

English



BS2000/OSD

MAREN V12.0B

Volume 1: Basics of MTC Management

User Guide

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1 Preface

The magnetic volume archive system, known as the MAREN system for short, is used to manage volume inventories in BS2000 computer centers. It stores all information on the volumes in a separate MAREN catalog, which can be set up as a central catalog for several systems. Cross-computer data transfer is handled either exclusively (in SPD mode) or in shared in (RFA) mode.

MAREN is closely linked to other BS2000 products, such as HSMS/ARCHIVE, ETERNUS CS HE, and ROBAR, and thus contributes to the optimization of computer center organization.

1.1 Target group

This manual describes the basic principles of MTC management with MAREN. It is aimed at BS2000 users, computer center managers, operators and systems support staff.

The manual “MAREN Volume 2: User Interfaces” [1] contains interface descriptions and examples of working with MAREN.

1.2 Summary of contents

The [chapter “Fundamentals of MTC management”](#) contains an overview of the various volume types, information on how to manage and control them, their fields of application, and on manual and automatic MTC handling in a computer center.

The [chapter “MAREN product overview”](#) describes how MAREN is integrated in BS2000/OSD.

The hosts in a MAREN network can be grouped to form domains. The [chapter “Domains in a MAREN network”](#) describes the concept of working with domains and explains how domains are set up and administered.

The [chapter “MAREN catalog”](#) contains information on the methods of accessing the MAREN catalog and on the various files it contains.

The [chapter “Volume management”](#) explains what a free tape pool is and how free volumes are reserved.

The [chapter “Location management”](#) explains what a location is and how it is specified.

The [chapter “ARCHIVE / HSMS / FDDRL and MAREN”](#) describes how MAREN interacts with the backup and archiving programs of the BS2000/OSD system and with the AVAS job management and scheduling system.

The [chapter “Archive systems and MAREN”](#) describes how MAREN interacts with the Scalar and ETERNUS CS HE archive systems, which are controlled via the software product ROBAR.

The [chapter “Foreign volume types”](#) describes how volumes whose types are not known to BS2000/OSD are administered with MAREN.

The [chapter “Computer center exits in the MAREN system”](#) contains information on supplying and programming computer center exits for the MAREN system. It also contains a sample exit routine for a computer center.

At the end of the manual you will find various overviews which make it easier for you to work with this manual.



All commands referred to in this manual are described in the manual “Commands” [4], unless specified otherwise.

README file

The functional changes to the current product version and revisions to this manual are described in the product-specific Readme file.

Readme files are available to you online in addition to the product manuals under the various products at <http://manuals.ts.fujitsu.com>. You will also find the Readme files on the Softbook DVD.

Information under BS2000/OSD

When a Readme file exists for a product version, you will find the following file on the BS2000 system:

```
SYSRME.<product>.<version>.<lang>
```

This file contains brief information on the Readme file in English or German (<lang>=E/D). You can view this information on screen using the `/SHOW-FILE` command or an editor. The `/SHOW-INSTALLATION-PATH INSTALLATION-UNIT=<product>` command shows the user ID under which the product's files are stored.

Additional product information

Current information, version and hardware dependencies and instructions for installing and using a product version are contained in the associated Release Notice. These Release Notices are available online at <http://manuals.ts.fujitsu.com>.

1.3 Changes since the preceding manual

This manual contains the following major changes compared to the preceding manual.

- Adaptation to BS2000/OSD V9.0.
- The “tape encryption” function is supported for LTO-x drives (LTO-4 and higher).
- The volume types TAPE-C5 and -C6 are supported.
- The archive systems 3594-L10 and 3594-L12 and the product TLS which is needed to operate them are no longer supported in BS2000/OSD-BC V7.0 and higher. Their description has been removed from this manual.
- ETERNUS CS HE replaces the product name ETERNUS CS (CentricStor).
- The utility routine MARENADM.ARCHIVE is supported for the last time in MAREN V12.0 as all the functions of the program are provided by the MARENADM statement UPDATE-MAREN-CATALOG. MARENADM.ARCHIVE is no longer described in this manual.

1.4 Notational conventions

Because certain names are frequently used, for the sake of simplicity and clarity the following abbreviations are used:

- **BS2000** for the operating system BS2000/OSD

The strings `<date>`, `<time>` and `<version>` in examples refer to the current outputs for the date, time, and version of a software product when the examples are otherwise independent of date, time, and version.

The following notational conventions are used in this manual:

Bold type Wherever syntax representations are explained, the lines that are currently being explained are shown in bold type. The text entered on the screen in examples which display input and output is also shown in bold type.

Example Sample inputs and outputs are also shown in typewriter font.



For notes on particularly important information



This symbol designates special information that points out the possibility that data can be lost or that other serious damage may occur.

[]

References to other publications within the text are given in abbreviated form, followed by numbers; the full titles are listed in the “References” section at the back of this manual.

2 Fundamentals of MTC management

Magnetic tape cartridges (MTCs) are an alternative storage option to online disk systems in computer centers.

MTCs supplement and optimize online disk storage capacity. Being a portable storage medium, they also allow you to store data at various locations. On the one hand, the computer center is relieved of the data storage load and, on the other hand, backup and archive volumes can be stored in a protected location (e.g. in a fireproof archive).

2.1 Overview of volume types

Magnetic disk systems and MTC systems are used for permanent data storage. Each storage medium (volume) is managed by the operating system on the basis of its VSN (Volume Serial Number).

MTC systems can accommodate large volumes of data and thus provide an easy means of exporting large data amounts for a variety of reasons, mainly for archiving or for data exchange with other computer centers.

In contrast, magnetic disk systems provide a permanent extension of the working storage (virtual memory systems) and an online storage area (file systems) for data storage.



This manual uses the terms volume and data carrier synonymously. They always refer to an MTC.

2.1.1 Magnetic tape cartridge (MBK)

In the case of magnetic tape cartridges (MTCs), the tape is rolled up on one or two reels and enclosed within a cartridge. A magnetic tape cartridge is robust and easy to use.

Once a cartridge has been inserted in a device, the device mechanism extrudes the tape from the cartridge and guides it over the read/write heads. In the case of MTCs with only one reel, a coupling block is attached to the end of the tape. This is used to extrude the tape from the cartridge.

MTCs are available in a variety of formats. Their length, density and the number of tracks determine their storage capacity.

In contrast to magnetic disk systems, the data on an MTC device is accessed sequentially. When data is written to the tape it is split up into data blocks which are written to the tape one after the other and separated from one another with tape marks. When you read a tape, all data blocks and tape marks have to be read, starting from the beginning of the tape right up to the position you want. However, the latest technological developments in this field are indicating the possibility of virtually direct access (tape speed, capacity, firmware developments).

2.1.2 Control and administration of data volumes

Control system

A data volume is logically accessed through DMS. Device allocation for processing a data volume is controlled through the device management of the BS2000 system (NDM).

Input and output requests are processed by the BS2000 device drivers.

The PPAM (Privileged Primary Access Method) device driver controls disk access during processing.

The PTAM (Privileged Tape Access Method) device driver controls tape access during processing and supplies NDM with any functions required to operate the magnetic tape devices.

When the “tape encryption” function is used on LTO drives (LTO-4 and higher), MAREN manages the encryption keys and supplies the data key required to encrypt or decrypt the volume to the drive. For details, see [section “Encrypting volumes” on page 94](#).

Removable volumes

Data volumes fall into two categories: fixed and removable volumes.

Removable volumes, such as MTCs, have the advantage of requiring relatively little space for storage while supplying a large amount of data storage capacity. They are easy to transport and can easily be dispatched by mail or by courier, for instance.

Magnetic disks are now only used as fixed disks and not as removable volumes any more.

Allocation of volumes and devices

The operating system distinguishes the various types of data carriers by their volume type. Volumes can only be processed by devices that support their specific volume type. The devices that process the various volume types are distinguished by the operating system through the device type.

The operating system identifies the individual volumes through their VSN (Volume Serial Number). Within a computer center, these numbers should be unique.

The operator is responsible for mounting the volumes in the appropriate devices.

2.2 Using magnetic tape cartridges

MTCs are generally used for the following purposes:

- for data transport and exchange between computer centers
- to extend the data storage capacity of a computer system
- for data backup and long-term archiving.

for data transport and exchange between computer centers

Data transport using MTCs is increasingly being replaced by data exchange through network systems. However, there are still some cases where data is exchanged using MTCs:

- software installation (data is on MTCs in compressed form and is installed on a system ready to run)
- transporting large volumes of data that are not urgently needed
- transporting data with a high level of security which should not be exchanged through possibly insecure networks for that reason

Nonetheless, due to more and more efficient technologies emerging (software shipment on CD-ROM, improved security standards in network systems) data transport using MTCs is becoming less important.

Extending the data storage capacity of a computer system

This use of MTCs is becoming their most frequent application. The data storage capacity may be extended for a variety of reasons:

- creating/copying data directly to a tape for processing at a later stage
- data backup of online disk systems (backup copies, archiving)
- exporting data that is not frequently needed online to less expensive data carriers (access time is not important)

By storing data on an MTC, the available disk storage space on a system can be freed for current applications; utilization of online storage capacity can be reduced and bottlenecks avoided.

Data backup and long-term archiving

Data backup and long-term archiving are preventive measures in which copies of the data in a computer center are created, stored and managed. Should a loss of data occur (e.g. through a software fault or a hardware defect) then the data can be recovered using the backup copies.

Examples

1. Data can be copied to a tape by creating a file on a tape and copying the data into it:

```
/CREATE-FILE TAPEFILE,SUPPORT=*TAPE(VOLUME=NA4419)
/START-EDT
@open TAPEFILE
```

The open statement requests the tape NA4419 to be mounted and positions it. Subsequently, the data can be written to the file called TAPEFILE on the tape NA4419.

2. Data backup or archiving:

```
/CREATE-FILE BACKFILE,SUPPORT=*TAPE(VOLUME=NA4419)
/COPY-FILE BACKUP.23-2001,BACKFILE
```

Backup of the file BACKUP.23-2001 to the tape NA4419.

3. Backup/archiving of data using utility routines:

```
/START-HSMS
//BACKUP-FILES TO=*TAPE
```

This statement writes all files and job variables with the current user ID to the tape. The tape is administered by the HSMS backup utility.

2.3 Manual MTC handling

Mounting MTCs

When the operating system encounters a request for a tape (e.g. within a file processing command), it informs the operator that the volume has to be mounted on an available device. The request waits for the operator to inform the operating system of the device ID of the device on which the MTC has been mounted. This device ID is also called the “mnemonic device name”.

Since the BS2000 system automatically recognizes any available devices in its configuration, it can propose a device on which to mount the tape. However, the operator may choose to use a different device.

The BS2000 system also recognizes MTCs that have already been mounted.

Operator console

Any tape requests from the system are issued to the operator console in the form of console messages that may or may not require a response. The operator console is the central location for operating the tapes and tape drives. The operator is informed of a tape request through the console and responds to the message when the required action has been taken.

Tape operator

The operator to whom the task of tape processing has been assigned, is the “tape operator”. The tape operator performs the following functions:

- Allocates devices to computers:
 - BS2000/OSD offers the commands ATTACH-DEVICE and DETACH-DEVICE (dynamic I/O reconfiguration) to attach or detach devices to or from systems.
- processes tape requests in accordance with the console messages:
 - mounts and dismounts tapes
 - deals with error situations reported at the console
- updates the tape utilization list generated/updated by the tape administrator, e.g.:
 - which user is using or has released which tape
 - which tapes are in the scratch pool
 - at which location is a tape kept

Locations

If an MTC is not currently mounted, then it has to be stored somewhere in the computer center, e.g. in special shelves close to the device.

MTCs that are used for long-term archiving will seldom be mounted again and may be kept at some more remote location. Data backups of crucial importance to a company are often stored in a fireproof room (tape archive). If one of these MTCs is needed, the operator has to retrieve it from there.

Request for a specific MTC

The operating system implicitly requests an MTC to be mounted if a user requests data backup to a volume other than an online disk. The magnetic tape cartridges are identified through their VSNs (volume serial number).

Either the VSN is specified by the user who started the job or the application automatically selects it from a range of VSNs in a specific table.

The operator has to react to this explicit tape request by retrieving the MTC with the specified VSN from its current location and mounting it in a free drive.

Request for any free MTC (scratch request)

The operating system also supports requests for MTCs whose VSN is specified neither by the user nor by the application. In this case the tape operator has to select the tape.

If operators receive a mount request without a VSN (keyword *SCRATCH) they have to select an MTC from their pool. The MTCs they select must not contain any data that is required by another application, i.e. they must choose a free MTC from the scratch pool. When operators have chosen an MTC which they intend to mount, they have to respond to the mount request by entering the tape's VSN.

It is important for the operator to know which MTCs are being used by applications and which not. If a large number of MTCs are being managed, the operator needs to keep a list of all MTCs being used in the computer center.

Tape owners and access to data on tapes

BS2000/OSD is a multiuser operating system. This means, data is only accessible to the user who owns it. When users write their data to a tape, they have to make sure that no other user can access the tape and the data it contains. A user remains owner of a tape until they release it again or until the expiration date is reached.

BS2000/OSD follows the following procedure, depending on the storage medium used:

- The shared file system on the disk is managed directly by the operating system (DMS component). Data generated on the disk is kept strictly separate, according to the user IDs. Shared ownership of files, general availability and various access methods are supported.
- The operating system does not contain specific data protection features referring to tape ownership, because tapes, unlike disks are not inseparably connected with the computer. They can be removed from the system at any time and they can be accessed by any other system, regardless of who owns them.

The operator has to protect the data: when a tape is used by an application, the operator must refuse to mount the tape for any user but its owner. An exception exists when two or more users agree to share the volume. The operator or tape administrator needs to be informed of the decision. The operator has to change the ownership information in the tape utilization list that the operator should keep.

The data on the volume is only protected reliably against unauthorized access, in particular from outside the CC, if the data is encrypted. For details, see [section “Encrypting volumes” on page 94](#).

Tape administrator

The tape administrator, i.e. the user ID with the TAPE-ADMINISTRATION system privilege, takes over tape administration. The tape administrator is responsible for managing the tapes in a computer center. The tape administrator is responsible for supplying the computer center with all tapes required for day-to-day work.

The administrator’s tasks comprise:

- formatting new tapes
- returning tapes that are no longer needed to the scratch pool (after having informed the user); before the tape is used again, the data on it should be deleted and the tape parameters should be reset
- reformatting tapes, if necessary, when tapes are released and returned to the scratch pool
- discarding defective volumes

- keeping track of volumes received from foreign computer centers or of volumes sent to foreign computer centers
- creating/updating a list containing the following information:
 - Which tapes exist in the computer center?
 - Where is which tape kept (location)?
 - Which user is using which tape?
 - Is a user sharing tapes with other users?
 - Until when does a user need a tape?
 - Which tapes are allotted to the scratch pool?

This list is drawn up by the tape administrator and updated by the operator when the tapes are mounted or dismounted.

- organizing secure tape operation (access control)

Encryption key administrator

When data volume encryption is used, the encryption key administrator manages the encryption keys of his/her domain. The user ID with the system privilege TAPE-KEY-ADMINISTRATION has the authorization for this task.

The administrator's tasks comprise:

- Creating encryption keys
- Defining the encryption key for encryption
- Managing key boxes
- Importing the encryption keys of foreign volumes
- Additional storage of the encryption data at a secure location to enable it to be reconstructed in the event of a disaster

For details, see [section "Encrypting volumes" on page 94](#).

2.4 Automation of MTC handling

The activities carried out by the tape operator and the tape administrator may become quite extensive as the computer center, the applications and the data volume grow or if data volumes need to be exchanged with other computer centers, e.g. in the course of centralization. Medium-sized and large computer centers frequently use as many as 10,000 volumes.

Such large numbers of volumes that need to be managed and processed call for an automation of the operator and administrator functions.

Mounting tapes automatically

The response times to tape requests are a critical performance factor in the administration of computer centers. In order to reduce the amount of manual operator actions and to be able to process most of the tape requests through automated mount operations, tape reels have been enclosed in a housing. The result is magnetic tape cartridges, which facilitate handling and allow the use of automated transport systems.

Cartridge magazines

MTCs are grouped in cartridge magazines. The operator inserts the cartridges in a magazine before starting an application. So several cartridges are available for mounting with no operator intervention needed when a tape is requested.

Cartridge magazines function in two different modes:

1. Sequential mode:
The cartridges are used one after the other (in descending order) to meet the system's tape requests. This mode is generally used for scratch tapes.
2. Direct mode:
The cartridges are used as they are requested:
 - the application requests a specific MTC in the magazine
 - the device locates the MTC and mounts it.

As long as one MTC is mounted, no other MTC in the magazine can be mounted elsewhere.

Archive systems

An archive system automatically mounts and unmounts an MTC following a request from the operating system. This is realized by means of a robot device.

An archive system connects a series of devices and a set of MTCs within a defined area. Thus the archive system is forming a unit. The devices installed within the archive system can only be mounted with the cartridges contained in that archive system. This means that the archive system is at the same time the MTC location.

The operator loads the archive system with cartridges (for an application) or removes cartridges from the import/export unit.

The archive system is linked with the operating system, so it can read and respond to mount requests. In order to be able to mount an MTC on request, the archive system searches for an appropriate tape among its MTCs and then performs the requested operation. It either chooses an appropriate device and ignores the device proposed by the system or it uses the specified device, in which case the device has to be at the same location as the data volume.

In order to assist the archive system in selecting the right device (i.e. a free device), the operating system has to request a device with the same location as the requested MTC.

The archive systems used for BS2000/OSD are the virtual archive system ETERNUS CS HE from Fujitsu Ltd. and the real archive systems from Quantum Corp.

Automatic tape operator

The archive system replaces the human tape operator in fulfilling mount requests. It is either directly linked with BS2000/OSD or through the interface of its MTC devices or its archiving computer and it evaluates the operator console messages. The archive system performs all tape processing activities (with the exception of some error situations) in the same way as a human operator.

Automatic tape management with MAREN

Beside having tapes mounted automatically, management of the volume catalog can also be automated.

MAREN offers various catalog management functions that can be processed by the command interface of the BS2000 operating system. Tapes that are introduced to the computer center are entered in the catalog along with any references and features they may have and these entries can be modified and deleted, etc.

MAREN tape management supports the tape administrator in various management tasks occurring in a computer center:

- scratch pool
- ownership and shared use
- initialization
- transport to various computer center locations
- sending tapes to or receiving them from other computer centers
- reservations
- release and expiry
- logging
- statistical records

MAREN is permanently linked with the operating system to be able to trace the useful life and the state of MTCs, and it is informed of tape requests and tape utilization through system interfaces.

This information is all recorded in the MAREN catalog.

Automatic response to scratch requests

Allocating a free tape when a scratch tape is requested can also be automated when an archive system is used. Standardized programs (such as MAREN) are closely linked to the operating system and are informed of any existing requests. If a scratch tape is requested, the program determines a free tape in the scratch pool that meets the reservation requirements (e.g. for the volume type) and supplies its VSN to the requesting application.

2.5 Organizing MTCs in computer centers

Life cycle of an MTC in a computer center

New MTCs have to be formatted (initialized) before they are used in a computer center for the first time.

The tape administrator enters the new tapes in the catalog of existing MTCs. This catalog can be created and administered with a variety of means (e.g. on paper or electronically). The new MTCs are formatted using the standard formatting routines available on the computer (e.g. INIT).

Only then can the operator respond to mount requests for the new MTCs. The operator needs to know which new MTCs are available.

Once an application has written data to an MTC the operator can no longer mount it for any other application, unless the tape owner informed the operator that a foreign application is authorized to read or write the MTC.

An MTC used by an application is reserved until the application (i.e. the application user and tape owner) decides that it is no longer required. The application user has to inform the tape administrator if the tape is not to be used by any other application. The criterion of ownership is the user ID under which the application was started. When the MTC is released, the user, or the application, must inform the tape administrator of the fact that it may now be used by other applications again.

An MTC can be released again automatically if the user agrees that the tape administrator may reuse the tape again when a default period of time has expired.

Once an MTC is released and can be used again by other applications, data protection measures require any data still contained on the tape to be deleted or to be protected against access by the next application, so the MTC has to be reformatted (reinitialized).

