

White Paper

Arcserve Backup Greatly Reduces the Cost of Backup Using All-Flash Arrays with the Latest LTO Ultrium Technology —Unlimited Backup Capacity and Number of Generations—

Adoption of all-flash arrays is increasing steadily, but from a cost-effectiveness point of view, the backup capacity and the number of generations must be taken into consideration.

Arcserve Backup, which is widely used in Windows environments, allows backups using the latest LTO tape technology while lowering costs.



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Preface

In recent years, all-flash arrays have become mainstream, but the price of flash memory remains high. For example, even though flash memory provides high speed performance, that benefit is offset by the cost of increasing the number of backup generations.

A solution to this problem is to combine the all-flash array with LTO tape technology.

This method consists of changing the storage destination of the backup data in the all-flash array from the backup dedicated flash storage to LTO tape cartridges.

Because LTO tape cartridges are cheaper than flash memory, cost concerns are eliminated even if a large number of backup generations are required.

A data protection product (backup software) is required to store backup data to LTO tape cartridges.

This document describes the characteristics of the procedure for backing up the data from the ETERNUS AF series and the ETERNUS DX series to the LTO tape unit using Arcserve Backup (data protection product) with the ETERNUS LT series and ETERNUS SF AdvancedCopy Manager. In addition, the system configuration for backup operations, the environment configuration procedure, and the backup operation procedure are also provided.

The verification results described in this document are current as of September 2018.

The product lineup and product information stated in this document are current as of November 2019.

■ Target Audience

This document targets the following audience:

- Those who want to install an all-flash array while minimizing the Total Cost of Ownership (TCO)
- Those who want to learn more about Arcserve Backup to help select a data protection product for their all-flash arrays
- Those who want an overview of the tape backup tasks using Arcserve Backup

■ Applicable Series

This document covers the following storage systems:

- FUJITSU Storage ETERNUS AF150 S3, AF250 S3/S2, and AF650 S3/S2
- FUJITSU Storage ETERNUS DX100 S5/S4, DX200 S5/S4, DX500 S5/S4, DX600 S5/S4, DX900 S5, and DX8900 S4
- FUJITSU Storage ETERNUS LT series

■ Terminology

The following terms are used in this document:

- Storage system A storage system consisting of flash storage
- Tape unit A device that reads data from and writes to magnetic tape
(Includes tape libraries that have a "robot mechanism" for moving tape cartridges)
- Advanced Copy function A function of the FUJITSU Storage ETERNUS AF series and ETERNUS DX series that transfers data in the storage system at high-speed without using the CPU of the server to copy data

■ Naming Conventions

The following abbreviations are used in this document:

- FUJITSU Storage ETERNUS AF series All-Flash Arrays ETERNUS AF series
- FUJITSU Storage ETERNUS DX series Hybrid Storage Systems ETERNUS DX series
- FUJITSU Storage ETERNUS LT series ETERNUS LT series
- ETERNUS SF AdvancedCopy Manager ACM

1. Back-up Challenges and Solutions for All-Flash Arrays

1.1. Flash to Flash Backup Issue

For data backups within the all-flash array, increasing the number of generations in the backup destination raises cost concerns. High speed performance is not a requirement for flash storage used for backups, but as the use of inexpensive media such as Nearline HDDs is not an option, the purchase of additional flash storage to accommodate a higher number of backup generations increases the cost. Because the business data can be transferred at high speed from flash storage to the backup dedicated flash storage, business downtime is not an issue since disruptions due to securing backup points are negligible.

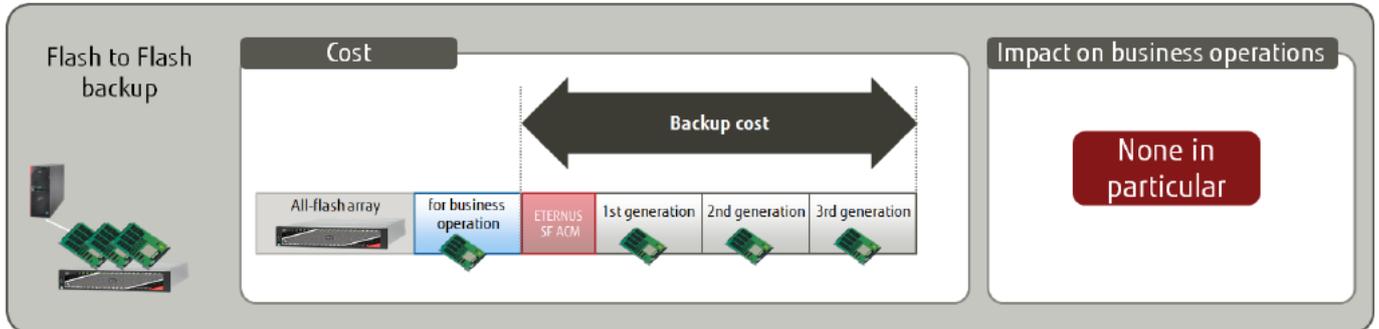


Figure 1-1 Flash to Flash Backup

1.2. Flash to Tape Backup Issue

For data backups directly from the all-flash array to an LTO tape cartridge, there is no limit for the number of generations in the backup destination and even if the number of generations is increased, the cost benefit remains since low-cost LTO tape cartridges are used. The cost of combining tape units, data protection products, and LTO tape cartridges is considerably less than purchasing additional flash storage required for a higher number of backup generations to save the all-flash array backup data. However, the benefits of using LTO tape cartridges are somewhat offset by business downtime to restrict access to the business data during a backup from the all-flash array to the LTO tape unit.

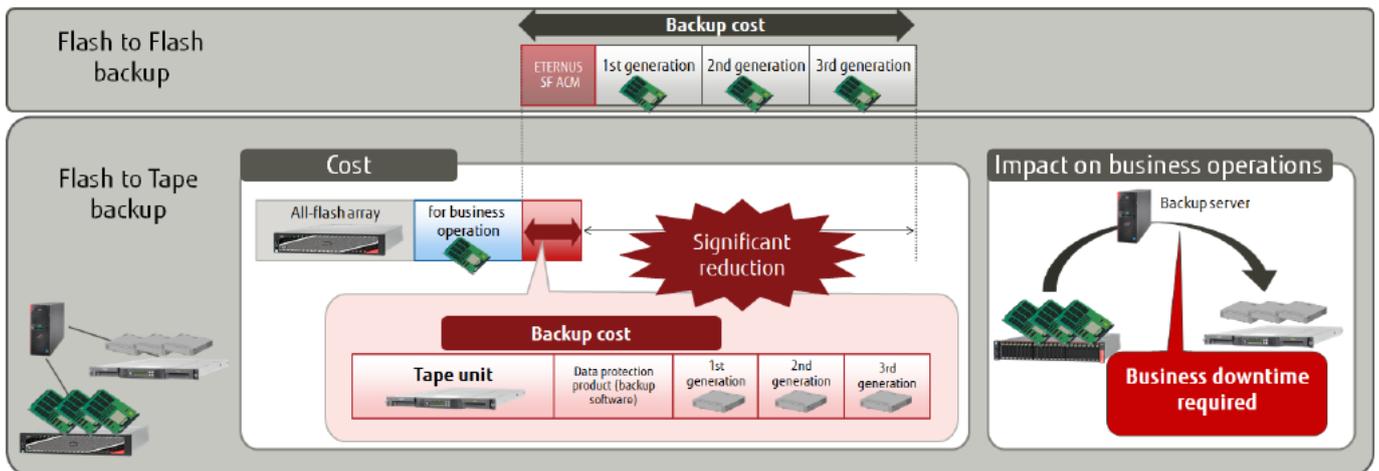


Figure 1-2 Comparison of Flash to Flash Backup and Flash to Tape Backup

1.3. Flash to Flash to Tape Backup Solution

This method can solve the issues inherent to both flash to flash backups and flash to tape backups by backing up the business data from flash storage to the backup dedicated flash storage and then backing up the data to LTO tape cartridges. Details of the flash to flash to tape solution are as follows.

Storing backup generations to LTO tape cartridges resolves the issue of flash to flash backups where all backup generations are stored in the all-flash array. With the cost per storage volume of the LTO tape cartridge being less than flash storage by a factor of two, LTO tape cartridges are more economical than flash storage. For LTO tape cartridges, there is no limit for the number of generations in the backup destination and the cost is minimal even if the number of generations is increased.

Business downtime, which is associated with flash to tape backups (backups directly from the all-flash array to an LTO tape cartridge), is unnecessary since the business data is backed up quickly to the backup dedicated flash storage using the all-flash array function. Furthermore, other than when a backup is running, a restore can be completed instantly because the most recent backup is stored in the backup dedicated flash storage.

If no backup data is stored in the backup dedicated flash storage, the backup data must be restored from the LTO tape unit, which requires extra time. If a long restore time is not a problem, the cost advantages of flash to flash to tape backups outweigh the disadvantages.

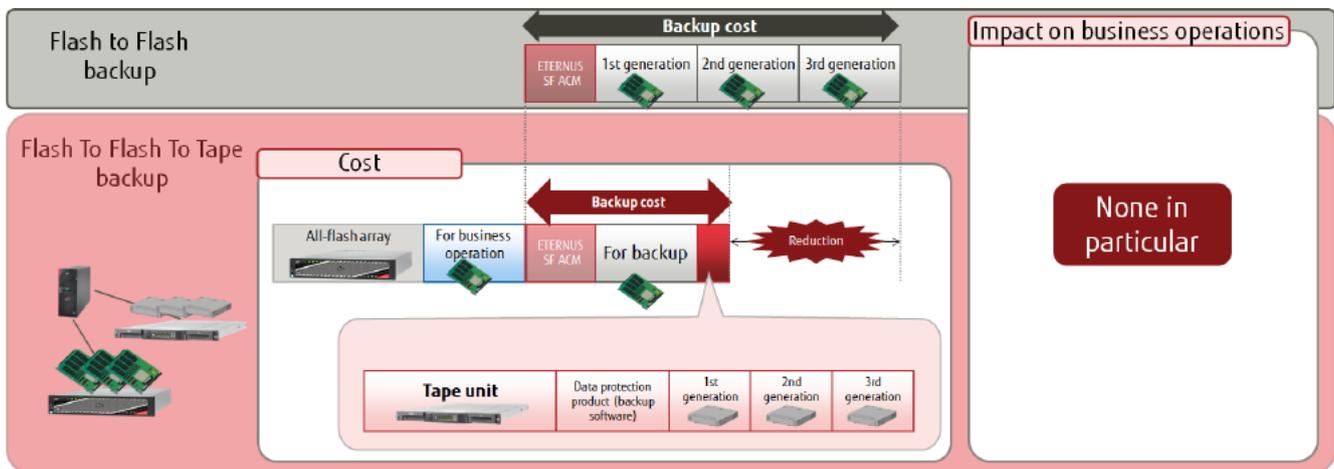


Figure 1-3 Comparison of Flash to Flash Backup and Flash to Flash to Tape Backup

1.3.1. Latest Trend in LTO Tape Formats

The latest generation of LTO formats is the 8th generation (LTO-8).

The merits of adopting LTO-8 are explained below based on comparisons with previous generations in terms of cost and performance.

LTO-8 can store up to 30 TB (compressed) per cartridge. Backup and restore times have been greatly reduced as well as the cost compared to previous generations.

As a cost comparison, a backup capacity of 60 TB can be realized with just two LTO-8 cartridges compared with ten LTO-6 cartridges, a reduction of approximately 80%. In addition, although a 20-cartridge tape unit is required for LTO-6, an 8-cartridge entry model can be selected for LTO-8 and LTO-7. LTO-8 does not require higher end tape units or a large number of cartridges which adds to the cost savings.

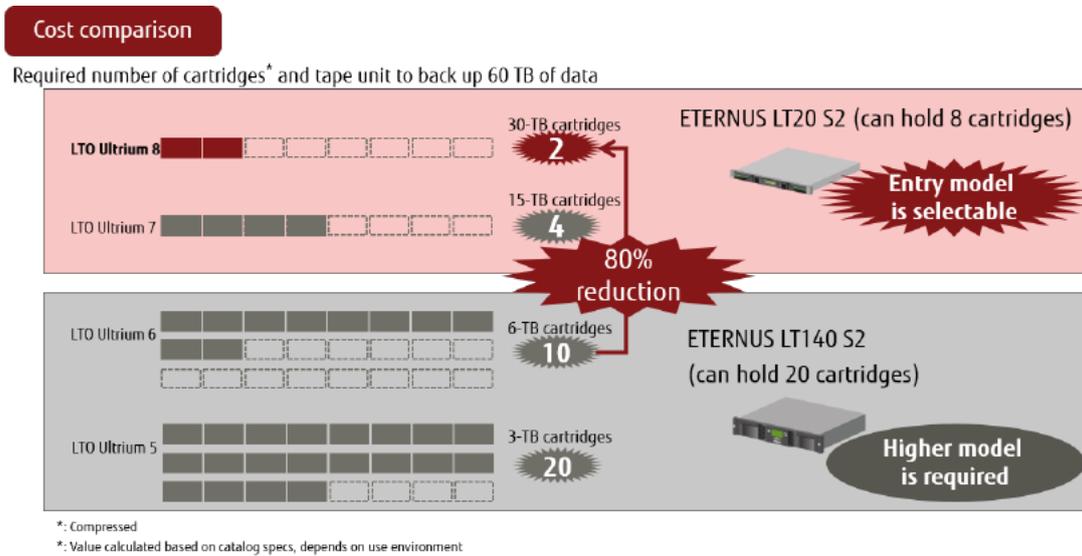


Figure 1-4 Cost Comparison of LTO-8 with Previous Generations

On the performance side, although the calculations are based on the catalog specifications, the transfer performance of LTO-8 is nearly double compared with LTO-6, so backups can be completed in almost half the time.

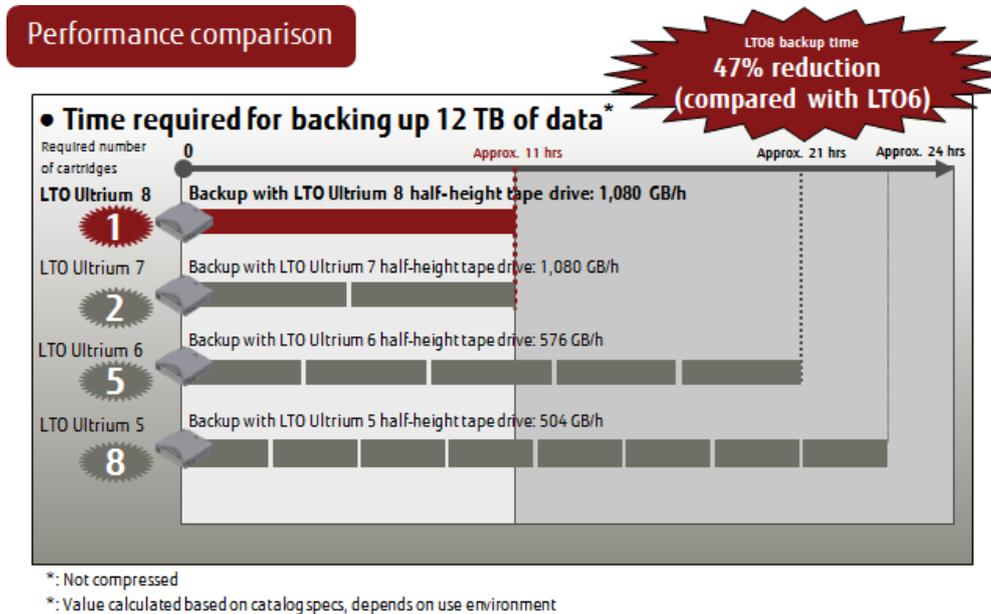


Figure 1-5 Performance Comparison of LTO-8 and Previous Generations

Some LTO tape cartridges are read-only or incompatible with certain generations of LTO Ultrium tape drives. Selecting cartridges with the latest LTO Ultrium generation is recommended because older generations may not be supported by the tape unit.

