# adic

# Infinite File Life

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# Preface

# NOTES

## Purpose of This Book

This book provides a summary of the Infinite File Life functionality within AMASS, ADIC's Archival Management and Storage System.

## Who Should Read This Book

This book is written for the system administrator who will be installing and using Infinite File Life for AMASS.

## How This Book is Organized

This book contains the following chapters:

**Chapter 1: Introducing Infinite File Life**

Discussion of Infinite File Life including architecture, implementation, features, and supported drives.

**Chapter 2: Installing and Using Infinite File Life**

How to install and use Infinite File Life.

**Chapter 3: Infinite File Life Commands**

Description of Infinite File Life Commands.

**Chapter 4: Configuring Infinite File Life**

How to configure Infinite File Life.

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# Conventions

The conventions used throughout the AMASS technical books are listed below:

| Convention | Example |
|---|---|
| The word "library" usually includes "jukebox" and "standalone drive" and is a generic way to reference a storage device. | If using HP SunSpot jukeboxes, install patch 1234. |
| Screen text, file names, program names, and commands are in `Courier` font. | `Request to add a new volume:`<br>`Volume group will be "20"`<br>`Volume position will be "A123"` |
| The root prompt is shown as a number symbol. | # **su root** |
| What you should type in is shown in `Courier` **bold** font. | **bulkinlet 1,2-10,21,23** |
| Site-specific variables are in a *Times italics* font. | **tar -xvf** *tapedevicename* |
| A backward slash ( \ ) denotes the input is continued onto the next line because the printed page is not wide enough to accommodate the line. | **# rsh** *nodename* **-n dd \**<br>**if=/cdrompath/amass/load.tar\**<br>**bs=20b │ tar xvBfb - 20**<br><br>(Type the entire command without the backward slash.) |
| Pressing <Return> after each command is assumed. | |
| A menu name with an arrow refers to a sequence of menus. | Edit Policy —> Add Library |

# 1

# Introducing Infinite File Life

# NOTES

## Introduction

The AMASS Infinite File Life (IFL) feature automatically manages volatile media over an extended period of time.

Figure 1-1 gives an overview of AMASS IFL.

## AMASS IFL Overview
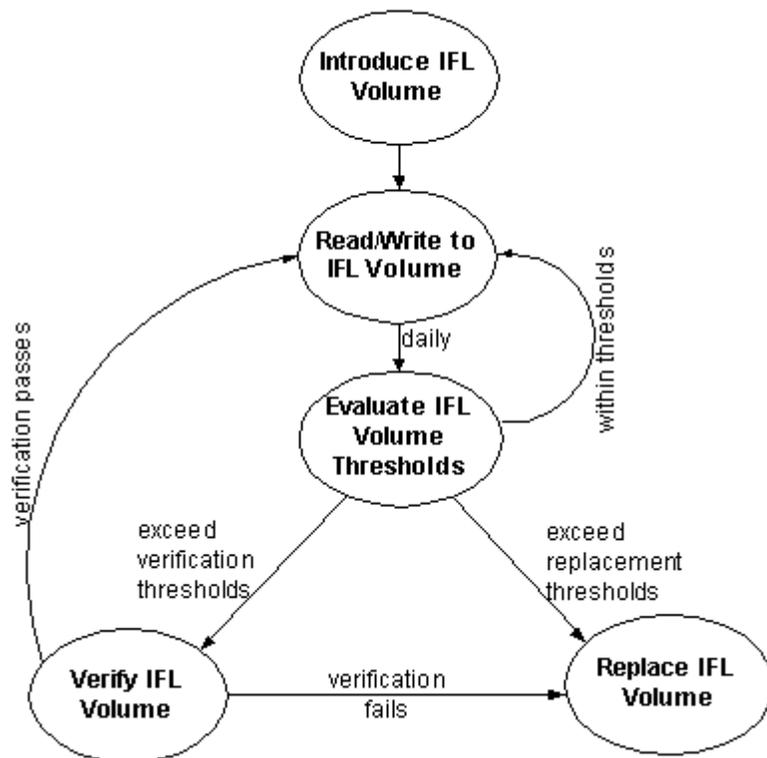


**Figure 1-1**    AMASS IFL Overview

A volume is created and normal read and write operations are performed on this volume. Statistics are gathered and checked against configurable thresholds to determine if a volume needs to be verified or replaced. Verification involves validating suspect blocks on the volume or the complete volume depending on how IFL is configured. If the verification fails, the volume is replaced by copying all of the volume's content to a new volume. Therefore, an AMASS volume has an Infinite File Life.

The statistics gathered include:

- Requests that succeed after one or more retries

- Requests that fail completely

- Requests that are recovered by the drive

- Age of media

- Blocks with errors

- Mounts

- Bytes read

- Bytes written

- Risk associated with a particular type of media

The error detection information for a failed or recovered I/O request requires little additional processing time.

# Architecture

Figure 1-2 shows the AMASS IFL Architecture.
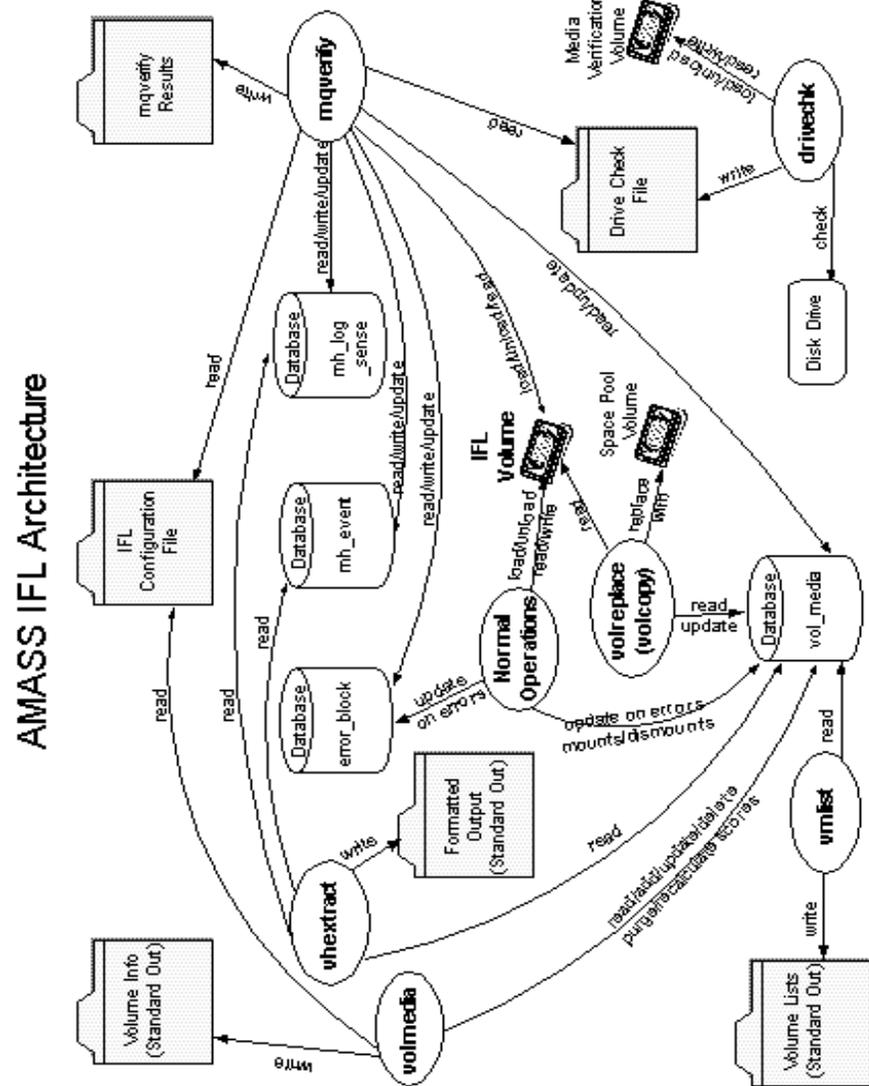


