

### 2.3.1.2 Estimation of Logical Volume Formatting Time

The standard formatting time of the high-speed LDEV format and the low-speed LDEV format for each Drive type is described below.

Note that the Storage System configuration at the time of this measurement is as shown below.

<Storage System Conditions at the Time of Format Measurement>

- The number of the installed DKBs (VSP G200: CTL is directly installed, VSP G400, G600: One per cluster, VSP G800: Two per cluster)
- Without I/O
- Perform the formatting for the single ECC
- Define the number of LDEVs (define a maximum number of 100GB LDEVs for the single ECC)
- Measurement emulation (OPEN-V)

#### 1. HDD

The formatting time of HDD doesn't depend on number of logical volumes, and be decided by capacity and the rotational speed of HDD.

##### (1) High speed LDEV formatting

The high-speed format time is indicated as follows.

It is an aim to the last in the standard time required, and the real formatting time may be different by RAID GROUP and a Drive type.

Table 2-13 High-speed format time estimation

HDD Capacity/rotation Speed	Formatting Time (*3)	Monitoring Time (*1)
10 TB / 7.2 krpm	1200 min	1360 min
6.0 TB / 7.2 krpm	770 min	1140 min
4.0 TB / 7.2 krpm	600 min	1010 min
1.8 TB / 10 krpm	170 min	270 min
1.2 TB / 10 krpm	170 min	270 min
600 GB / 10 krpm	85 min	130 min
600 GB / 15 krpm	70 min	115 min
300 GB / 15 krpm	45 min	70 min

## (2) Slow LDEV formatting

The low-speed format time is indicated as follows.

Rough formatting time per 1 TB/1 PG without host I/O is indicated as follows (\*2).

Table 2-14 15 krpm

RAID Level		Standard Formatting Time (*3)					
		300 GB			600 GB		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	120 min	105 min	95 min	115 min	95 min	85 min
RAID5	3D+1P	85 min	70 min	65 min	70 min	55 min	50 min
	4D+1P	65 min	55 min	50 min	55 min	40 min	40 min
	6D+1P	50 min	40 min	35 min	40 min	30 min	25 min
	7D+1P	45 min	35 min	30 min	35 min	25 min	25 min
RAID6	6D+2P	45 min	40 min	35 min	40 min	30 min	30 min
	12D+2P	30 min	20 min	20 min	25 min	20 min	15 min
	14D+2P	25 min	20 min	20 min	20 min	15 min	15 min

Table 2-15 10 krpm

RAID Level		Standard Formatting Time (*3)					
		600 GB			1.2 TB		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	150 min	130 min	125 min	170 min	145 min	135 min
RAID5	3D+1P	100 min	80 min	75 min	110 min	100 min	90 min
	4D+1P	80 min	65 min	55 min	85 min	75 min	65 min
	6D+1P	55 min	45 min	40 min	60 min	50 min	45 min
	7D+1P	50 min	40 min	35 min	50 min	40 min	40 min
RAID6	6D+2P	55 min	45 min	40 min	60 min	45 min	45 min
	12D+2P	30 min	25 min	25 min	35 min	25 min	25 min
	14D+2P	30 min	25 min	20 min	30 min	25 min	20 min

RAID Level		Standard Formatting Time (*3)		
		1.8 TB		
		VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	140 min	120 min	115 min
RAID5	3D+1P	80 min	65 min	60 min
	4D+1P	60 min	50 min	45 min
	6D+1P	45 min	35 min	30 min
	7D+1P	40 min	30 min	30 min
RAID6	6D+2P	40 min	30 min	30 min
	12D+2P	25 min	20 min	20 min
	14D+2P	20 min	20 min	15 min