Without the use of MAREN, the tape administrator has to inform the operator of the current status of a tape available for mount requests:

- the MTC can be reallocated to an application (new or released MTC)
- the MTC may only be used by the application it is already allocated to
- the MTC may be used by the application it is already allocated to or by other applications

The [figure 5 on page 90](#) illustrates the life cycle of a tape.

MTCs in multicomputer systems

How MTCs are distributed to different computers depends on the way a computer center is organized. Here are some options:

- the computers are allocated to specific departments (or customers) and their resources (peripherals, MTCs, printer, etc.) are separate.
- the computers are allocated to different customers, depending on the current load. Their resources are shared.

The tapes can be administered as follows:

- in a common pool used by all the computers in the center
- separately according to computer
- separately according to customer
In this case, separate lists can be kept specifying on which computer an MTC is located.

The MTCs available for new reservations are contained in a free tape pool. MTCs reserved by an application are allocated to the user ID under which the application was started. Tape organization can be graded even more finely by reserving a range of VSNs for a specific user group or some other criterion (job name, file name, etc.).

Some free tape pools can be reserved for standard applications (e.g. HSMS). Standard system components, such as MAREN, have been extended in order to administer the pools of other system programs.

Example of how to organize MTCs

1. The free MTCs are all in a common free tape pool and are available for all users on all computers.

	computer_1			computer_2		
	USER1	USER2	USER3	USER1	USER3	USER4
Reserved						
Free	common free tape pool					

2. The free MTCs are allocated to individual pools for specific users or user groups on each computer. The users can only reserve MTCs from the pool allocated to them.

	computer_1			computer_2		
	USER1	USER2	USER3	USER1	USER3	USER4
Reserved	only in pool1	only in pool2		only in pool3	only in pool4	only in pool5
Free	pool1	common pool2		pool3	pool4	pool5

3. The MTCs and computers of various computer center customers are grouped to form domains, and each user can only work within his/her domain.

	domain_1			domain_2		
	computer_1		computer_2	computer_3	computer_4	
	USER1	USER2	USER2	USER3	USER4	USER5
Reserved						
Free	common pool					

The tape administrator has to distribute the available resources according to the requirements of the customers. System programs such as MAREN allow the utilization of MTCs to be administered and monitored according to specific requirements.

The regulations concerning the release of MTCs (expiration date, retention period) can be defined by the tape administrator and modified on the request of the users. These regulations define, among other things, how a tape's transition from the "reserved" status to the free tape pool is to be effected.

Beside a tape's utilization, the tape administrator must make sure that the data on the tape is retained for the duration of its reservation. This general data protection aspect is extended by legal regulations that require data to be retained for a period of time.

The life cycle of the recordings may be lower than the prescribed retention period. In this case the data has to be “refreshed”, i.e. it either has to be rewritten or copied to another volume.

Another problem that the tape administrator must keep in mind is the useful life of a data carrier. If a tape volume is used frequently, faults may occur that reduce the quality of data recordings. Read errors or sequence errors as well as errors during mounting (load check) will occur more frequently. The tape administrator has to keep an eye on the frequency with which a volume is used and, if necessary, copy its contents to a new volume and throw out the old one.

Location of MTCs

When a computer center reaches a certain size, the number of MTCs that have to be kept at various locations is more than a human operator can keep track of. In order to support the operator in his search for a specific MTC, the tape administrator must keep a record of the storage location of an MTC when it is first put to use and update it each time it is used again. This information is referred to as the **location** of the MTC.

At locations that are served automatically (archive systems), the application can address the archive system explicitly or implicitly by specifying the location.

In modern computer centers, the main location will be served automatically by one or more archive systems. Locations of this type are used by all applications requiring automated operation (e.g. procedures recurring on a weekly basis).

Manually operated devices may be available for historic reasons or for special data exchange purposes if the archive system is to be kept free of specific input/output operations. MTCs used on manually operated devices should be assigned to a special location in the vicinity of such devices, so the operator can find them quickly when they need to be mounted.

Besides archive systems, manual devices may also be equipped with cartridge loading systems for sequential or direct access. Such devices may have a location of their own which can be addressed by applications.

Moving MTCs to other locations

MTCs contained in a cartridge loading system are not automatically allocated to the location defined for the device. The tape administrator can change the location allocated to such tapes, if necessary, in order to make this temporary situation known to the applications using the location.

Volumes that are used for archiving or backup purposes are kept in a secure room (e.g. a fireproof room) which forms a location of its own. The volumes contained in this location are either recorded manually (on paper) by the tape administrator or by a system program for MTC administration.

The tape administrator has to record the removal of tapes from one location to another according to his own method.

MTCs can either be moved from one location to another within the same computer center or they can be sent to another computer center (foreign computer center).

Both types of relocation can either be recorded manually (on paper) or automatically by a system program. If the information is recorded automatically, the system program (e.g. MAREN) has to have a connection to the operator to inform him of the necessity to relocate or transport the volume. This connection is realized by console messages and the output of special forms. The operator confirms the relocation (which is then his responsibility) and, at the same time, the system program records the volume's new location.

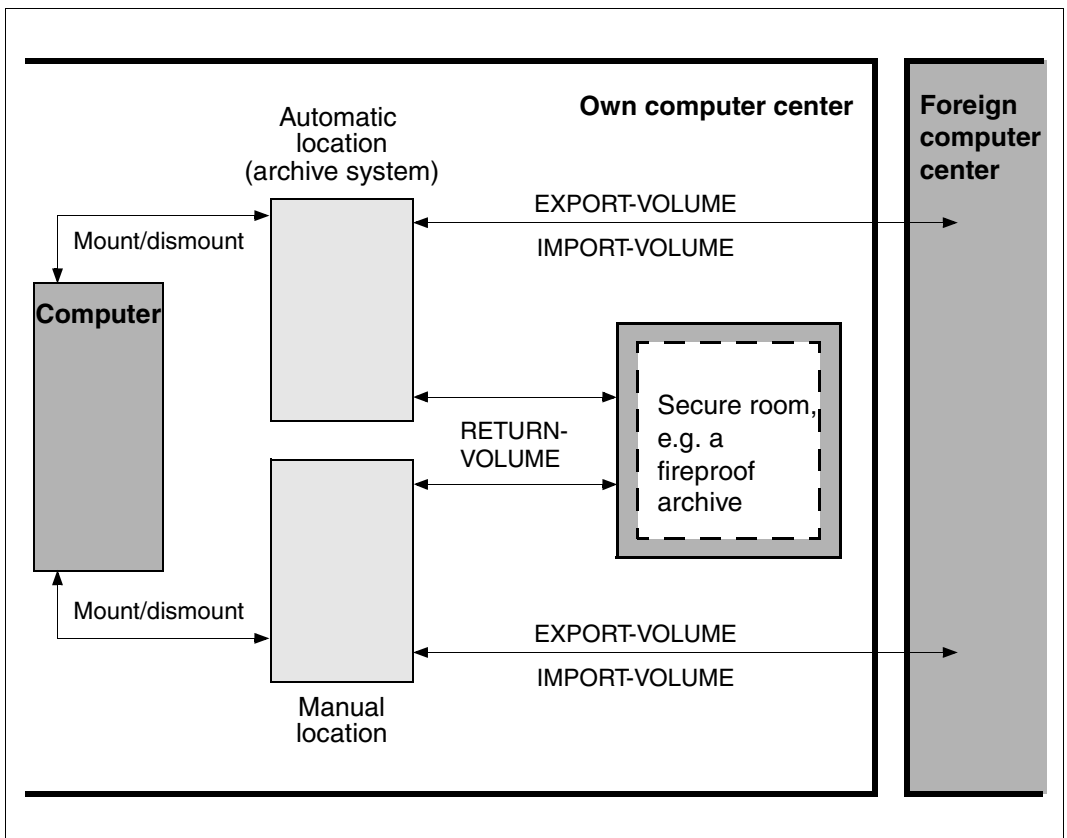


Figure 1: Example of typical locations in a computer center

3 MAREN product overview

The MAREN system is used to manage volume inventories in BS2000 computer centers. MAREN stores all information on the volumes in a separate MAREN catalog. The MAREN catalog that can be set up as a central catalog for several systems.

The volumes in a MAREN system are MTCs and magnetic disks.

3.1 Integration in BS2000/OSD

The MAREN system is provided with a connection to the BS2000/OSD operating system to ensure that the information in the MAREN catalog is always up to date. Via this connection, the MAREN catalog is updated each time a magnetic tape is processed.

The link to the operating system is established via the MAREN subsystem. This subsystem also performs checks for access authorization (protection against overwriting), availability and plausibility before a tape is processed.

The MAREN catalog is VSN-oriented, i.e. volume serial numbers must be unique throughout the entire computer center, even for different types of volumes. However, MAREN does not require a special kind of VSN system.

The MAREN catalog is neither a copy nor a superset/subset of the file-name-oriented system catalog TSOSCAT, because:

- TSOSCAT is processor- and/or pubset-oriented. The MAREN catalog contains information involving more than just one processor.
- Even if archive entries for private volumes are deleted from TSOSCAT with the aid of the EXPORT-FILE command, the volumes will still remain stored in the MAREN catalog.
- In TSOSCAT, any number of file sequence number (FSEQ) allocations to the same VSN may exist. In the MAREN catalog, each allocation is unique.
- In the MAREN catalog, any number of entries with the same file name may exist. In TSOSCAT, the file name is unique, because the complete path name (including the catalog ID, user ID and file name) is entered.

3.2 Components of the MAREN system

Components	Interfaces	Description
MAREN subsystem	System interfaces, coordination of the MARENCP and MARENUCP control programs, MAREN-TFT commands	Vol. 2 Vol. 2 Vol. 2
MAREN user program	Statements, subroutine	Vol. 2
MARENADM administrator program	Statements, subroutine	Vol. 2
MARENEKM administrator program	Statements	Vol. 2
MARENLM utility routine	Forms	Chapter 7, S. 127
MARENCP control program	Command or statement for startup and termination	Vol. 2
MARENUCP control program	Parameters	Vol. 2

A MAREN subsystem has to be running.

The MAREN user program and the MARENADM administration program are used for the management of archive entries and provide a wide variety of information services. When data volume encryption is used on LTO volumes, the MARENEKM administration program enables encryption keys to be generated and managed in a domain on a cross-computer basis. The MARENLM utility routine can be used to create and manage a reservation file.

MARENCP is the control program for accessing the MAREN catalog and runs in a task of its own. Another important component of the MAREN system is MARENUCP for automatic free tape allocation. A free tape is automatically allocated, e.g. for a “mount scratch” request and the tape is reserved in the MAREN catalog.

Program execution in interactive mode and in batch mode

The programs of the MAREN system can be executed both in interactive mode and in batch mode. All statements are read from the system file SYSDTA.

- Interactive mode:
SYSDTA is assigned to the terminal in interactive mode.
- Batch mode:
Programs which are to be started in a procedure or an ENTER file can read the statements from a SAM or ISAM file. These files are assigned using the command:

```
/ASSIGN=SYSDTA TO=<filename>
```

or

```
/ASSIGN=SYSDTA TO=*SYSCMD
```

The figure 2 gives an overview of all components comprising the MAREN system:

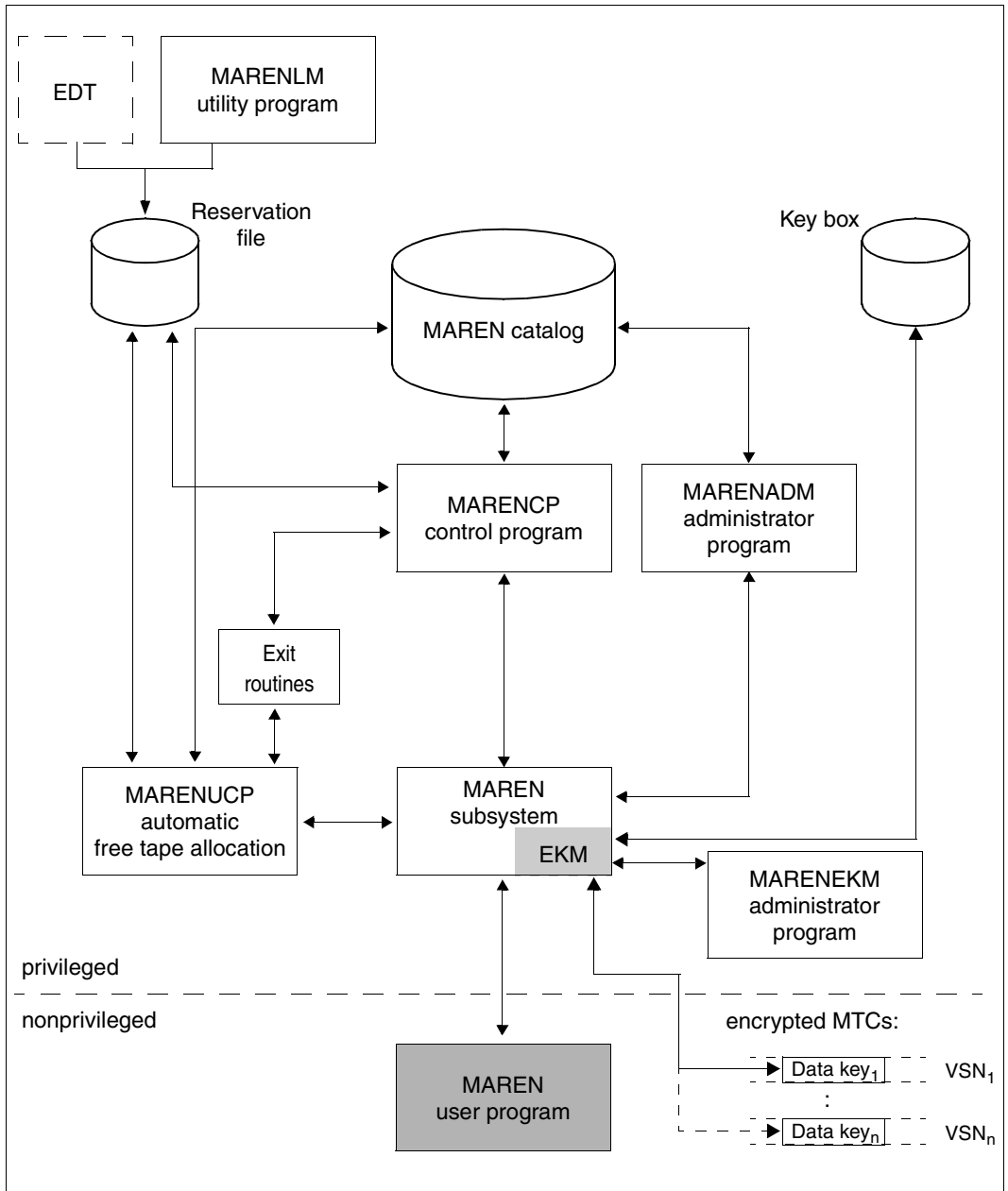


Figure 2: Components of the MAREN system

How the components in a MAREN network with several hosts run is described in the [section “The MAREN network” on page 47](#).

3.3 Authorization structure in MAREN

MAREN is used by privileged and nonprivileged users to administer volumes. Privileged users work on a user ID which has the system privilege TAPE-ADMINISTRATION. They are consequently authorized to perform the administration tasks of MAREN.

Some tasks additionally require the operator role which is entered in the host-specific MAREN parameters is also required for some tasks. The default is the operator role SYSMAREN.

3.3.1 Assigning authorizations

Systems support specifies which ID is assigned authorizations for tape administration.

System privilege TAPE-ADMINISTRATION

The system privilege TAPE-ADMINISTRATION authorizes an ID to perform tape management tasks.

- In a BS2000 system using the product SECOS
The chargeable software product SECOS enables the standard privilege assignment of BS2000 to be changed. Systems support can assign the system privilege TAPE-ADMINISTRATION to any ID.
- In a BS2000 system not using the product SECOS
In BS2000/OSD V6.0B and higher, not only TSOS but also the system ID SYSMAREN is configured with the system privilege TAPE-ADMINISTRATION.



The MARENADM statements CHECK-TSOSCAT and ADD-RESERVED-VOLUMES with the VOLUME=*BY-TSOSCAT operand can only be issued under the system ID TSOS.

MARENADM can also be started under any IDs if systems support makes the user syntax file SYSSDF.MAREN.120.USER supplied available for these IDs and has assigned an administrator password (see the MAREN statements MODIFY-MAREN-PARAMETERS and MODIFY-GLOBAL-PARAMETERS). Users legitimate themselves as the administrator by entering the password in their password table (BS2000 command ADD-PASSWORD).

System privilege TAPE-KEY-ADMINISTRATION

When data volume encryption is used, the system privilege TAPE-KEY-ADMINISTRATION authorizes an ID to manage the encryption keys of its own domain.

- In a BS2000 system using the product SECOS
The chargeable software product SECOS enables the standard privilege assignment of BS2000 to be changed. Systems support can allocate the system privilege TAPE-KEY-ADMINISTRATION to any ID.
- In a BS2000 system not using the product SECOS
In BS2000/OSD V8.0A and higher the SYSMAREN system ID is by default configured with the system privilege TAPE-KEY-ADMINISTRATION.

Operator role

For MARENUCP and the MARENADM statement INITIALIZE-VOLUMES, a particular operator role is required for the connection to UCON. This operator role is entered in the local MAREN parameters (the default is SYSMAREN). Under the SYSPRIV system ID this operator role must be configured once for the authorized ID using the following commands, e.g. for SYSMAREN:

```
/CREATE-OPERATOR-ROLE OPERATOR-ROLE=SYSMAREN,ROUTING-CODES=(A,E,G,P,T)
```

```
/MODIFY-OPERATOR-ATTRIBUTES USER-ID=<user-id>,ADD-OPERATOR-ROLE=SYSMAREN
```

If the operator role SYSMAREN is already configured, check whether all routing codes (especially the routing code G) are assigned. You can assign the missing routing codes as follows:

```
/MODIFY-OPERATOR-ROLE OPERATOR-ROLE=SYSMAREN,ADD-ROUTING-CODES=<code>
```

You will find the description of the commands in the "Commands" manual [\[4\]](#).

The table below shows the minimum authorization which an ID must have in order to work with the various MAREN components and MARENADM statements.

MAREN components and MARENADM statements	Minimum authorization
MAREN user program	Standard processing
MARENADM	System privilege TAPE-ADMINISTRATION
MARENEKM	System privilege TAPE-KEY-ADMINISTRATION
MARENCP	System privilege TAPE-ADMINISTRATION
MARENUCP	Operator role which is defined in the MAREN parameters (default: SYSMAREN) System privilege TAPE-ADMINISTRATION
MARENLM	System privilege TAPE-ADMINISTRATION
MARENADM statement ADD-RESERVED-VOLUMES (VOLUME = *BY-TSOSCAT operand)	TSOS
MARENADM statement CHECK-TSOSCAT	TSOS
MARENADM statement INITIALIZE-VOLUMES	Operator role which is defined in the MAREN parameters (default: SYSMAREN) System privilege TAPE-ADMINISTRATION

3.3.2 The MAREN administrator and MAREN user

The term MAREN user is a generic term which refers to the privileged (MAREN) administrator and the nonprivileged (MAREN) user.

The MAREN administrator

The privileged MAREN user is addressed in the manuals as the (MAREN) administrator. He/She works mainly with the statements of the MARENADM administrator program. When domains are used, the administrator role is split into two further roles: the Domain Administrator (DA) and the All-Domain Administrator (ADA) (see [“User roles” on page 57](#)).

The encryption key administrator

When data volume encryption is used, the encryption key administrator is responsible for creating and managing encryption keys of his/her own domain. Statements of the administration program MARENEKM are used for this purpose.

If the TAPE-KEY-ADMINISTRATION privilege was not assigned to another user ID, it is assigned to the SYSMAREN system ID. In this case the MAREN administrator also performs the tasks of the encryption key administrator.

The MAREN user

The MAREN user with no special privileges is referred to in the manuals as (MAREN) user. The user manages the volumes which are reserved in the MAREN catalog for his/her ID using the MAREN user program.

3.4 Use of domains

Large computer centers often offer their services to several customers or they work for separate groups within a large company. In this case a customer or group operates with a specific host or group of hosts. This grouping of hosts can be transferred to MAREN by defining domains. The information on the domains is stored in the MAREN catalog.

The users access only those volumes which are assigned to the hosts of their domain. They cannot access the volumes of another domain. They obtain also no information about them. A Domain Administrator (DA) performs the administrative functions in a domain. An All-Domain Administrator (ADA) defines the domains and administers the entire MAREN catalog. The ADA also has the rights of a DA in the domains.