**Figure 1-2**   AMASS IFL Architecture

The purpose of IFL is to track the quality of an AMASS volume over time. Operations such as loads/unloads reads/writes are part of normal AMASS functionality. When errors occur during these Normal Operations, the events are recorded in the AMASS IFL database tables.

AMASS IFL uses two commands to validate IFL volumes. The volmedia command is used to calculate volume scores used in determining if a volume needs to be replaced. The mqverify command also reads blocks, suspect or as specified, from volumes that have been determined to need verification.

When an IFL volume has been marked for replacement, the AMASS volreplace command is used to replace the volume. Space Pool volumes are used as replacements.

Database tables are used to track IFL volumes over time. The database tables track media characteristics and specific error events associated with a volume. Refer to the Database Schema section of this chapter for a complete description of database tables.

Various commands are provided to extract information from the IFL databases. This includes vhextract, vmlist, and options to volmedia command. For further information on these and other commands, refer to Chapter 3.

To use a drive for IFL volume verification, we use the drivechk command. This consists of using a new piece of media added into the Media Verification (MV) volume group, and then performing reads/writes to assure that the drive is functioning as expected. The command does generate a file for each drive that mqverify uses to determine which drives can be used to verify IFL volumes.

# Life Cycle of an IFL Volume

Figure 1-3 describes the various life cycle states of an IFL volume.
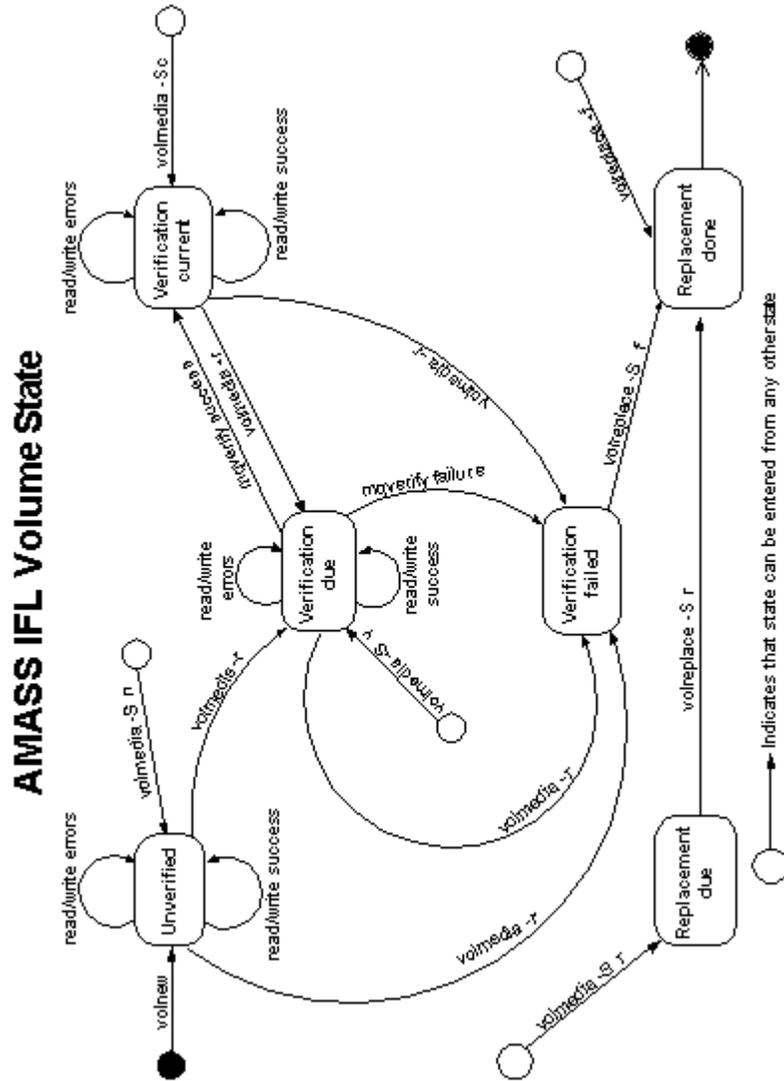
**Figure 1-3**    AMASS IFL Volume State

When a volume is created via the volnew command, it's state is Unverified. Normal read/write operations then occur for this new volume. If an error occurs the errors are recorded, but the state is not changed. The nightly IFL crontab will execute a "volmedia –r" command which checks for factors that have exceeded thresholds. If verification thresholds have been exceeded, the volume state is changed to Verification due. If replacement thresholds have been exceeded, the volume state is changed to Verification failed.

When the volume state is Verification due, mqverify will verify the volume. If the Verification is successful, mqverify will change the state to Verification current. If the verification was unsuccessful, mqverify will mark the volume as Verification failed.

When the volume is in Verification current state, normal read/write operations proceed and if any errors occur, they are recorded. Again, the nightly IFL crontab will execute a "volmedia –r" command which checks for factors that have exceeded thresholds and will change the volume state to Verification due or Verification failed.

When a volume is in the Verification failed state, two things can happen. If volreplace is configured to automatically replace failed volumes, through the IFL Configuration File, then the volume will be copied to another volume from the space pool. If volreplace is not configured to automatically replace volumes, then the AMASS administrator must manually set the volume state to Replacement due. Once the volume state is Replacement due, it will be copied to another volume by volreplace.

The ifldaily script generates files that list the volumes in various states. The files can be emailed to an AMASS administrator allowing the administrator to easily track volumes within AMASS IFL.

