |
| RAID level | More than 3Drive Model: 5<br>2Drive Model: 1 |
| Hot spare drive | No |
| Buzzer mode | On |
| Auto reconstruction mode | On |
| Cache buffer mode | On |
| AIX | Off |
| UNIX C/H/S | Off |
| Ultra SCSI | On |
| Initiator mode | Off |
| Background surface verify | On |
| Period of surface verify | Weekly |
| Start time | Sunday at 00:00 |
| Execution time | 60 minutes |
| DPO/FUA bit | OFF |
| Password | 1 2 3 4 |

# Appendix D Replacement Parts

The following items are defined as field replaceable parts.

| Parts Name | Parts Number | Description |
|---|---|---|
| 9GB drive unit | A208082 | Replacement/addition for AXRS-J092/3/4S/drives |
| 18GB drive unit | A208084 | Replacement/addition for AXRS-J182/3/4S/drives |
| ArrayMasStor J Series RAID box unit | A208087 | Replacement for ArrayMasStor J Series (except drives) |
| Front cover | A208088 | Replacement for ArrayMasStor J Series |
| Drive lock/key | A200213 | Replacement for all J Series |

# Appendix E Feature Setting

Setting ArrayMasStor's features depends on the number of drives configured. Refer the chart when changing the ArrayMasStor configuration.

| Feature \ No. of Drives | | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| **RAID Level** | **Spare** | | | | |
| 5 | Assigned | X | X | X | O |
| 5 | Not assigned | X | X | O | O |
| 1 | Assigned | X | X | O | O |
| 1 | Not assigned | X | O | O | O |
| 0 | Assigned | X | X | X | X |
| 0 | Not assigned | X | O | O | O |

Where:
O – means configuration is ALLOWED.
X – means configuration is NOT ALLWED.

# Electronic Emission Notices

## *Federal Communications Commission (FCC) Statement*

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.
However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## *FCC WARNING*

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from ADTX authorized dealers or contributor. ADTX is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user’s authority to operate the equipment.

# Information

For more information about this product, please contact your distributor.

| Distributor's information |
| --- |
| |

## - Product Records

Product Name : _____

Model/Type : _____

Serial Number : _____

## *- Manufacturer*

ADTX
Advanced Technology and Systems Co.,Ltd.
http://www.adtx.co.jp

This product is manufactured by
Advanced Technology and Systems Co., Ltd.
in Japan.