A MAREN network in which no domains are defined can also be regarded as a network in which all hosts and volumes are combined in a single domain. This is then known as the standard domain (see [page 58](#)). In some outputs after SHOW statements the standard domain is therefore displayed even if you are working without domains.

Detailed information on this is provided in the [chapter “Domains in a MAREN network” on page 57](#). The special aspects which you must take into consideration when working with domains are also described there.

3.5 Runtime environment and parameters

The MAREN system has to be started on each computer and linked to the MAREN catalog.

1. In an initial installation: incorporate (possibly through renaming) the desired version of the MAREN catalog supplied (SYSDAT.MAREN.120.CATALOG).
2. Start the MAREN subsystem on each computer
3. Start the MARENCP program which accesses the MAREN catalog (batch mode)
4. Where appropriate, start MARENUCP for automatic free tape allocation (batch mode)
5. Start the MAREN administrator MARENADM and/or the MAREN user program in order to process volume information in the MAREN catalog.

The MAREN and MARENADM utility routines access the MAREN catalog via the MAREN subsystem and the MARENCP process. The instructions from the MAREN and MARENADM programs can also be transferred using subroutine interfaces (see “MAREN Volume 2” [1]).

Access modes to the MAREN catalog

MAREN can process the MAREN catalog in two ways.

1. Exclusive access mode (called “SPD mode” for historical reasons):

The catalog is on a shared private disk (SPD) or on a shared pubset, which can be accessed from several computers. Each access is enclosed between DMS-OPEN and DMS-CLOSE.

2. Shared access mode (called “RFA mode” for historical reasons):

The catalog is on a disk (shared or exclusive). It is accessed via ISAM and RFA in the shared update mode.

The shared access mode has been introduced in order to increase performance in MAREN catalog processing. The software product RFA is required (see the “RFA” manual [11]).

Runtime parameters

Various parameters can be used to influence how MAREN works. The following types of parameter exist:

- Host-specific parameters which are set with the `MODIFY-MAREN-PARAMETERS` or `MODIFY-DOMAIN-ASSIGNMENT` statement.

When a host is added to the MAREN network the host-specific parameters are generated. Two different cases are involved here:

- The host is added explicitly using the `ADD-HOST` statement (mandatory when domains are used, also possible without domains):

The host-specific parameters of another (specified) host are taken over.

- The host is added implicitly by starting the MARENCMP program (only possible when domains are used).
- Global parameters which are set with the `MODIFY-GLOBAL-PARAMETERS` statements. With the exception of the access mode, global parameters are only meaningful when domains are used.
- Domain-specific parameters which are set with the `MODIFY-DOMAIN-PARAMETERS` statement. The domain-specific parameters are only meaningful when domains are used.



Before MAREN V10.0 a distinction was made between local parameters and global parameters. The local parameter were defined as the start parameters of MARENCMP, the global parameters were set using the `MODIFY-MAREN-PARAMETERS` statement. These two types of parameter are now combined in the host-specific parameters which are all set exclusively with the `MODIFY-MAREN-PARAMETERS` statement. The parameters of MARENCMP are meaningless.

The former MARENUCP are no longer supported in MAREN V12.0 and higher:

- The `INIT` and `PROPOSE` parameters have been removed and not replaced.
- The `MOUNT-CHECK-INTERVAL` and `RESERVATION-SEQUENCE` parameters are now available as host-specific MAREN parameters and can be set using the MARENADM statement `MODIFY-MAREN-PARAMETERS`.
- The `UCON-USER-ID` parameter is still interpreted for reasons of compatibility.

Effectiveness of modifications to parameters

The MAREN administrator can modify host-specific, domain-specific and global parameters. The following MARENADM statements are available to the MAREN administrator:

- Host-specific parameters are modified using the MODIFY-MAREN-PARAMETERS statement.
- Global parameters are modified using the MODIFY-GLOBAL-PARAMETERS statement.
- Domain-specific parameters are modified using the MODIFY-DOMAIN-PARAMETERS statement.

The modified parameter records are stored in the MAREN catalog.

The modifications become effective immediately on the administrator's host because the parameter records are read with every MAREN or MARENADM statement. Each time MARENUCP is called, the MAREN subsystem transfers the parameter records to MARENUCP. MARENUCP does not need to be terminated and restarted to accept the new values.

In a MAREN network, modifications to parameters also become effective immediately. Each time a MAREN component accesses the MAREN catalog on a network host, the modified parameter records are read and accepted (see the section [section "The MAREN network" on page 47](#)).

Restriction

The global parameter ACCESS-MODE can only be modified without problems by means of the following actions:

1. Termination of MARENUCP on all hosts
2. Termination of MARENUCP on all hosts except the local host
3. Modification of the parameter using //MODIFY-GLOBAL-PARAMETERS ACCESS-MODE=...
4. Termination of MARENUCP on the local host
5. Starting MARENUCP and MARENUCP on all hosts

Host-specific parameters	
ALL-DOMAIN-ADMIN	Controls whether an ADA may work on the host
ARCHIVES-WORK-TIME	Time the central archive is open
AUDIT	controls the volume-specific checks
BATCH-EXEC-TIME	batch task execution time
BATCH-REQUEST-TIME	batch task request time
CID-UID	transfers catalog and user IDs to the archive entry
DEFAULT-ADMIN-SCOPE	administration scope when MARENADM is started
DEFAULT-DENSITY	default write density
DEFAULT-DEVICE-TYP	device type for new reservations
DEFAULT-FREE-DATE	default volume retention period
DEFAULT-HOME-LOC	default permanent location
DEFAULT-USER-ACCESS	determines whether volumes are shareable by default
DEVICE-COMPLETION	DEVICE parameter completion
DIALOG-EXEC-TIME	dialog task execution time
DIALOG-REQUEST-TIME	dialog task request time
FREE-POOLS	Free tape pool
EXPORT-ADDRESS-ACK	acknowledge export address
EXPORT-FOREIGN-TAPES	export foreign tapes
EXPORT-PROCESSING	export permission
EXPORT-RECEIPT	receipt output control
FOREIGN-TAPE-CHECK	Foreign tape check
HOST	BCAM name of the local host
INPUT-FILE-CHECK	check name of input file
INPUT-TAPE-CHECK	check input tape
LOCATION-NAME	Name of a location
LOGGING	determines whether logging records are written
MAREN-PASSWORD	password for the administrator
MOUNT-CHECK-INTERVAL	wait time until a check is made to see whether a MTC has been mounted
OPERATING-MODE	operating mode of a storage location
OPERATOR-ROLE	operator role which is required when MARENUCP runs or INITIALIZE-VOLUMES is called
PRIVILEGED-USER-ID	user privileges

Host-specific parameters	
RESERVATION-SEQUENCE	the volumes which are to be reserved are selected in the order specified
RESERVE-DEVICE-TYPES	volume reservation table
RETPD-CHECK	check retention period
SYMBOLIC-NAME	symbolic name of a location
TEST-MODE	enables test mode
TSOS-PRIVILEGED	TSOS privilege
TYPE	location ID (REMOTE or LOCAL)

Global parameters	
ACCESS-MODE	mode of access to the MAREN catalog (shared or exclusive)
ALL-DOMAIN-ADM-PASSW	password for the All-Domain Administrator
DOMAIN-PROTECTION	controls whether domains are used

Domain-specific parameters	
FREE-VOLUMES	defines whether free volumes are taken from the user's own domain or the standard domain

You will find overviews of the parameters in the appendix starting on [page 217](#).

You will find detailed information on the installation and configuration of MAREN and on the MAREN parameters in "MAREN Volume 2" [1].

3.6 The MAREN network

A MAREN network consists of all the hosts which access the same MAREN catalog. The following MAREN components must be started on all the hosts involved:

- MAREN subsystem
- MARENCP
- MARENUCP

Depending on the application, components are started on the hosts involved:

- MARENADM administrator program
- MARENEKM administrator program
- MAREN user program
- MARENLM utility routine

The MAREN catalog is the central database of the MAREN system. The MAREN components of all hosts access it.

When domains are used, the MAREN network is split into different host groups (see the [section “Use of domains” on page 41](#)).

Particular runtime parameters influence the way in which MAREN works. The administrator makes modifications to the runtime parameters on his/her own host and enters them in the MAREN catalog. When the MAREN components of the other hosts access the MAREN catalog, they take over the modified parameters (see the [section “Effectiveness of modifications to parameters” on page 44](#)).

In addition to modifying parameters, the MAREN administrator can also use some MARENADM statements to cause a change of status, for example closing or opening the files in the MAREN catalog, or switching the logging file.

The MAREN administrator uses the HOST-NAME operand of the following MARENADM statements to define whether a change of status is to apply on his/her own host or (also) on other hosts in the MAREN network:

MARENADM statement	Meaning
CHANGE-LOGGING-FILE	Switches the logging file on one or more hosts
CLOSE-MAREN-FILES	Closes and locks the files in the MAREN catalog for one or more hosts
OPEN-MAREN-FILES	Opens and unlocks the files in the MAREN catalog for one or more hosts
SHOW-MAREN-STATUS	Displays the current MAREN status of all hosts in the MAREN network
STOP-CONTROL-PROGRAM	Terminates the control tasks on one or more hosts

Whether these changes of status take effect on the other hosts in the MAREN network depends on the administrator host's capability to communicate with the other hosts.

Communication in the MAREN network using HIPLEX MSCF

Maximum availability of MAREN in a network can be implemented using the software product HIPLEX MSCF. The hosts in the network are connected to each other via BCAM connections. The hosts use HIPLEX MSCF to exchange messages and signals.

All hosts which are envisaged for MAREN administrators must be linked to all the hosts in the MAREN network by way of BCAM connections. Only if this is the case will cross-computer communication function for the entire MAREN network. Systems support configures and starts up this network.

If the MSCF network is not fully configured, cross-computer status changes will only become effective on the "connected" hosts.

Basic procedure for cross-computer administration tasks in MAREN

- The administrator uses the HOST-NAME operand of the MARENADM statements mentioned above to specify that these are also to be effective for hosts other than his/her own. The administrator can specify one particular host or all hosts. (When domains are used, the DA is restricted to the hosts of his/her own domain.)
- MARENADM sends a message to all hosts which the administrator has specified and waits for a reply.
- On the hosts specified, the message is evaluated and the relevant activities are initiated.
- After the activities have been completed, their execution is reported to MARENADM on the requesting host. With some statements the feedback information only consists of an acknowledgment. With others, data is also transferred which is processed further by MARENADM.

3.7 Working with MAREN – a brief introduction

The sections below describe how to work with MAREN without taking domains into consideration. What you need to bear in mind in addition when using domains is described in the [chapter “Domains in a MAREN network” on page 57](#).

3.7.1 Reserving MTCs

The volumes registered in the MAREN catalog can be *explicitly* reserved for a user with the RESERVE-FREE-VOLUME statement.

Volumes can be reserved *implicitly*, if automatic free tape allocation is active (MARENUCP program). When a system component recognizes the reservation request for a volume, it calls the MAREN subsystem, which then processes the request along with the MARENUCP and MARENCPP programs. The reserved VSN is then returned to the caller.

MAREN then reserves the volumes according to the criteria specified in the reservation request. Volume selection for a reservation can also be influenced via a reservation file or customer system exits.

Reserving MTCs for one’s own user ID is not bound to any privileges. Reserving volumes for other user IDs can be performed with MARENADM. Reserved MTCs can be used for read and write operations without explicitly having to call up MAREN.

3.7.2 Managing MTCs

Entering MTCs in the MAREN catalog

Before a volume can be used for the first time, it has to be registered in the MAREN catalog as a free data volume. If the volume already contains data, it is entered as a reserved volume.

Volumes that are temporarily supplied by an external computer center can be entered as private volumes. They are also registered as reserved volumes.

In the MAREN catalog, volumes are entered with a variety of attributes that depend on the volume type, its master data and its location.

The attributes and the locations of volumes are used as selection criteria in the reservation process.

Volume information can be called up from the MAREN catalog using specific output statements or program interfaces.

Initializing volumes

Before a volume can be used, it has to be initialized by means of the MARENADM statement INITIALIZE-VOLUMES. This initialization formats the volume for its initial use.

A further initialization will be necessary later, when an owner ID or a security code is written to the volume. MAREN records this in the catalog entry for the volume (volume attribute INIT=YES). The attribute can also be set using the MARENADM statement MODIFY-VOLUME-ATTRIBUTES ...,INITIALIZATION=*YES.

Volumes marked in this way have to be initialized again before they can be reserved (either explicitly by the MAREN administrator using the INITIALIZE-VOLUMES statement or implicitly when the volume is allocated with MARENUCP).

The initialization of volumes requires the TAPE-ADMINISTRATION privilege and the operator role which is entered in the host-specific MAREN parameters.

Reserving and releasing volumes

When a volume is reserved, a reservation term (expiration date) is defined. The MAREN administrator sets a default value which the VSN owner can modify (statement MODIFY-VOLUME-ATTRIBUTES ..., FREE-DATE=...).

The volume is released by the MAREN administrator (FREE-VOLUMES statement). All volumes whose expiration date has been reached are set to the status "FREE" and are available again to the applications for reservation.

The TAPE-ADMINISTRATION privilege is needed to set default reservation terms or to release volumes.

Managing the MTCs registered in the MAREN catalog

In the MAREN catalog, volumes are entered with a variety of attributes that depend on the volume type, its master data and its location.

The owner of the VSN can modify the protection attributes (password, access rights of other users, volume and file expiration date) and the comment fields.

The MAREN administrator can modify all volume attributes of all volumes.

Volume information can be called up from the MAREN catalog using specific output statements or program interfaces.

Removing volumes

Volumes may be removed from the MAREN catalog for many reasons, for instance, because the volume type is no longer supported or because a reorganization has taken place.

When a volume from another computer center that was added to the MAREN catalog with ADD-PRIVATE-VOLUME, is returned to its original computer center again, it has to be removed from the MAREN catalog again with EXPORT-VOLUME.

Volumes are removed from the catalog with REMOVE-USER-VOLUMES or REMOVE-FREE-VOLUMES.

Volumes are removed with MARENADM.

3.7.3 Working with volumes which are logically related

Definition of a volume group

The MAREN user can combine one or more volumes which are logically related to form a volume group.

The user determines the criteria according to which the volumes are selected. He/She assigns this volume group a name. He/She uses this name to address the volumes as a whole in various MARENADM and MAREN statements.

The name of the volume group is another attribute for a volume and is stored in the MAREN catalog. All files which are located on the volume belong to the same volume group. When a volume group is defined for a volume group, MAREN automatically updates all the file-specific archive entries of this volume.

Only reserved volumes can be assigned to a volume group. When the volume is released, the volume group assignment of MAREN is canceled again.

Meaning for the MAREN user

For several versions MAREN has labeled tapes which have been created by HSMS and ARCHIVE with a logical connection as related. These can be processed together in MARENADM and MAREN statements.

However, in BS2000 other band sets are also created, e.g. multi-volume sets or related FDDRL tapes. These can be combined in a volume group and processed together. Furthermore, tapes which were created using different programs can be combined in a volume group. For instance the tapes of an HSMS backup and an FDDRL backup of the same day. These could, for example, be stored as a group in a fireproof safe and later be fetched from there.

Assigning volumes to a volume group

Volumes can be assigned to a volume group at different times during MAREN operation:

Assignment to a volume group at a particular time

- Assignment using the MARENADM or MAREN statement RESERVE-FREE-VOLUME

The user defines the assignment of a volume to a volume group when the volume is reserved (VOLUME-GROUP=... operand).

- Assignment while scratch tapes are being written

The ADD-MAREN-FILE-ENTRY command enables the user to assign scratch tapes to a volume group while they are being written. The assignment is defined using the USAGE=*SCRATCH(VOLUME-GROUP=...) operand. The command REMOVE-MAREN-FILE-ENTRY (FILE-NAME=*ALL-SCRATCH-FILES operand) is used to reset the entry in the MAREN TFT again for all future scratch tapes.

Assignment to a volume group at any particular time

Assignment using the MARENADM or MAREN statement MODIFY-VOLUME-ATTRIBUTES

The MODIFY-VOLUME-ATTRIBUTES command enables the user to assign reserved volumes to a volume group at any time or to modify an existing assignment.

The MAREN administrator uses the SELECT=*RESERVED(NEW-VOLUME-GROUP=...) operand to assign a volume to a volume group.

The MAREN user assigns a selected volume to a volume group using the VOLUME-GROUP=... operand.

The name of a volume group is a volume-specific attribute. Nevertheless, when the volumes are selected using the VOLUME=<vsn>(...) and VOLUME=*INTERVAL(...) operands, the FILE-SEQUENCE operand is always specified in addition. The file sequence number specifies the file whose archive entry is to be modified. The default value is 1. When assigning volume groups, MAREN takes the file sequence number into account as a selection criterion. However, to ensure file consistency, all of this volume's archive entries are modified, i.e. all the files located on the volume then belong to the defined volume group.

Addressing volumes using the volume group name

The statements below enable the user to select volumes by means of the volume group and then to process them further:

MARENADM statements

MARENADM statement	Meaning
EXPORT-VOLUME	The VOLUME=*BY-VOLUME-GROUP(VOLUME-GROUP=...) operand defines the volume group to which a volume must belong to permit it to be exported.
FREE-VOLUME	The VOLUME=*BY-VOLUME-GROUP(VOLUME-GROUP=...) operand defines the volume group to which a volume must belong to permit it to be released.
MODIFY-VOLUME-ATTRIBUTES	The SELECT=*RESERVED(VOLUME-GROUP=...) operand defines the volume group to which a volume must belong to permit it to be processed. The selection criterion SELECT=*FREE(...) has no meaning for volume groups since modification of the archive entries is restricted to reserved volumes.
PRINT-VOLUME-ATTRIBUTES	One field is provided for the volume group in each of the input masks for the selection, sort and layout parameters.
RETURN-VOLUMES	The VOLUME=*BY-VOLUME-GROUP(VOLUME-GROUP=...) operand defines the volume group to which a volume must belong to permit it to be returned.
SHOW-VOLUME-ATTRIBUTES	The VOLUME-GROUP= operand defines the volume group to which a volume must belong to permit it to be displayed.
SHOW-VSNS	The SELECT=*VOLUME-GROUP(VOLUME-GROUP=...) lists the volume serial numbers of all reserved volumes which contain the specified volume group in the archive entry.

MAREN statements

MAREN statement	Meaning
EXPORT-VOLUME	The VOLUME=*BY-VOLUME-GROUP(VOLUME-GROUP=...) operand defines the volume group to which a volume must belong to permit it to be exported.
MODIFY-VOLUME-ATTRIBUTES	The SELECT=*BY-VOLUME-GROUP(VOLUME-GROUP=...) operand defines the volume group to which a volume must belong to permit it to be processed.
PRINT-VOLUME-ATTRIBUTES	One field is provided for the volume group in each of the input masks for the selection, sort and layout parameters.
SHOW-VOLUME-ATTRIBUTES	The VOLUME-GROUP= operand defines the volume group to which a volume must belong to permit it to be displayed.

The MARENADM and MAREN statements RESERVE-FREE-VOLUME and SHOW-VOLUME-ATTRIBUTES and the MARENADM statement SHOW-VSNS are used to output the name of the volume group in the S variable var(*LIST).VOL-GROUP.

3.7.4 Managing locations

Volumes are allocated to specific locations. The MAREN administrator monitors the distribution of volumes to the locations. The number of free volumes per location has to be sufficient to guarantee smooth tape processing in the course of daily operations (or at weekends).

Beside the volume type, the location is an explicit selection criterion for reserving volumes. If a user did not specify a location, the location is selected implicitly based either on the MAREN default mechanism or on exit routines.

The location can be modified using the MARENADM statement MODIFY-VOLUME-ATTRIBUTES ..., LOCATION=... This operation has to be accompanied by physically removing the volume from its former location to the new one. Here the volumes must also be moved physically from their old location to the new location.

Exporting/import volumes

Volumes may have to be dispatched to other computer centers (i.e. to another MAREN catalog), by mail or by courier, for instance. This physical change of location has to be concluded in the volume's original computer center with the MAREN statement EXPORT-VOLUME.

In the foreign computer center, the volume has to be included in the catalog there using the MARENADM statement ADD-PRIVATE-VOLUME.