Furthermore, since LTO units are magnetic tape units, the dust generated from the magnetic tape or fine dirt entering the device will inevitably adhere to the magnetic head of the tape drive. This may cause errors and failure. To ensure stable operation, the drive must be cleaned periodically.

For this reason, a cleaning cartridge is provided to clean the magnetic head of the tape drive and can be used up to 50 times. Instructions on how to use the cleaning cartridge are provided in the appendix.

2. Arcserve Backup Overview

Arcserve Backup is a data protection product that allows backup and restore in various platforms, as well as central management with a backup server where Arcserve Backup Manager is installed. Arcserve Backup supports both small-scale and large-scale environments consisting of one or more devices.

Because the backup destination can be hard disks, tape, or the cloud, the most appropriate storage location can be selected based on your environment.

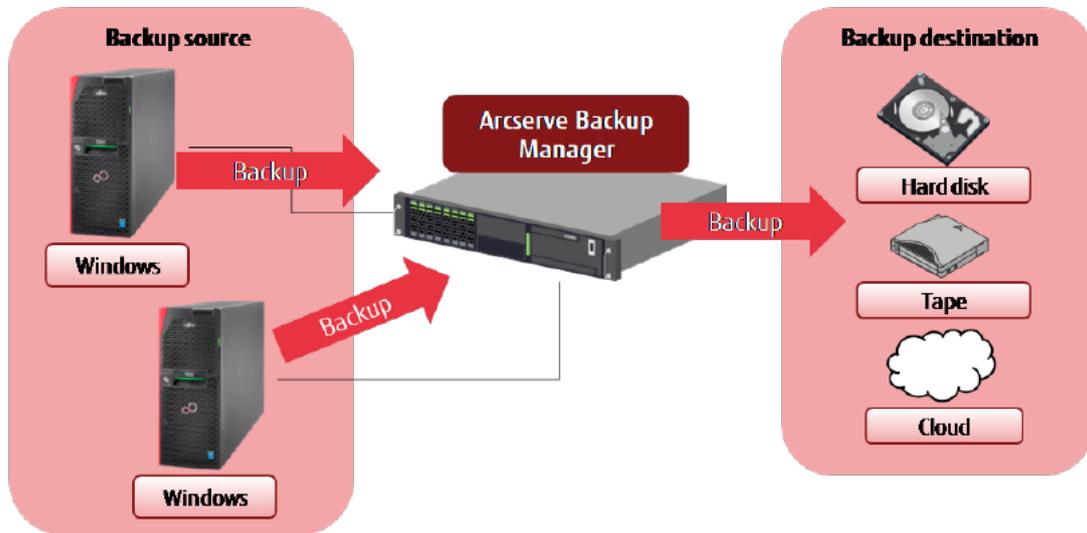


Figure 2-1 Arcserve Backup Diagram

Because Arcserve Backup operations are performed using the user-friendly Arcserve Backup Manager GUI, users can easily manage media, such as tape cartridges and hardware devices, configure backup and restore jobs, execute jobs, and check job statuses. The following is an example showing the Home screen of Arcserve Backup Manager.



Figure 2-2 Home Screen of Arcserve Backup Manager

3. Backup/Restore Verification Using ACM and Arcserve Backup

This section describes the backup and restore verification of an all-flash array and LTO tape combination.

3.1. Verification Details

A verification is performed to confirm that the three-generation backup of the production volume on the all-flash array is stored to the LTO tape unit and that the restore is completed successfully.

The production volume in the all-flash array is backed up to the backup volume in the all-flash array with the Advanced Copy function QuickOPC and is then backed up to the tape library (LTO tape unit) with Arcserve Backup for generation management. In this verification, two backup types to the LTO tape unit are verified: Full backup and incremental backup. The restore operation consists of restoring full backup data from the LTO tape unit to the backup volume of the all-flash array, and then restoring the data of the backup volume to the production volume with the Advanced Copy function OPC.

In the verification environment, a backup and restore of the production volume is performed with ACM. ACM is a storage management software that allows high-speed backups/restores and replication operations with the Advanced Copy function. Configure the ACM agent in the business server and the ACM Manager/agent in the backup server, and use them for backup and restore operations.

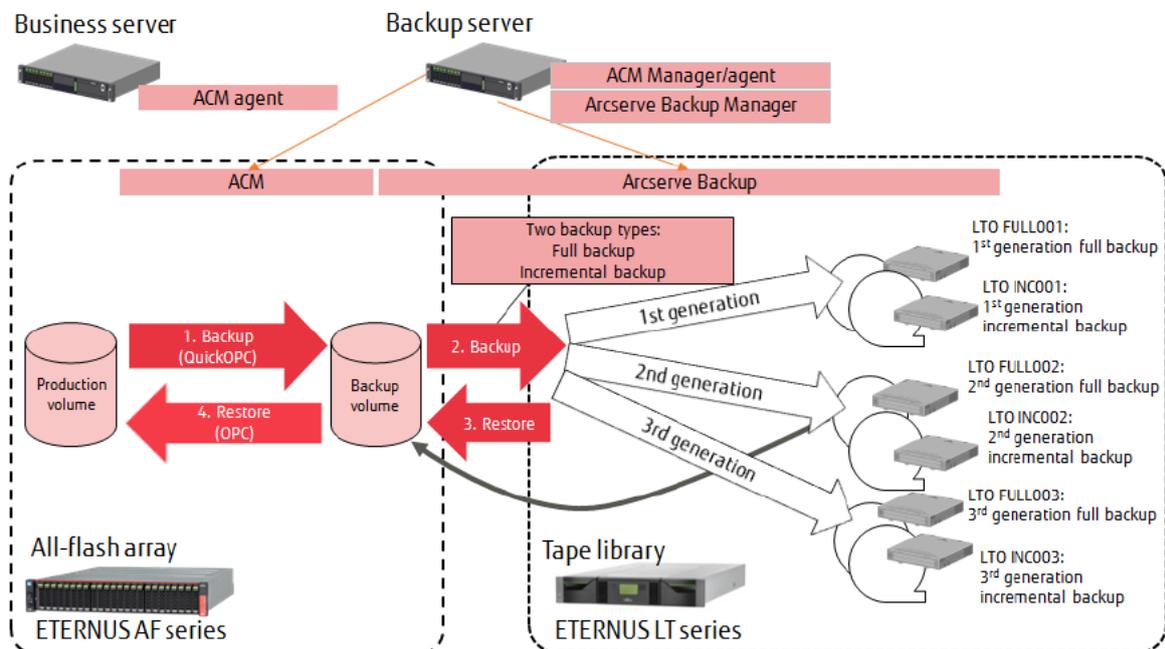


Figure 3-1 Verification Diagram

Use the following procedure to perform backups with ACM and Arcserve Backup.

1. Execute QuickOPC from ACM Manager to back up data from the production volume to the backup volume.
2. From Arcserve Backup Manager, perform a full or incremental backup of the data from the backup volume to the LTO tape cartridges.

The production volume backed up by QuickOPC is currently stored in the LTO tape cartridges.

Use the following procedure to restore data from the LTO tape cartridges to the production volume.

3. Perform a restore from Arcserve Backup Manager to restore data from the LTO tape cartridges to the backup volume.
4. Execute OPC from ACM Manager to restore data from the backup volume to the production volume.

Full backup verification

Verification of a full backup consists of backing up the production volume to the backup volume and then backing up the backup volume of each generation to the LTO tape cartridges with the backup jobs of Arcserve Backup.

To back up the production volume, execute QuickOPC with **swsrpmake** (replication creation command) of ACM.

Arcserve Backup automatically starts the backup job of each generation at a fixed interval.

The full backup verification method is shown below.

Backup Generation	Backup Method		LTO media name	Remark
	Production volume → Backup volume	Backup volume → LTO tape cartridge		
1st generation	Execute QuickOPC with swsrpmake	Start backup job #1 of Arcserve Backup (full backup)	FULL001	Backup jobs of Arcserve Backup start automatically at a fixed interval.
2nd generation	Execute QuickOPC with swsrpmake	Start backup job #2 of Arcserve Backup (full backup)	FULL002	
3rd generation	Execute QuickOPC with swsrpmake	Start backup job #3 of Arcserve Backup (full backup)	FULL003	

Table 3-1 Full Backup Verification Method

Incremental backup verification

Verification of an incremental backup consists of backing up the production volume to the backup volume and then backing up the backup volume to the LTO tape unit, but only the differential data from the last backup, with a backup job of Arcserve Backup.

To back up the production volume, execute QuickOPC with **swsrpmake** of ACM.

Arcserve Backup automatically starts the backup job of each generation at a fixed interval.

The incremental backup verification method is shown below.

Backup Generation	Backup Method		LTO media name	Remark
	Production volume → Backup volume	Backup volume → LTO tape cartridge		
1st generation	Execute QuickOPC with swsrpmake	Start backup job #1 of Arcserve Backup (incremental backup)	INC001	Backup jobs of Arcserve Backup start automatically at a fixed interval.
2nd generation	Execute QuickOPC with swsrpmake	Start backup job #2 of Arcserve Backup (incremental backup)	INC002	
3rd generation	Execute QuickOPC with swsrpmake	Start backup job #3 of Arcserve Backup (incremental backup)	INC003	

Table 3-2 Incremental Backup Verification Method

Restore verification

Verification of a restore consists of restoring data from the LTO tape cartridge, which is the full backup data of the second generation, to the backup volume with Arcserve Backup.

To restore data from the backup volume to the production volume, execute OPC with **swsrpmake** of ACM.

The restore verification method is shown below.

Restore Generation	LTO media name	Restore Method		Remark
		LTO tape unit → Backup volume	Backup volume → Production volume	
Full backup of the 2nd generation	INC002	Start the restore job by specifying the full backup session of Arcserve Backup	Execute OPC with swsrpmake	Arcserve Backup restore job starts immediately.

Table 3-3 Restore Verification Method

3.2. System Configuration

The system configuration of the verification environment is described below.

Connect the business server, backup server, all-flash array, and tape library via the SAN.

Install ACM agent on the business server.

On the backup server, install ACM Manager/agent and Arcserve Backup Manager.

Use Windows Server 2016 for the OS on both the business server and the backup server.

The system configuration of this verification environment and the list of devices used are shown below.

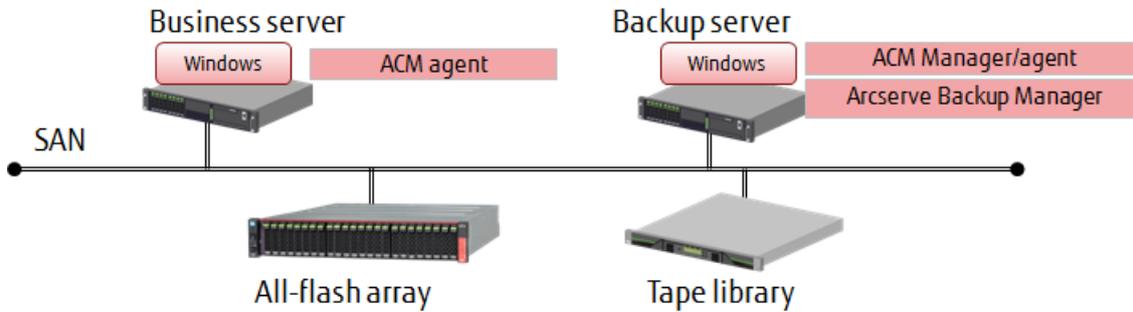


Figure 3-2 System Configuration Diagram

Device	Model	Remark
Business server	PRIMERGY RX2540 M1	Fibre Channel interface × 2
Backup server	PRIMERGY RX2540 M1	Fibre Channel interface × 2
All-flash array	ETERNUS AF250 S2	Flash storage × 4 (RAID 5) Fibre Channel interface × 4
Tape library	ETERNUS LT20 S2	Tape drive × 1, slot × 8 Fibre Channel interface × 1

Table 3-4 Device List

The management LAN and operation terminals are omitted from the diagram. The business server, backup server, all-flash array, and tape library must be connected via the same management LAN.

A Fibre Channel switch connected to the SAN is also required.

Software and licenses

- Windows Server 2016 × 2 licenses (for the business server and backup server)
 - Arcserve Backup r17.5* for Windows × 1 license
 - ETERNUS SF Storage Cruiser Standard Edition 16 Tier1 × 1 license
 - ETERNUS SF AdvancedCopy Manager Standard Edition 16 Tier1 × 1 license
- *Arcserve Backup 17.5 SP1 must be applied to use LTO8.

3.3. System Construction

An overview of the system construction is described below.

SAN connection

Connect each device to the Fibre Channel switch to enable communication between the business server and the all-flash array, between the backup server and the all-flash array, and between the backup server and the tape library. In an actual environment, zoning is set in the Fibre Channel switch according to security requirements.

All-flash array

For the all-flash array, configure a RAID with flash memory and assign the production volume and backup volume used by the business server to the RAID. Assign the same size for the production volume and the backup volume.

Format the production volume from the business server and assign a drive letter.

The backup volume must be visible from the backup server.

To perform a copy using the functions of ETERNUS with ACM, create a software role account and register the following licenses in the ETERNUS using ETERNUS Web GUI.

- ETERNUS SF Storage Cruiser Standard Edition license
- ETERNUS SF AdvancedCopy Manager Standard Edition license

Tape library

In the tape library, insert six tape cartridges (LTO) and a cleaning tape cartridge.

ACM installation and initial settings

On the backup server, perform a standard installation of ACM Manager and ACM agent.

Perform a standard installation of ACM agent on the business server.

On the Windows Server 2016 backup server, create a user account for ETERNUS SF Storage Cruiser.

Arcserve Backup installation and initial settings

On the backup server, perform a standard installation of Arcserve Backup Manager.

No additional configuration is required for Arcserve Backup other than the installation. Arcserve Backup will automatically recognize the backup volume and tape library.

List of system setting values

The following table shows the system setting values for the verification environment.

The following values are used for backups/restores with ACM and Arcserve Backup.

Item	Target	Setting Value	Remark
Windows computer name for the verification server	Business server	GYOM01	
	Backup server	MGRSV01	
Volume name	Production volume	g1d2p1	Mount the volume in the business server and assign it with driver letter (E:)
	Backup volume	g1d4p1	Mount the volume in the backup server and assign it with drive letter (J:)

Table 3-5 List of System Setting Values

List of backup job setting values of Arcserve Backup

The following table shows the backup job setting values used for Arcserve Backup verifications.