Table 2-16 7.2 krpm

RAID Level		Standard Formatting Time (*3)					
		4 TB			6 TB		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	235 min	190 min	170 min	225 min	175 min	160 min
RAID5	3D+1P	150 min	110 min	95 min	160 min	125 min	110 min
	4D+1P	115 min	85 min	75 min	125 min	95 min	85 min
	6D+1P	80 min	60 min	55 min	85 min	65 min	55 min
	7D+1P	75 min	50 min	45 min	75 min	55 min	50 min
RAID6	6D+2P	85 min	60 min	50 min	85 min	65 min	55 min
	12D+2P	45 min	35 min	30 min	45 min	35 min	30 min
	14D+2P	40 min	30 min	25 min	40 min	30 min	30 min

RAID Level		Standard Formatting Time (*3)		
		10 TB		
		VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	225 min	175 min	160 min
RAID5	3D+1P	160 min	125 min	110 min
	4D+1P	125 min	95 min	85 min
	6D+1P	85 min	65 min	55 min
	7D+1P	75 min	55 min	50 min
RAID6	6D+2P	85 min	65 min	55 min
	12D+2P	45 min	35 min	30 min
	14D+2P	40 min	30 min	30 min

## 2. SSD

SSD doesn't have the self LDEV format function.

LDEV formatting is performed by slow LDEV format only.

Rough formatting time per 1 TB/1 PG without host I/O is indicated as follows (\*2).

Table 2-17 SSD format time estimation

RAID Level		Standard Formatting Time (*3)					
		200 GB			400 GB		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	45 min	35 min	30 min	45 min	35 min	30 min
RAID5	3D+1P	30 min	30 min	25 min	30 min	30 min	25 min
	4D+1P	25 min	25 min	20 min	25 min	25 min	20 min
	6D+1P	20 min	20 min	15 min	20 min	20 min	15 min
	7D+1P	15 min	15 min	15 min	15 min	15 min	15 min
RAID6	6D+2P	20 min	15 min	15 min	20 min	15 min	15 min
	12D+2P	10 min	10 min	10 min	10 min	10 min	10 min
	14D+2P	10 min	10 min	10 min	10 min	10 min	10 min

RAID Level		Standard Formatting Time (*3)		
		1.9 TB		
		VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	20 min	20 min	10 min
RAID5	3D+1P	15 min	15 min	10 min
	4D+1P	10 min	10 min	5 min
	6D+1P	10 min	10 min	5 min
	7D+1P	10 min	5 min	5 min
RAID6	6D+2P	10 min	10 min	5 min
	12D+2P	10 min	5 min	5 min
	14D+2P	10 min	5 min	5 min

The formatting time becomes the same in 16 SSDs because the transmission of the format data does not arrive even at the limit of passing.

## 3. FMD

The formatting time of FMD doesn't depend on number of ECC, and be decided by capacity of FMD.

### (1) High speed LDEV formatting

The high-speed format time is indicated as follows.

It is an aim to the last in the standard time required, and the real formatting time may be different by RAID GROUP and a Drive type.

Table 2-18 FMD High-speed format time estimation (NFxxx-PxxxSS)

FMD Capacity	Formatting Time (*3)	Time Out Value (*1)
1.75 TB (1.6 TiB)	65 min	120 min
3.5 TB (3.2 TiB)	130 min	180 min

Table 2-19 FMD High-speed format time estimation (NFxxx-QxxxSS)

FMD Capacity	Formatting Time (*3)	Time Out Value (*1)
1.75 TB (1.6 TiB)	5 min	10 min
3.5 TB (3.2 TiB)	5 min	10 min
7 TB (6.4 TiB)	5 min	10 min
14 TB (12.8 TiB)	5 min	10 min

## (2) Slow LDEV formatting

The low-speed format time is indicated as follows.

Rough formatting time per 1 TB/1 PG without host I/O is indicated as follows (\*2).