It is removed again from the foreign catalog with EXPORT-VOLUME when it is returned to its original computer center.

In the volume's original computer center, it is made available again with the MARENADM statement IMPORT-VOLUME.

3.7.5 Exit routines for MAREN

MARENCP and MARENUCP (which both run as background processes) can be controlled using exit routines that the MAREN administrator can write and load together with the programs.

The exit routines allow MAREN catalog access to be controlled by modifying the data pertaining to a volume (attributes) or by controlling the operations on the volumes (accepting/rejecting them).

MAREN exit routine	Brief description
MARENEX1	Reserve-request exit (for reserving a volume)
MARENEX3	Reserve-return exit (after a volume has been reserved)
MARENEX2	Write-request exit (before modifying volume attributes)
MARENEX4	Write-return exit (after modifying volume attributes)
MARENEX5	Exit while reading a volume attribute
MARENEX6	Exit for device depot

MARENCP can be controlled with the exit routines MARENEX1 to MARENEX5, and MARENUCP can be controlled using the exit routines MARENEX1 and MARENEX6. Volumes can also be reserved via a reservation file instead of or in addition to reserving them using the standard exit routines MARENEX1 and MARENEX6 (see [section “Location management via a reservation file” on page 120](#)).

Refer to [chapter “Computer center exits in the MAREN system” on page 197](#) for a detailed description of the MAREN exit routines.

4 Domains in a MAREN network

This chapter first of all introduces the [Concept](#) of domains. The [section “Setting up domains”](#) then describes how this concept is implemented in a MAREN network. Typical administrator functions are presented briefly in the [section “Administering domains”](#). The [section “Removing domains” on page 67](#) describes how to proceed if domains are no longer to be used in a MAREN network which is working with domains.

4.1 Concept

A MAREN network consists of all the hosts which operate using the same MAREN catalog. These hosts can be split into groups, which are called domains. A domain can be assigned any number of hosts. In addition to the hosts, the volumes that are processed on them also belong to the domain.

Domains represent a protection mechanism: Access to volumes is only possible within the domain involved. This applies on the one hand for accesses to data stored on the volumes. On the other hand also for accesses to the MAREN catalog, in other words to the data about the volumes.

The use of domains is optional. The conditions and requirements in the computer center determine whether it makes sense to structure the MAREN network with domains.

User roles

When domains are used, three roles with different privileges exist:

- The MAREN user
The statements of the MAREN user program are available to the users. Users work solely in their own domain. For the users it makes no difference whether they are working in a domain with one or a specific number of hosts or in a MAREN network with the same hosts.

- The Domain Administrator (DA)
DAs are permitted to execute statements of the MARENADM administration program within their own domain. They may not work in other domains.
- The All-Domain Administrator (ADA)
ADAs administer the domains using special statements of the MARENADM administration program. Furthermore they are permitted to perform DA tasks in all domains. To do this they can explicitly adopt the role of the DA. The default domain- and host-specific parameters then apply for the ADA.
The ADA must have authorization to execute statements on at least one host in the MAREN network.

The ADA and DA roles are password-protected. For details, please refer to the MODIFY-GLOBAL-PARAMETERS and MODIFY-MAREN-PARAMETERS statements in “MAREN Volume 2” [1].



In the MAREN manuals the term “MAREN administrator” is used to mean the following:

- Generic term for all users with administrator rights regardless of whether or not domains are used
- Administrator in the MAREN network without domains

The meaning is made clear by the context. When this is not the case the particular administrator roles are named explicitly: ADA, DA, administrator without domains.

Assignment of volumes to domains

A domain consists not only of the hosts, but also of the volumes which are processed on these hosts. The MAREN catalog contains this assignment of volumes to domains.

When a volume is reserved by a host and is, if required, being written to, it belongs to this host’s domain. The volume can then not be processed on the hosts of the other domains. Nor is information about this volume visible in the MAREN catalog on the hosts in the other domains.

In addition to the domains which are defined as a group of hosts, there is also another domain, known as the standard domain (STD-DOM). Generally no hosts belong to this domain, but the volumes which can be processed on all hosts. These comprise:

- Free volumes which are available for all hosts to reserve. (Free volumes can, however, also be assigned to a domain.)
- Reserved volumes which can be made accessible specifically for all hosts.
- Volumes which were reserved in an earlier MAREN version and have not (yet) been assigned to a domain.

The following figures illustrate two typical applications of domains. They differ in the assignment of the reserved and free volumes to the standard domain and the other domains. For information please refer to the FREE-VOLUMES= operand of the MODIFY-DOMAIN-PARAMETERS statement in “MAREN Volume 2” [1].

Example 1: Free volumes in the standard domain, reserved volumes in the other domains

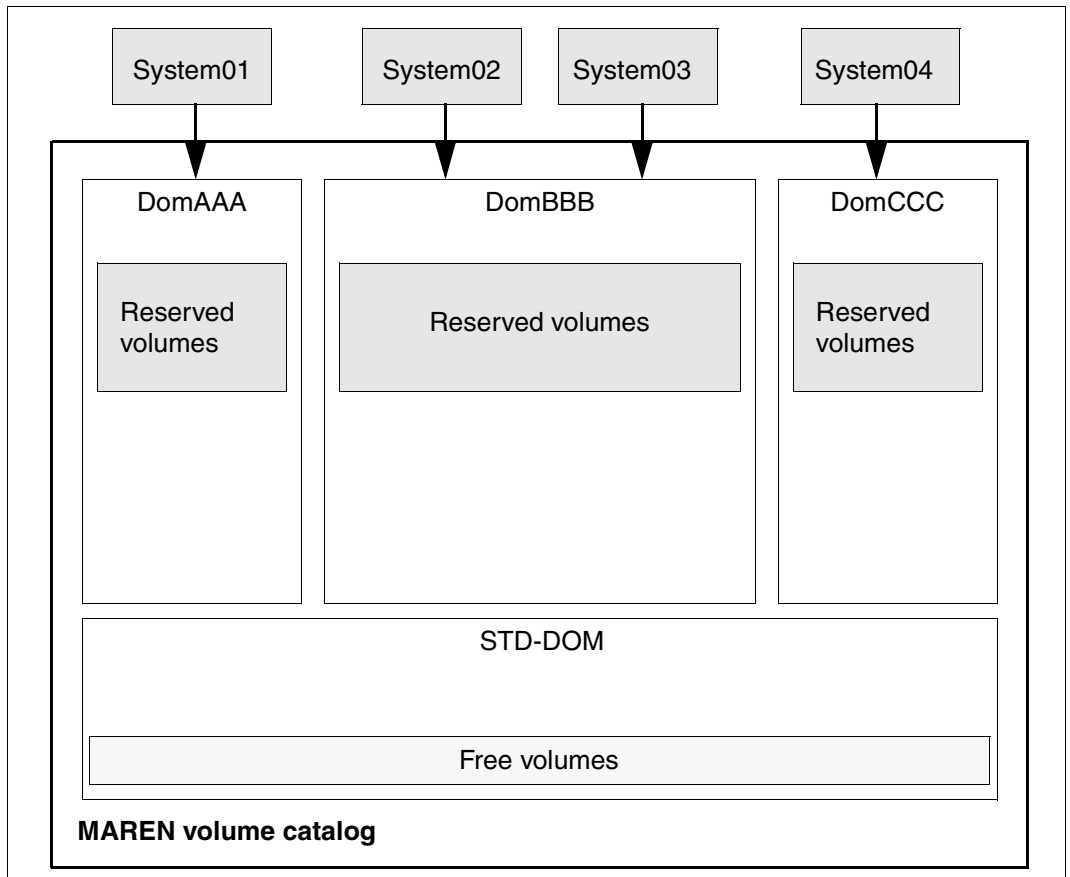


Figure 3: Free volumes in the standard domain, reserved volumes in the other domains

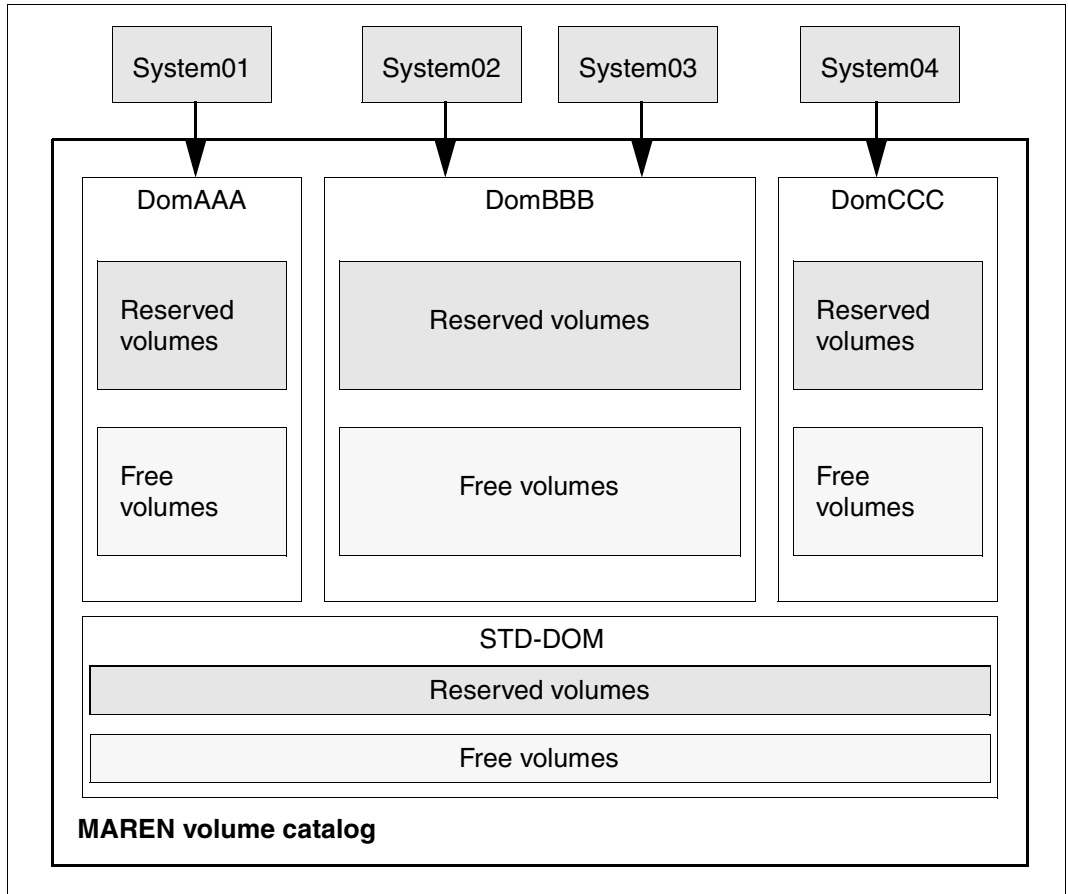
Example 2: Reserved and free volumes in all domains

Figure 4: Reserved and free volumes in all domains

Statements

Domains are set up and administered using MARENADM statements. Some statements are intended exclusively for use with domains. In other statements operands are available which are only meaningful when domains are used. These statements and operands largely concern all domains or one domain as a whole and are available to the All-Domain Administrator.

4.2 Setting up domains

Prerequisite

The domains are set up in an existing MAREN network. For this purpose MAREN V10.0 or higher must be operating on all hosts in the network.

Planning

Before domains are set up the following questions must be answered:

- Which hosts of the MAREN network should be combined to form a domain? What should the domains be called?
- On which hosts should the ADA work?
- Are all reserved volumes assigned to the domain in question or do some/all belong to the standard domain?
- Are all free volumes assigned to the standard domain or do some/all belong to other domains?

Example

A slightly modified form of the constellation in [figure 3 on page 60](#) is taken as an example for this section:

- System01 forms the domain DomAAA
- System02 and System03 form the domain DomBBB
- System04 forms the domain DomCCC
- Reserved volumes always belong to the relevant domains, free volumes to the standard domain. Only domain DomCCC is also to contain free volumes.

Procedure

Proceed as described below when you set up domains. Keep to the sequence of the steps. Work from the very beginning with MARENADM on a host on which it is intended that the ADA should continue to work.

For the procedure described it is assumed that domains will be introduced in an existing MAREN network which already contains reserved and free volumes.

Details of the statements mentioned can be found in "MAREN, Volume 2" [1].

1. Enable operation with domains. You use the following statement here:

```
//MODIFY-GLOBAL-PARAMETERS DOMAIN-PROTECTION=*ACTIVE
```

2. Restart the MARENCP, MARENUCP and MARENADM programs on all the hosts.



After these two steps MAREN distinguishes between Domain Administrators (DAs) and All-Domain Administrators (ADAs). Here the ADA can initially enter statements on all hosts in the network.

3. Define domains and assign hosts to the domains.

The MODIFY-DOMAIN-ASSIGNMENT statement assigns a host to a domain. At the same time a new domain is defined if the name of a domain which does not currently exist is specified.

Example

The domains DomAAA, DomBBB and DomCCC are defined with the statements below. At the same time the hosts System01, System02, System03 and System04 are assigned to the relevant domains:

```
//MODIFY-DOMAIN-ASSIGNMENT HOST=System01,NEW-DOMAIN=DomAAA
//MODIFY-DOMAIN-ASSIGNMENT HOST=System02,NEW-DOMAIN=DomBBB
//MODIFY-DOMAIN-ASSIGNMENT HOST=System03,NEW-DOMAIN=DomBBB
//MODIFY-DOMAIN-ASSIGNMENT HOST=System04,NEW-DOMAIN=DomCCC
```

Incidentally: The name of the NEW-DOMAIN operand does not come from the fact that it can be used to define a new domain. Rather, the MODIFY-DOMAIN-ASSIGNMENT statement can be used to assign a host which already belongs to one domain to another ("new") domain.

4. Release selected hosts for the All-Domain Administrator (ADA).

The ALL-DOMAIN-ADMIN= and HOST= operands in the MODIFY-MAREN-PARAMETERS statement determine the hosts on which the ADA may work. Either individual hosts or all hosts in a domain can be specified here. As soon as (at least) one host has been released for the ADA, the ADA can no longer work on hosts which have not been explicitly released for him/her.

The subsequent MODIFY-GLOBAL-PARAMETERS statement with the ALL-DOMAIN-ADM-PASSW= operand defines whether the ADA must legitimate himself/herself with a password.

Example

The ADA works on all hosts of the domain DomBBB:

```
//MODIFY-MAREN-PARAMETERS ,HOST=*ALL-FROM-DOMAIN(DOMAIN=DomBBB),
ALL-DOMAIN-ADMIN=*ALLOWED
```

The password for the ADA is: A4M

```
//MODIFY-GLOBAL-PARAMETERS ALL-DOMAIN-ADM-PASSW=A4M
```

5. Legitimate yourself and log on as the ADA.

To do this the administrator quits MARENADM with the HOLD-PROGRAM statement, enters the ADA password in BS2000 with the ADD-PASSWORD command and returns to MARENADM using the RESUME-PROGRAM command. You then log on as the ADA with the MODIFY-ADMINISTRATION-SCOPE DOMAIN=*ALL statement.

6. Assign reserved volumes to domains (optional).

After the domains have been defined, all previously reserved (and the free) volumes belong to the standard domain. Using the MODIFY-VOLUME-ATTRIBUTES statement (VOLUME= and SELECT=*RESERVED operands) the ADA assigns reserved volumes to another domain.

Example

For this example it is assumed that a file exists for each domain which contains the volumes which are to be assigned to the domain (cf. INPUT-FILE operand in the MODIFY-VOLUME-ATTRIBUTES statement). For the domain DomAAA this is the file VOLAAA, for DomBBB the file VOLBBB, and for DomCCC the file VOLCCC. (Naturally the volumes can also be selected in a different way.) The ADA then assigns the reserved volumes to the domains using the following statements:

```
//MODIFY-VOLUME-ATTRIBUTES ,VOLUME=*BY-INPUT-FILE(FILENAME=VOLAAA),
SELECT=*RESERVED(NEW-DOMAIN=DomAAA)
//MODIFY-VOLUME-ATTRIBUTES ,VOLUME=*BY-INPUT-FILE(FILENAME=VOLBBB),
SELECT=*RESERVED(NEW-DOMAIN=DomBBB)
//MODIFY-VOLUME-ATTRIBUTES ,VOLUME=*BY-INPUT-FILE(FILENAME=VOLCCC),
SELECT=*RESERVED(NEW-DOMAIN=DomCCC)
```

7. Assign free volumes to domains (optional).

Free volumes normally belong to the standard domain. Using the MODIFY-VOLUME-ATTRIBUTES statement (VOLUME= and SELECT=*FREE operands) the ADA assigns free domains to another domain.

Using the subsequent MODIFY-DOMAIN-PARAMETERS statement (DOMAIN= and FREE-VOLUMES=*FROM-OWN-DOMAIN operands) the ADA defines that these free volumes will be used for future reservations. This definition is also effective for the release and initialization of volumes. Thus the release or initialization of volumes results in them either being put in the standard domain or remaining in their own domain.

Example

For this example it is assumed that free volumes with the numbers V001 through V199 exist in the standard domain. The ADA now assigns these to the domain DomCCC:

```
//MODIFY-VOLUME-ATTRIBUTES ,VOLUME=*INTERVALL(*FIRST=V001,TO=V199),  
SELECT=*FREE(NEW-DOMAIN=DomCCC)
```

Subsequently the ADA defines that these free volumes can only be used in the domain DomCCC:

```
//MODIFY-DOMAIN-PARAMETERS DOMAIN=DomCCC, FREE-VOLUMES=*FROM-OWN-DOMAIN
```

4.3 Administering domains

This section provides an overview of typical tasks that arise when working in a MAREN network with domains.

Changing administration areas

The administrative tasks in a MAREN network with domains are shared between All-Domain Administrators (ADAs) and Domain Administrators (DAs). A DA can switch to the role of the ADA and vice versa. The DA and ADA must always be authorized to work with the MARENADM program (see [page 34](#)).

DA becomes an ADA

DAs can only switch to the role of the ADA if they are working on a host which is authorized for the ADA (see [step 4 on page 63](#)). A DA proceeds as follows:

- Quit MARENADM:

```
//HOLD-PROGRAM
```
- Enter the ADA password in BS2000:

```
/ADD-PASSWORD PASSWORD=<pw>
```

- Return to MARENADM:
`/RESUME-PROGRAM`
- Log on as ADA:
`//MODIFY-ADMINISTRATION-SCOPE DOMAIN=*ALL`

If the ADA role is not password-protected, the last step alone is sufficient.

ADA becomes a DA

If the ADA takes over the role of the DA of a domain, he/she switches to the relevant domain. In this case the ADA selects a host whose host-specific parameters will become effective for the ADA's further statements (for information on the host-specific parameters see the [section "Runtime environment and parameters" on page 42](#)).

The ADA switches to the domain:

```
MODIFY-ADMINISTRATION-SCOPE DOMAIN=<dom>(HOST=<system>)
```

This statement is also required if the ADA is already working on a host in the domain which he/she wants to administer as the DA. In this case the ADA enters `DOMAIN=*OWN`. It is not necessary to specify a host (`HOST=`) as the host-specific parameters of the user's own host will become effective.

Modifying the assignment of volumes to domains

Only the ADA is authorized to assign volumes to another domain. This is done using the `MODIFY-VOLUME-ATTRIBUTES` statement with the `SELECT=` operand.

Example

The ADA now assigns all reserved volumes of domain DomAAA to domain DomCCC:

```
//MODIFY-VOLUME-ATTRIBUTES  
SELECT=*RESERVED(DOMAIN=DomAAA,NEW-DOMAIN=DomCCC)
```

Adding new hosts to a domain

Only the ADA is authorized to add a new host to the MAREN network and in the process to a domain. The `ADD-HOST` statement is used for this purpose. Using the `PARAMETER=` operand the ADA defines the other host from which the host-specific parameters are taken over. Naturally these parameters can subsequently be modified.

Only when the host is assigned to the network and a domain can MARENCP be started on this host.

Example

Host System05 is assigned to domain DomBBB:

```
//ADD-HOST HOST=System05,DOMAIN=DomBBB
```

Assigning a host to another domain

Only the ADA is authorized to assign a host to another domain. The MODIFY-DOMAIN-ASSIGNMENT statement is used for this purpose.