Item	Target Job	Setting Value			Remark
		Job Name	Target Folder	Backup Destination Slot Media Name	
Backup job	Full backup 1st generation	Full_Backup1	J:\backup	Slot: 1 FULL001	On the Backup screen, click the Schedule tab and then select Full (Clear Archive Bit) as the backup method. On the Global Options screen, select Overwrite same media name, or blank media for First backup media.
	Full backup 2nd generation	Full_Backup2		Slot: 3 FULL002	
	Full backup 3rd generation	Full_Backup3		Slot: 5 FULL003	
	Incremental backup 1st generation	Inc_Backup1		Slot: 2 INC001	On the Backup screen, click the Schedule tab and then select Incremental as the backup method. On the Global Options screen, select Append to media for First backup media.
	Incremental backup 2nd generation	Inc_Backup2		Slot: 4 INC002	
	Incremental backup 3rd generation	Inc_Backup3		Slot: 6 INC003	

Table 3-6 Backup Job Setting Values of Arcserve Backup

3.4. Verification Procedure

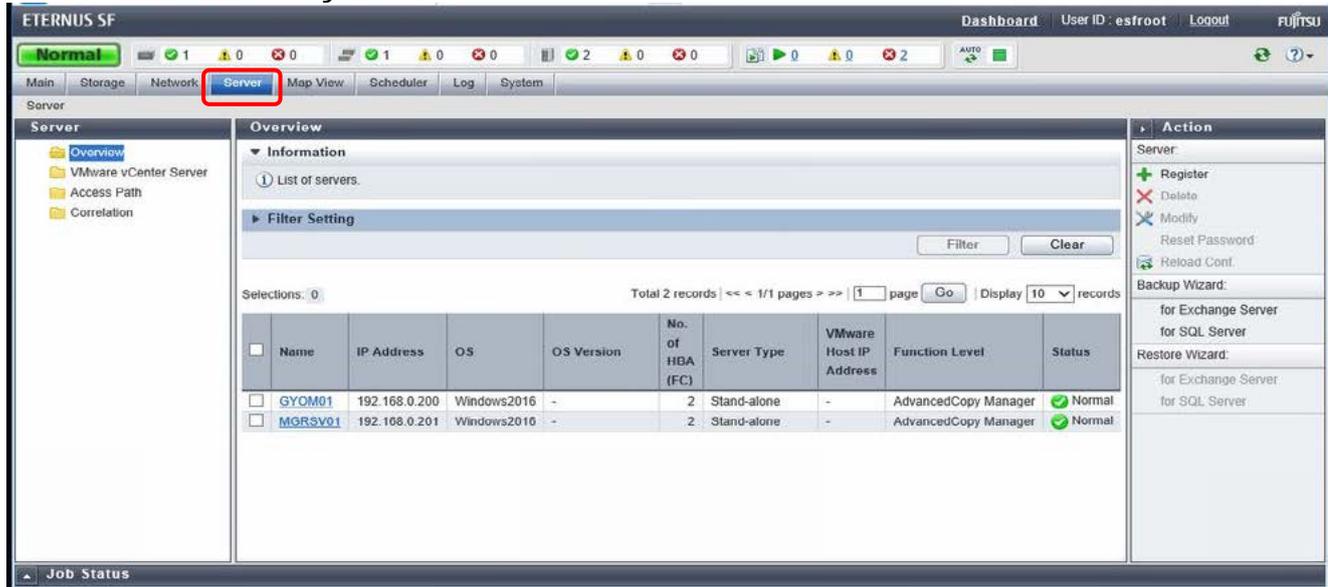
3.4.1. Backup Verification Procedure

This section describes the backup verification procedure using ACM and Arcserve Backup.

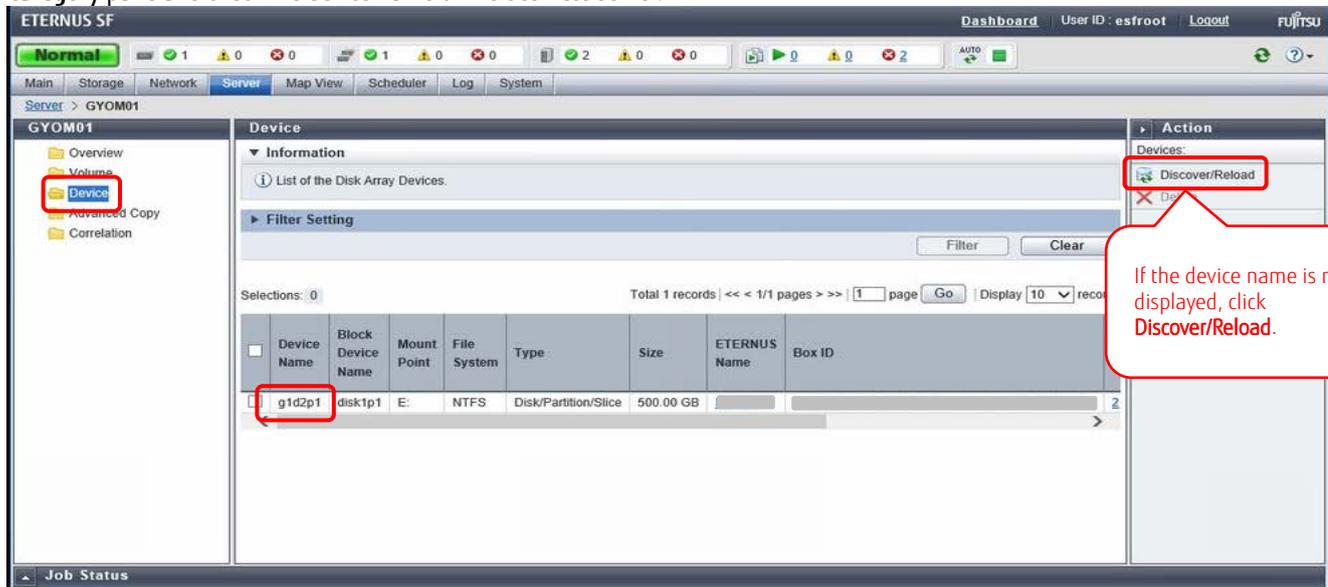
3.4.1.1. Configuration of ACM

(1) Check the device name

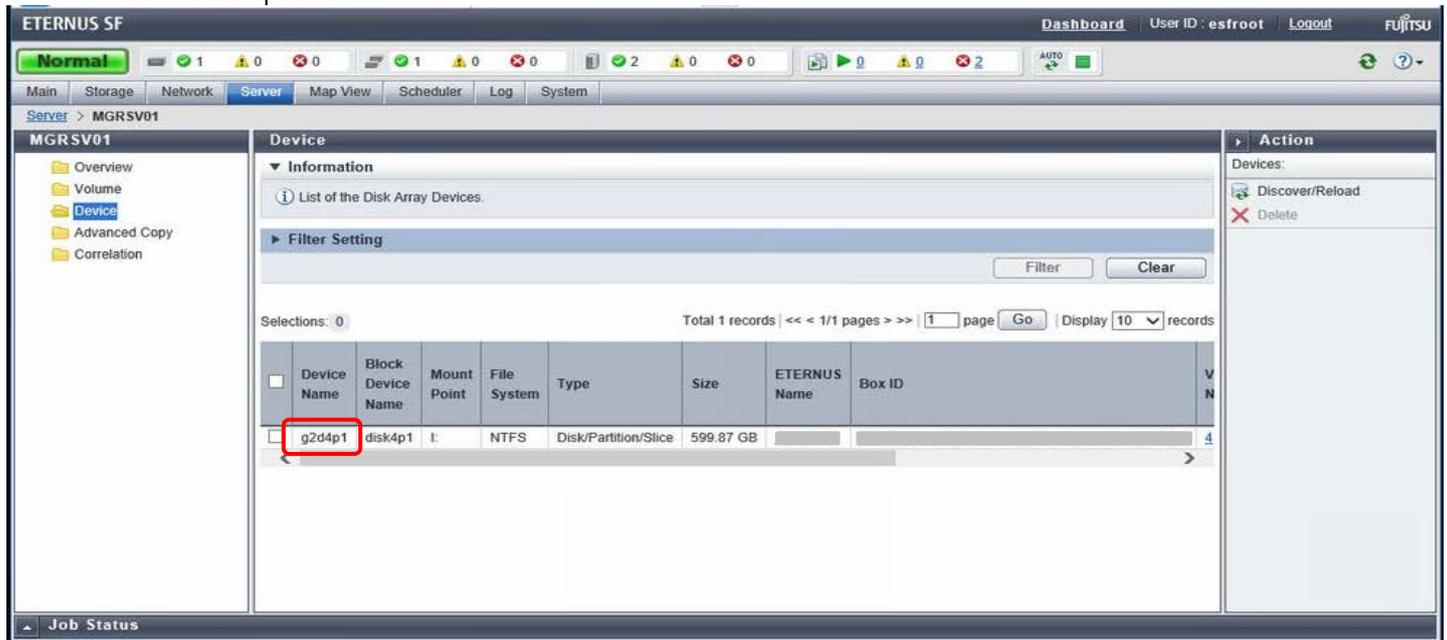
On ETERNUS SF Web Console, confirm the device names of the business server (GYOM01) and backup server (MGRSV01). Click **Server** on the **Global Navigation** tab of ETERNUS SF Web Console.



On the main pane of the Overview screen, click GYOM01 under the **Name** column of the operation target server, then click **Device** in the **Category** pane and check the device name of the business server.



On the main pane, click MGRSV01 under the **Name** column of the operation target server, then click **Device** in the **Category** pane and check the device name of the backup server.



(2) Set the source and destination volumes

Set the source and destination volumes to be used for backups.

Execute **swsrpsetvol** (replication volume information setting command) from the command prompt of the backup server, set the device name g1d2p1 as the source volume (business server) and the device name g2d4p1 as the destination volume (backup server).

```
C:\>
C:\>C:\ETERNUS_SF\ACM\bin\swsrpsetvol -n -o ORG -u g1d2p1@GYOM01 g2d4p1
swsrpsetvol completed
```

Execute **swsrpvollinfo** (replication volume information display command) to confirm the settings.

```
C:\>
C:\>C:\ETERNUS_SF\ACM\bin\swsrpvollinfo -h GYOM01
Server Original-Volume Size      Replica-Volume Size      Copy      Op-Server
GYOM01 g1d2p1@GYOM01      499.9 Gbyte g2d4p1@MGRSV01      599.8 Gbyte uni-direction original
```

3.4.1.2. Backup Job Settings of Arcserve Backup

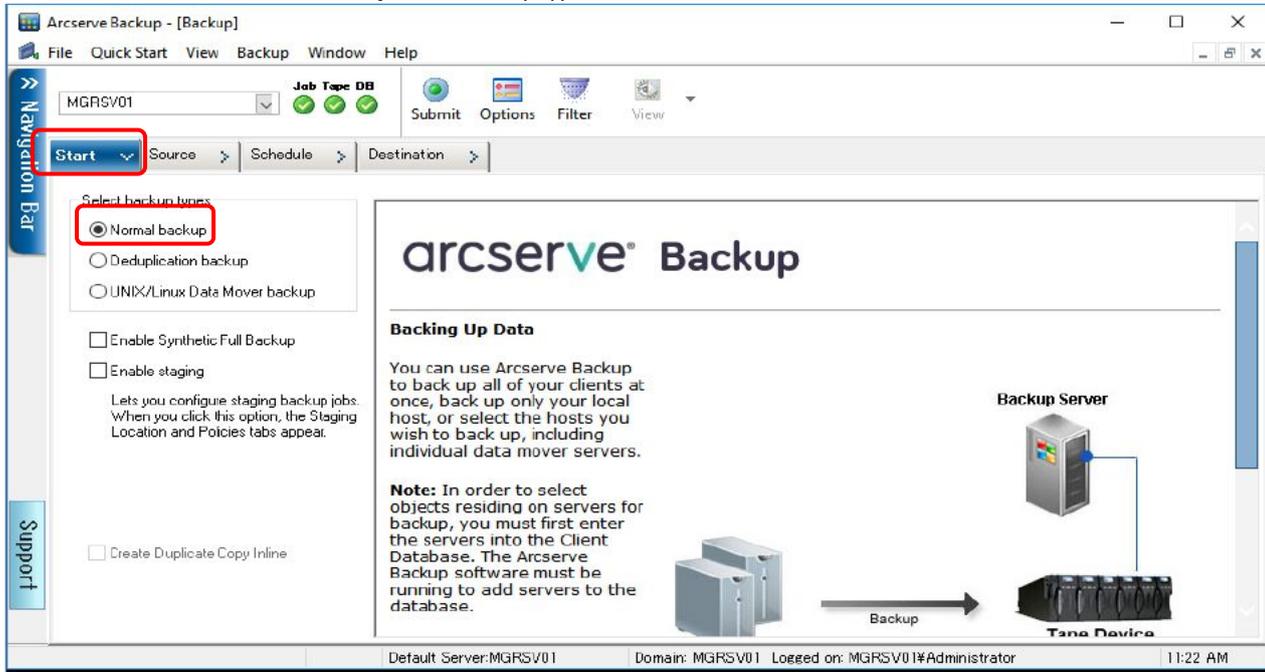
Arcserve Backup will set up backup jobs according to the navigation on the Backup Manager screen.

(1) Set a backup job to perform a full backup

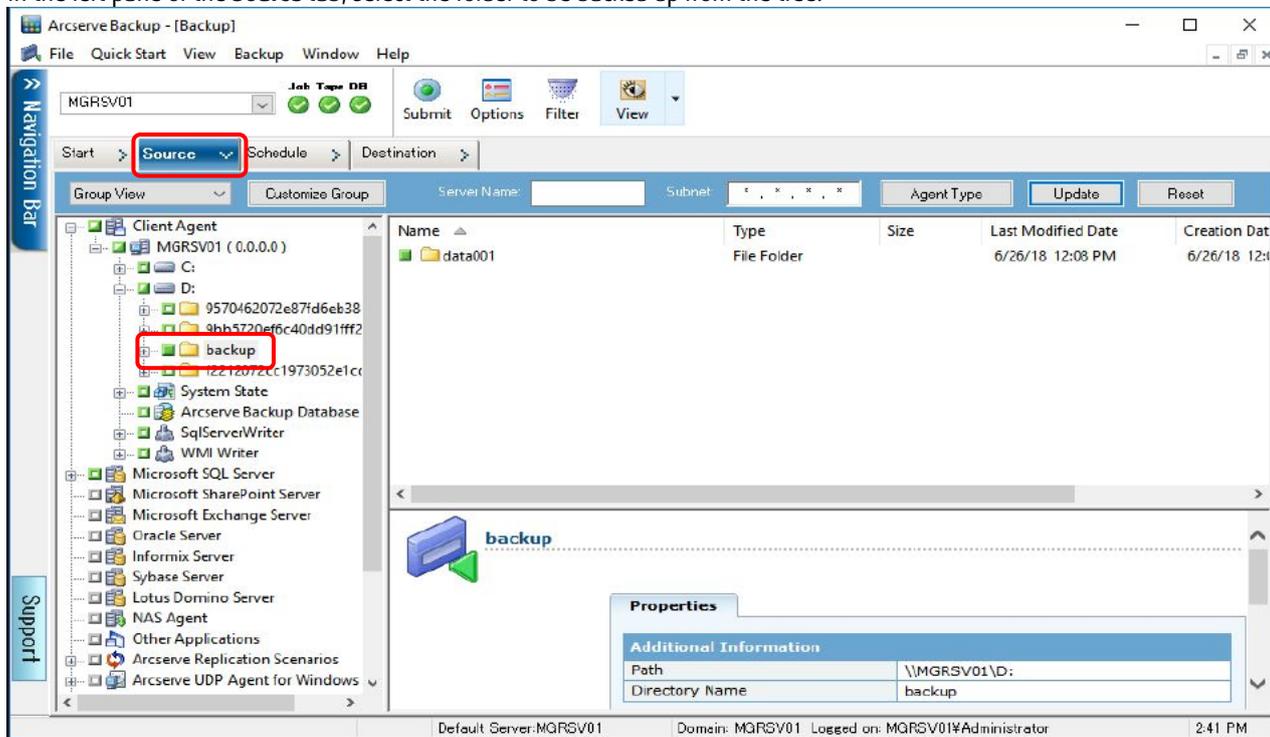
Select **Backup Manager** on the Home screen of Arcserve Backup.