Note that the volmedia command allows a user to get to numerous states regardless of the current state.

Additional states defined for an IFL volume include:

| State | Description | Action |
|---|---|---|
| A | Volume is **absent**, it is not physically in the library. | Bring the volume physically into the library and put it online |
| N | Volume is **nonresident** in the library because it is normally stored offline. For example, in offsite fire storage. | Must be retrieved from storage prior to use; returned to storage afterwards |
| R | A **Reference Volume** belonging to the MV (media verification) volume group. | No action |
| X | Volume is **excluded** from being used by IFL. | No action |

# Database Schema

Figure 1-4 describes the database schema for Infinite File Life. This consists of four tables that are located at /usr/filesysdb/vol. In addition to the individual tables, there are sets which describe relationships between tables.
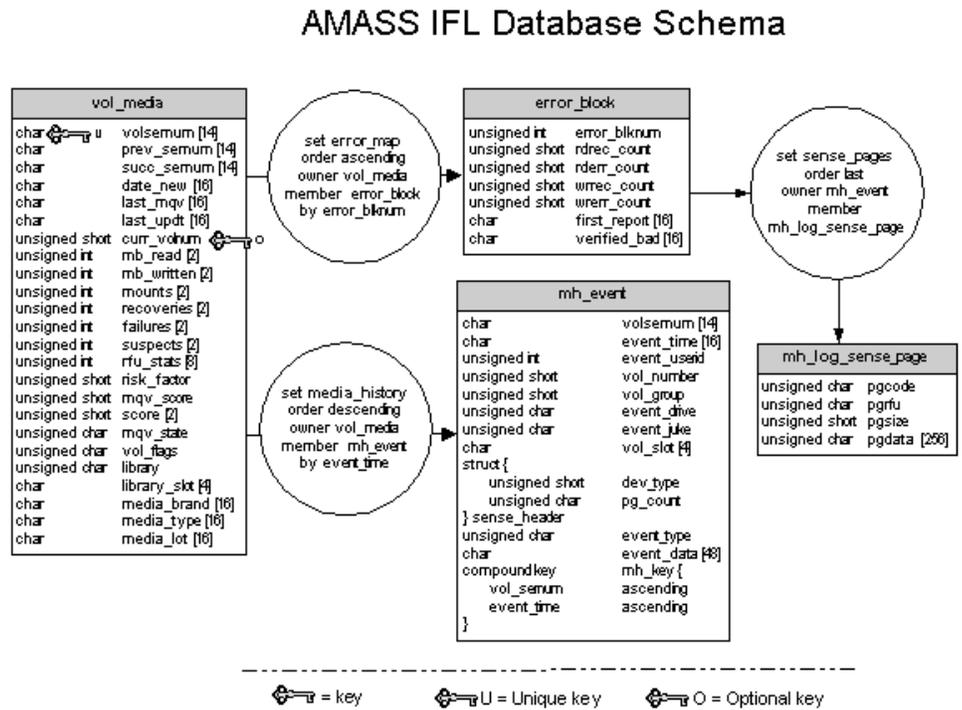


**Figure 1-4**   AMASS IFL Database Schema

The vol_media table is used to track individual volumes within IFL. This table includes a volume serial number (volsernum) which identifies a specific cartridge for its lifetime whether the media is present in the automated library or if the media has been outlet from the library and has been moved to off-line storage. The volume serial number is usually the bar code label.

Any volume present before IFL was installed is added to the vol_media table as it is encountered during normal I/O processing. AMASS makes sure the correlation between the IFL volume serial number in the IFL databases and the unique volume number assigned by AMASS remains current.

The error_block table is used to record blocks that have errors. This table is populated when errors are encountered during normal AMASS operations. The mqverify command then reads this table to find the blocks that had errors and need to be verified.

The mh_event and mh_log_sense tables are used by mqverify to record sense data obtained during the verification process.

The amassbackup and amassrestore commands also give the ability to back up and restore these IFL databases. For a description of these commands, refer to the Command Reference chapter in *Managing the AMASS File System*.

# Reference Volumes

A Reference Volume is "good" fresh-out-of-the-package media. Assign these Reference Volumes to the media verification (MV) volume group with the AMASS `volnew` command.

Reference Volumes are used to validate a drive for use with IFL. In addition, Reference Volumes can determine whether a failure is caused by deteriorating media or by a bad drive.

| Tip |
| --- |
| (1) For a definition of volume groups, see Volume Groups Defined in the Managing the AMASS File System. |
| (2) For information on using volnew, refer to the Command Reference chapter in the Managing the AMASS File System. |

# Optional Feature

To enable the Infinite File Life feature, obtain a unique authorization string from your AMASS sales representative. Enter this alphanumeric string during the installation process.

Because IFL currently uses the `volcopy` command as a replacement mechanism, the IFL authorization string also licenses the `volcopy` command.

# Supported Tape Drives

IFL supports the following tape drives with at least the minimum firmware level.

Refer to the AMASS Release Notes for the latest firmware levels that have been tested.

| Tape Drive | Minimum Firmware Level |
|---|---|
| Sony DTF GY-2120 | 1.10 |
| Sony SDX-300 (AIT-1) | 0400 |
| Sony SDX-500 (AIT-2) | 0107 |

The minimum firmware versions provide access to the low-level Error Detection and Correction (EDAC) data upon which IFL depends.

# 2

**Installing And
Using Infinite
File Life**

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# Installing IFL

Installing IFL is part of the normal AMASS installation procedure. For detailed instructions, refer to the *Installing AMASS* manual.

The following steps are specific to an IFL installation:

**Step 1.** Verify that your AMASS authorization string has been IFL enabled. Because volcopy is used in conjunction with IFL, it is also enabled at this time.

**Step 2.** Install AMASS.

The installamass script amends the crontab file to run the ifldaily script.

> **Note**
>
> To provide adequate time for ifldaily processing, the IFL installation reschedules the daily amassbackup from 0300 hours to 0105 hours. The ifldaily session is scheduled by default, to start at 0115 hours and end at 0600 hours daily.

**Step 3.** Use the Default IFL Configuration File without modification or create a Customized IFL Configuration File. For more information about the IFL Configuration File, see the *Infinite File Life Commands* chapter in this manual.

# IFL Operations

This section describes how to introduce data volumes, create reference volumes, and validate drives for use with IFL.

## Introducing Data Volumes

There are no special commands to introduce Data Volumes to IFL. When new volumes are introduced to AMASS, via the volnew command, they are then added to the IFL database. Any volume present before IFL was installed is added to the IFL database as it is encountered during normal I/O processing.

## Creating Reference Volumes

Reference volumes are used by IFL to determine whether a failure is caused by deteriorating media or by a bad drive. You must have a separate Reference Volume for each drive. A Reference Volume is "good" fresh-out-of-the-package media.