Example

The ADA assigns host System02 to domain DomCCC:

```
//MODIFY-DOMAIN-ASSIGNMENT HOST=System02,NEW-DOMAIN=DomCCC
```

4.4 Removing domains

Removing individual domains from the network

An individual domain is removed from the MAREN network by assigning all hosts and volumes of the domain to another domain:

- If the domain uses its own free volumes, the ADA first of all disables their use:

```
//MODIFY-DOMAIN-PARAMETERS DOMAIN=<dom>,FREE-VOLUMES=*FROM-STD-DOMAIN
```

- Subsequently the ADA assigns the domain's volumes to another domain. The ADA can do this for free and reserved volumes at the same time if the volumes are only to be assigned to one other domain, e.g. the standard domain:

```
//MODIFY-VOLUME-ATTRIBUTES VOLUMES=*ALL,
SELECT=*ALL(FROM-DOMAIN=<dom>,NEW-DOMAIN=*STD-DOMAIN)
```

However, the ADA can also assign free and reserved volumes to various domains by using first SELECT=*FREE(...) and then SELECT=*RESERVED(...).

- Finally the ADA assigns all hosts of the domain to other domains:

```
//MODIFY-DOMAIN-ASSIGNMENT HOST=<system>,NEW-DOMAIN=<ndom>
```

- Alternately the ADA can also completely remove some or all hosts in the domain from the MAREN catalog by entering the following for each host:

```
//REMOVE-HOST HOST=<system>
```

Temporarily disabling working with domains

Working with domains can be temporarily disabled without the assignment of hosts or volumes to domains being changed. This is practical if, for example, the use of domains is to be replanned but MAREN must continue to operate. To do this the ADA enters the following statement:

```
//MODIFY-GLOBAL-PARAMETERS DOMAIN-PROTECTION=*NON-ACTIVE
```

While working with domains is disabled, free volumes are taken exclusively from the standard domain. Sufficient free volumes must therefore be available in the standard domain.

Working with domains can be enabled again later. The assignments of the hosts and volumes to the domains are retained provided they have not been explicitly changed in the MAREN catalog in the meantime.

Permanently disabling working with domains

If working with domains is to be permanently disabled, the ADA assigns all hosts and volumes of the network to the standard domain and then disables the domains. This is done as follows:

- The ADA disables the use of free volumes in all domains which have these:

```
//MODIFY-DOMAIN-PARAMETERS DOMAIN=<dom>, FREE-VOLUMES=*FROM-STD-DOMAIN
```

- The ADA assigns the volumes of all domains to the standard domain:

```
//MODIFY-VOLUME-ATTRIBUTES VOLUMES=*ALL,
SELECT=*ALL(FROM-DOMAIN=*ANY, NEW-DOMAIN=*STD-DOMAIN)
```

- The ADA assigns all hosts in the network to the standard domain by entering the following for each host:

```
//MODIFY-DOMAIN-ASSIGNMENT HOST=<system>, NEW-DOMAIN=*STD-DOMAIN
```

- The ADA disables working with domains:

```
//MODIFY-GLOBAL-PARAMETERS DOMAIN-PROTECTION=*NON-ACTIVE
```

5 MAREN catalog

Flow of information to and from the MAREN catalog

The MAREN catalog contains all the information needed to manage volumes. The information can be queried, created or modified by the various components of the MAREN system. The flow of information between the MAREN catalog and the various components of the MAREN system is illustrated in [figure 2 on page 36](#).

Components of the MAREN catalog

The MAREN catalog consists of two parts:

- volume catalog (VSN-oriented)
- logging files (optional).

To prevent unauthorized access, all files should be created with the attribute `USER-ACCESS=*OWNER-ONLY`.

The volume catalog when using domains

When domains are used, all information about the domains is contained in the volume catalog. In this case the MAREN user and the Domain Administrator only access information on their own domains. See also the [chapter “Domains in a MAREN network” on page 57](#).

5.1 Modes of accessing the MAREN catalog

MAREN can be run in two different modes which use different methods of accessing the MAREN catalog:

- in **SPD mode**, access to the MAREN catalog is **exclusive**,
- in **RFA mode**, access to the MAREN catalog is **shared**.

The table below contains the main factors that distinguish the two access modes:

	Exclusive mode		Shared mode
Access method used by the DMS	Exclusive ISAM access (i.e. only one task can open, read, write (and close) the catalog at any given time.		ISAM access in shared update mode (several tasks can access the catalog simultaneously).
Definition of the disk or pubsets in MRSCAT	The catalog is located on the home pubset, private disk, SPD disk or shared pubset.	The catalog is located on the SPD disk or shared pubset.	The catalog is located on the home pubset, private disk, SPD disk or shared pubset.
Disk access	Via RFA (in this case, the MARENCP start procedure has to be modified).	Direct access	Via RFA

You will find further information on which mode to choose in “MAREN Volume 2” [1].



Operation in SPD mode means that only one task can access the MAREN catalog at any given time (exclusive access). The term “SPD mode” only refers to the access method, not to the type of volume on which the MAREN catalog is located, i.e. the MAREN catalog does not have to be located on an SPD disk.

5.2 Volume catalog

File structure of the volume catalog

```
ACCESS-METHOD = ISAM
RECORD-FORMAT = V
KEY-POSITION = 5
KEY-LENGTH = 10
```

The file must be set up with ACCESS=*WRITE.

Record structure of the volume catalog

The records of the volume catalog start with 1002 bytes for including the secondary indexes. This is followed by the fields of the table below (1014 bytes). This structure is defined by the MARENA macro. The total record length is then 2016 bytes.



MAREN can only be used with a catalog in NK-ISAM format. Records in the earlier V8 format are no longer supported.

The individual archive entry fields can be symbolically addressed in Assembler programs via the dummy section MARENA. For COBOL programmers, the copy element MARENAC is provided. Allocation of the archive entry fields to the field names of the dummy sector of the MARENA macro or the output of SHOW-VOLUME-ATTRIBUTES is described in the appendix on [page 225](#).

Date fields with a length of 8 bytes and the 2-byte device name are no longer supported in MAREN V10.0 and higher.

Field name/ Length in bytes		Designation / Value range / Meaning
---	4	Record length field
VOLUME	6	Volume serial number
FILE-SEQUENCE	4	File sequence number 0001,.....,9999 Corresponds to field 6 (file sequence number) in the HDR1 label.
<i>Note</i> VOLUME and FILE-SEQUENCE together represent the ISAM key.		
FILE-NAME	41	File name (without catalog ID and user ID) for a tape file
---	1	Internal MAREN field
CREATION-CAT-ID	4	Catalog ID from the file name at the time of file creation.
CREATION-USER-ID	8	User ID from the file name at the time of file creation.
<i>Note</i> The preceding four fields are combined to form the following DIRECTORY-NAME field for all volumes contained in an ARCHIVE directory.		
DIRECTORY-NAME	54	Name of an ARCHIVE directory (with catalog ID and user ID) which contains the volume.
USER-IDENTIFICATION	8	User ID of the volume' s owner Automatically entered by MAREN when a volume is reserved and then no longer modified.
ACCOUNT	8	Account number of the volume' s owner The information for USER-IDENTIFICATION and ACCOUNT is taken automatically from the SET-LOGON-PARAMETERS command of the user at reservation time.
REMARK	24	Remarks field This field is displayed on the terminal when a SHOW statement is issued. The volume' s owner should therefore complete this field using an explanatory text. It is possible to assign different text to each catalog entry of a VSN (different FSEQ).
USER-FIELD	54	User field Here the owner of the volume may enter any relevant data such as name, department, telephone number or work scheduling data. It is possible to assign different text to each catalog entry of a VSN (different FSEQ)
EXPORT-ADDRESS	50	Mailing address When the EXPORT-VOLUME statement is used, a mailing address, short message (e.g. "will be picked up personally"), a mail box number or similar may be entered here, depending on how the computer center is organized.

continued ►

Field name/ Length in bytes	Designation / Value range / Meaning	
	<p><i>Note</i></p> <p>The above fields REMARK, USER-FIELD and EXPORT-ADDRESS are not provided with values by the MAREN system and are not evaluated; they are simply kept along with the remaining data. It is the responsibility of the user to provide these fields with values.</p>	
USER-ACCESS	1	Shareability of the volume OWNER-ONLY: not shareable (default value) FOREIGN-READ-ONLY: read access only ALL-USERS: unrestricted access
ARCHIVE-USAGE	1	ID for the ARCHIVE free tape pool Permitted values: *NO, *GLOBAL, *TSOS, <filename>
PASSWORD	4	Password (default value: 4X' 00') Any password entered in this field is for the volume and not for the files on the volume. If a password exists, it must always be specified.
CHECK-COUNT	2	Check number (00 to 99) This MAREN-internal field is incremented each time the catalog entry is modified (modulo 100); it is used for reorganization purposes, etc.
ACCESS-COUNT	4	Access counter (0000, ..., 9999) This counter is incremented each time the volume is accessed, even when the volume is exported.
FREE-LOCATION	8	Free-tape location A volume released by MARENADM is relocated to this location.
HOME-LOCATION	8	Permanent location Location where a volume is placed after the so-called MARENADM "clear-up" run.
TEMPORARY-LOCATION	8	Temporary location This field designates the location where the volume can be found at the moment. If the volume is being processed, it contains the processor name, unless the volume is at an external location or in an archive system.
	<p><i>Note</i></p> <p>The above fields FREE-LOCATION, HOME-LOCATION and TEMPORARY-LOCATION may contain a processor name, 'CENTRAL' for the central archive, or some other location name, e.g. 'SAFE' or 'FIRE-PROOF'.</p>	
DEVICE-TYPE	2	Device type of volume
CREATION-JOB-NAME or REQUEST-NAME	8	for HSMS: REQUEST-NAME else: CREATION-JOB-NAME (Creation job name)

continued ➡

Field name/ Length in bytes		Designation / Value range / Meaning
CREATION-TIME	8	Creation time (hh:mm:ss)
<p><i>Note</i> The above fields CREATION-JOB-NAME/REQUEST-NAME and CREATION-TIME are updated at OPEN time each time a file is created.</p>		
LAST-CLOSE-TIME	8	CLOSE time (hh:mm:ss)
<p><i>Note</i> The above field LAST-CLOSE-TIME is updated at CLOSE time in the case of output.</p>		
OPEN-MODE	2	OPEN type of last access
VOLUME-SEQUENCE	4	File section number (0001,.....,0225) This field corresponds to field 5 (file section number) in the HDR1 label.
FIRST-VOLUME	6	First VSN of the MF/MV set This field corresponds to field 4 (file set identifier) in the HDR1 label.
RESERVATION-COUNT	4	Reservation counter (0000,.....,9999) This counter is incremented each time a volume is newly reserved.
INITIALIZATION	1	Initialization flag (YES/NO/ERASE) The value ERASE is only set by //MODIFY-VOLUME-ATTRIBUTES. 'YES' is set during tape processing: <ul style="list-style-type: none"> – if there are no default labels (e.g. HDR1) – or HDR3 is missing – or the access indicator in VOL1 is set to ' 1' – or the access indicator in HDR3 is set to ' 1'; – otherwise, 'NO' is set. 'YES' is set during //MODIFY-VOLUME-ATTRIBUTES if the EXPIRATION DATE is decremented.
VOLUME-STATUS	1	Volume status FREE: free volume belonging to the computer center PRIVATE: private foreign volume RESERVED: reserved volume belonging to the computer center
CLOSE-INDICATOR	1	CLOSE indicator This field provides information on the successful creation of a tape file. At the start of creation, i.e. OPEN time, the indicator is set to 'OPEN'. If file creation is terminated by means of a CLOSE macro in the user program, the MAREN subroutine sets the CLOSE indicator to 'CLOSED'. In many other cases, such as is the case with the TERM, LOGOFF, EXIT-JOB, CANCEL-JOB and SHUTDOWN macros as well as in the case of a system dump, an implicit CLOSE ALL does take place, but this does not affect the indicator.

continued ►

Field name/ Length in bytes		Designation / Value range / Meaning
LAST-ACCESS-SNO	3	Session number of the last access (001,...,255)
LAST-ACCESS-TIME	8	Time of the last access (hh:mm:ss)
LAST-ACCESS-TSN	4	Task sequence number of the last access (only as long as the volume is allocated)
LAST-ACCESS-CPU-NAME	8	Processor name of the last access
LAST-ACCESS-JOB-NAME	8	Job name of the last access
LAST-ACCESS-USER-ID	8	User ID of the last access
LAST-ACCESS-ACCOUNT	8	Account number of the last access
LAST-ACCESS-FUNCTION-FLAG	2	This MAREN-internal field indicates the action last taken on the archive entry or the volume. Possible values are, for example: ' 11': Add archive entry ' 17': Reserve ' 23': Modify
LAST-ACCESS-FUNCTION-NAME	8	Function name This field contains the name of the MAREN component or MAREN routine which last modified the archive entry. See "MAREN Volume 2" [1] for the possible settings.
<i>Note</i> The above fields are used internally for the transfer of program information when program interfaces are employed.		
---	10	Start of number range: volume serial number and file sequence number
RETFLAG	1	This MAREN-internal field indicates whether the last action attempted was executed successfully. See "MAREN Volume 2" [1] for possible values.
ERRORKEY	7	This MAREN-internal field contains the error key for the last action performed.
---	6	End of number range (volume serial number)

continued ➡

Field name/ Length in bytes		Designation / Value range / Meaning
ADMINISTRATOR-FIELD	8	Computer center administration field Here the computer center can store any information, e.g. pertaining to the MAREN exit routines. When working with HSMS, the degree of tape utilization (number of PAM pages written to the tape) can be recorded here. This field cannot be modified by the user.
AUDIT	1	Indicator byte 2 ⁰ : audit flag If this bit is set, AUDIT=YES applies. In this event, the MAREN subsystem monitors and, if necessary, rejects all access attempts on the relevant volumes. This AUDIT flag is only evaluated if the MAREN administrator has set the host-specific parameter AUDIT to OPTIONAL.
FREE-POOL-NAME	54	Name of the free tape pool in which this tape is located or in which it should be located when it is shared.
PAM-PAGE-NUMBER	10	Number of blocks (not PAM pages) written to the volume concerned. This is transferred from DMS to MAREN at the end of every write operation (number is cumulated)
DEVICE-NAME	4	4-byte device name of the last tape device used. 2-byte device names are left-justified.
LAST-ACCESS-DATE	10	Date of the last access (yyyy-mm-dd)
FREE-DATE	10	Expiration date of the volume (yyyy-mm-dd) This date specifies when the volume can be released, i.e. when the volume reservation for a specific user ID can be lifted. Release is effected by the administrator in the so-called release session using the MARENADM statement FREE-VOLUMES. In the case of foreign volumes, this field is not interpreted and it contains blanks.
EXPIRATION-DATE	10	File expiration date (yyyy-mm-dd) This field corresponds to the RETENTION-PERIOD entry in the ADD-FILE-LINK command or in field 10 (expiration date) in the HDR1 label, as long as it is not explicitly modified at a later date.
EXPORT-DATE	10	Export date (yyyy-mm-dd) This field contains blanks when the volumes are not exported.
CREATION-DATE-EXT	10	Creation date (yyyy-mm-dd)
LAST-CLOSE-DATE	10	CLOSE date (yyyy-mm-dd) In the case of output, this field is updated at CLOSE time. (see also LAST-CLOSE-TIME)

continued ➡

Field name/ Length in bytes		Designation / Value range / Meaning
RESERVATION- DATE	10	Reservation date (yyyy-mm-dd) Date of the reservation of the computer center' s own volume or archiving of a foreign volume.
SAVE-FILE-ID	15	SAVE-FILE (HSMS) or SAVE-VERSION (ARCHIVE)
SUBSAVE	3	Number of subtask for parallel save run in HSMS
SUBSEQUENCE	2	Number of subsequent tape within a parallel save run in HSMS
DIR-ON-VOL	1	Displays whether an ARCHIVE directory is stored at the end of the tape
DOMAIN-NAME	8	If domains are being used, the name of the domain to which the relevant volume belongs, otherwise blanks for '*STD-DOM'.
ADMINISTR- FIELD-2	16	Freely definable administrator field
REMARK2	10	User field which can be freely set
REMARK3	12	User field which can be freely set
ACCESS-COUNT	8	Access counter (00000000, ..., 99999999). This counter is incremented each time the volume is accessed, even when exported.
VOLUME-GROUP	32	Name of the volume group
REGISTRATION- DATE	10	Date on which the volume was entered in the MAREN catalog (yyyy-mm-dd).

5.3 Logging files

File structure of the logging file

```
ACCESS-METHOD = ISAM
RECORD-FORMAT = V
KEY-POSITION = 5
KEY-LENGTH =32
```

The ISAM key consists of the volume serial number, the file sequence number, the date, the time and the catalog ID. This ensures that the logging records will still be unique even if several logging files from different systems are combined.

The complete, updated archive entry is logged on the basis of the ISAM key. Its length depends on the format of the MAREN catalog. The length of the logging records is 1050 bytes.

Date details in the timestamp are always written with a four-digit year specification.

If no other block size was selected when assigning the logging file in the start procedure for the control program, the logging file is created with BUFFER-LENGTH=STD(1).

Exception: If the logging file is created on an NK4 pubset, it is given a block size of (STD,2).

Record structure of the logging file

Length in bytes	Designation / Value range / Meaning	
4	Record length field	
6	VSN	
4	File sequence number	These fields form the ISAM key
10	Date (yyyy-mm-dd)	
8	Time (hh:mm:ss)	
4	Four-character catalog ID of the home pubset of the system where the modification of the archive entry originated.	
1014	Complete, i.e. already updated archive entry.	

If the host-specific MAREN parameter LOGGING-TIMESTAMP is specified in the start procedure for the control program, a record is written to a logging file every time a change is made to an archive entry.

For performance reasons, as well as for increasing availability and maintaining data security, a separate logging file is kept for each system. If the parameter SHARED-UPDATE=*YES has been specified in the file allocation for a logging file, the MARENADM statement SHOW-MAREN-FILE can be used to access the current logging file.

Modifications of the MAREN parameter, e.g. via MODIFY-MAREN-PARAMETERS, will also be written to the logging file.

Variable block size for the MAREN logging file

If a logging file is assigned in the MARENCP start procedure, the command ADD-FILE-LINK with the parameter BUFFER-LENGTH=*STD(SIZE=n) can be used to specify a block size other than the standard block size. The user must ensure that sufficient storage space is reserved when assigning the file. With a blocking factor of n, the primary allocation (PRIMARY ALLOCATION) must be at least $2n+1$ for K-ISAM and at least $2n+2$ for NK-ISAM; the secondary allocation (SECONDARY-ALLOCATION) must be at least n.

If a new logging file is opened later during an active MAREN session by means of the MARENADM statement CHANGE-LOGGING-FILE, this is opened with the same blocking factor and the same secondary allocation as the previous logging file and with a sufficiently large primary allocation.

If the new logging file is created on an NK4 pubset, the old logging file must have an even-numbered block size, e.g. STD(2). If this is not the case, MARENCP is aborted.

Updating the MAREN catalog

The MARENADM statement UPDATE-MAREN-CATALOG and all the information from the logging files enable the MAREN catalog to be brought up to the current status or reconstructed if inconsistencies or defects occur.

5.4 File version in the MAREN catalog

When data is written to a tape, the name of the tape file, together with other features, is stored in the MAREN catalog entries of the volumes used. (This does not apply in the case of an ARCHIVE save run involving a directory.) This makes it possible to determine which volumes contain a tape file (statement SHOW-VOLUME-ATTRIBUTES FILE-NAME=...).

The MAREN catalog contains several versions of a tape file if the same tape file was created at different times and using different volumes and if the relevant tapes or tape cartridges have not yet been released in the MAREN catalog. These individual versions of a file are not distinguished by their file name, as are, for example, file generations.

The volumes belonging to a file version form a MAREN tape set in the MAREN catalog. Used in this context, however, the term “tape set” is only loosely related to the term as used in a number of BS2000 commands (e.g. CREATE-TAPE-SET).

The common feature of a MAREN tape set and thus of a file version in the MAREN catalog is the fact that in all associated tapes the fields FILE-NAME and FIRST-VOLUME are identical in the MAREN catalog, FIRST-VOLUME containing the volume serial number of the first tape to which this file version has been written.

The order in which data was written to the tapes when creating the file can be determined with the aid of the VOLUME-SEQUENCE field. This field is given the value 1 for the first volume, the value 2 for the second volume, etc.