In Backup Manager, perform the settings in the following order: **Start**, **Source**, **Schedule**, and **Destination**.

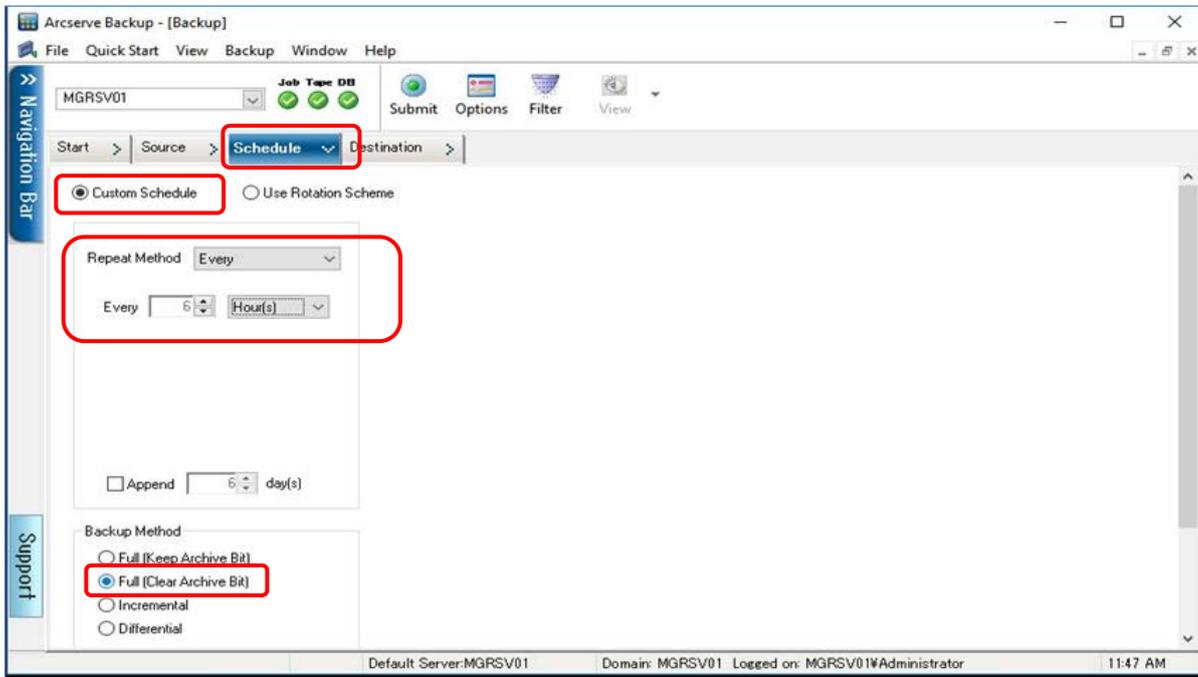
In the **Start** tab, select **Normal backup** as the backup type.



In the left pane of the **Source** tab, select the folder to be backed up from the tree.

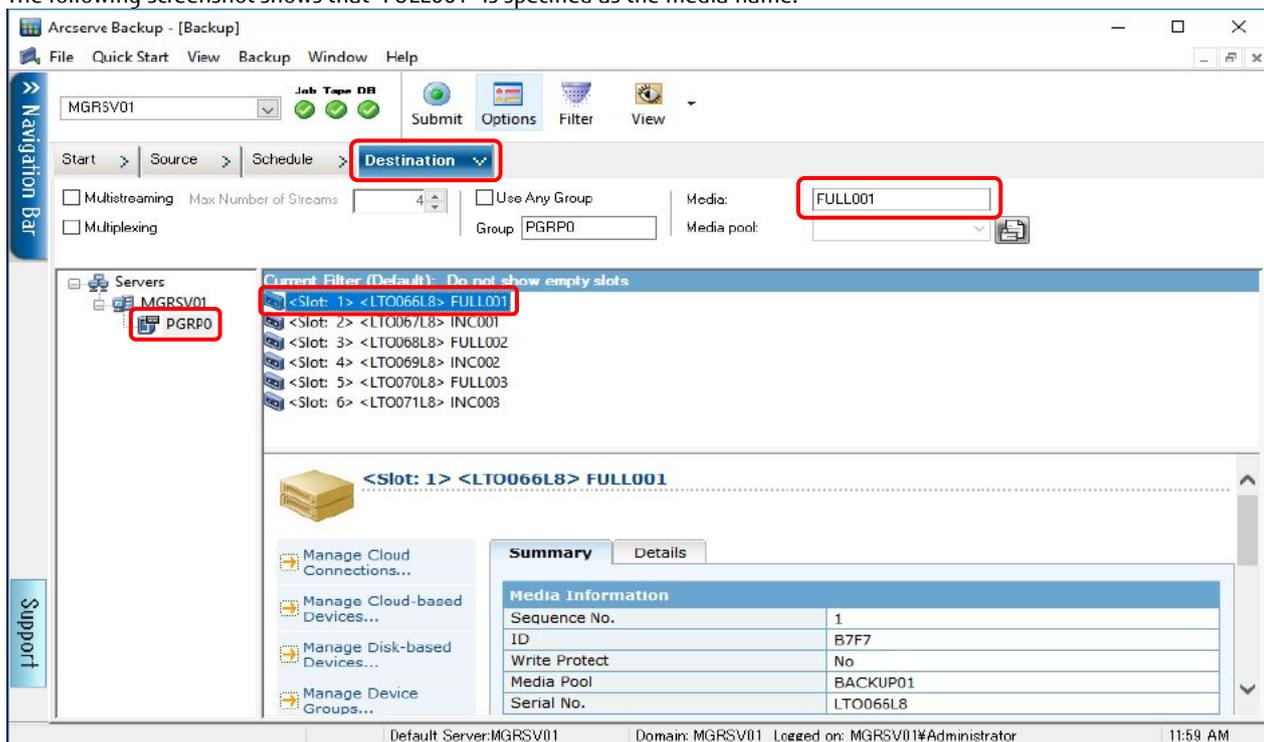


In the **Schedule** tab, set the repeat method and the backup method. Select **Custom Schedule** and set the repeat method to **Every** and **Every 6 Hour(s)**. For full backups, select **Full (Clear Archive Bit)** as the backup method. The following shows the **Schedule** to perform full backups.

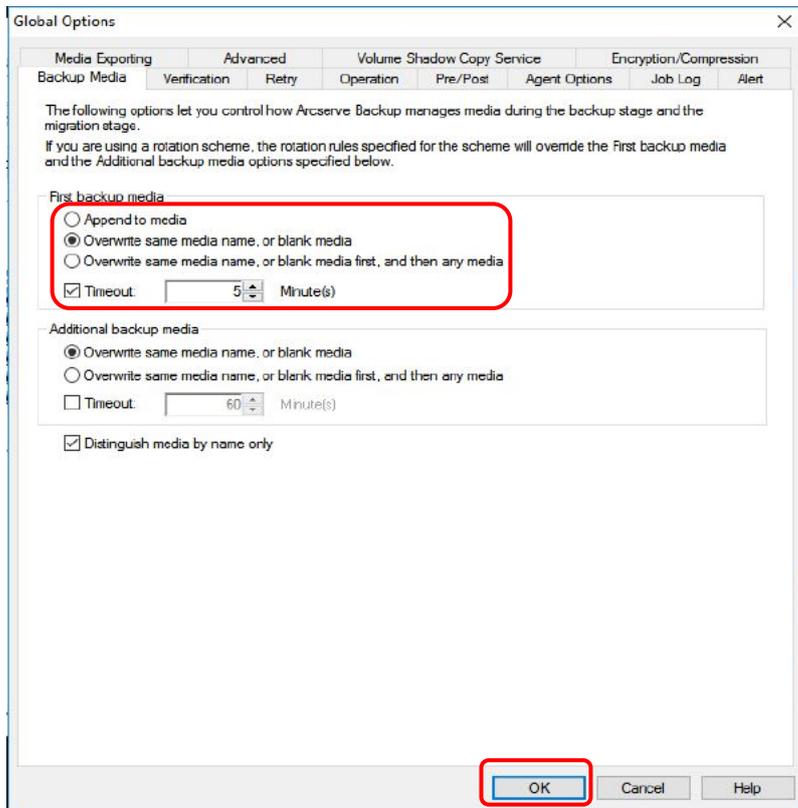


In the **Destination** tab, select the backup destination medium. In the left pane, select the device group (PGRP0); and on the main pane, select the tape cartridge of the backup destination from the displayed slots. Assign a name to an unformatted media. Enter the name in the **Media** field to format it during job execution. Refer to "Table 3-6 Backup Job Setting Values of Arcserve Backup" for the media name of each job.

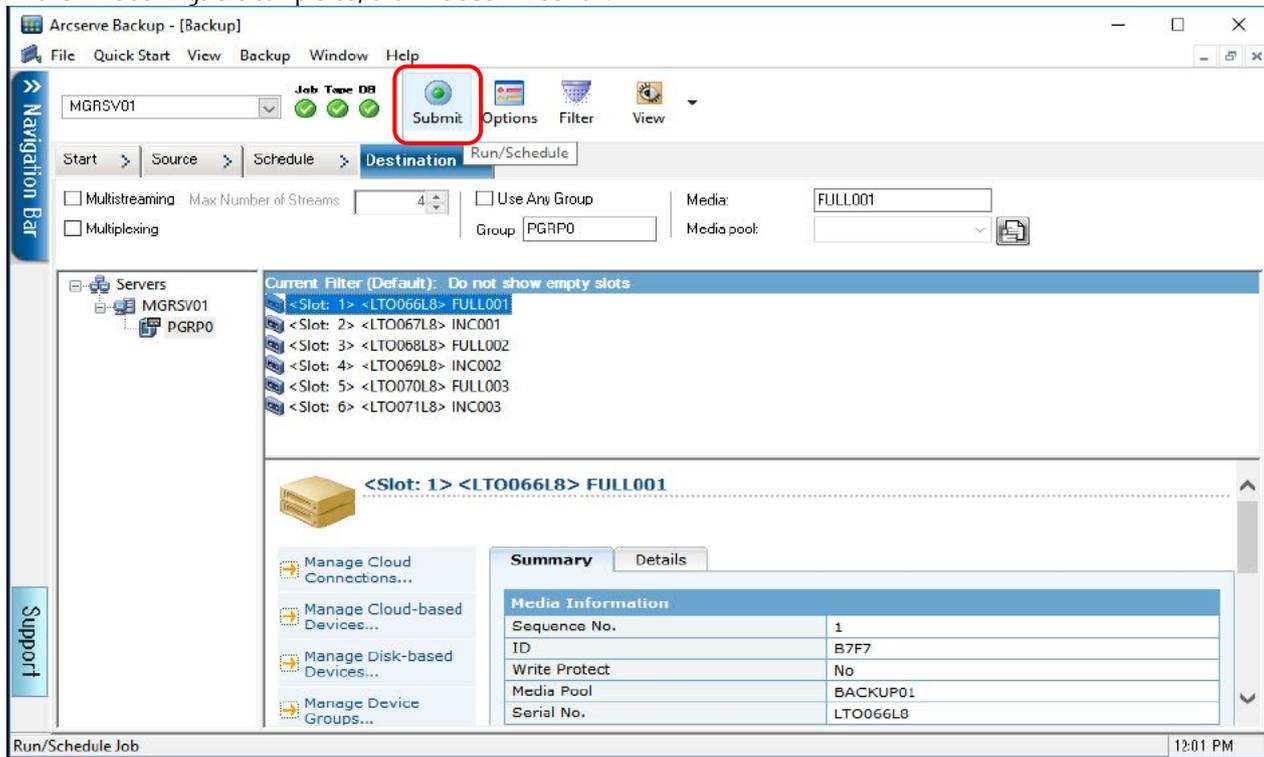
The following screenshot shows that "FULL001" is specified as the media name.



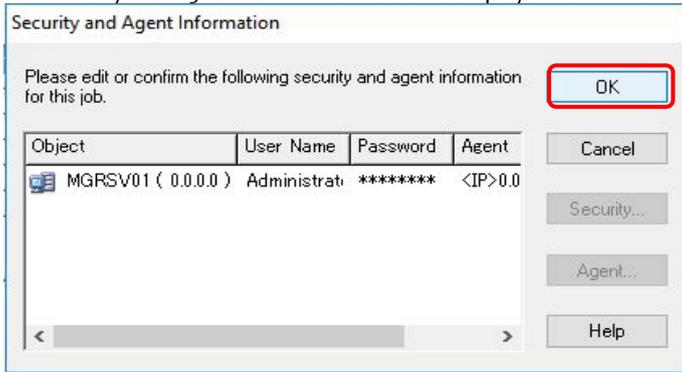
Set the options for the backup. Select the **Options** button at the top of the Backup Manager screen to display the Global Options screen. In the **Backup Media** tab, select **Overwrite same media name, or blank media** for **First backup media** and then click the **OK** button. For full backups, select to overwrite the media.



After all the settings are completed, click the **Submit** button.



The Security and Agent Information screen is displayed. Click the **OK** button.



The Submit Job screen is displayed.

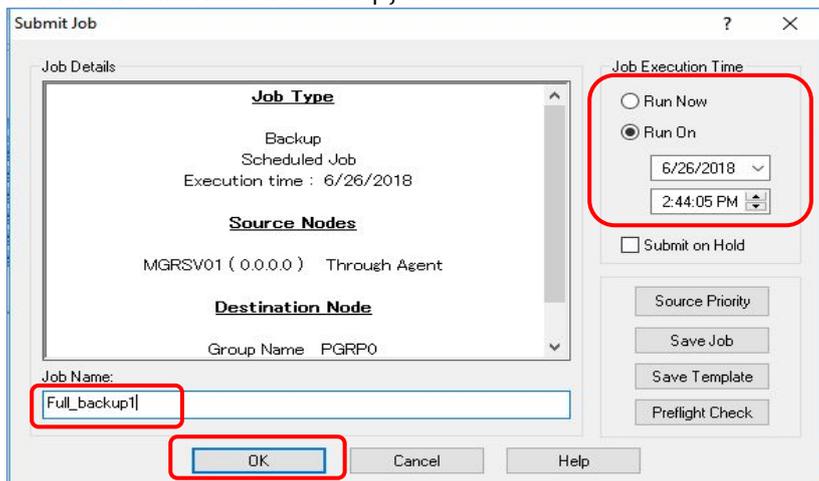
Set **Job Name** and **Job Execution Time** on the Submit Job screen.

In **Job Name**, set a unique job name that indicates full or incremental backup and the generation.