Table 2-20 FMD Low-speed format time estimation (NFxxx-PxxxSS)

RAID Level		Standard Formatting Time (*3)					
		1.75 TB (1.6 TiB)			3.5 TB (3.2 TiB)		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	15 min	15 min	15 min	15 min	15 min	15 min
RAID5	3D+1P	15 min	10 min	10 min	15 min	10 min	10 min
	4D+1P	10 min	10 min	10 min	10 min	10 min	10 min
	6D+1P	10 min	5 min	5 min	10 min	5 min	5 min
	7D+1P	10 min	5 min	5 min	10 min	5 min	5 min
RAID6	6D+2P	10 min	10 min	10 min	10 min	10 min	10 min
	12D+2P	10 min	5 min	5 min	10 min	5 min	5 min
	14D+2P	10 min	5 min	5 min	10 min	5 min	5 min

Table 2-21 FMD Low-speed format time estimation (NFxxx-QxxxSS) (When the firmware version is less than 83-03-21-x0/xx.)

RAID Level		Standard Formatting Time (*3)								
		1.75 TB (1.6 TiB)			3.5 TB (3.2 TiB)			7 TB (6.4 TiB)		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	10 min	10 min	10 min	10 min	10 min	10 min	10 min	10 min	10 min
RAID5	3D+1P	10 min	10 min	10 min	10 min	10 min	10 min	10 min	10 min	10 min
	4D+1P	10 min	5 min	5 min	10 min	5 min	5 min	10 min	10 min	5 min
	6D+1P	10 min	5 min	5 min	10 min	5 min	5 min	10 min	10 min	5 min
	7D+1P	10 min	5 min	5 min	10 min	5 min	5 min	10 min	10 min	5 min
RAID6	6D+2P	10 min	5 min	5 min	10 min	5 min	5 min	10 min	5 min	5 min
	12D+2P	10 min	5 min	5 min	10 min	5 min	5 min	10 min	5 min	5 min
	14D+2P	10 min	5 min	5 min	10 min	5 min	5 min	10 min	5 min	5 min

Table 2-22 FMD Low-speed format time estimation (NFxxx-QxxxSS) (When the firmware version is 83-03-21-x0/xx or later.)

RAID Level		Standard Formatting Time (*3)					
		1.75 TB (1.6 TiB)			3.5 TB (3.2 TiB)		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	3 min	2 min	2 min	3 min	2 min	2 min
RAID5	3D+1P	3 min	1 min	1 min	3 min	1 min	1 min
	4D+1P	2 min	1 min	1 min	2 min	1 min	1 min
	6D+1P	2 min	1 min	1 min	2 min	1 min	1 min
	7D+1P	2 min	1 min	1 min	2 min	1 min	1 min
RAID6	6D+2P	2 min	1 min	1 min	2 min	1 min	1 min
	12D+2P	1 min	1 min	1 min	1 min	1 min	1 min
	14D+2P	1 min	1 min	1 min	1 min	1 min	1 min

RAID Level		Standard Formatting Time (*3)					
		7 TB (6.4 TiB)			14 TB (12.8 TiB)		
		VSP G200	VSP G400, G600	VSP G800	VSP G200	VSP G400, G600	VSP G800
RAID1	2D+2D	3 min	2 min	2 min	3 min	2 min	2 min
RAID5	3D+1P	10 min	10 min	10 min	10 min	10 min	10 min
	4D+1P	10 min	10 min	10 min	10 min	10 min	5 min
	6D+1P	10 min	10 min	5 min	10 min	10 min	5 min
	7D+1P	10 min	5 min	5 min	10 min	5 min	5 min
RAID6	6D+2P	10 min	10 min	5 min	10 min	10 min	5 min
	12D+2P	10 min	5 min	1 min	10 min	5 min	1 min
	14D+2P	10 min	5 min	1 min	10 min	5 min	1 min

\*1: After the standard formatting time has elapsed, the display on the Web Console shows 99% until it reaches to the monitoring time. Because Drive itself performs the format, and the progress rate to the total capacity is not understood, the ratio at the elapsed time from the format beginning to the Formatting time required is displayed.

\*2: If there is an I/O operation, the minimum formatting time is over 6 times as long as the discrete value, depending on the I/O load.