If only one volume was required for the creation of a tape file, the MAREN tape set then consists of a single tape and no additional volumes are required to access this file version.

In addition, the MAREN catalog entry contains a number of other fields for every file on the tape which MAREN evaluates when determining a file version. These include:

- CREATION-DATE Date when a file was last written to the tape.
- CREATION-TIME Time when a file was last written to the tape.
- CLOSE-INDICATOR Indicator showing whether the tape was properly closed when the tape file was created.
- USER-IDENTIFICATION User ID assigned to the volume in the MAREN catalog. However, this field is relevant only if selection is to be based on user IDs.
- DEVICE-TYPE If a device type was specified explicitly in the IMPORT-FILE (or FILE) command, only MAREN catalog entries with exactly this device type are used to determine the file version.

MAREN tape sets can be accessed explicitly in various statements of the programs MAREN and MARENADM. The MODIFY-TAPE-SET-ATTRIBUTES statement is available as a special statement for modifying MAREN catalog entries for a tape file.

5.5 Occupancy level of the MTCs

Within the MAREN catalog, the LAST-WRITE-BLOCK-COUNT field in the archive entry is supplied with a block counter. This field indicates the number of blocks (not PAM pages) occupied on the MTC.

When tape processing is terminated, the device's BLOCK-ID is read and the number of blocks used is determined. This is only done after write access to the tape. LAST-WRITE-BLOCK-COUNT is consequently only supplied with a new value when the volume was created on a device supporting the block ID (which is always the case where MTC devices are concerned).

The information on a tape's occupancy level supplied by the block counter must be interpreted in view of a variety of factors such as the following:

- tape length
- number of tracks
- state of the MTC
- state of the read/write head
- number of files
- number of gaps between blocks
- size of the gaps between blocks
- is the block size recorded
- compression factor (determined by the device)
- entries in tape administration block 0 (e.g. fault administration by the device)

Each time a file located on the MTC is closed, the block counter or LAST-WRITE-BLOCK-COUNT field is supplied with a value. If FSEQ > 0001, the field contains the number of blocks of the relevant VSN including this file. If FSEQ = 0001, the field contains the total number of blocks of the relevant VSN (not the number of blocks up to the end of the file for FSEQ = 0001).

If an MTC contains 10 files, for instance, and the file is extended with FSEQ=0002 or rewritten, the files with FSEQ=0003 to FSEQ=0010 can no longer be accessed although their catalog entries are still available. The file with FSEQ=0001 then has the same value in the LAST-WRITE-BLOCK-COUNT field as the file with FSEQ=0002.

6 Volume management

6.1 Volume states, volume types and volume locations

When a volume is introduced for the first time in a computer center, it is free. Before a volume can be used for the first time it must be initialized.

When an application requests a volume, it is reserved. A volume is not available for other applications as long as a reservation exists.

Once the expiration date has been reached, a volume can be released again. Before it may be used again by another application it has to be reinitialized. When a volume is reserved, it can be exported to another computer center.

Refer to [page 90](#) for an overview of a volume's life cycle.

Volume types

A volume type can be defined freely in MAREN.

The system operations that are supported by MAREN, e.g. volume initialization and free tape allocation, are restricted to the areas currently supported by the operating system. MAREN supports system operations for all volume types offered by NDM.

The volume types supported (depending on the BS2000/OSD version) are listed in the manual "System Installation" [6].

MAREN automatic free tape allocation implicitly supports any volume type supported by BS2000 (NDM), provided the functionality offered by the hardware is within the range of functions currently supported by MAREN (see MARENUCP in "MAREN Volume 2" [1]).

MAREN supports the volume types used by all device types returned by NDM when MARENUCP or MARENADM is started. This excludes the volume types that will be covered in future extensions of NDM.

When the I/O configuration is changed dynamically, a new device type may need to be included in the host-specific parameters using the MARENADM statement `MODIFY-MAREN-PARAMETERS RESERVE-DEVICE-TYPES`.

Locations

Locations are defined in the host-specific parameters (see the MODIFY-MAREN-PARAMETERS statement in “MAREN, Volume 2” [1]).

Locations must be defined for archive systems and can be defined for manual devices. The names of the device depots installed in NDM using the ADD-DEVICE-DEPOT command must match the definitions of these locations in the MAREN system. In MAREN, they must always be assigned the operating mode “MANUAL”, “EXTERNAL”, “ROBAR-1” or “ROBAR-2” (see [page 112](#) for further details on the operating mode).

A volume from specific location is selected either by naming the location explicitly in the request, through the default mechanism, or via a reservation file/EXIT.

6.2 Free volume pool (Free-Pool)

Every tape, regardless of whether it is free or reserved, is connected to a free pool name. If it is free, then it is located in this free pool. If it is reserved, then it drops back into this free pool when it is released. MAREN knows and manages all pool names mentioned in the catalog. Even a free tape pool that does not contain any free tapes may still be needed later. If no tapes refer to this pool name, then it becomes possible to delete the administration block (*REMOVE in the LOCATION-ENTRIES operand FREE-POOL of the MODIFY-MAREN-PARAMETERS statement). Only explicit deletes can be performed.

When a free tape is requested, a free tape pool is found that can be used to meet the demand. If there is no suitable tape free, the tape operator of the computer center is requested to make a suitable tape available in **this** free tape pool.

In MAREN there may not be any connection between the free pool *TSOS/*GLOBAL/*dirname and ARCHIVE. *GLOBAL tapes cannot only be used by ARCHIVE, but also by other applications. See [figure 6 on page 92](#) for other possible ways to divide the MAREN free tape pool.

6.3 Reserving free volumes

Free volumes can either be reserved explicitly using a MAREN command or implicitly using automatic free tape allocation (MARENUCP background program).

Exit routines are available to adjust the automatic free tape allocation to various features according to the requirements of the users.

The reservation of free volumes according to locations with specific features (user ID, job name, file name, etc.) can also be influenced via a reservation file (see the [section "Location management via a reservation file" on page 120](#)).

6.4 Automatic free volume allocation with MARENUCP

MARENUCP automatically allocates free volumes to users.

If a volume is requested and no VSN is specified (scratch request) MARENUCP automatic free tape allocation selects a free volume and marks it as reserved in the MAREN catalog.

MARENUCP takes on the tasks of the operator. It determines a free volume in the MAREN catalog, reserves it for the user and makes sure that the volume is ready for processing. If the computer center has its own exit routine, this is taken into account.

MARENUCP is a permanent batch process running under a privileged user ID which has been configured with the system privilege TAPE-ADMINISTRATION and the operator role which is entered in the host-specific MAREN parameters. It reads all messages referring to tape processing through the UCON interface.

A request for an free volume triggers the following steps in MARENUCP:

- The volumes mounted in the devices are determined.
- A mounted, free volume is determined and reserved in the MAREN catalog. This step takes account of a computer center exit routine or a reservation file.
- If no mounted, free volume is available, the operator is prompted to mount a free volume. This request contains the application-oriented number range, as necessary.

It is not necessary to respond to the prompt, because MARENUCP will detect when the volume is mounted.

6.4.1 VSN proposal

MARENUCP requests the operator to mount a free volume.

```
MOUNT TAPE vsn...
```

The operator can mount the proposed volume or any other free volume, which will then automatically be allocated.

If a free volume is already mounted, it will be allocated without a request being issued to the operator.

The sequence in which volumes are proposed is defined automatically on the basis of how frequently they are utilized. Volumes that have been used less often are given preference.

The criterion used to measure the frequency with which a volume is used is defined with the host-specific MAREN parameter RESERVATION-SEQUENCE.

The possible selection criteria are VSN, RESERVATION-COUNT, LAST-ACCESS-DATE and FREE-DATE.

6.4.2 Automatic volume initialization

There is another way of initializing a volume, beside the INITIALIZE-VOLUMES command, if a volume needs to be initialized before it is reserved again.

If this method is to be used the FREE-VOLUMES command has to be issued with the operand INIT-FILE=*NONE. This also releases volumes that still need to be initialized.

If such a volume is later mounted for reservation by MARENUCP, MARENUCP carries out initialization.

The operator only needs to intervene if the volume cannot be allocated automatically. For example because the volume is in a device that is busy, in particular, if it is not mounted on the proposed device. In that case the following message is issued:

```
NKVT013 MOUNT TAPE <vsn> ON DEVICE <mn> . . .
```

The operator has to respond with “<tsn>.<mn>”.

Restrictions

An automatic initialization cannot be performed in the following cases:

- The reservation is made with the RESERVE-FREE-VOLUME command from MAREN or MARENADM.
- If volumes are requested with the CREATE-FILE or CREATE-FILE-GENERATION command and the operand VOLUME=*ANY(NUMBER-OF-DEVICES=n), only the first volume can be initialized if n>1.

In these cases the volumes are reserved. Problems may occur when a new owner accesses a volume for the first time if the tape label contains a protection term that has not expired or still contain a foreign owner ID. In this case, initialization must be performed manually by the operator.

6.5 Import and export

If a volume is to be sent to a foreign computer center, it has to be exported by the MAREN administrator or using a user command. A standard form can be printed to record that the volume has been dispatched to a foreign computer center.

When the foreign computer center receives the volume, systems support imports it to the MAREN catalog as a private volume. In this procedure, a VSN that already exists in the catalog may be specified and entered. The local volume with that VSN cannot be used for as long as the foreign volume remains in the computer center.

When the foreign volume has been processed it is removed again from the MAREN catalog by an export statement. From this point on, the local volume can be used again.

While the volume is exported from the dispatching computer center, the host there cannot access it. Once the volume has been returned to its original computer center, the MAREN administrator has to make it available again explicitly using an import command.

If the volume belongs to a location served by an archive system, the export and import operations are performed together with the eject and insert operations at the archive system's import/export unit.

6.6 Life cycle of a volume

A volume's life cycle is basically characterized by constant alternations between the states "free" and "reserved". Other states a volume might have are "to initialize", "exported" and "private". These states are represented by the following archive entry fields in the MAREN catalog:

free: VOLUME-STATUS=FREE

to-initialize:

VOLUME-STATUS=RESERVED and USER-ID=SYSMAREN/<other id for volumes that are to be initialized>

reserved: VOLUME-STATUS=RESERVED

exported: VOLUME-STATUS=RESERVED and EXPORT-DATE=<date of last export>

private: VOLUME-STATUS=PRIVATE

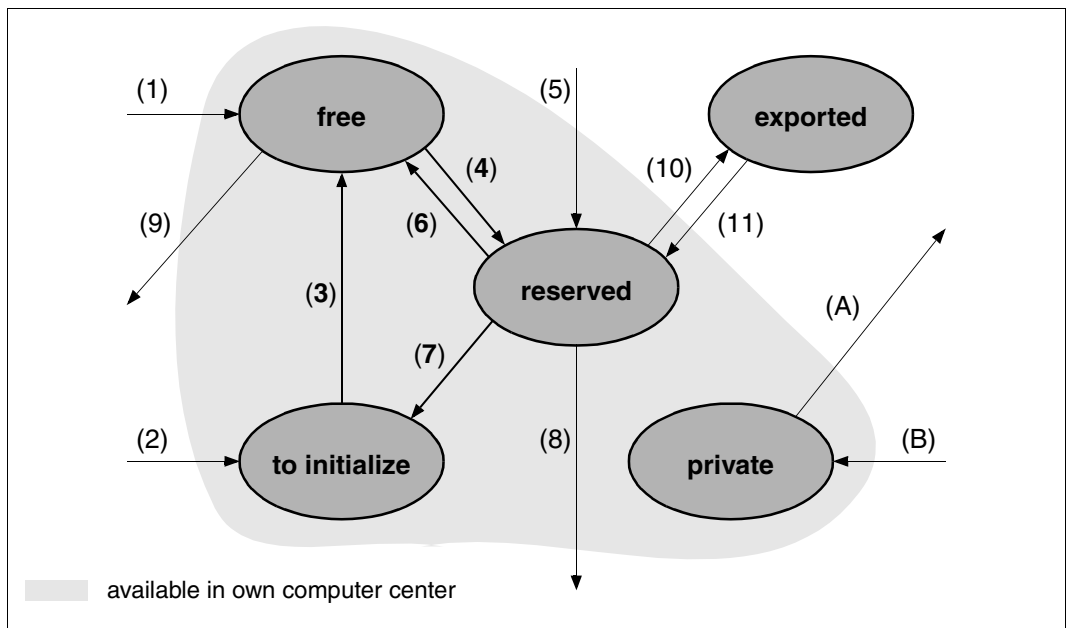


Figure 5: Life cycle of a volume

- (1) A free volume is included in a computer center with the ADD-FREE-VOLUME command. If the volume was already initialized for some prior use, it can be utilized right away. VOLUME-STATUS=FREE is set in the MAREN catalog.
- (2) A free volume (that needs to be initialized before it is used) is added to a computer center's volume inventory with the command ADD-FREE-VOLUME INIT=*YES.
- (3) A volume is initialized with the INITIALIZE-VOLUMES command. VOLUME-STATUS=FREE is set in the MAREN catalog.
- (4) A free volume can be reserved with RESERVE-FREE-VOLUMES. If MARENUCP automatic free tape allocation is activated, then it will implicitly reserve a free volume when no particular VSN is requested. VOLUME-STATUS=RESERVED is set in the MAREN catalog.
- (5) ADD-RESERVED-VOLUME generates an archive entry for a volume that already exists in the computer center but that has not yet been archived in the MAREN catalog. VOLUME-STATUS=RESERVED is set in the MAREN catalog.
- (6) If a reserved volume has reached the expiration date, it can be released with FREE-VOLUMES. If it is to be reinitialized before it is used again, the operand INIT-FILE=*NONE is set. VOLUME-STATUS=FREE is set for the volume in the MAREN catalog.
- (7) With FREE-VOLUMES INIT-FILE=<anything-but-*NONE>, the volume has to be reinitialized before it is used again. The volume is reserved for a specific user ID until it is reinitialized (SYSMAREN default). The volume status RESERVED is retained for the time being.
- (8),(9) Volumes with VOLUME-STATUS=RESERVED or free volumes with VOLUME-STATUS=FREE can be removed from the computer center at any time (with REMOVE-USER-VOLUMES or REMOVE-FREE-VOLUMES).
- (10),(11) Reserved volumes can be exchanged with a foreign computer center. This is done with the aid of the EXPORT-VOLUME and IMPORT-VOLUME commands. Exported volumes cannot be used in their original computer center.
- (A),(B) A foreign volume can be used temporarily in your own computer center. It has to be exported from the foreign computer center (EXPORT-VOLUME command in the foreign computer center) and imported in your own computer center with the ADD-PRIVATE-VOLUME command for that purpose. In the MAREN catalog, the volume is archived with VOLUME-STATUS=PRIVATE. The foreign volume is exported again from the MAREN catalog of your own computer center with the EXPORT-VOLUME command.

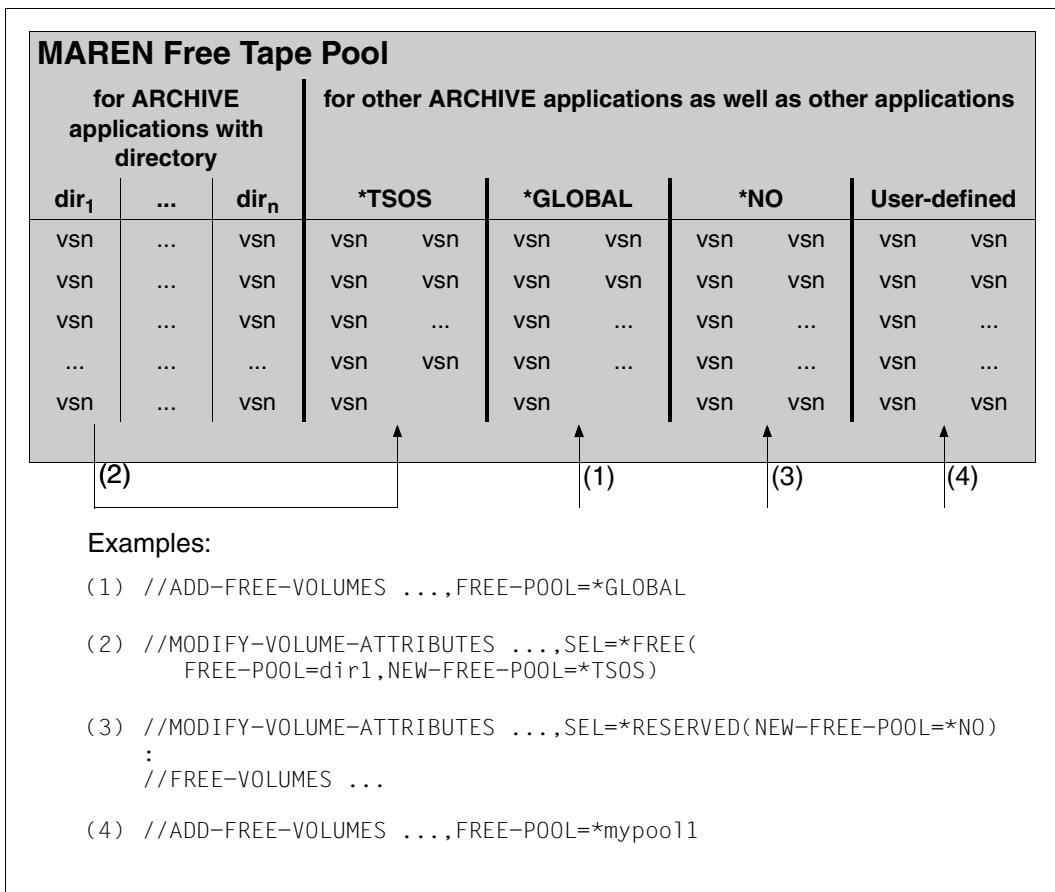


Figure 6: Possible allocation of the MAREN free tape pool

The MAREN free tape pool can be roughly split up into two areas:

- free volumes prereserved for applications (e.g. ARCHIVE) (`FREE-POOL=*TSOS/*GLOBAL/<dir-name>`)
- free volumes for applications that are not specified (`ARCHIVE-USAGE=*NO`), e.g. for requests via the command `CREATE-FILE`.

Free volumes for ARCHIVE applications can only be reserved in the course of an ARCHIVE run. Depending on their allocation, they can be split up into the following groups:

- Volumes prereserved for ARCHIVE applications in a specific ARCHIVE directory (<dir-name> tape pool)
- Volumes prereserved for ARCHIVE applications under the TSOS user ID (TSOS tape pool)
- Volumes prereserved for all other ARCHIVE applications (GLOBAL tape pool)

A volume's allocation determines its location after it has been processed with ARCHIVE. Volume reservation in ARCHIVE is closely linked with MARENUCP automatic free tape allocation.

When ARCHIVE requests a volume, MAREN will search for an appropriate volume using the following criteria in the order given below:

1. If a request is received for a specific ARCHIVE directory, a volume is reserved that was prereserved for that specific directory (FREE-POOL=<dir-name>).
2. If a request is received from an ARCHIVE application running under the TSOS user ID and if there is no tape pool for the specified ARCHIVE directory, then a volume is reserved that is prereserved for ARCHIVE applications running under TSOS (FREE-POOL=<*TSOS). From HSMS/ARCHIVE V6.0, the free tape pool FREE-POOL=*TSOS is only selected if the TSOS user ID is the owner of the directory.
3. A volume is reserved that was prereserved for optional ARCHIVE applications (FREE-POOL=*GLOBAL) under the following conditions: A request is received from any other ARCHIVE application resp. HSMS/ARCHIVE is running (from V6.0) and the owner of the directory is not TSOS and no tape pool exists for the specified ARCHIVE directory.
4. In all other cases, a free volume is taken from that section of the free tape pool that has no reservations for ARCHIVE (FREE-POOL=*NO).

If the section of the free tape pool allocated to the request type is empty, the operator is prompted to make an appropriate volume available.

The volumes can only be released following a PURGE run.

The MARENADM command FREE-VOLUMES returns them to their section of the free tape pool. Volumes can be allocated with the ADD-FREE-VOLUME and MODIFY-VOLUME-ATTRIBUTES commands.

6.7 Encrypting volumes

Data encryption on LTO drives

LTO drives (LTO-4 and higher) which incorporate the hardware feature “tape encryption” can write data to the volume in encrypted form and decrypt the data again when the volume is read.