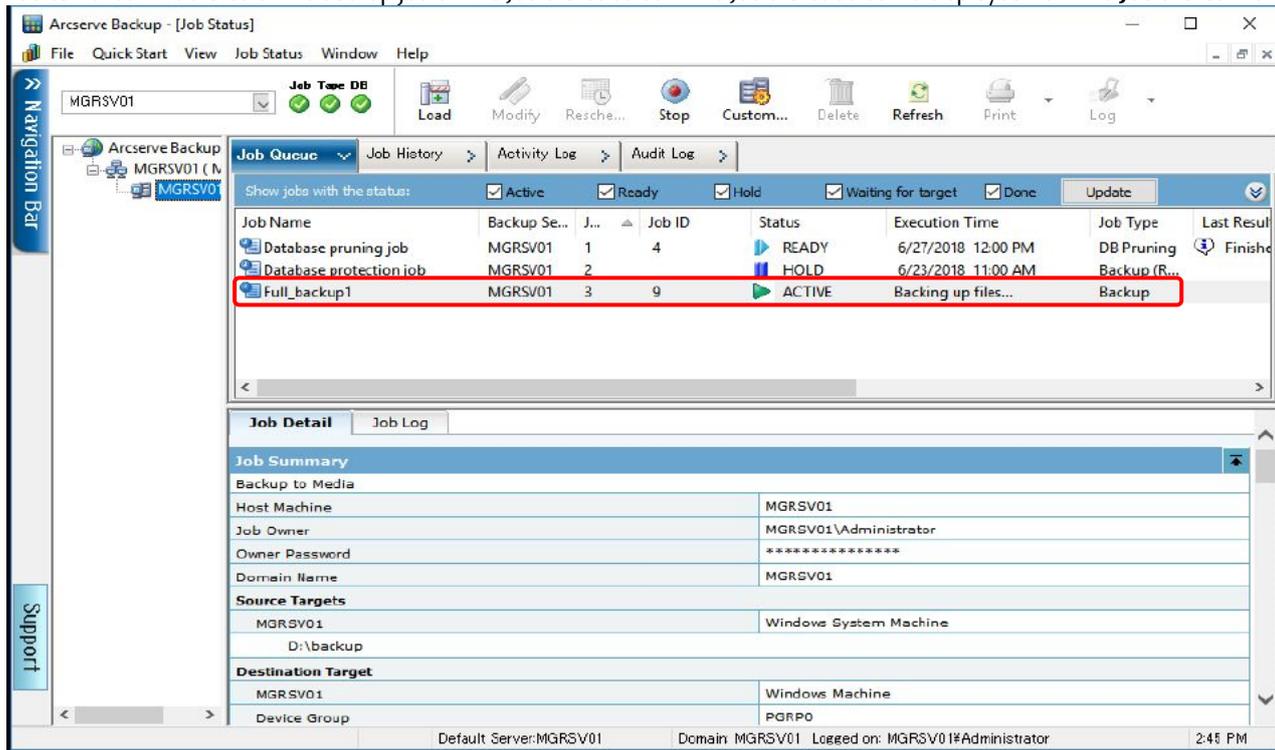
In **Job Execution Time**, select **Run On** to specify a date and time for each backup generation. By selecting **Run Now**, a backup job can be started immediately after the job is created.

Refer to "Table 3-6 Backup Job Setting Values of Arcserve Backup" for the job names.

Click the **OK** button to create a backup job.



You can check the status of the backup job on the Job Status screen. The Job Status screen is displayed from the **Job Status** menu.

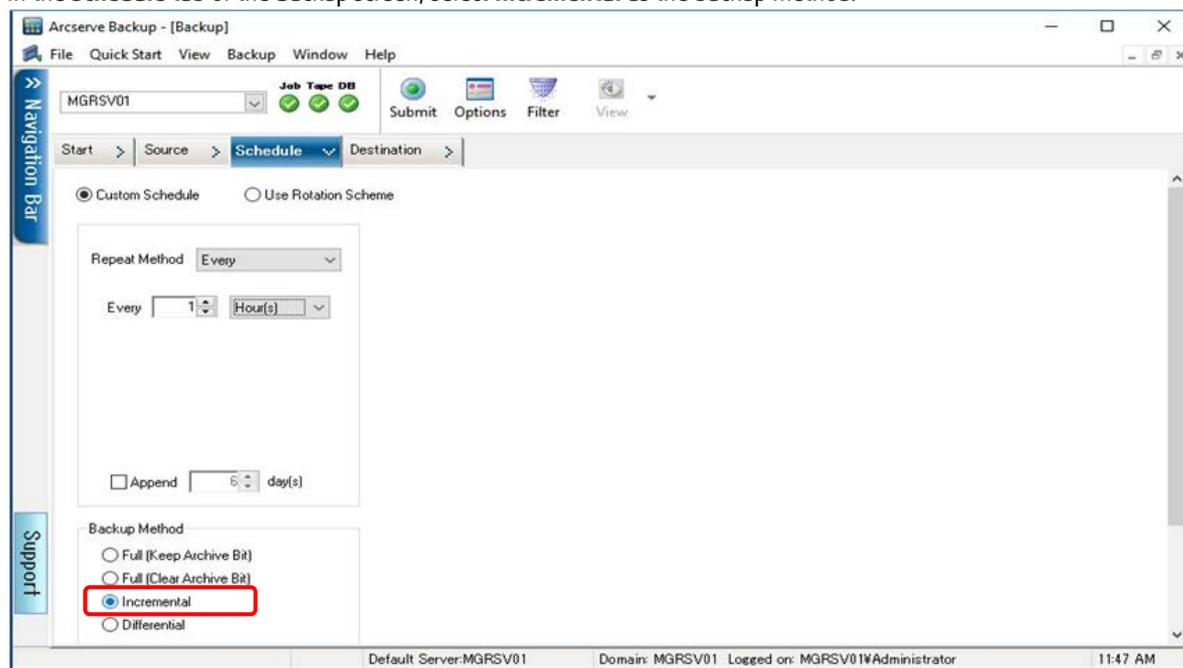


(2) Set a backup job to perform an incremental backup

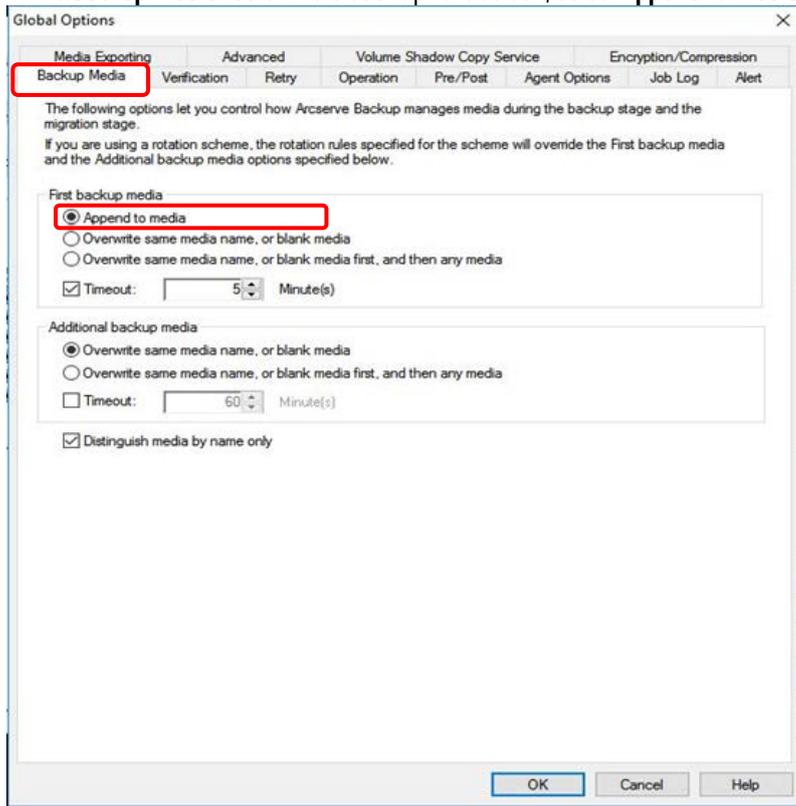
The settings are performed in the same manner as a full backup. Start **Backup Manager** and then perform the settings in the following order: **Start, Source, Schedule, and Destination.**

Incremental backups use methods that are different from full backups to back up data and to add or overwrite media. The following sections describe the settings that are different from full backups. For other procedures, refer to "(1) Set a backup job to perform a full backup".

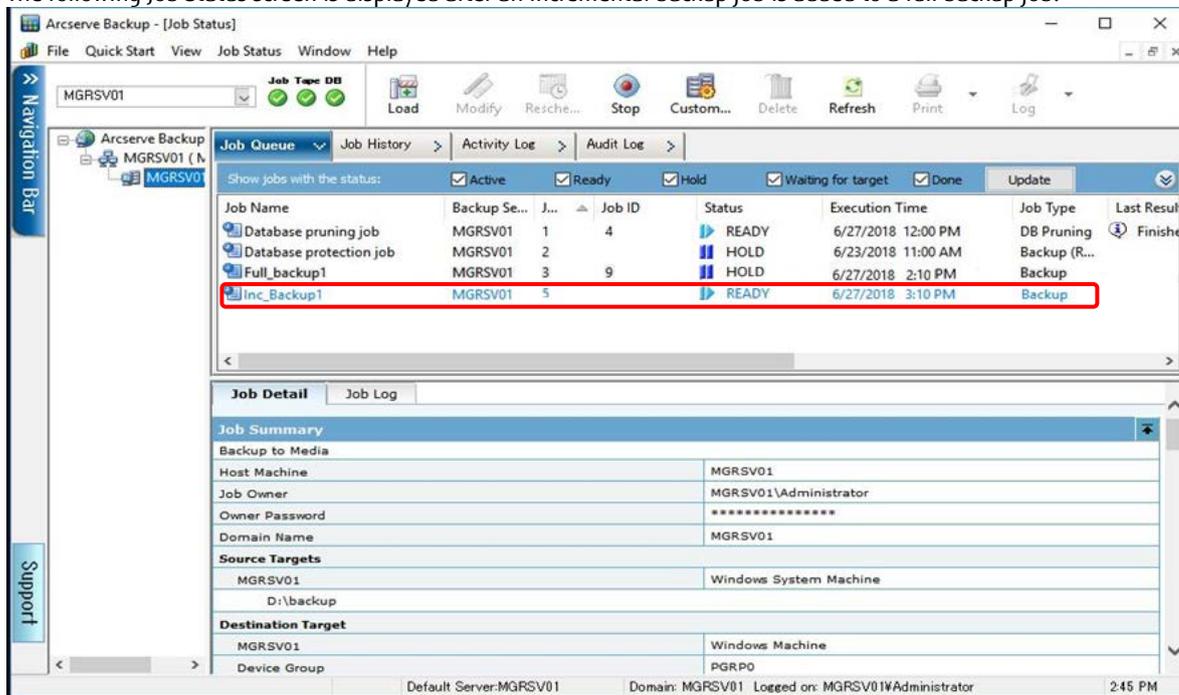
In the **Schedule** tab of the Backup screen, select **Incremental** as the backup method.



In the **Backup Media** tab of the Global Options screen, select **Append to media** for **First backup media**.

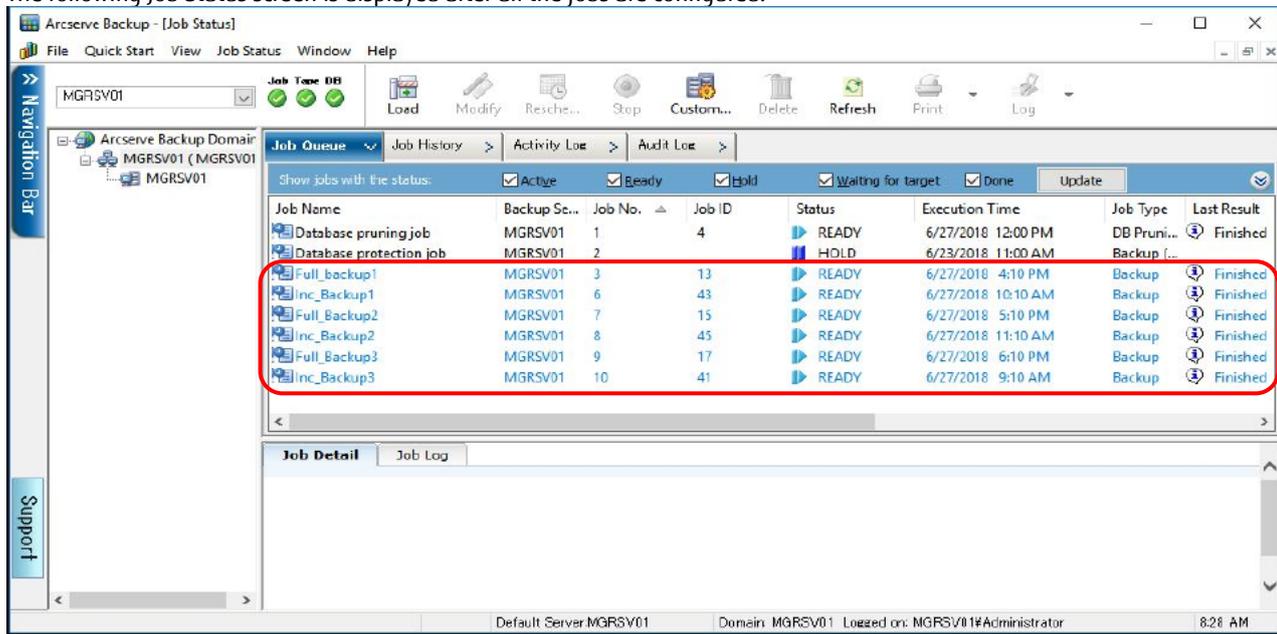


The following Job Status screen is displayed after an incremental backup job is added to a full backup job.



(3) Job status after backup jobs are set

For verification, create jobs with three generations of full backups and incremental backups. The following Job Status screen is displayed after all the jobs are configured.



Set backup jobs according to the actual operation. Examples of actual operations are as follows: operations that require alternating full backups and incremental backups with various generations on a weekly basis, operations that require reusing the same media, and operations that require removing media from the tape unit every week or every month and storing it in a storeroom for one year. In addition, media has different life expectancies depending on the use count and the used environment. If the same media is reused, regular replacement of the media should be planned according to the operations requirements.

The following example shows backup jobs for acquiring three generations of backups where weekly full backups and daily incremental backups are performed with one week being regarded as a single generation. In the fourth week, the job for the first generation is executed and the media is overwritten.

Week: Generation	Job Name	Execution Day of Week	Media Name	Target Folder	Backup Method (Pages 16 and 19)	Write to Backup Media (Pages 17 and 20)	Schedule (job execution interval) (Pages 16 and 19)	Submit Job Run On (Page 18)	
1st week: 1st generation	full_Backup1	Sunday	FULL001	J\backup	Full*2	Overwrite*3	Three weeks	9/2 1:00	
	inc_Backup1_mon	Monday	INCO01		Incremental	Overwrite*3	Three weeks	9/3 1:00	
	inc_Backup1_tue	Tuesday					Append to media	Three weeks	9/4 1:00
	inc_Backup1_wed	Wednesday					Three weeks	9/5 1:00	
	inc_Backup1_thr	Thursday					Three weeks	9/6 1:00	
	inc_Backup1_fri	Friday					Three weeks	9/7 1:00	
inc_Backup1_sat	Saturday	Three weeks	9/8 1:00						
2nd week: 2nd generation	full_Backup2	Sunday	FULL002	J\backup	Full*2	Overwrite*3	Three weeks	9/9 1:00	
	inc_Backup2_mon	Monday	INCO02		Incremental	Overwrite*3	Three weeks	9/10 1:00	
	inc_Backup2_tue	Tuesday					Append to media	Three weeks	9/11 1:00
	inc_Backup2_wed	Wednesday					Three weeks	9/12 1:00	
	inc_Backup2_thr	Thursday					Three weeks	9/13 1:00	
	inc_Backup2_fri	Friday					Three weeks	9/14 1:00	
inc_Backup2_sat	Saturday	Three weeks	9/15 1:00						
3rd week: 3rd generation	full_Backup3	Sunday	FULL003	J\backup	Full*2	Overwrite*3	Three weeks	9/16 1:00	
	inc_Backup3_mon	Monday	INCO03		Incremental	Overwrite*3	Three weeks	9/17 1:00	
	inc_Backup3_tue	Tuesday					Append to media	Three weeks	9/18 1:00
	inc_Backup3_wed	Wednesday					Three weeks	9/19 1:00	
	inc_Backup3_thr	Thursday					Three weeks	9/20 1:00	
	inc_Backup3_fri	Friday					Three weeks	9/21 1:00	
inc_Backup3_sat	Saturday	Three weeks	9/22 1:00						

Table 3-7 Setting Example of a Three Generation Backup with Full and Incremental Backups

*2 Select either Full (Keep Archive Bit) or Full (Clear Archive Bit).
 *3 Select Overwrite same media name, or blank media.