Perform the following steps to create a reference volume. This assumes a SCSI attached library. Consult the *Managing AMASS File System* guide for creating and formatting volumes on other configurations.

**Step 1.** Create Reference Volumes to be used by the Infinite File Life (IFL) feature.

```
# volnew MV 0004 REF1

Request to add a new volume:
Volume group will be MV
Volume position will be 0004
Volume label will be REF1
Volume jukebox number will be 1
    Is this information correct? [y - n]: y

MQV Reference Volume 5 has been added.
```

**Step 2.** Mark the volume online.

```
# volloc -n 5

Volume 5 status is now Online.
```

**Step 3.** Enter the `volformat` command as shown below to format a Reference Volume:

```
# su root
# volformat -y 5

volformat: format of volume 5 started.
volformat: format of volume 5 complete
volformat: completed formatting all volumes
```

**Step 4.** View attributes for the Reference Volume in the library with the `vollist` command. In line 5 below is an example of the output for Reference Volume number 5 in the MV volume group.

```
# vollist

VOL   VOL   JUKE  POS   VOLLABEL       FLAGS  USED    AVAIL   DEAD  ERRS
NUM   GRP                                     (MB)    (MB)    %

1           1     net   BACKUPVOLUME   I      23      42984   0     0

2     800   1     net   data1          A      29827   12012   3     0

3     801   1     net   data2          A      7730    35276   0     0

4     800   1     net   data3          I      820     42187   0     0

5     MV    1     net   REF1           I      0       43007   0     0

5 volumes in filesystem
```

**Note**

All Reference Volumes in the MV volume group are always INACTIVE.

## Validating Drives for Use With IFL

Use the drivechk command to check the quality of the specified drive used by IFL. In the following example, Reference Volume 5 from the MV volume group is used to check drive 1 in jukebox 1.

```
# drivechk -V 5 1 1

Verify Drive 1 in jukebox 1? [y-n]: y

Drive 1 passed verification.
```

This checking process writes and reads to special media from the MV volume group. The drivechk command collects error statistics on the drive. For more information, see drivechk.

If the drive error rate is low, the drive can be used by the mqverify command to verify the rest of the media used by IFL.

## **Daily Operational Sequence**

Each night after backups are performed the ifldaily script is run via cron.

The ifldaily script performs the following tasks:

**Task 0.**    Setup

Sets up or validates the directories needed for IFL. The IFL directory structure is shown in the following illustration:
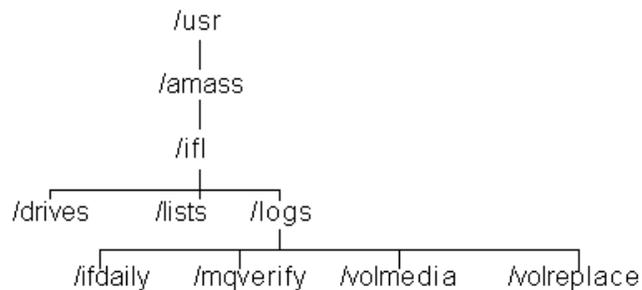


The script then determines if a custom IFL Configuration File (config) or if the default IFL Configuration File (config.default) is being used. This file is located in /usr/amass/ifl. The IFL Configuration File is then read by the script and parameters are passed to various IFL commands.

**Task 1.**  volmedia -r

The volmedia -r command searches through the vol_media table to evaluate each volume for a state change, then recomputes the verification and replacement priorities. Verification and replacement are based on factors defined in the IFL Configuration File. Each individual factor is evaluated against its limit defined in the IFL Configuration File. If any of the individual factors exceed their specified limit, the volume state is set to Verification due or Verification failed.

All individual factors are combined into a mqv score. This is where weights come into play. The weights are used to give an individual factor greater/lesser influence on the total mqv score. The mqv score is a sum of the individual factors times their respective weight factor. A factor with a higher weight has a greater influence on the mqv score. Once the mqv score is calculated, it too can be evaluated against a limit defined in the IFL Configuration File.

By providing the users the ability to configure factors and the weights, as we learn more over time about our media characteristics we can adjust these appropriately. Note that the mqv score also includes drive characteristics which obviously depend on the individual drive. Therefore, if the drive itself is suspect, that will be taken into account for an individual volume score.

**Task 2.** volreplace

The ifldaily script then runs the volreplace command to replace volumes that have been marked as verification failed or replacement due depending on the options specified for volreplace. The default IFL Configuration File specifies the "-S r" option to volreplace. This tells volreplace to replace volumes marked as replacement due. The volumes are sorted by their scores in determining replacement order. During replacement, the contents of a degraded volume are copied to healthy media and the replaced volume is removed from service.

Volumes can only be marked as replacement due by running volmedia manually. This was provided so that a AMASS administrator could check the list of volumes that were marked as verification failed and manually mark those volumes to be replaced. If we pass the "-S f" option to volreplace, it will automatically replace volumes marked as verification failed.

**Task 3.** mqverify

The ifldaily script then runs mqverify. The mqverify script reads the volmedia database to determine the volumes marked as verification due. The flagged volumes are tested in turn loading the volume into a drive. Reads are performed on error blocks previously found on the volume or the whole volume depending on the options passed to mqverify. This is called the Media Quality Verification (MQV) process.

Sense data is examined from the drives and any additional errors are recorded as bad error blocks. Then mqverify, as volmedia -r did, computes and compares factor values against limits defined in the IFL Configuration File.

In this case when one of the factors exceeds a limit, AMASS marks it inactive, writes a message to the syslog, and marks the volume as verification failed. In addition, a mqv score is calculated and checked against a limit defined in the IFL Configuration File. Note that we assume that a drive has passed a drivechk and can be used for mqverify.

**Task 4.**     Create Volume Lists

The ifldaily script then uses vmlist, which reads the volmedia database and creates lists for the system administrator. These lists are reminders to make volumes available for verification, authorize replacement of volumes that have failed verification, and to move non-resident media to or from off-site storage. The lists are stored in one or more of the following files:

| File Path | Name of List | Description |
|---|---|---|
| /usr/amass/ifl/lists | replacement_indicated | Candidate for replacement |
| | replacement_due | Approved for replacement |
| | replacement_done | Volume replaced |
| | nonres_fetch | To be retrieved from offsite storage |
| | nonres_return | To be returned to offsite storage |
| | verify_online | No action, information only |
| | verify_offline | Bring volume online |

**Task 5.**     Send List Notifications

The ifldaily script can be configured to send the lists to an AMASS administrator via email (mailx). For more information see the IFL Configuration File in the Configuring Infinite File Life chapter of this manual.