Encryption on the drive implements data protection at volume level and protects the tape contents against unauthorized reading. This enables tape contents to be protected against misuse, above all outside CC and MAREN operation, e.g. while it is being transported or stored externally or when tapes are loaned out.

Encryption and decryption are performed by the hardware in the drives. Tape encryption is selectable; by default it is disabled. Encryption has only a minimal effect on access times (performance loss less than 1% of the data rate).

To perform encryption, the LTO drive requires a 256-bit string as a **data key**. The drive uses the AES encryption method and the data key to encrypt the data when it is written to the volume. As the encryption method is symmetrical, the same data key is required to decrypt the data again when it is accessed for reading.

If data compression is enabled for the driving, the data is initially compressed when it is written and then encrypted.

Utilization of volume encryption by BS2000/OSD

BS2000/OSD V8.0 and higher supports tape encryption. The tape encryption function of the LTO drives can be used via MAREN V12.0 and higher.

MAREN generated the data key function required and, by means of PTAM, supplies it to the drive, which then performs encryption. To permit the tape contents to be decrypted again, MAREN stores the data key in the metadata on the volume. The data key is stored in encrypted form to protect against unauthorized access.

The encryption key which MAREN keeps safely in a key box is used to encrypt the data key.

When an encrypted volume is read, MAREN fetches the appropriate encryption key from the key box, decrypts the data key and, by means of PTAM, supplies it to the drive, which decrypts the tape data again. On the basis of the volume type specification, the application determines whether an encrypted volume is accessed.

Each volume is encrypted with its own data key. All of a volume's data blocks are encrypted with the same data key. A new key is assigned each time the volume is reserved again.

MAREN makes interfaces for creating and managing encryption keys available to the encryption key administrator (MAREN administrator with the TAPE-KEY-ADMINISTRATION privilege) by means of the MARENEKM utility routine. By default this privilege is assigned to the SYSMAREN system ID.

Encryption key

The encryption key administrator creates encryption keys using the CREATE-ENCRYPTION-KEY statement. An encryption key consists of the **key ID** and the **key value**.

The key ID is assigned by MAREN and is used to find the encryption key, which is required for decryption. It consists of a total of 18 characters and has the following format:

```
<prefix>--<date>--<time>
```

Meaning:

- | | |
|----------|---|
| <prefix> | 4-character long prefix (specified by the caller in the PREFIX-OF-KEY-ID operand) |
| <date> | Creation date in the format yymmdd (set by MAREN) |
| <time> | Creation time in the format hhmmss (set by MAREN) |

The key value, which is up to 256 bytes long and is used to encrypt the data key, is determined by the caller.

The encryption key administrator can create a new encryption key at any time. An encryption key is used for encryption only if it has been specified explicitly as the write encryption key using the SET-WRITE-ENCRYPTION-KEY statement. All data keys of the volumes are encrypted using the same encryption key until a new write encryption key has been defined.

The encryption keys are stored in a key box and fetched from there when encryption or decryption is performed.



CAUTION! An additional copy of the encryption key must always be stored:

- The encryption key administrator **must** make a note of the encryption key, which consists of the key ID **and** key value, and store this in a safe place (e.g. a safe).
- The encryption key must be stored for as long as volumes which are encrypted with it are used.

It is essential to store an additional copy of the encryption key in case the key box is destroyed and it can also not be reconstructed from a backup. Without the encryption key, the tape contents which it was used to encrypt can no longer be decrypted.

Key box

The key box is a specially protected ISAM file in which encryption keys are stored. Key boxes are created on a host-specific basis. When encrypted volumes are to be written on a host, an encryption key must be defined as the write encryption key. When a volume is encrypted or decrypted, MAREN accesses the system key box of the host on which the access take place. The system key box has the fixed name \$SYSMAREN.MAREN.KEY-BOX and resides on the home pubset. If no system key box exists yet, MAREN creates one when an encryption key is saved.

The administrator can create further system key boxes, for example for backup purposes. Such “private” key boxes can also only be accessed using MARENEKM.

Managing the encryption keys

Management of the with encryption keys MARENEKM is domain-specific. The statements can be assigned for one, more than one or all hosts in the home domain. To permit this, all the hosts must belong to the same domain. If a host (temporarily) does not belong to the same MSCF network as the home host, this is reported and the action must be repeated for this host. Hosts which belong to another domain are ignored.

Managing the key box

The key box is also managed with MARENEKM on a host-specific basis. The key box and domain record in the MAREN catalog are permanently linke to each other by a joint identifiaction number. This assignment is checked each time an action is executed. This prevents, for example, a stolen key box from being used in another domain.

Transfer of a key box to another domain is supported for reconfiguration purposes. In this case a transfer key box can be created which can be imported only on a defined host using a defined password. A transfer key box cannot be ised for any other purpose.

If a key box which was backed up in encrypted form is to be restored, at least one “mini key box” containing the encrypted backaup tape’s encryption key muat be stored on this host. If this data was also stored in a “safe” (this should be the rule!), it can be reconstructed from there.

Volume types for volume encryptions

In BS2000/OSD V8.0 and higher NDM supports the volume types of the LTO drives which can also be specified at command and program interfaces by DMS and HSMS/ARCHIVE. By means of the volume type specification the user decides whether his/her data is to be written to an LTO volume in encrypted or unencrypted form:

- TAPE-Ux without encryption
- TAPE-UxE with encryption

Free LTO volumes are always entered in the MAREN catalog as volume type TAPE-Ux. Free encrypted LTO volumes cannot be added using the `//ADD-FREE-VOLUME` statement. Nor can they be specified in the `SHOW-`, `REMOVE-` and `SECURE-FREE-VOLUMES` statements.

Only when an encrypted volume is reserved (using `//RESERVE-FREE-VOLUME` or by means of a request via DMS, ARCHIVE, PERCON, FDDRL or NDM) is the volume type TAPE-UxE entered in the MAREN catalog instead of TAPE-Ux.

The volume type TAPE-UxE is also entered in the MAREN catalog if it was specified in the `DEVICE-TYPE` operand of the `//ADD-RESERVED-VOLUME` or `//ADD-PRIVATE-VOLUME` statement.

When an encrypted volume is released using `//FREE-VOLUME`, the volume type is changed back to TAPE-Ux in the MAREN catalog.

As soon as a volume has been reserved (`RESERVED` status), applications must access the volume using the correct volume type when they read from or write to it. In other words a volume with the type TAPE-UxE cannot be accessed by means of `DEVICE=TAPE-Ux` and vice versa.

Exporting volumes

An encrypted volume which has been exported from a foreign computer center and entered in the home MAREN catalog using the `//ADD-PRIVATE-VOLUME` statement can be read only if the encryption key created in the foreign computer center has been transferred to the home key box. This transfer is executed using a compiled S procedure which was created when the volume was exported (using `//EXPORT-VOLUME`). After the foreign volume has been entered by means of `//ADD-PRIVATE-VOLUME` with `DEVICE-TYPE=TAPE-UxE`, the MAREN administrator must start the S procedure explicitly. The administrator is notified of this by a message to this effect when the `//ADD-PRIVATE-VOLUME` statement is executed.

After the exported volume has been returned, the MAREN administrator uses `//EXPORT-VOLUME` to delete the associated entry from the MAREN catalog. This also implicitly deletes the entry in the key box.

Note on data privacy and data protection

As separate encryption data can be generated for each volume, the tape contents can be encrypted only using the associated procedure file. To prevent the volume plus the encryption data from falling into the wrong hands, the two should be sent separately. The following procedure is recommended:

- ▶ Send the volume to the partner.
- ▶ Wait for confirmation of receipt.
- ▶ Send the encryption data (procedure file) to the partner (e.g. by means of File Transfer or by email).



Only when the compiled S procedure is created (using /EXPORT-VOLUME) need the subsystem SDF-P be available. The S procedure can already execute with SDF-P-BASYS.

6.8 MAREN system controls

The MAREN system is automatically activated for the following activities during tape reservation and processing using the BS2000 Data Management System (DMS).

- Access control
- Availability checking
- updating of archive entries
- output of transport messages
- use of the DEVICE parameter
- determining the VSNs for a tape file

This link between BS2000 and MAREN is active for the following events:

- reserving tapes
- creating TFT entries
- opening files
- changing reels
- closing files
- releasing tapes

Certain checks can be deactivated using MAREN parameters (see [page 217](#), [page 224](#) and [page 224](#) of the Appendix). The BS2000 checks are always carried out, independent of the MAREN activities.

6.8.1 Access control

Before each access to a tape, a check is made as to whether the following conditions have been met.

- If domains are being used the volume must belong to the domain to which the host also belongs, or the volume must belong to the standard domain *STD-DOM.
- If the tape is assigned to a foreign user ID, the USER-ACCESS attribute must be set to ALL-USERS or FOREIGN-READ-ONLY (exception: TSOS).
- If the tape is password-protected, the appropriate ADD-PASSWORD command must first be entered.
- If the tape is reserved for an ARCHIVE pool of free tapes (i.e. FREE-POOL does not equal *NO), this tape can only be accessed by ARCHIVE.

- If the tape is to be used for output operations, the USER-ACCESS attribute must be set to ALL-USERS (exception: TSOS).
- If the tape is to be used for output operations, the file expiration date must be less than or equal to the current date.
- If MAREN computer center exit routines are being used, these must permit access.

If any of these conditions is not fulfilled, access is rejected and an appropriate message is sent to SYSOUT. In the case of an ARCHIVE backup run, checks are carried out by the MAREN subsystem in two special cases:

1. Backup run without a directory file (DIR=NONE) and using the parameter TAPES=<tvsn>.
2. Backup run using a directory file and using the parameter TAPES=<tvsn> if the VSN <tvsn> is not contained yet in the tape pool of the specified directory file.

If the volume tvsn has the attribute VOLUME-STATUS=FREE, implicit reservation is carried out (only for HSMS and ARCHIVE) provided that the following conditions are fulfilled:

- The volume must be contained in the appropriate pool of free tapes (see [section “ARCHIVE free tape pools in the MAREN catalog” on page 155](#)).
- The volume must not be intended for the automatic free tape allocation facility MARENUCP (see the SECURE-FREE-VOLUMES statement in “MAREN Volume 2” [1]).
- The volume type must be permitted for new reservations (see the RESERVE-DEVICE-TYPES operand in the MODIFY-MAREN-PARAMETERS statement in “MAREN Volume 2” [1]).

If the volume tvsn has the attribute VOLUME-STATUS=RESERVED or PRIVATE, the following conditions must be fulfilled:

- If DIR=NONE applies, the volume must not be contained in a directory.
- If DIR=<filename> applies, the volume must be assigned to the user’s own ID (exception: TSOS).
- The attribute FREE-POOL for the volume tvsn must match the existing pools of free tapes.

6.8.2 Availability checking

Before any access is made to a volume, a check is made to see whether the following conditions for availability are fulfilled:

- The volume must be entered in the MAREN catalog. If domains are being used the volume must belong to the domain to which the host also belongs, or the volume must belong to the standard domain *STD-DOM. Exception: If the host-specific MAREN parameter FOREIGN-TAPE-CHECK=*NO is set the volume needs not to be entered in the MAREN catalog .
- The volume must not have been exported.
- The volume must have the attribute VOLUME-STATUS=RESERVED or PRIVATE.
- The volume must be available locally, i.e. the location contained in the entry field TEMPORARY-LOCATION must not possess the attribute TYPE=REMOTE in the location table.
- The volume must not currently be in use on another computer (the check as to whether the tape is currently in use on the local computer is performed by BS2000, not by MAREN).
- If the volume is to be used for input operations, the file names in the MAREN archive entry and in the TFT must match. The catalog ID, user ID and version are ignored. This check is not carried out if the volume is accessed via ARCHIVE.

6.8.3 updating of archive entries

The following fields in the relevant archive entry are updated when a volume is processed:

LAST-ACCESS-DATE
LAST-ACCESS-TIME
LAST-ACCESS-JOB-NAME
LAST-ACCESS-USER-ID
LAST-ACCESS-ACCOUNT
LAST-ACCESS-CPU-NAME
LAST-ACCESS-TSN
LAST-ACCESS-SNO
LAST-ACCESS-FUNCTION-NAME
LAST-ACCESS-FUNCTION-FLAG
CHECK-COUNT
DEVICE-TYPE
TEMPORARY-LOCATION (*only for locations with operating mode MANUAL*)
ACCESS-COUNT
OPEN-MODE
DEVICE-NAME

If output operations are carried out the following archive entry fields are also updated:

CREATION-DATE
CREATION-TIME
CREATION-JOB-NAME
FIRST-VOLUME
VOLUME-SEQUENCE
FILE-NAME
CREATION-CATALOG-ID
CREATION-USER-ID
CLOSE-INDICATOR
LAST-CLOSE-DATE
LAST-CLOSE-TIME
INITIALIZATION
EXPIRATION-DATE
FREE-DATE *(only if smaller than EXPIRATION-DATE)*

If an ARCHIVE backup run is being performed, the following archive entry field is also updated:

DIRECTORY-NAME *(only when saved with directory)*

6.8.4 Outputting transport messages

If the volume is not yet located on the host computer (i.e. TEMPORARY-LOCATION is not equal to host name), the transport message MAR4164 is output to the console. This message includes information on the current location of the volume.

No transport messages are issued for volumes in whose archive entries a robot-supported location (operating mode "ROBAR-1" or "ROBAR-2") or an external location (operating mode "EXTERNAL") is entered as the TEMPORARY-LOCATION.

6.8.5 Using the DEVICE parameter

When processing input tapes archived in the MAREN catalog, the user can omit specification of the otherwise mandatory DEVICE parameter (see the MAREN parameter DEVICE-COMPLETION, [page 219](#)). This function can also be used for private disks.

6.8.6 Determining the VSNs for a tape file

When MAREN is used, the VSNs of tape files that were not cataloged in TSOSCAT can be determined automatically, provided one of the following two conditions is met:

- the tape file is to be processed on the same processor on which it was created, or
- both processors, i.e. the one on which the tape file was created and the one on which it is to be further processed, are joined together in a MAREN network and therefore use the same MAREN catalog.

If either of these conditions is met, which is usually the case when a tape file is further processed in the same computer center, the information required for the file assignment concerning the volumes to be used and their device type is located in the MAREN catalog and can be called from there.

It is thus no longer necessary to insert the VSNs and their device type manually. A file assignment may look like this, for instance (possibly with other parameters):

```
/IMPORT-FILE SUPPORT=TAPE(VOLUME=*ANY,DEVICE-TYPE=*ANY,  
FILE-NAME=TAPE.FILE)
```

DMS no longer rejects such a command, but instead passes the file name on to MAREN. If the MAREN catalog contains entries with this name, MAREN returns the VSNs and device type of the volumes marked in these MAREN catalog entries to DMS ("volume substitution"). Using the information received from MAREN, DMS can complete the file assignment and request the required volumes.

One problem that may arise in connection with volume substitution is that the same file name, e.g. TAPE.FILE, may occur more than once in the MAREN catalog. This is the case when the same tape file was created more than once at different times and using different volumes, and the tapes or tape cartridges involved have not yet been released in the MAREN catalog. These individual versions of a file are not distinguished by the file name, as is the case with file generations, for example. By default, MAREN can select the latest (youngest) file version. However, it must also be possible to select a specific older file version.

Another potential problem lies in the fact that tape files cannot always be uniquely assigned to user IDs. This means that there may be several entries in the file catalog (TSOSCAT) for the same tape file in the BS2000 Data Management System. For example, the two file names \$USERA.TAPE.FILE and \$USERB.TAPE.FILE may refer to the same file on the same reel.

For this reason, BS2000 tape management stores only the max. 41-character file name without the user ID in the tape labels (HDR3 label) and the tape file names in the MAREN catalog do not contain any user IDs.

Volume substitution encounters problems at the latest when the file name involved has several entries in the MAREN catalog and the associated tape files were created under different user IDs. Selection based on the file version does not always provide a solution here, as the different tape files with the same name may easily refer to files with completely different contents (e.g. file \$A.XY contains inventory data, and file \$B.XY contains personnel data).

File version and user ID selection

The MAREN command ADD-MAREN-FILE-ENTRY selects a specific file version, taking into account the user ID.

The VERSION operand in this command is used in volume substitution to define which file version in the MAREN catalog is accessed in a subsequent IMPORT-FILE command (with VOLUME=*ANY) and thereby to determine which VSNs are required for processing.

The USER-IDENTIFICATION operand is used when determining these VSNs to specify whether only MAREN catalog entries of the user's own ID or of foreign IDs are to be evaluated or if selection is not to be based on user IDs (a detailed description of the commands for processing MAREN-TFT can be found in "MAREN Volume 2" [1]).

6.8.7 Notes on consistent tape processing and modification of expiration dates

This section describes what has to be done or observed to ensure safe and consistent tape processing in conjunction with MAREN, ARCHIVE/HSMS, ROBAR, and NDM.

The following requirements must be met to ensure consistent tape processing:

1. Volume data protection:
 - a) Protection against overwriting
 - b) Protection against unauthorized export from the MAREN catalog
 - c) Possibility of reconstruction after catalog loss
 - d) Correction of inconsistencies in the catalog

2. Volume data security:
 - a) Unauthorized reading or export from the MAREN catalog
 - b) Unauthorized reading of archive entries
3. Consistent handling of expiration dates:
 - a) The expiration dates must be consistently observed
 - b) It must be possible to postpone the expiration dates if necessary
 - c) It must be possible to bring forward the expiration dates if necessary
 - d) It must be possible to release volumes prematurely
4. Consistency of various databases:
 - a) MAREN: MAREN catalog
 - b) ARCHIVE: various directories
 - c) HSMS: various archive directories
 - d) ROBAR: archive record
 - e) NDM: DEVICE-DEPOT table
5. Access to secure data must be possible at any time for authorized users.
6. When volumes are released prematurely, they must be reinitialized; otherwise, subsequent jobs could have problems with the tape labels.
7. The above requirements must also be met when using foreign tapes.

Notes and recommendations are given below on how best to meet the above requirements.

Notes on MAREN

The number in brackets indicates a reference to the requirement with that number.

1. The settings of the host-specific MAREN parameters on all computers in the MAREN network should be:

FOREIGN-TAPE-CHECK	= YES	(1a), (2a), (7)
INPUT-TAPE-CHECK	= YES	(2a)
INPUT-FILE-CHECK	= YES	(2a)
RETPD-CHECK	= YES	(1a), (3a)
TSOS-PRIV	= NO	(1a)

```

PRIVILEGED-USER-ID = *NONE      (1a)
MAREN-PASSWORD     = YES        (1c),(2b)
LOGGING            = YES        (1c),(1d)
AUDIT              = YES        (1a),(2a),(2b),(3a)

```

2. To prevent VSNs of the same name being mistaken for each other, there should be only one MAREN catalog in each computer center. You should also note that MAREN V12.0 only works with MAREN V10.0 and V11.0 in a cluster.
(1a),(2a),(3a),(7)
3. When archive systems are used, all sets of cartridges accessible to the archive system should belong to the same MAREN catalog.
(1a),(2a),(3a),(4a),(4d),(7)
4. The MAREN subsystem should not be unloaded during a BS2000 session. If, however, you do unload it, you must carry out organizational measures in the computer center to ensure that tape processing is no longer possible.
(1),(2),(3a),(4),(6)
5. During MAREN release sessions, an init file should always be created so that any necessary reinitializations can be carried out.
(6)
6. The MAREN catalog entry must have the attribute USER-ACCESS=*OWNER-ONLY.
(2b)
7. The MAREN catalog and the computer-specific logging files should be on different pubsets for availability reasons.
(1c)
8. If you are using the SECOS software package, the user ID SYSMAREN and all user IDs with administration functions in the MAREN system should be allocated the system privilege of the same name using the command /SET-PRIVILEGE PRIV=TAPE-ADM,USER-ID=... (see the "SECOS" manual [13]).
(2b)
9. When reimporting exported volumes belonging to the computer center, the MAREN administrator must carry out special steps if it is suspected that the volume may have been overwritten in another computer center. In these cases, the administrator must release the volume immediately after import so that it can be reinitialized.
(4a),(4b),(4c),(6)

Notes on ARCHIVE

1. Directory files must not be deleted until all VSNS have been canceled using the PURGE and POOL statements.
(4a), (4b)
2. If you rename a directory file, you must also change its name in the MAREN catalog for all affected volumes. The MARENADM statement //UPDATE-MAREN-CATALOG is provided to make these changes easier.
(4a), (4b)
3. Note: When data is saved, the specifications for RETPD and SHARE are automatically copied to the MAREN catalog via the ARCHIVE-MAREN link. No special steps have to be taken. The specification SHARE=YES is converted to USER-ACCESS=*FOREIGN-READ-ONLY.
(3a), (4a), (4b)
4. Note: There are no functions for postponing and bringing forward the expiration date in ARCHIVE. This is possible only with MAREN (see [page 108](#)).
(3b), (3c)
5. Note: When incomplete saved data versions are released prematurely with the statement PURGE ...,FORCE=YES, the ARCHIVE-MAREN link automatically ensures that the expiration dates are handled consistently, and that the tape cannot be reserved again until it has been reinitialized.
(3d), (4a), (4b), (6)
6. When creating free tape pools for ARCHIVE in the MAREN catalog, the administrator must make sure that all the volumes of a pool have the same location. Otherwise, there may be problems when devices are reserved by NDM.
(5)
7. Recommendation: No AVAILABLE tapes should be added to the directories; all output tapes should be assigned through the automatic free tape allocation of the MAREN system. This means that all tapes in the directories have the INQUIRE attribute OWNER=OPERATOR. The advantage of this is that free volumes are used more efficiently.