3.4.1.3. ACM Backup Execution

(1) Check the backup volume name

Check the name of the backup volume (J:) on the OS.

From the command prompt of the backup server, execute the **mountvol /L** command.

```
C:\>mountvol J: /L
¥¥?¥Volume [xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx]¥
```

Confirm that the volume name is displayed. The volume name is used to mount the backup volume (J:).

(2) Unmount the backup volume

Before performing a backup with ACM, unmount the backup volume (J:) from the backup server to prevent access to the backup volume.

From the command prompt of the backup server, execute the **mountvol /P** command.

```
C:\>mountvol J: /P
C:\>
```

(3) Execute a backup

From the command prompt of the backup server, execute **swsrpmake** to perform a backup from the source volume (g1d2p1) to the destination volume (g2d4p1).

The -T option of **swsrpmake** specifies QuickOPC.

```
C:\>
C:\>C:\¥ETERNUS_SF¥ACM¥bin¥swsrpmake -h GYOM01 -T g1d2p1@GYOM01 g2d4p1@MGRSV01
FROM=g1d2p1@GYOM01, TO=g2d4p1@MGRSV01 swsrpmake completed
C:\>
```

After executing the command, mount the backup volume.

(4) Check the progress of the backup

Check the progress of the backup by executing **swsrpstat** (operation status display command).

You can check the progress of the replication under the **Execute** column.

```
C:\>
C:\>C:\¥ETERNUS_SF¥ACM¥bin¥swsrpstat -h GYOM01 -L g1d2p1@GYOM01
Server Original-Volume Replica-Volume Direction Status Execute Trk Update Rcv Split Xfer Snap-Gen
GYOM01 g1d2p1@GYOM01 g2d4p1@MGRSV01 regular snap 97% on ---- ---- ---- ----
```

When the backup is completed, the **Status** and **Execute** columns become "----".

```
C:\>
C:\>C:\¥ETERNUS_SF¥ACM¥bin¥swsrpstat -h GYOM01 -L g1d2p1@GYOM01
Server Original-Volume Replica-Volume Direction Status Execute Trk Update Rcv Split Xfer Snap-Gen
GYOM01 g1d2p1@GYOM01 g2d4p1@MGRSV01 regular ---- ---- on 0% ---- ---- ---- ----
```

*For incremental backups with Arcserve Backup, the files marked with the archive file attribute are backed up.

Clear the attribute after a backup is performed.

Therefore, in order to perform an incremental backup after a backup is performed with ACM, clear the archive attribute of the source volume from the command prompt of the business server by executing the **attrib** command.

The following example shows that the archive attribute of all the files in "E:¥backup¥*.*)" is cleared using the **attrib** command.

```
C:\>attrib -A E:¥backup¥*.*) /S
C:\>
```

Note that the **attrib** command cannot clear the archive attribute of hidden files such as system files. Therefore, hidden files are always backed up.

(5) Mount the backup volume

From the command prompt of the backup server, execute the **mountvol** command to mount the destination volume (g2d4p1) as the backup volume (J:).

Specify the driver letter (J:) and the volume name checked in "(1) Check the backup volume name" for the options of the **mountvol** command.

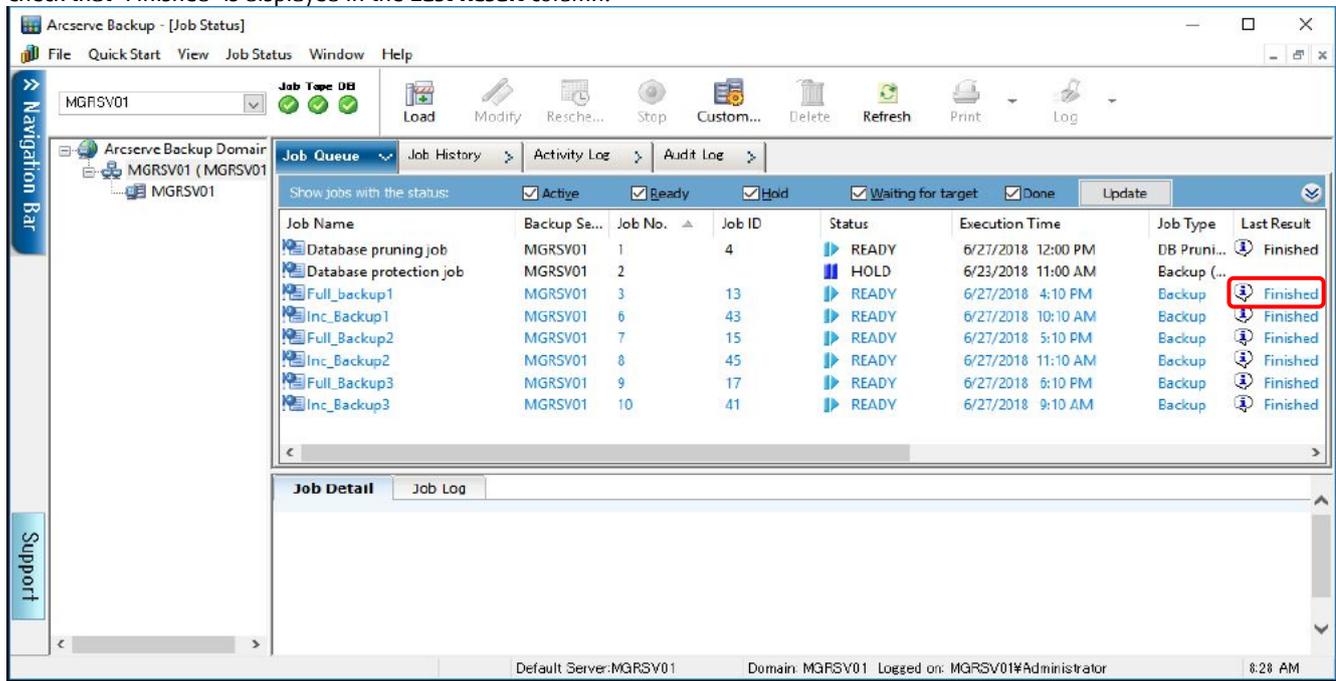
```
C:\>mountvol J: ¥¥?¥Volume [xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx]¥
C:\>
```

The items checked for the first backup are "(1) Check the backup volume name" and "(4) Check the progress of the backup".

For the second and subsequent backups, perform "(2) Unmount the backup volume", "(3) Execute a backup", and "(5) Mount the backup volume". For incremental backups, execute the **attrib** command and then perform "(5) Mount the backup volume".

3.4.1.4. Verification of the Backup Results

Check the result of the jobs set in the backup job settings of Arcserve Backup.
 Select the Job Status menu to display the Job Status screen.
 Check that "Finished" is displayed in the **Last Result** column.

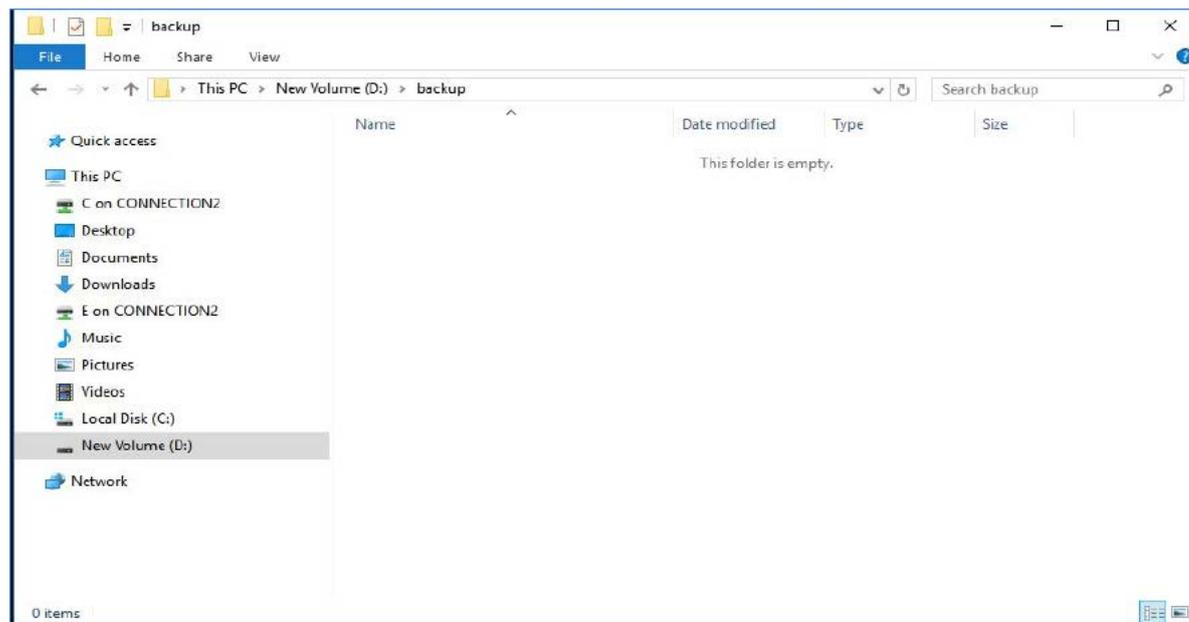


3.4.2. Restore Verification Procedure

This section describes the restore verification procedure using ACM and Arcserve Backup.

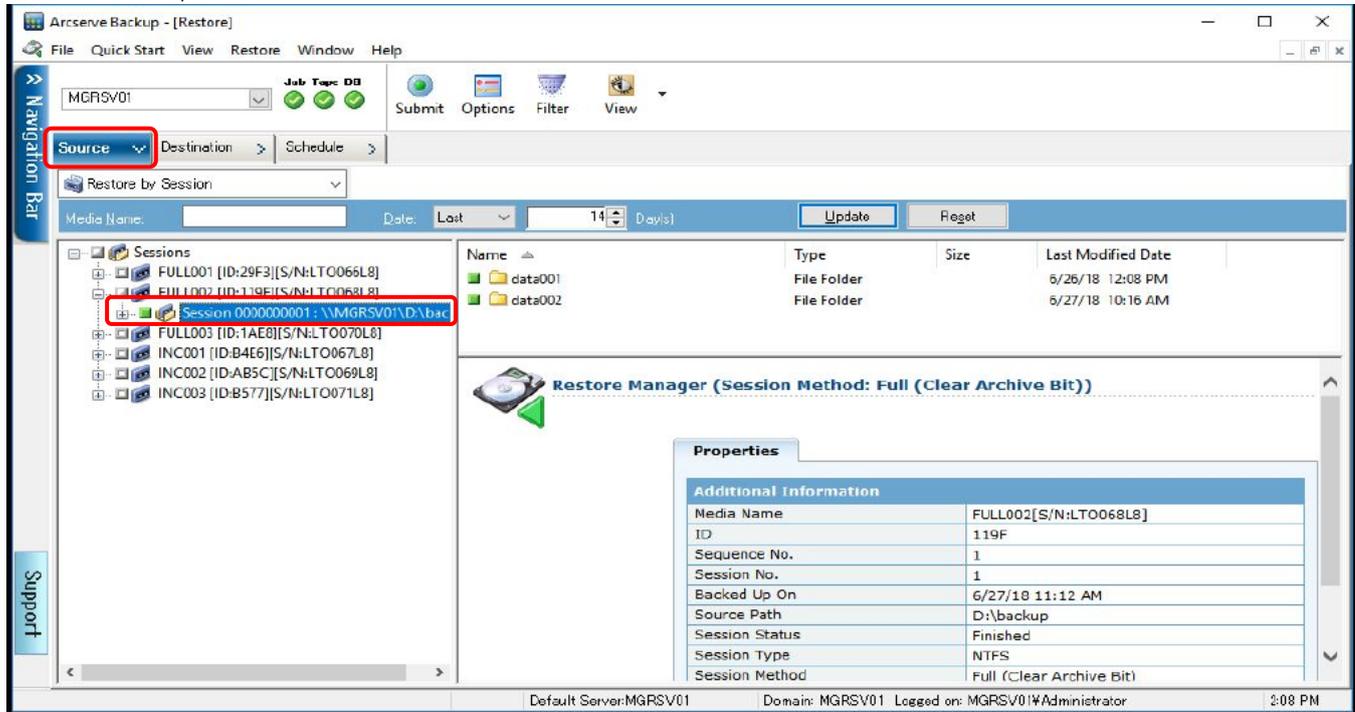
3.4.2.1. Restore Job Settings of Arcserve Backup

As preparation, empty the restore destination folder in Windows Explorer.

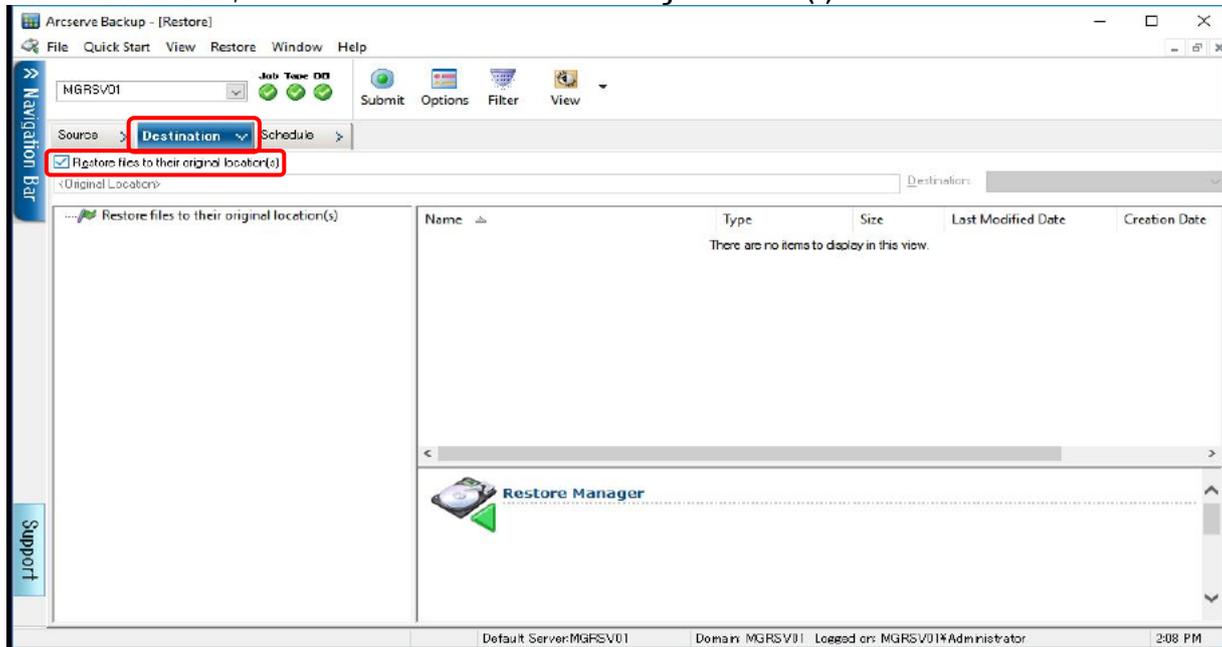


Arcserve Backup will set the restore job according to the navigation on the Restore Manager screen and then execute a restore. Select **Restore Manager** on the Home screen of Arcserve Backup to display the restore screen. On the Restore screen, perform the settings in the following order: **Source**, **Destination**, and **Schedule**.