\*3: The formatting time varies according to the generation of the Drive in standard time distance.

NOTE: The formatting time when mixing the Drive types and the configurations described in “(1) High speed LDEV formatting” and “(2) Slow LDEV formatting” divides into the following cases.

- (a) When only the high speed formatting available Drives (1. HDD, 3. FMD) are mixed  
The formatting time is the same as the formatting time of Drive types and configurations with the maximum standard time.
- (b) When only the low speed formatting available Drives (2. SSD) are mixed  
The formatting time is the same as the formatting time of Drive types and configurations with the maximum standard time.
- (c) When the high speed formatting available Drives (1. HDD, 3. FMD) and the low speed formatting available Drives (2. SSD) are mixed
  - (1) The maximum standard time in the high speed formatting available Drive configuration is the maximum high speed formatting time.
  - (2) The maximum standard time in the low speed formatting available Drive configuration is the maximum low speed formatting time.

The formatting time is the sum of the above formatting time (1) and (2).

When the high speed formatting available Drives and the low speed formatting available Drives are mixed in one formatting process, the low speed formatting starts after the high speed formatting is completed. Even after the high speed formatting is completed, the logical volumes with the completed high speed formatting cannot be used until the low speed formatting is completed.

In all cases of (a), (b) and (c), the time required to start using the logical volumes takes longer than the case that the high speed formatting available Drives and the low speed formatting available Drives are not mixed.

Therefore, when formatting multiple Drive types and the configurations, we recommend dividing the formatting work and starting the work individually from a Drive type and a configuration with the shorter standard time.

## 2.3.2 Quick Format

### 2.3.2.1 Overviews

Quick Format provides the function to format in the background that allows the volumes to be usable without waiting for the completion of the formatting when starting the formatting function.

The support specifications are shown below.

Table 2-23 Quick Format Specifications

Item No.	Item	Contents
1	Support Drive HDD type	All Drive type support
2	Number of parity groups	<ul style="list-style-type: none"> <li>• Quick Format can be performed on multiple parity groups simultaneously. The number of those parity groups depends on the total of parity group entries.</li> <li>The number of entries is an indicator for controlling the number of parity groups on which Quick Format can be performed. The number of parity group entries depends on the drive capacity configuring each parity group. The number of entries for parity groups is as follows. <ul style="list-style-type: none"> <li>• Parity group configured with drives of 8 TB or less: 1 entry</li> <li>• Parity group configured with drives of more than 8 TB: 2 entries</li> </ul> </li> <li>The maximum number of entries on which Quick Format can be performed is as follows. <ul style="list-style-type: none"> <li>• VSP G200: 18 entries</li> <li>• VSP G400, G600; VSP F400, F600: 36 entries</li> <li>• VSP G800; VSP F800: 72 entries</li> </ul> </li> <li>• The number of volumes does not have a limit if it is less than or equal to the maximum number of entries.</li> <li>• In the case of four concatenations, the number of parity groups is four. In the case of two concatenations, the number of parity groups is two.</li> </ul>
3	Combination with various P.P.	It is operable in combination with all P.P.
4	Formatting types	When performing a format from Maintenance PC, Web Console or CLI, you can select either Quick Format or the normal format.
5	Additional start in execution	Additional Quick Format can be executed during Quick Format execution. In this case, the total number of entries during Quick Format and those to be added is limited to the maximum number of entries per model.
6	Preparing Quick Format	<ul style="list-style-type: none"> <li>• When executing Quick Format, management information is created first. I/O access cannot be executed in the same way as the normal format in this period.</li> <li>• Creating management information takes up to about one minute for one parity group, and up to about 36 minutes in case of 36 parity groups for the preparation.</li> </ul>

(To be continued)

(Continued from the preceding page)