# 3

**Infinite File
Life
Commands**

# NOTES

# IFL Commands

Following are the available IFL commands:

- drivechk
- mqverify
- vhextract
- vmlist
- volmedia
- volreplace

# drivechk

Check the quality of a specified drive for use by IFL. This checking process writes and reads to special media from the MV (media verification) volume group. The MV volume group consists of media known as "good."

**Note**

This drive checking is not a "rigorous" process, it checks the drive for use only for the AMASS IFL feature. Do not use this command to verify the overall merit or superiority of your drives.

The drivechk command collects error statistics on a drive. If the error rate is low, the drive can be used by the mqverify command to verify the rest of the media used by IFL.

**Tip**

Verifying a Sony DTF drive can take about 30 minutes; verifying a Sony AIT drive can take about 60 minutes.

The drivechk command creates a verification file for each drive it tests in /usr/amass/ifl/drives/*jXdYY*, where *X* = jukebox number, *YY* = drive number.

The format of this file is a "status" field (either PASSED or FAILED) followed by a "date_time" field (with a format of *yyyymmdd.hhmm*). An example is shown below, where a drive passed on 2000 May 30 at 4:44 pm and another drive failed on 2000 May 30 at 5:30 pm:

```
PASSED                  20000530.1644

FAILED                  20000530.1730
```

There is a "drive valid time_in_days" parameter in the IFL configuration file where you can specify the "life time" value for a drive. After this life time value expires, you must run the drivechk command again. An example of this parameter in the configuration file is shown below, where a drive will be valid for 366 days after it has been checked by the drivechk command:

```
drive valid        366
```

Options

```
/usr/amass/bin

./drivechk

-uy
[ -V volume-number ]
drive-number
[ juke-number ]
```

| Option | Description |
|--------|-------------|
| -V *volume-number* | Specify a media verification volume number from the MV volume group |
| *drive-number* | Enter the drive number that you want AMASS to check |
| *juke-number* (defaults to 1) | Enter the AMASS library number where the drive is located |
| -u | Usage statement |
| -y | Suppress interactive messages |

## mqverify

The mqverify command performs the following tasks:

- By default, it will select a drive that has been previously verified as good by the drivechk command.

- Verifies volumes and volume groups for use by IFL. To prevent conflict with any activity in the same volume group, AMASS flags the volume as INACTIVE while it is being verified. AMASS recomputes the priorities and sets the most important volumes first. The sequence is as follows:

    - Creates an internal list of volumes (either specified or by scanning the VolMedia Database), then sorts them in descending priority.

    - Starts verifying one volume at a time (mounts the volume and performs the reads as specified in the command line.) If either the -m or -M option is specified, the only information taken from the data is the list of error blocks.

    - As each volume completes verification, its current statistics are added to the totals, the verification and replacement priorities are recalculated and the Media Quality Verification (MQV) state is set.

- When the verification process completes, AMASS updates the VolMedia Database, and logs its findings to syslog. It also writes or appends a report to the /usr/amass/logs/mqverify/*yyyy:mm:dd.hh:mm* file. For example, to the 1999:08:03.0115 file.

- If the volume requires replacement, AMASS flags it as INACTIVE and sends a message to syslog.

If you do not specify a volume or volume group with the
mqverify command, AMASS scans the VolMedia Database
for volumes that meet the following criteria: (1) are listed in the
verification_due state and (2) are online and formatted.

**Note**

Volumes that are offline or unformatted cannot be verified.

Options

```
/usr/amass/bin

./mqverify

-u

[ -fmMqy ]

[ -b block-number ... ]
[ -c count ]
[ -d drive-number ]
[ -g volume-group ... ]
[ -i interval]
[ -s block-number ... ]
[ -v vol-number | #volserial-number ]
[ -x vol-number | #volserial-number ]
```

| Option | Description |
|---|---|
| -b *block-number* | Verify the specific block number |
| -c *count*<br><br>(defaults to full volume)<br><br>Use with -f and -i options. | To verify a volume, AMASS will test the number of specified suspect block counts |
| -d *drive-number* | Enter a drive number<br><br>Forces AMASS to use this drive, even if it has not been verified as good with the drivechk command |
| -f | Force verification of specified volumes, even if volumes are not due for verification |
| -g *volume-group* | Verify **all** online volumes in the specified volume group. |
| -i *interval*<br><br>(defaults to lastpbn/count) | To verify a volume, AMASS will test the blocks at the specified interval |
| -m | AMASS will only test newly reported suspect blocks.<br><br>The VolMedia Database is locked during this verification process. |
| -M | AMASS will test all blocks, including blocks that were previously reported as bad.<br><br>The VolMedia Database is locked during this verification process.<br><br>**NOTE**: This can be very time consuming. |
| -q | Suppress informational messages |

| Option | Description |
|---|---|
| -s *block-number* <br> (defaults to 0) | To verify a volume, AMASS will test the blocks starting at the specified block address. |
| -u | Usage statement |
| -v *volume-number* or <br> -v *#volserial-number* | Verify the specified volume by entering either: <br> • AMASS unique volume number <br> • IFL volume serial number |
| -x *volume-number* or <br> -x *#volserial-number* | Exclude data for either: <br> • specified AMASS unique volume number <br> • specified IFL volume serial number |
| -y | Suppress interactive messages |
| **NOTE**: Some shells give the pound sign (#) special meaning. Enclose the IFL volume serial number in quotation marks if it contains any spaces or is misinterpreted by the command shell. Do not use the leading # for IFL volume serial numbers that begin with an alphabetic letter. | |

## vhextract

The vhextract command reports information from the IFL
Database.

Selected data is separated by tabs and can generate input for
either spreadsheets or for other reporting programs.

Options

```
/usr/amass/bin

./vhextract

-u
[ -aio ]
[ -S cdflnrv ]
[ -s date_time ]
[ -t date_time ]
[ -v volume-number  │  #volserial-number
  │-x  volume-number  │  #volserial-number
  │-g  volume-group ]  ...
```

| Option | Description |
|---|---|
| -a | List active volumes |
| -g *volume-group* | List specified volume group |
| | By default, AMASS includes all volumes except the Backup Volume and the cartridges in the CL (cleaning) volume group. Specifying a volume group further restricts this selection. |
| -i | List only inactive volumes |