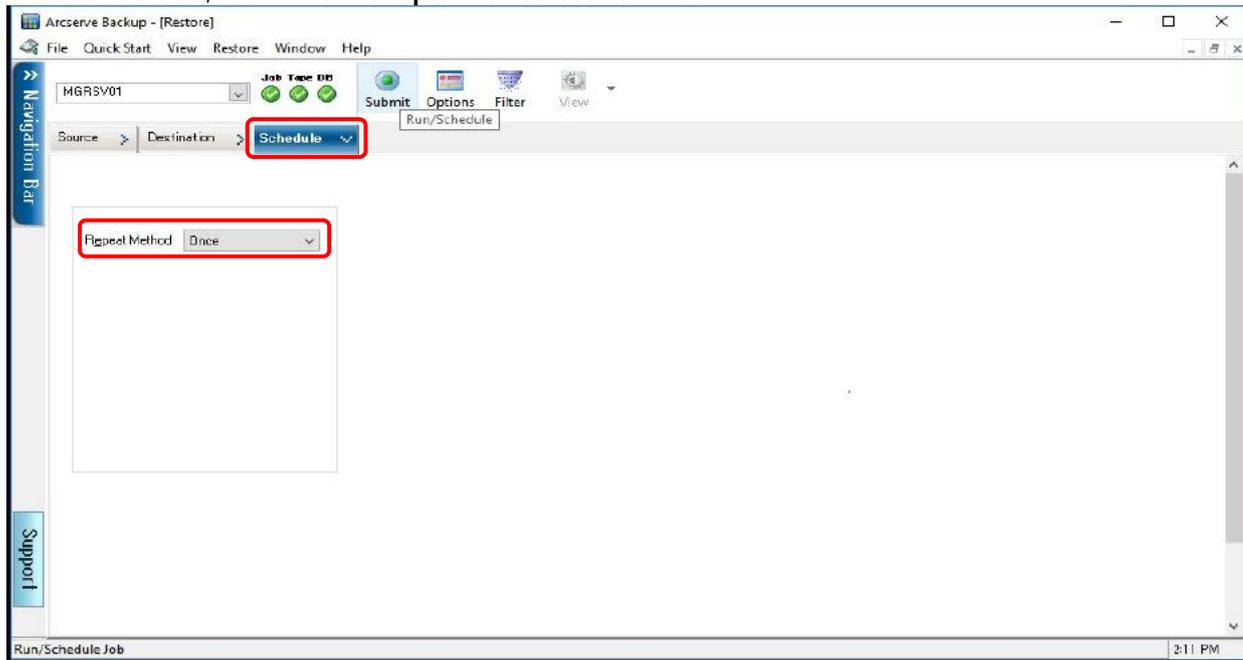
In the **Source** tab, select the session to be restored.



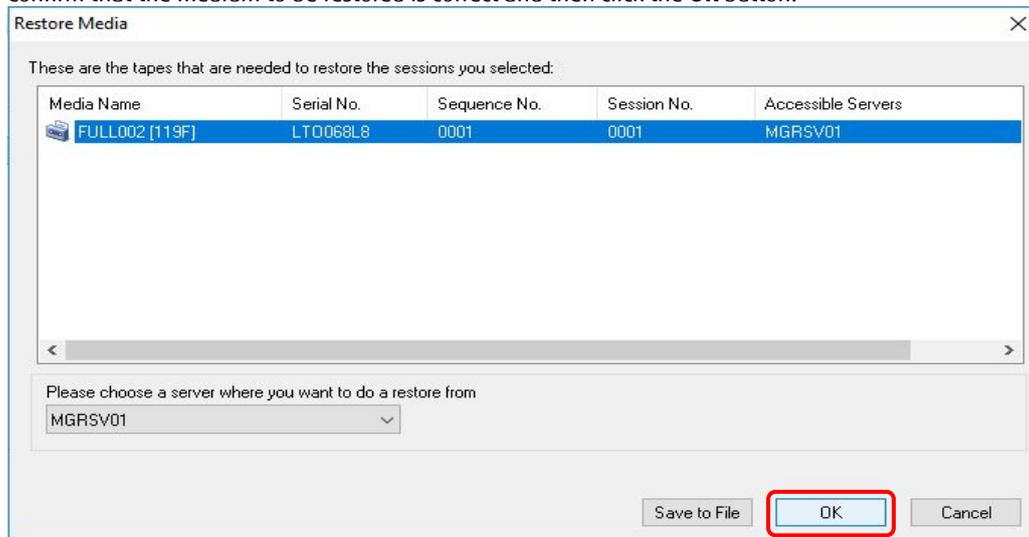
In the **Destination** tab, confirm that the **Restore files to their original location(s)** check box is selected.



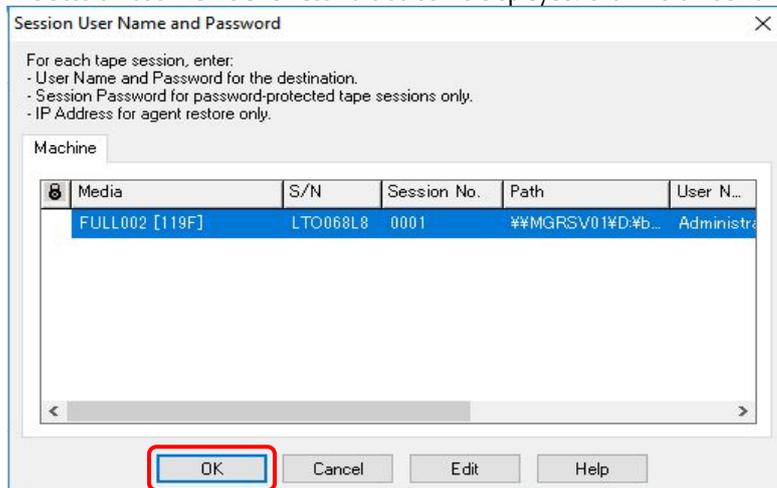
In the **Schedule** tab, confirm that the **Repeat Method** is set to "Once".



Click the **Submit** button at the top of the Restore Manager screen. The Restore Media screen is displayed. Confirm that the medium to be restored is correct and then click the **OK** button.



The Session User Name and Password screen is displayed. Click the **OK** button.



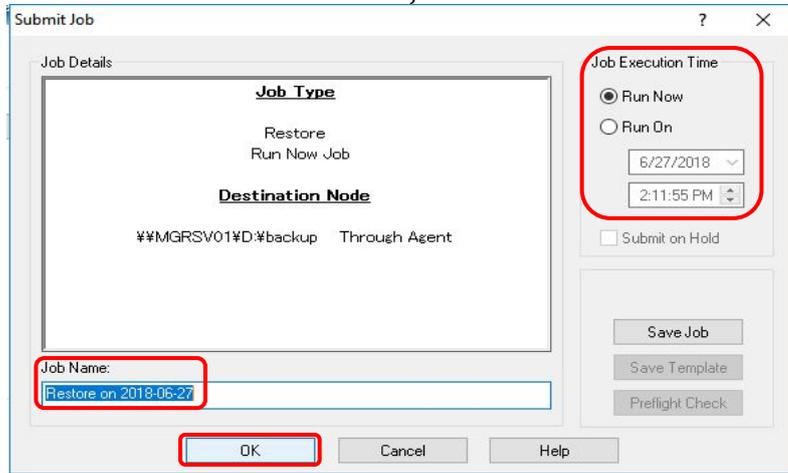
The Submit Job screen is displayed.

Set **Job Name** and **Job Execution Time** on the Submit Job screen.

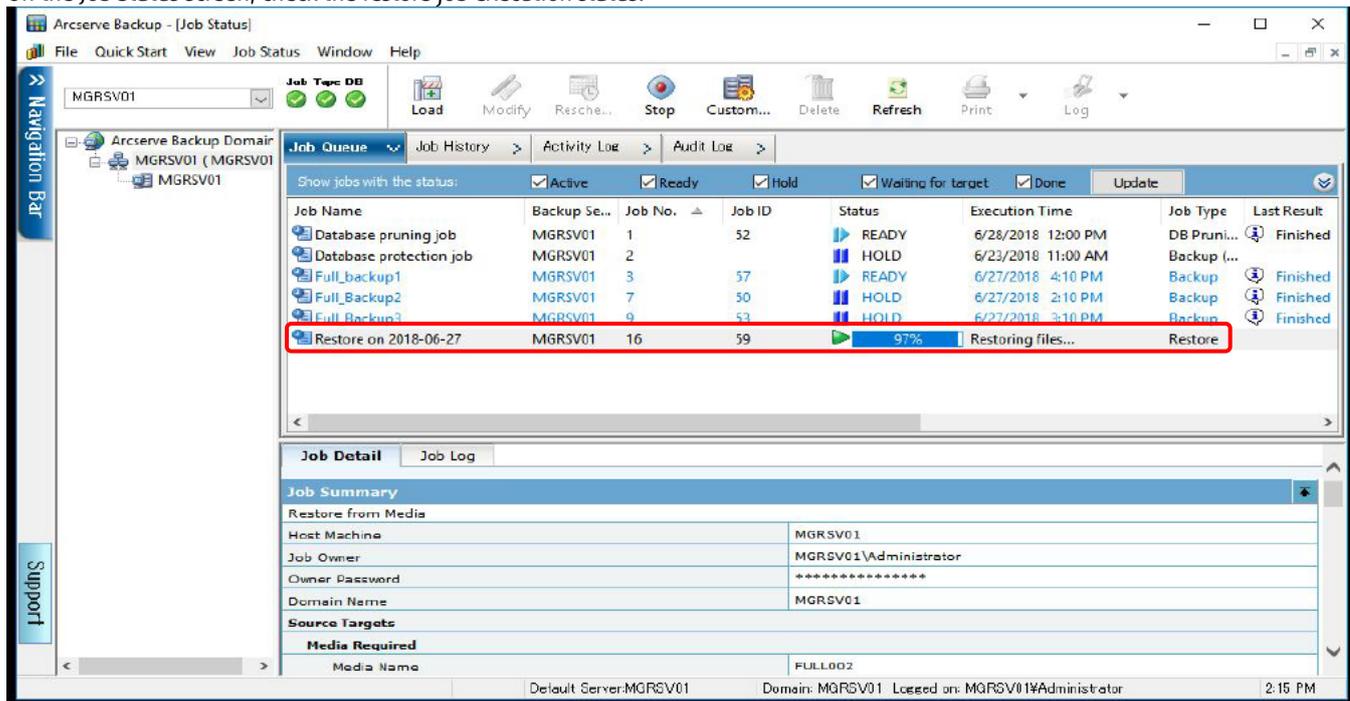
In **Job Name**, set the automatically entered value or enter a value.

In **Job Execution Time**, select **Run Now** or select **Run On** to specify a date and time.

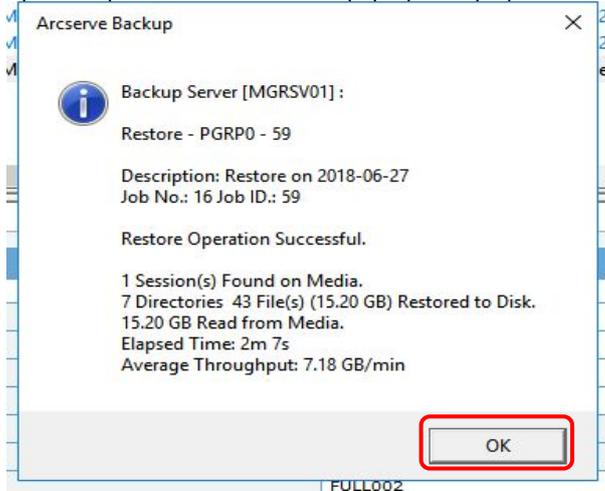
Click the **OK** button to create the restore job.



On the Job Status screen, check the restore job execution status.

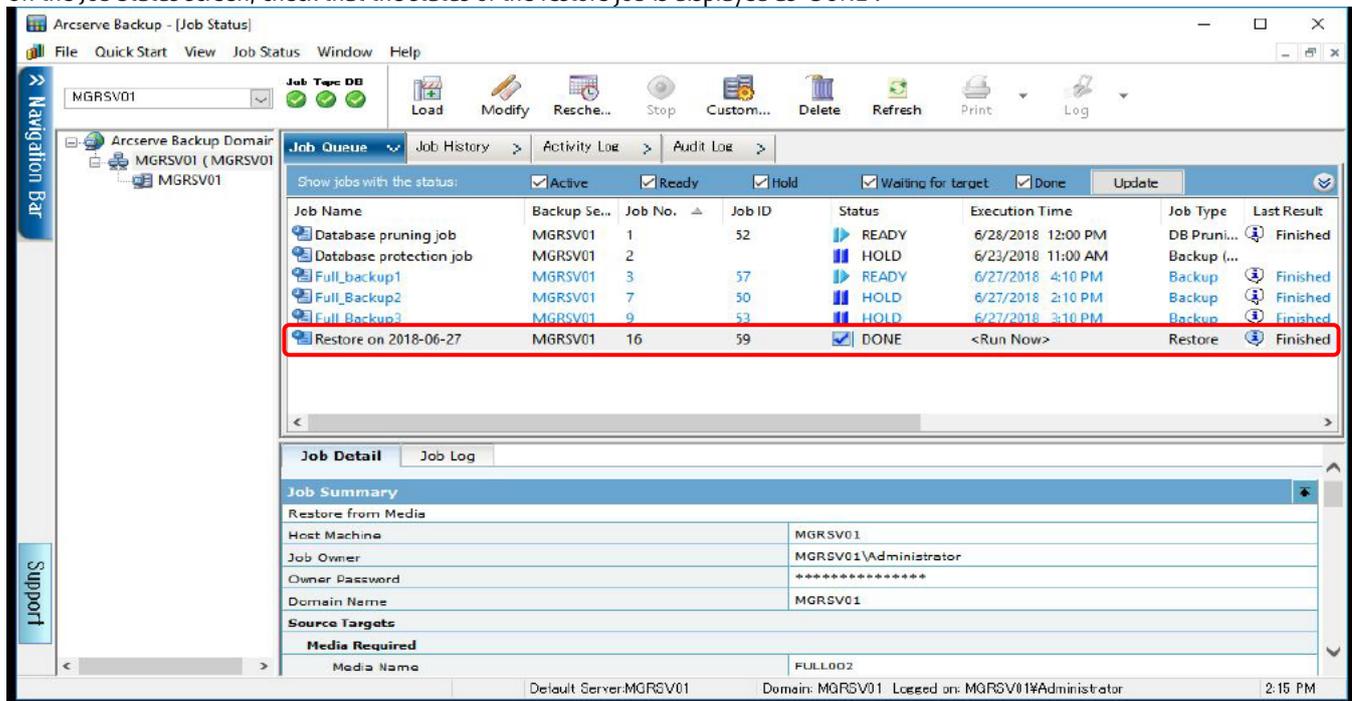


Upon completion of the restore, a pop-up is displayed. Check that the restore completion message is displayed and then click **OK**.