Item No.	Item	Contents
7	Blocking and restoring the volume	<ul style="list-style-type: none"> <li>When the volume during Quick Format execution is blocked for maintenance, the status of the volume (during Quick Format execution) is stored in the Storage System. When the volume is restored afterwards, the volume status becomes "Normal (Quick Format)".</li> </ul> <p>Therefore, parity groups in which all volumes during Quick Format are blocked are included in the number of entries during Quick Format. The number of entries for additional Quick Format can be calculated with the following calculating formula: The maximum number of entries per model - X - Y</p> <p>(Legend)</p> <p>X: The number of entries for parity groups during Quick Format.</p> <p>Y: The number of entries for parity groups in which all volumes during Quick Format are blocked.</p>
8	Operation at the time of PS OFF/ON	After P/S ON, Quick Format restarts.
9	Restrictions	<ul style="list-style-type: none"> <li>Quick Format cannot be executed to the journal volume of Universal Replicator, external volume, and virtual volume.</li> <li>Volume Migration and Quick Restore of ShadowImage cannot be executed to a volume during Quick Format.</li> <li>When the parity group setting is the Accelerated Compression, Quick Format cannot be performed. (If performed, it terminates abnormally)</li> </ul>

### **2.3.2.2 Volume Data Assurance during Quick Formatting**

The Quick Formatting management table is kept on SM. This model can prevent the management table from volatilizing by backing up the SM to an SSD, and assures the data quality during Quick Formatting.

### 2.3.2.3 Quick Formatting Time

Quick Format executes the format in background while executing I/O from HOST.

Therefore, the Quick Format time may change significantly depending on the number of I/O from HOST or other conditions.

The following table shows the Quick Format time without I/O.

The Quick Format time with I/O might be twice or three times of the following time.

Table 2-24 Quick Format Time

Drive type	Formatting time
4R0H3M/4R0H3MC/4R0H4M/4R0H4MC (7.2 krpm)	52 h
6R0H9M/6R0HLM (7.2 krpm)	78 h
10RH9M/10RHLM (7.2 krpm)	130 h
600JCM/600JCMC (10 krpm)	8 h
1R2JCM/1R2JCMC/1R2J5M/1R2J5MC/1R2J7M/1R2J7MC (10 krpm)	15 h
1R8JGM/1R8J6M/1R8J8M (10 krpm)	23 h
300KCM/300KCMC (15 krpm)	4 h
600KGM (15 krpm)	8 h
200MEM (SSD)	1 h
400MEM/400M6M/400M8M (SSD)	2 h
1R9MEM/1R9MGM (SSD)	8 h
1R6FM (FMD)	8 h
3R2FM (FMD)	16 h
1R6FN (FMD)	8 h
3R2FN (FMD)	16 h
6R4FN (FMD)	32 h
7R0FP (FMD)	32 h
14RFP (FMD)	64 h

- The time above shows the time when Quick Format is executed to all areas of the parity group, and when Quick Format is executed to a part of LDEV in the parity group, the time will be faster in proportion to the capacity of LDEV.
- The Quick Format time with I/O may be over five times of the time above.
- When Quick Format is executed to multiple parity groups, the time becomes slower than the time above depending on the number of parity groups. The proportion of the time becoming slower is generally two times slower when the number of parity groups are 15, and three times slower when the number of parity groups are 30.
- The time above might be up to four times slower depending on the capacity of Cache Memories and the number of I/F Boards.
- When Quick Format is executed to parity groups with different Drive capacities at the same time, calculate the time with the parity group of the largest capacity.
- When the RAID level is RAID1, the formatting time becomes about half compared with the above-mentioned time.

### 2.3.2.4 Performance during Quick Format

Quick Format executes the formatting in background while executing I/O from HOST.

Therefore, it may influence the HOST performance.

The following table shows the proportion of the performance influence.

(However, this is only a rough standard, and it may change depending on the conditions.)

Table 2-25 Performance during Quick Format

I/O types	Performance when the ratio shows 100% at normal condition
Random read	80%
Random write to the unformatted area	20%
Random write to the formatted area	60%
Sequential read	90%
Sequential write	90%