| Option | Description |
|---|---|
| -o | List only offline volumes |
| -S c<br>-S d<br>-S f<br>-S l<br>-S n<br>-S r<br>-S v | List volumes in specified states where:<br><br>-S c verification current<br>-S d volume replaced<br>-S f verification failed<br>-S l volume relabelled<br>-S n new/unverified volume<br>-S r replacement due<br>-S v verification due<br>(defaults to -S clrv) |
| -s *date_time* | List data since specified *date_time*<br><br>• Dates are in the format MM/DD/YYYY<br>• Times are in the format hh:mm[:ss]<br>• Both are enclosed in double quotes separated by a space. For example, a *date_time* would be entered as:<br>"08/30/2000 02:00:00"<br><br>If a *date_time* is not entered, all data for the selected volumes will be listed. |
| -t *date_time* | List data through specified *date_time*.<br><br>• Dates are in the format MM/DD/YYYY.<br>• Times are in the format hh:mm[:ss].<br>• Both are enclosed in double quotes separated by a space. For example, a *date_time* would be entered as:<br>"08/30/2000 02:00:00"<br><br>If a *date_time* is not entered, all data for the selected volumes will be listed. |
| -u | Usage statement |

| Option | Description |
|---|---|
| -v *volume-number* or<br><br>-v *#volserial-number* | List data for either:<br><br>• Specified AMASS unique volume number<br>• Specified IFL volume serial number<br><br>If a *volume-number* or *#volserial-number* is not entered, data for all volumes will be listed. |
| -x *volume-number* or<br><br>-x *#volserial-number* | Exclude data for either:<br><br>• Specified AMASS unique volume number<br>• Specified IFL volume serial number |
| **NOTE**: Some shells give the pound sign (#) special meaning. Enclose the IFL volume serial number in quotation marks if it contains any spaces or is misinterpreted by the command shell. Do not use the leading # for IFL volume serial numbers that begin with an alphabetic letter. ||

## **vmlist**

The vmlist command lists media from the AMASS File System Database and IFL Databases.

Options

```
/usr/amass/bin

./vmlist

-u
[ -aio ]
[ -F anrx ]
[ -S cdflnrv ]
```

| Option | Description |
|---|---|
| no option | List: active, inactive, offline volumes |
| -a | List only active volumes |
| -F a<br>-F n<br>-F r<br>-F x | List volumes with specified flags where:<br>-F a absent from library<br>-F n non-resident volume<br>-F r IFL Reference Volume in MV volume group<br>-F x exempt from IFL |
| -i | List only inactive volumes |
| -o | List only offline volumes |

| Option | Description |
|---|---|
| | List volumes in specified states where: |
| -S c | -S c verification current |
| -S d | -S d volume replaced |
| -S f | -S f verification failed |
| -S l | -S l volume relabelled |
| -S n | -S n new/unverified volume |
| -S r | -S r replacement due |
| -S v | -S v verification due |
| | (defaults to -S cfrv) |
| -u | Usage statement |

Output            An example of the `vmlist` output is shown below:

```
# vmlist
VOLUME      SERIAL    VID    VOL STATE    FLAGS    IFL STATE    COMMENT

201801                9      offline      A---     Unverified   MQV prioroity=0

201891                6      offline      A---     Unverified   MQV prioroity=0

201892                22     active       ----     Unverified   MQV prioroity=0

201894                5      inactive     ----     MQV Passed   06 Jul 2000

201895                4      active       ----     Unverified   MQV prioroity=0
```

## volmedia

The volmedia command performs the following tasks:

- Displays and modifies IFL Databases

- Records the brand, media type, lot/case number, and acquisition date of each IFL volume

**Note**

The `volmedia` command operates either in inquiry mode or update mode, but not both at the same time.

## Options

```
/usr/amass/bin

./volmedia

(display usage)
volmedia -u

(display volume)
volmedia [ { <volume-number> | #<volserial-number> } ... ]

(add/update volume)
volmedia
[ -A { yes | no } ]
[ -d <date_acquired> ]
[ -l <lot> ]
[ -m <manufacturer> ]
[ -N { yes | no } ]
[ -R { yes | no } ]
[ -S { new | current | verify | replace } ]
[ -t <type> ]
[ -X { yes | no } ]
[ -y ]
{ <volume-number> | #<volserial-number> } ...

(delete volume)
volmedia
-D
[ -y ]
{ <volume-number> | #<volserial-number> } ...

(purge history)
volmedia
{ -p | -b <date> }
[ -y ]
{ <volume-number> | #<volserial-number> } ...

(recalculate scores)
volmedia
-r
[ -y ]
```

| Option | Description |
|---|---|
| -A y<br><br>-A n | Set or clear absent volume flags from IFL Database.<br><br>-A y set flags<br><br>-A n clear flags |
| -D<br><br>-D *volume-number* or<br>-D *#volserial-number* | In IFL Databases:<br><br>-D delete all records<br><br>-D *volume-number* or<br>-D *#volserial-number* delete specified volume record |
| -d *date_acquired volume-number* or<br>-d *date_acquired #volserial-number*<br><br>(defaults to current date) | Enter date specified media was put in service<br><br>Dates are in the form MM/DD/YYYY [hh:mm[:ss]]. |
| -l *lot volume-number* or<br>-l *lot #volserial-number* | Enter media lot or case number for specified media. Maximum of 15 characters. |
| -m *manufacturer volume-number* or<br>-m *manufacturer #volserial-number* | Enter media manufacturer or brand name for specified media. Maximum of 15 characters. |
| -N y<br><br>-N n | Set or clear nonresident volume flags for specified volume.<br><br>-N y set flags<br><br>-N n clear flags |

| Option | Description |
|---|---|
| -P<br><br>-Pb *date*<br><br>-P *volume-number* or<br><br>-P *#volserial-number*<br><br><br>-Pb *date volume-number* or<br><br>-Pb *date #volserial-number* | In VolMedia History Database:<br><br>-P purge all records in history log<br><br>-Pb purge all records before specified *date*<br><br>-P *volume-number* or<br><br>-P *#volserial-number* purge records for specified volume<br><br>-Pb *date volume-number* or<br><br>-Pb *date #volserial-number* purge records for specified volume before specified *date* |
| <br>-R y<br><br>-R n | Set or clear Reference Volume flags for specified volume.<br><br>-R y set flags<br><br>-R n clear flags |
| <br>-S c<br><br>-S v<br><br>-S r | Set state of volume to either:<br><br>-S c current state<br><br>-S v verification state<br><br>-S r replacement state |
| -t *type volume-number* or<br><br>-t *type #volserial-number* | Enter media type, which is the stock or reorder number for specified media. Maximum of 15 characters. |
| -u | Usage statement |
| <br><br>-X y<br><br>-X n | Set or clear IFL exempt flags for specified volume.<br><br>-X y set flags<br><br>-X n clear flags |

| Option | Description |
|---|---|
| -y | Suppress interactive messages |
| *volume-number* or *#volserial-number* | Perform action for either:<br>• Specified AMASS unique volume number<br>• Specified IFL volume serial number |
| **NOTE**: Some shells give the pound sign (#) special meaning. Enclose the IFL volume serial number in quotation marks if it contains any spaces or is misinterpreted by the command shell. Do not use the leading # for IFL volume serial numbers that begin with an alphabetic letter. | |