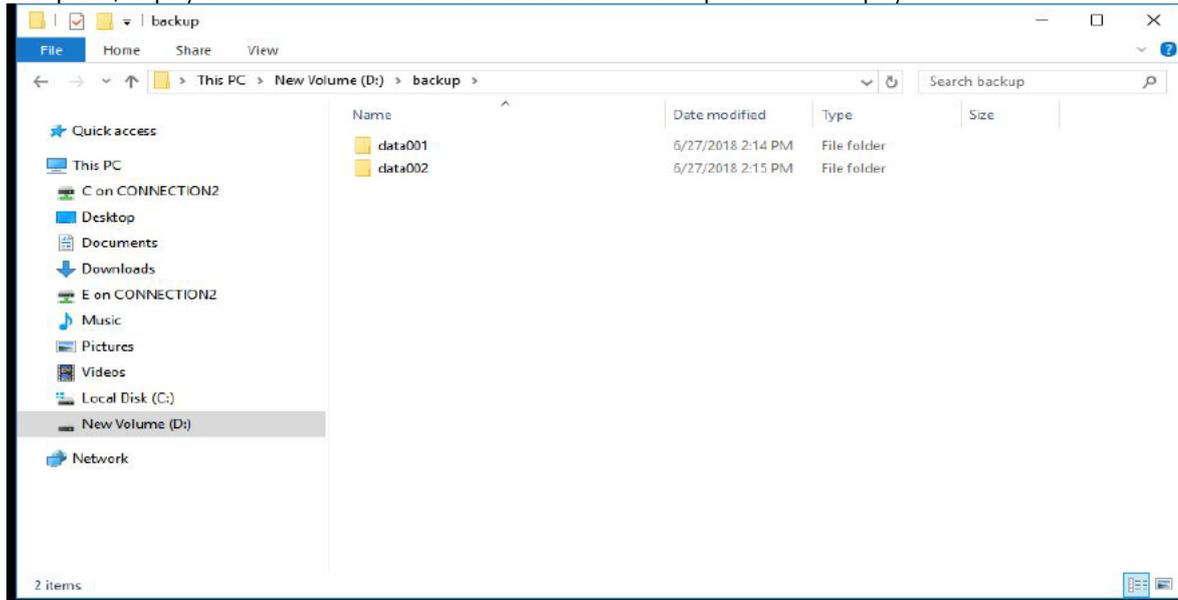


3.4.2.2. Verification of the Restore Results

On the Job Status screen, check that the status of the restore job is displayed as "DONE".



In Explorer, display the restored folders and confirm that the backed up folders are displayed.



3.4.2.3. Configuration of ACM

(1) Delete the source and destination volumes

From the command prompt of the backup server, delete the settings for the source and destination volumes used for the backup by executing **swsrpdelvol** (replication volume information deletion command).

```
C:\>C:\ETERNUS_SF\ACM\bin\swsrpdelvol -h GYOM01 g1d2p1@GYOM01 g2d4p1@MGRSV01
swsrpdelvol completed
```

(2) Set the source and destination volumes

Set the source and destination volumes to be used for the restore.

Execute **swsrpsetvol** to set the device name g2d4p1 as the source volume (backup server) and the device name g1d2p1 as the destination volume (business server).

```
C:\>C:\ETERNUS_SF\ACM\bin\swsrpsetvol -n -o ORG -u g2d4p1 g1d2p1@GYOM01
swsrpsetvol completed
```

Execute **swsrpvoinfo** to confirm the settings.

```
C:\>C:\ETERNUS_SF\ACM\bin\swsrpvoinfo -h GYOM01
Server Original-Volume Size Replica-Volume Size Copy Op-Server
GYOM01 g2d4p1@MGRSV01 599.8 Gbyte g1d2p1@GYOM01 499.9 Gbyte uni-direction original
```

3.4.2.4. ACM Restore Execution

(1) Execute a restore

Execute a restore from the source volume (g1d2p1) to the destination volume (g2d4p1) by executing **swsrpmake**.

For **swsrpmake**, specification of the -T option is not available so OPC is executed.

```
C:\>C:\ETERNUS_SF\ACM\bin\swsrpmake g2d4p1@MGRSV01 g1d2p1@GYOM01
FROM=g2d4p1@MGRSV01, TO=g1d2p1@GYOM01 swsrpmake completed
```

(2) Check the progress of the restore

Check the progress of the restore by executing **swsrpstat** (operation status display command).

You can check the progress of the replication under the **Execute** column.

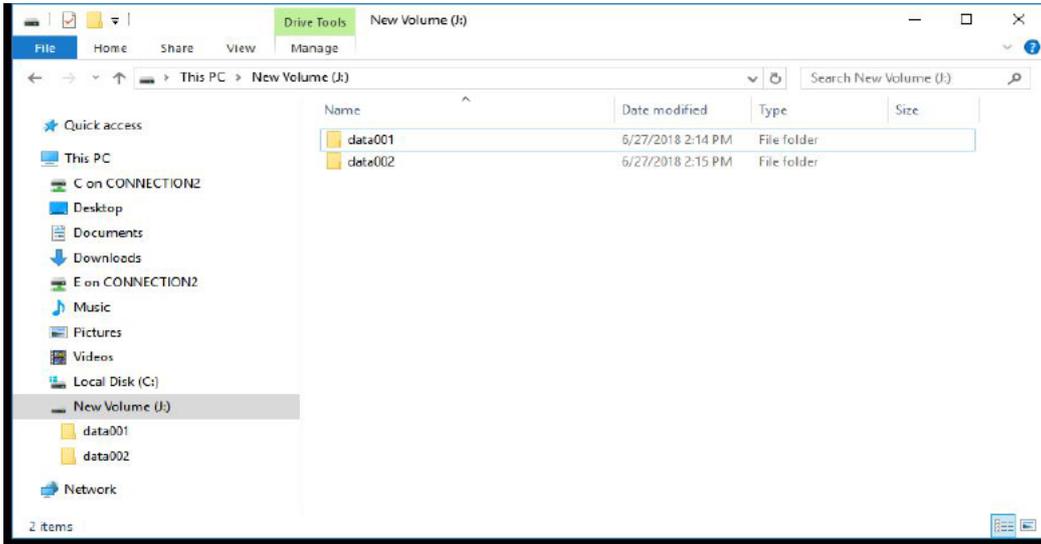
```
C:\>C:\ETERNUS_SF\ACM\bin\swsrpstat g2d4p1@MGRSV01
Server Original-Volume Replica-Volume Direction Status Execute
MGRSV01 g2d4p1@MGRSV01 g1d2p1@GYOM01 regular snap 94%
```

When the restore is completed, the **Status** and **Execute** columns become "----".

```
C:\>C:\ETERNUS_SF\ACM\bin\swsrpstat g2d4p1@MGRSV01
Server Original-Volume Replica-Volume Direction Status Execute
MGRSV01 g2d4p1@MGRSV01 g1d2p1@GYOM01 ---- ---- ----
```

3.4.2.5. ACM Restore Result Verification

Upon completion of the restore, confirm that the restored data exists in the restore destination folder of the business server. The following shows an example of the restore destination folders in the business server.



3.5. Verification Result

For the production volume on the all-flash array used with ACM and Arcserve Backup, the three-generation backup was acquired and both full and incremental backups were successfully acquired for each generation.

A restore was performed to the business volume using the backup data in the LTO tape unit via the backup volume and a successful restore was confirmed.

Full backup verification result

Backup Generation	Backup Method		LTO Media Name	Verification Result
	Production volume → Backup volume	Backup volume → LTO tape cartridge		
1st generation	Execute swsrpmake	Start backup job #1 of Arcserve Backup (full backup)	FULL001	Successful completion of swsrpmake Backup job #1 of Arcserve Backup started automatically and was successfully completed.
2nd generation	Execute swsrpmake	Start backup job #2 of Arcserve Backup (full backup)	FULL002	Successful completion of swsrpmake Backup job #2 of Arcserve Backup started automatically and was successfully completed.
3rd generation	Execute swsrpmake	Start backup job #3 of Arcserve Backup (full backup)	FULL003	Successful completion of swsrpmake Backup job #3 of Arcserve Backup started automatically and was successfully completed.

Incremental backup verification result

Backup Generation	Backup Method		LTO Media Name	Verification Result
	Production volume → Backup volume	Backup volume → LTO tape cartridge		
1st generation	Execute swsrpmake	Start backup job #1 of Arcserve Backup (incremental backup)	INC001	Successful completion of swsrpmake Backup job #1 of Arcserve Backup started automatically and was successfully completed.
2nd generation	Execute swsrpmake	Start backup job #2 of Arcserve Backup (incremental backup)	INC002	Successful completion of swsrpmake Backup job #2 of Arcserve Backup started automatically and was successfully completed.
3rd generation	Execute swsrpmake	Start backup job #3 of Arcserve Backup (incremental backup)	INC003	Successful completion of swsrpmake Backup job #3 of Arcserve Backup started automatically and was successfully completed.

Restore verification result

Restore Generation	LTO Media Name	Restore Method		Verification Result
		LTO tape unit → Backup volume	Backup volume → Production volume	
Full backup of the 2nd generation	FULL002	Start the restore job by specifying the target Arcserve Backup full backup session	Execute OPC	Successful completion of Arcserve Backup restore job Successful completion of swsrpmake The backed up production volume was restored.

4. Conclusion

Performing backups using an all-flash array and an LTO tape unit reduces the purchase cost associated with generation backup storage by replacing flash storage with LTO tape cartridges. In addition, since the business data stored on the flash storage can be saved to the backup flash storage at high speed, this method has the benefit of no business downtime. Use of the data protection product Arcserve Backup allows users to set tape units and perform backup and restore operations with a user-friendly UI.

Reduce backup costs by taking advantage of the benefits provided by the all-flash array, LTO tape unit, and Arcserve Backup combination.

Appendix Cleaning Operation Procedure

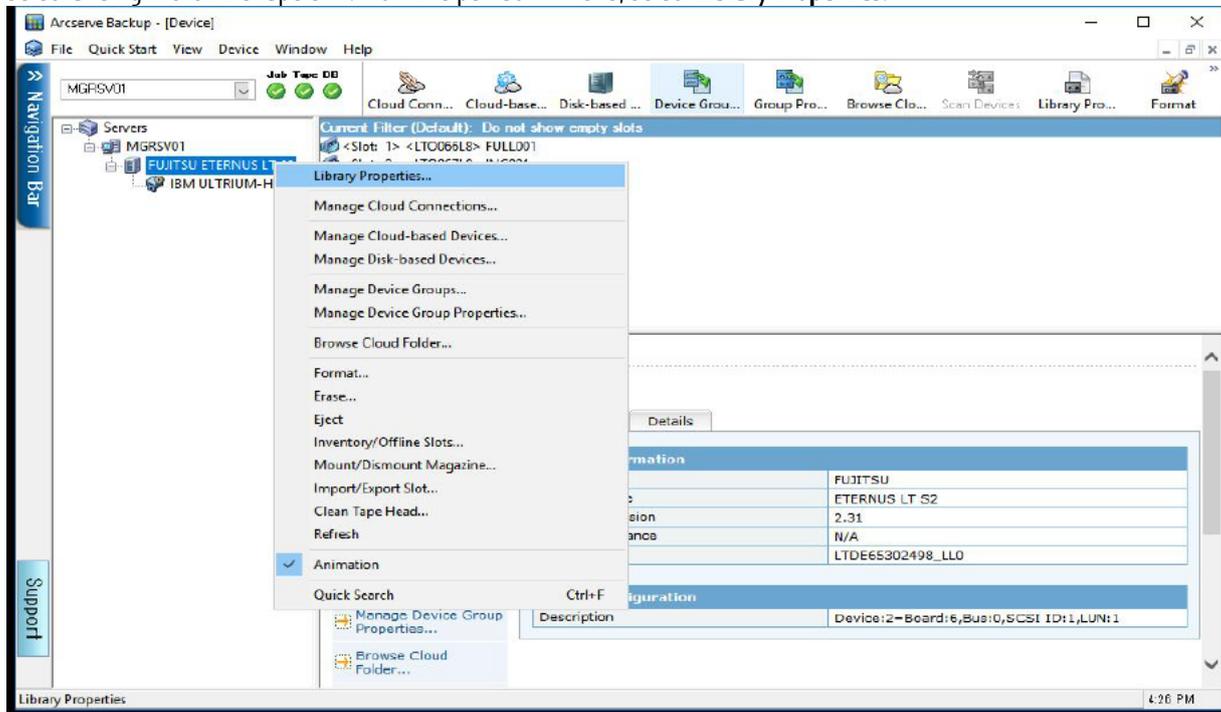
Tape libraries require periodic cleaning of the tape head.

Arcserve Backup has an automatic cleaning function that uses a cleaning tape cartridge for tape libraries.

The setup procedure for the automatic cleaning is described below.

First, place the cleaning tape cartridge in an empty magazine slot of the tape library.

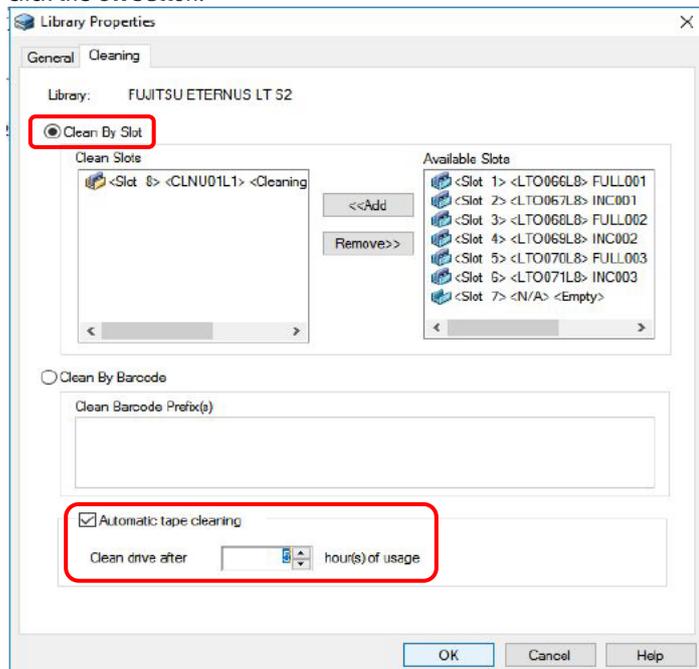
Open Arcserve Backup Manager and from **Administration** on the navigation bar, click **Device** to display the Device screen. Select and right click the tape unit. From the pull down menu, select **Library Properties**.



On the Library Properties screen, click the **Cleaning** tab.

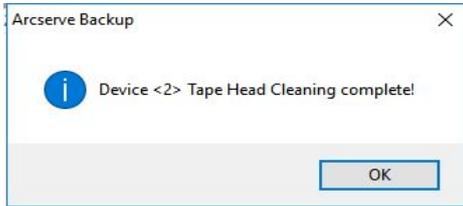
Select the **Automatic tape cleaning** check box and set the **Clean drive after** (hour(s) of usage).

Click the **OK** button.



Cleaning starts according to the total usage time of the tape head.

Upon completion of the cleaning, a pop-up is displayed. Check that the cleaning completion message is displayed and then click the **OK** button.



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