Output

An example of the volmedia output is shown below:

```
# volmedia
VOLUME      SERIAL   VID   IN   SERVICE    FLAG   VERIFICATION STATE    LATEST UPDT
                                           S

201801               9     23   Jun 2002   A---   New/Unverified Vol    23 Jun 2002

201891               6     23   Jun 2002   A---   New/Unverified Vol    23 Jun 2002

201892               22    23   Jun 2002   ----   Verification Current  23 Jun 2002

201894               5     23   Jun 2002   --R-   Verification Due      29 Jun 2002

201895               4     23   Jun 2002   -N--   Verification Due      03 Jul 2002
```

## volreplace

The volreplace command gathers information from the IFl Databases and the IFL Configuration File to establish a priority list of volumes to replace that are close to degenerating. The AMASS `volcopy` command creates an exact copy of the volume to be replaced and the unique AMASS volume number is reused for the copied version.

**Note**

At least one volume must be in the AMASS space pool (SP) volume group because `volreplace` uses new volumes from the SP. This command will fail if there is not an available volume in the SP volume group.

If you do not specify any volumes or volume groups to replace, AMASS searches the volumes in the IFL created by the `ifldaily` script, and builds a list of prioritized volumes to be replaced. If a to-be-replaced volume is offline, make the volume online.

Options

```
/usr/amass/bin

./volreplace

-u
[ -fqy ]
[ -r { volcopy | none } ]
[ -S fr ]
[ -v {<volume-number> |#volserial-number}
 |-x {<volume-number> |#volserial-number}
 |-g <volume-group> ] ...
```

| Option | Description |
|---|---|
| -f | Force replacement of specified volumes even if not marked for replacement |
| -g *volume-group* | Include volume group |
| -q | Suppress informational messages |
| -r | Override configured replacement utility |
| -S f<br><br>-S r | Include volumes in designated states where:<br><br>-S f verification failed<br>-S r replacement due<br><br>(default to -S r) |
| -u | Usage statement |
| -v *volume-number* or<br>-v *#volserial-number* | Include either:<br><br>• Specified AMASS unique volume number<br>• Specified IFL volume serial number |
| -x *volume-number* or<br>-x *#volserial-number* | Exclude either:<br><br>• Specified AMASS unique volume number<br>• Specified IFL volume serial number |
| -y | Suppress interactive messages |
| **NOTE**: Some shells give the pound sign (#) special meaning. Enclose the IFL volume serial number in quotation marks if it contains any spaces or is misinterpreted by the command shell. Do not use the leading # for IFL volume serial numbers that begin with an alphabetic letter. | |

# NOTES

# 4

# Configuring Infinite File Life

# NOTES

# Default IFL Configuration File

The following illustration shows the Default IFL Configuration File.

```
# This is the default IFL configuration file.
# It is first installed as /usr/amass/scripts/iflconfig.default, but
# is copied to /usr/amass/ifl/config.default by IFL installation.
#
# IFL sites are encouraged to use this file as a template for their
# site-specific /usr/amass/ifl/config file.
#
include all              # IFL applies by default
exclude volume  1           # exclude backup volume
maximum drives  2            # volreplace requires 2 drives

# The IFL processing session runs from 1:15 - 6:00 each morning.
session start   0115    daily
session stop    0600    daily

# Verify every 365 days; weight = 1 per day.
verify  age     365    1

# Verify when 1 new error occurs; no weight.
verify  errors  1

# Verify when 3 new suspect blocks; weight = 10 per suspect.
verify  errblk  3       10

# mqverify options when launched by ifldaily.
verify  options -M -c 200

# Replace at 120 months (10 yrs); weight = 1 per month.
replace age     120     1

# Replace when 3 total errors; no weight.
replace errors  3

# Volreplace options when launched by ifldaily.
replace options -S r

# Replace when 10 bad blocks; weight = 10 per bad block.
replace errblk  10      10

# Execute volcopy as the replacement mechanism.
replace using   volcopy
```

# Parameters Defined

This section defines parameters used in the Default IFL
Configuration File (`/usr/amass/ifl/config.default`) or
in a Customized IFL Configuration File
(`/usr/amass/ifl/config`).

The following list shows the available parameters types:

- Command Parameters
- Debug Parameters
- Media Parameters
- Processing Parameters
- Threshold Parameters

# Command Parameters

The following tables describe Command Parameters that are used to specify how IFL commands are run by the ifldaily script:

mqverify Parameters

| | | Parameter | Description |
|---|---|---|---|
| **mqverify** | **ver**[ify] | **opt**[ions] | Specify mqverify options to ifldaily script. See `mqverify` command for options. |
| | | **min**[imum] *sample* | Minimum valid test sample |

volreplace Parameters

| | | Parameter | Description |
|---|---|---|---|
| **volreplace** | **repl**[ace] | **opt**[ions] | Specify volreplace options to ifldaily script. See volreplace command for options. |
| | | **using volcopy** | To replace media, run the `volcopy` command. |

## Debug Parameters

The following table describes the Debug Parameters:

| | Parameter | Description |
|---|---|---|
| **Debug** | **debug** | **NOTE**: Do not modify this record type unless instructed to do so by ADIC Technical Support. This value can severely impact performance. User can specify alphabetic or hex values. For hex values, specify one hex value that includes all options desired. |
| | **all** | Turn on all debug options. |
| | **api_req** or **0x1** | Output API request information. |
| | **api_tot** or **0x2** | Output API total information. |
| | **drv_st**[ats] or **0x100000** | Output drive statistic information. |
| | **ext_sk**[ip] or **0x10** | Output when volume is skipped by vhextract. |
| | **post_s**[ense] or **0x40000** | Output AIT post sense data. |
| | **read_s**[ense] or **0x10000** | Output log sense data on reads. |
| | **rep_sk**[ip] or **0x20** | Output when volume is skipped by volreplace. |
| | **ver_sk**[ip] or **0x80** | Output when volume is skipped by mqverify. |
| | **volcopy=0** **volcopy=1** **volcopy=2** **volcopy=3** | Turn on debug option in volreplace. volcopy=0 is equal to no debug. volcopy=3 is the highest debug amount. volcopy=0 is the default. |
| | **write_s**[ense] or **0x20000** | Output log sense data on writes. |

## Media Parameters

The following table describes Media Parameters. These parameters affect which volumes or volume groups upon which IFL operates.

| Note |
| --- |
| The cleaning volume group (CL) and media verification group (MV) are always excluded from IFL. |

| | | Parameter | | Description |
| --- | --- | --- | --- | --- |
| **Media** | **incl**[ude] | **all** (default) | | IFL applies to all media except as excluded below. |
| | | **vg**[roup] *vgid*... | | Include specific volume groups. Usually executed after performing an **exclude**. |
| | | **vol**[ume] *volid*... | | Include specific volumes. Usually executed after performing an **exclude**. |
| | **excl**[ude] | **all** | | Excludes all named volumes or volume groups. Usually executed before performing an **include**. |
| | | **vg**[roup] *vgid*... | | Exclude specific volume groups. |
| | | **vol**[ume] *volid*... | | Exclude specific volumes. |
| | **NOTE**: Number ranges from volume ID (*volid*) or volume group ID (*vgid*) are not supported, but multiple include and exclude records are used and interpreted from specific (*volid*) to least specific (all). | | | |

## Description of Media Parameter Values

The following table describes the Media Parameter values.

| Parameter | Description |
|-----------|-------------|
| *volid* | A *#volserialnumber* (barcode label) or an AMASS-assigned *volumenumber.* |
| *vgid* | A *volgroup* assignment:<br>• A numeric value, 1 through 2047<br>• The space pool (SP) |

## Processing Parameters

The following table describes Processing Parameters:

| | Parameter | | Description |
|---|---|---|---|
| **Processing** | **drive** | **valid** *#days* | Drive will be valid for *#days* after it has been verified by the drivechk command. |
| | **send** | **list** *recipient* | Email list to specified addresses. |
| | | **List**s include: | |
| | | **dai**[ly] | ifldaily log file |
| | | **offl**[ine] | Offline volume list |
| | | **nonr**[es] | Nonresident volume list |
| | | **repl**[ace] | Replacement state list |
| | | **verif**[y] | Verification state list |
| | **sess**[ion] | **star**[t] *time* [*day…*] | IFL session start time |
| | | **stop** *time* [*day…*] | IFL session stop time |

## Description of Processing Parameter Values

The following table describes the Processing Parameter values.

| Parameter | Description |
|-----------|-------------|
| *day* | The valid entries are as follows:<br><br>**sun**[*day*]<br><br>**mon**[*day*]<br><br>**tue**[*sday*]<br><br>**wed**[*nesday*]<br><br>**thu**[*rsday*]<br><br>**fri**[*day*]<br><br>**sat**[*urday*]<br><br>**dai**[*ly*]<br><br>**weekd**[*ay*]<br><br>**weeke**[*nd*] |
| *time* | 24-hour clock (local) time (hhmm). |

# Threshold Parameters

Threshold Parameters are used to determine when volumes need to be verified or replaced. When used as verification parameters, Threshold Parameters are used to change the state of a volume to "Verification due" as defined in Figure 1-3 AMASS IFL Volume State. When used as replacement parameters, Threshold Parameters are used to change the state of a volume to "Verification failed" as defined in Figure 1-3 AMASS IFL Volume State

## Generic Threshold Parameters

The following table describes Generic Threshold Parameters.

| | **Parameter** | | **Description** |
|---|---|---|---|
| **Generic Threshold** | **repl**[ace] | *factor value* [*weight*] | Replace when the factor [TOTAL] is greater than or equal to the value. |
| | **ver**[ify] | *factor value* [*weight*] | Verify when the factor [TOTAL] is greater than or equal to the value. |

*Description of Generic Threshold Parameter Values*

The following table describes the Generic Threshold Parameter values.

| Parameter | Description | |
|---|---|---|
| *factor* | A Media Quality Verification (MQV) decision factor performed by the `mqverify` command that may be one of the following: | |
| | **age** | Months in service, for replacement threshold; days since `mqverify`, for verification threshold |
| | **erro**[rs] | Unrecoverable error count |
| | **errb**[lk] | Blocks where errors have been reported **NOTE:** A single I/O error may apply to multiple blocks on tape. |
| | **moun**[ts] | Total mounts |
| | **mqv** | Raw score from `mqverify` |
| | **read**[s] | Bytes read, stored internally as MB, but the threshold should be expressed with a scaling suffix (example: 100G for 100GB) |
| | **rec**[overies] | Recoverable error count |
| | **risk** | Media-specific relative risk of data loss: 0-1000. The data is presented numerically in a range of 0 to 1000 to represent a relative probability of data loss during subsequent I/O requests on the volume. |

| Parameter | Description | |
|---|---|---|
| **(factor continued)** | **scor**[e] | Sum of factors * weights (not usable in weight) |
| | | **NOTE**: `Verify` factors use the `IFLNEW` counters; `replace` factors use the `IFLTOTAL` counter. |
| | **writ**[es] | Bytes written. Stored internally as MB, but the threshold should be expressed with a scaling suffix. For example: 100G for 100GB. |
| *weight* | A multiplier of the "factor" value used to compute a Media Quality Verification (MQV) process score. | |
| | **NOTE**: Weights and limits can include a scaling suffix, which follows ISO 9000 conventions (M=mega, G=giga). The case is significant. For weights, a leading "/" inverts the sign of the binary exponent. For example: "Verify reads 100G 5/G." means the volume is verified after each 100GB of data reads and adds 5 points to the verification score for each GB read. | |

## Drive-Specific Threshold Parameters

### *AIT Threshold Parameters*

The following table describes AIT Threshold Parameters:

| | | Parameter | Description |
|---|---|---|---|
| **AIT Threshold** | **ver**[ify] | AIT *rd_error_rate* | Maximum current read error rate. The volume will be replaced if the AIT drive detects a maximum of xx correctable read errors.<br>• AIT-1 defaults to 50<br>• AIT-2 defaults to 80 |
| | | AIT *wr_error_rate* | Maximum total write error rate. The volume will be replaced if the AIT drive detects a maximum of xx correctable write errors.<br>• AIT-1 defaults to 180<br>• AIT-2 defaults to 850 |
| | | AIT *ll_error_rate* | Low level block error rate threshold.<br>Defaults to **.**05 |
| | | AIT *sigma* | **NOTE**: Do not modify this parameter unless instructed to do so by ADIC Technical Support.<br>Defaults to 2 |
| | | AIT *peak* | Maximum number of times the AIT drive can detect an error rate greater than average<br>Defaults to 5 |
| | | AIT *limit* | Maximum score<br>Defaults to 500 |

*DTF Threshold Parameters*

The following table describes DTF Threshold Parameters:

| | | Parameter | Description |
|---|---|---|---|
| **DTF Threshold** | **ver**[ify] | DTF *sigma* | **NOTE**: Do not modify this parameter unless instructed to do so by ADIC Technical Support. Defaults to 35 |
| | | DTF *peak* | Maximum number of times the DTF drive can detect an error rate greater than average. Defaults to 20 |
| | | DTF *limit* | Maximum score. Defaults to 500 |

# **NOTES**

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