Notes on HSMS

1. The expiration date for backup files can be extended in HSMS (HSMS statement `MODIFY-ARCHIVE`). The expiration date is updated accordingly in the MAREN catalog through a MAREN interface.
In former HSMS versions this is possible only with MAREN (see “Postponing expiration dates”).
(3b), (3c)
2. Note 5 for `ARCHIVE` also applies to premature release in HSMS using the statement:
`MODIFY-ARCHIVE . . . ,SAVE-FILES=DELETE(. . . ,FORCED-DELETE=YES)`
(3d), (4a), (4b), (6)

Notes on ROBAR

1. Foreign tapes should not be deposited in the foreign tape area of the import/export unit, but added officially to the area of the storage location.
(1a), (2a), (4a), (4d), (7)
2. When exporting cartridges from the archive system, you should use the `MARENADM` statement `EXPORT-VOLUME` or `RETURN-VOLUMES` instead of the `ROBAR` statement `EXPORT-ROBAR-VOLUME`. Only then can proper `MAREN-ROBAR` interaction be guaranteed.
(4a), (4d)
3. There are also commands at archive system level for importing and exporting cartridges to and from the archive system. However, you should not use these, as interaction with the MAREN system cannot be guaranteed.
(4a), (4d), (7)

Postponing expiration dates

The file expiration date in the MAREN catalog can be extended by any length of time using the following `MARENADM` statement:

```
//MODIFY-VOLUME-ATTR VOL=<vsn>, EXPIRATION-DATE=<date>, FILE-SEQ=2
```

If necessary, the volume expiration date `FREE-DATE` is also extended at the same time. The MAREN subsystem then prevents any DVS write attempts until the specified release date is reached.

These tapes are therefore logically protected against overwriting, but only if no `PURGE` is executed via `ARCHIVE` or `HSMS`.

Since the expiration date entered on the `HDR1` label is, of course, not modified, the postponed logical expiration date applies only to systems in the MAREN network. These tapes must therefore not be exported, since they themselves are not protected.

Bringing forward expiration dates

The file expiration date and the volume expiration date in the MAREN catalog can be reduced by any length of time using the following MAREN/MARENADM statement:

```
//MODIFY-VOL-ATTR VOL=<vsn>,EXPIR-DATE=<date>,FREE-DATE=<date>,FILE-SEQ=2
```

However, once the specified release date of a tape that has been reserved by ARCHIVE or HSMS has been reached, a PURGE must be executed. Only then can the volumes be labeled as free in the MAREN catalog. If you forget to execute the PURGE, a note is output for the relevant volumes during the MAREN release session, to tell you that the expiration dates have passed but the volumes are still contained in an ARCHIVE directory. This procedure ensures consistency between the MAREN catalog and the ARCHIVE directories.

If the specified file expiration date is lower than the volume expiration date, the INIT flag will be set to INIT=YES.

7 Location management

In BS2000, locations can be assigned to volumes and the devices on which they are to be mounted. The use of assigned locations enables the user to reserve volumes and devices from a predefined set. In the sections below, the term “volume” is used to designate all types of data media suitable for tape management. These are therefore magnetic tapes and, particularly in the case of automatic tape library systems, magnetic tape cartridges.

7.1 Defining a location

“Location” is understood to include:

- a central archive, identified by means of the name “CENTRAL”
- a host as processing location. No entry in the location table is required in this case and can be omitted to save space in the table.
- miscellaneous locations (e.g. archive systems or special archives), identified by means of freely selectable names such as “TRESOR”, “BRAND”.

Exported volumes are identified by means of an export date; they are given the temporary location “CENTRAL”, since they are usually exported via the central archive. The actual location of the exported volumes can be stored in the EXPORT-ADDRESS field of the archive entry.

Operating mode for locations

In addition to manually operated locations, MAREN also supports storage locations served by archive systems (see [chapter “Archive systems and MAREN” on page 177](#)). To enable MAREN to detect whether it should send its jobs to the console or to an archive system via ROBAR, an “operating mode” must be allocated to the location:

MANUAL	location to be operated manually
ROBAR-1	for archive systems from Quantum Corp.
ROBAR-2	for the archive system ETERNUS CS HE from Fujitsu Ltd.
EXTERNAL	for a location of a group of tape stations. The group is, for example, set up in a separate archive that is to be operated manually. The volumes in this archive should be processed only on the devices located there and not be mixed with volumes from other archives.

The administrator defines the operating mode with the MODIFY-MAREN-PARAMETER statement, OPERATING-MODE= operand (see also “MAREN Volume 2” [1]).

Location identification

Each location is identified by the following:

- its name (a maximum of 8 characters; permitted characters: A..Z, 0..9 and the special characters \$, # and @)
- its type (REMOTE or LOCAL)
- its mode of operation (manual or operated through an archive system, see above)

Location table

A location table exists for each host. The location table belongs to the host-specific parameters. It is therefore processed using the MARENADM statement MODIFY-MAREN-PARAMETERS.

The location called “CENTRAL” is always included in the location table.

In the MAREN system, 24 different locations can be managed. The locations are stored in the table with their name, symbolic name and type, and their operating mode.

The default value for the location is defined by the DEFAULT-HOME-LOCATION operand in the MARENADM statement MODIFY-MAREN-PARAMETERS.

The MARENADM statement SHOW-MAREN-PARAMETERS outputs information on the location table.

Any number of locations beyond the 24 contained in the location table are supported. These locations are, however, subject to certain restrictions.

1. These locations cannot be accessed via symbolic location names.
Effects: none.
2. The location ID LOCAL is always assumed for these locations.
Effects: processing of volumes from these locations can never be aborted with the following error message:

```
MAR4125 VOLUME '(&00)' NOT LOCALLY AVAILABLE
```

This restriction is of no importance if all remote locations (e.g. fireproof cellar) are entered in the location table.

3. Volumes processed at these locations are not subject to an internal MAREN volume lock applicable to all computers.
Effects: none on the local computer.

On remote computers, the operator is first requested to mount the volume. If he/she then notices that the volume is being used by another computer, he/she must either wait or reject the request.

7.2 Creating a new location

7.2.1 Procedure

Before the devices and volumes can be accessed via their locations, sundry preparatory steps must be carried out. Only after the preparatory steps can the volumes be mounted without conflicts and can it be guaranteed that NDM, MAREN, and PROP-TPM will operate smoothly together.

Adding a location to the location table

If a host is to access a new location, the new location must be added to the host's location table using the MARENADM statement MODIFY-MAREN-PARAMETERS.

If the PROP-TPM product is being used for multisystem tape device management in multiprocessor configurations or configurations including VM2000, the location names must be the same in all systems supported by PROP-TPM.

Assignment of volume to location

The volumes are allocated to locations via their volume serial numbers using the MARENADM statement MODIFY-VOLUME-ATTRIBUTES. Depending on their use, volumes can reside in three types of location:

- HOME-LOCATION = <location-name>
Location at which the volume is usually stored.
- FREE-LOCATION = <location-name>
Location at which the volume is to be stored when it is transferred to the pool of free volumes after reaching its expiration date.
- TEMPORARY-LOCATION = <location-name>
Current location of the volume.

The three location names are stored by MAREN in the MAREN catalog. The MARENADM statement SHOW-VOLUME-ATTRIBUTES outputs information on the locations assigned to the volume.

Assignment of device to location

The ADD-DEVICE-DEPOT command informs the BS2000 NDM of the assignment of the devices to the locations. The name of the location must be the same as the location name defined in MAREN.

Device depots must be created using the command ADD-DEVICE-DEPOT each time a BS2000 system is booted.

The SHOW-DEVICE-DEPOT command outputs information on the assignments of tape devices to locations; the REMOVE-DEVICE-DEPOT command cancels the assignments.

When using archive systems, the mount/dismount specifications should define that volumes are mandatorily unloaded:

```
/MODIFY-MOUNT-PARAMETER
    UNLOAD-RELEASED-TAPE=*REGARDLESS-OF-USER-REQUEST(TAPE-FAMILY=*MBK)
```

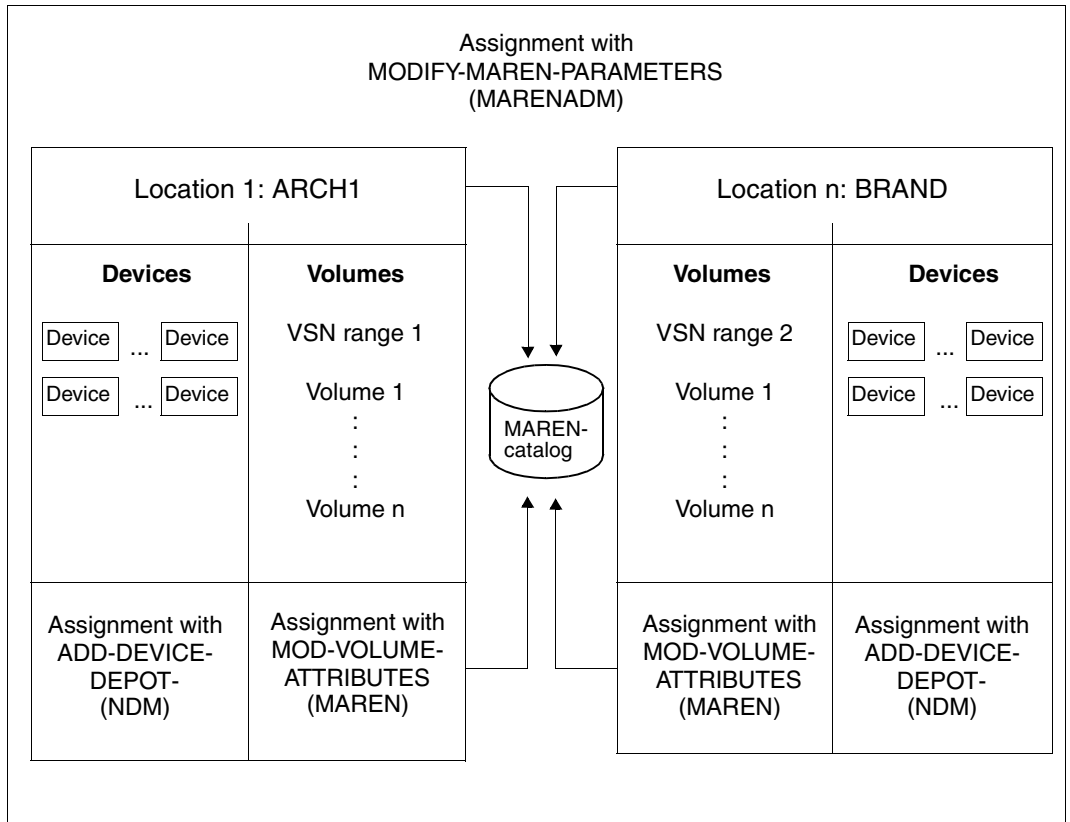


Figure 7: location

7.2.2 Example of location creation

A location with the name CENTSTOR is to be created for the archive system ETERNUS CS HE. Devices HI, HJ, HG, HH, T4 and T5 and the volumes from the VSN range MT2240 through MT2249 are to be assigned to this location.

The MARENADM administration program is called up. The MAREN administrator adds the new location CENTSTOR to the MAREN location table. The location is within the computer center (default TYPE=*LOCAL); its symbolic name is also CENTSTOR (default SYMBOLIC-NAME=*SAME):

```
/START-MARENADM
//MODIFY-MAREN-PARAMETERS LOCATION-ENTRIES=
    PARAMETERS(LOCATION-NAME=CENTSTOR,ACTION=*ADD(OPERATING-MODE=ROBAR-2))
```

Outputting the MAREN parameters:

```
//SHOW-MAREN-PARAMETERS
HOST-NAME = D017ZE22   DOMAIN      = DOM17           SNO = 209           RFA
EXP-PROC      = Y      INPUT-F-CH = N              FOREIGN-T-CH = Y      TSOS-PRIV = N
EXP-FOREIGN   = N      INPUT-T-CH = Y              RETPD-CHECK  = Y      DEV-COMPL = N
EXP-ADDR-ACK  = N      AUDIT       = YES           TEST-MODE    = N      LOGGING    = Y
EXP-RECEIPT   = FILE

BATCH-REQ-TIME=01800 DEF-FREE-DATE = 0000          ARCH-WORK-TIME = (00:00,24:00)
BATCH-EX-TIME =00100 DEF-HOME-LOC  = CENTRAL      PRIV-USER-ID  =
DIAL-REQ-TIME =00500 DEF-DENSITY  = T6250          EXITS         =
DIAL-EX-TIME  =00500 DEF-DEV-TYPE  = TAPE-C5      LAYOUT-FOR-SHOW= V8.1-AND-LOWER
CID-UID       = N      DEF-USER-ACC = OWNER-ONLY

MAREN-PASSWORD=NONE

RES-DEV-TYPES =(T6250 /TAPE-C4 /TAPE-C6 /TAPE-C5 /TAPE-C3 /TAPE-C2 )

% MARM103 CONTINUE ACTION? REPLY (Y=YES; N=NO)? Y
LOCATION-ENTRIES:(LOCATION-NAME,SYMBOLIC-NAME,TYPE,OPERATING-MODE)
( CENTRAL ,CENTRAL ,LOCAL ,MANUAL ) (CENTSTOR,CENTSTOR,LOCAL ,ROBAR-2 )
( ROBABBA ,ROBABBA ,LOCAL ,ROBAR-1 ) (EXTERNAL,EXTERNAL,LOCAL ,EXTERNAL)
( SECURE ,SECURE ,REMOTE,MANUAL ) ( , , , )
( , , , ) ( , , , )
( , , , ) ( , , , )
% MARM103 CONTINUE ACTION? REPLY (Y=YES; N=NO)? N
```

The volumes are assigned to the CENTSTOR location via their VSN range (MT2240 through MT2249).

```
//MODIFY-VOLUME-ATTRIBUTES VOLUME=*INTERVAL(FROM=MB2240,TO=MB2249),
  LOCATION=*PARAMETERS(HOME-LOCATION=CENTSTOR,
  FREE-LOCATION=CENTSTOR,TEMPORARY-LOCATION=CENTSTOR)
% MARM121 MAREN CATALOG ENTRY 'MB2240'/'0001' MODIFIED
% MARM121 MAREN CATALOG ENTRY 'MB2241'/'0001' MODIFIED
% MARM121 MAREN CATALOG ENTRY 'MB2242'/'0001' MODIFIED
. . .
% MARM121 MARM121 'MB2249'/'0001' MODIFIED
% MARM120 TOTAL OF 9 MAREN CATALOG ENTRIES PROCESSED
```

The MAREN catalog is output. Since a range of volumes has been specified, only the most important catalog features are output for each volume.

```
//SHOW-VOLUME-ATTRIBUTES VOLUME=*INTERVAL(FROM=MB2240,TO=MB2249)
```

```
-----
VOLUME FSEQ DEV-TYPE USER-ID ACCOUNT RES-DATE FREE-DATE HOME-LOC ACC# E FL
-----
MB2240 0001 TAPE-C4 SYSMAREN <date> <date> CENTSTOR 0014 F
MB2241 0001 TAPE-C4 TSOS <date> CENTSTOR 0000 P
MB2242 0001 TAPE-C4 TSOS <date> CENTSTOR 0007 P
MB2243 0001 TAPE-C4 TSOS <date> <date> CENTSTOR 0000 F
MB2244 0001 TAPE-C4 TSOS <date> <date> CENTSTOR 0000 F
MB2246 0001 TAPE-C4 TSOS <date> <date> CENTSTOR 0001 F
MB2247 0001 TAPE-C4 TSOS <date> CENTSTOR 0000 P
MB2248 0001 TAPE-C4 TSOS <date> CENTSTOR 0000 P
MB2249 0001 TAPE-C4 TSOS <date> CENTSTOR 0000 P
% MARM120 TOTAL OF 9 MAREN CATALOG ENTRIES PROCESSED
```

The MARENADM administration program is terminated.

```
//END
% MARM198 MARENADM TERMINATED NORMALLY
```

This required devices are assigned to the location already defined in MAREN.

```
/ADD-DEVICE-DEPOT UNIT=(HI,HJ,HG,HH,T4,T5),LOCATION=CENTSTOR
```

And finally, the assignments of location, routing code and devices are output

```
/SHOW-DEVICE-DEPOT UNIT=*LOCATION(LOCATION=CENTSTOR)
% LOCATION RTC TAPE-MNEMONICS
% CENTSTOR T HI ,HJ ,HG ,HH ,T4 ,T5
```

7.2.3 Automatic location definition

MAREN must define a location when the following conditions are met:

- more than one location is being operated with tape processing in a computer center (i.e. especially if manually operated devices are being used as well as a Tape Library System)
- there are applications which neither explicitly nor implicitly (by specifying a VSN) specify the location.

MAREN allocates a location for the following applications:

- a) Device reservation by means of the SECURE-RESOURCE-ALLOCATION command without explicit specification of a location
- b) Device reservation for a scratch request
- c) Free tape allocation by MAREN for a scratch request

Location definition without exit routines and reservation file

MAREN selects the first archive system entered in the location table. If there is no archive system in the table, MAREN uses the location specified in the host-specific MAREN parameter DEFAULT-HOME-LOC.

If this location assignment does not meet the requirements of the computer center, because, for example, there are two magnetic tape cartridge locations to be used for handling scratch requests, the location definition must be controlled by a reservation file or exit routines.

Location definition with a reservation file

The location can be defined with a reservation file (see [page 120](#)). The MAREN administrator creates and edits the reservation file using the MARENLM program or EDT.

Location definition with exit routines

Instead of defining the location via a reservation file in addition to this, it is also possible to define the location via exit routines (see the [chapter “Computer center exits in the MAREN system” on page 197](#)). Since in the applications (a) and (b) named above, the device depot exit MARENEX6 is used and in the application (c) the reserve request exit MARENEX1 is used.

In both exit routines, the location name can be input either directly or indirectly by specifying a number range.

The decisive criterion for direct or indirect specification of the location name in the exits can be the file name, the volume type (see note 1), the job name or the user ID.



1. When evaluating the volume type, note that MAREN transfers it in different formats to the exits. For example, when a tape of type TAPE-C4 is requested, MAREN transfers the volume type code “BC” to exit MARENEX1 in the 2-byte long DEVICE field and the volume type “TAPE-C4” to exit MARENEX6 in the 8-byte long DEVTYPE field (in USERFELD). The volume type codes can be found in the the manual “System Installation” [6].
2. For scratch requests, the location is determined twice (applications (a) and (b)). If a location is determined in one exit, the same location must also be determined in the other exit.

7.3 Location management via a reservation file

For reservations that have to be made with specific allocations (e.g. with specific locations or number ranges) MAREN uses a reservation file. This contains the data relevant for reservations. In the event of a reservation, MAREN compares the specified selection criteria (e.g. of the RESERVE-FREE-VOLUMES statement) with the criteria from the reservation file.

The MAREN administrator generates, edits and manages the reservation file via the menu interface of the MARENLM program. Alternately he/she can edit the reservation file with EDT.

In addition to a reservation file, the administrator can also use MAREN exit routines (see [“Location definition with exit routines” on page 119](#)).

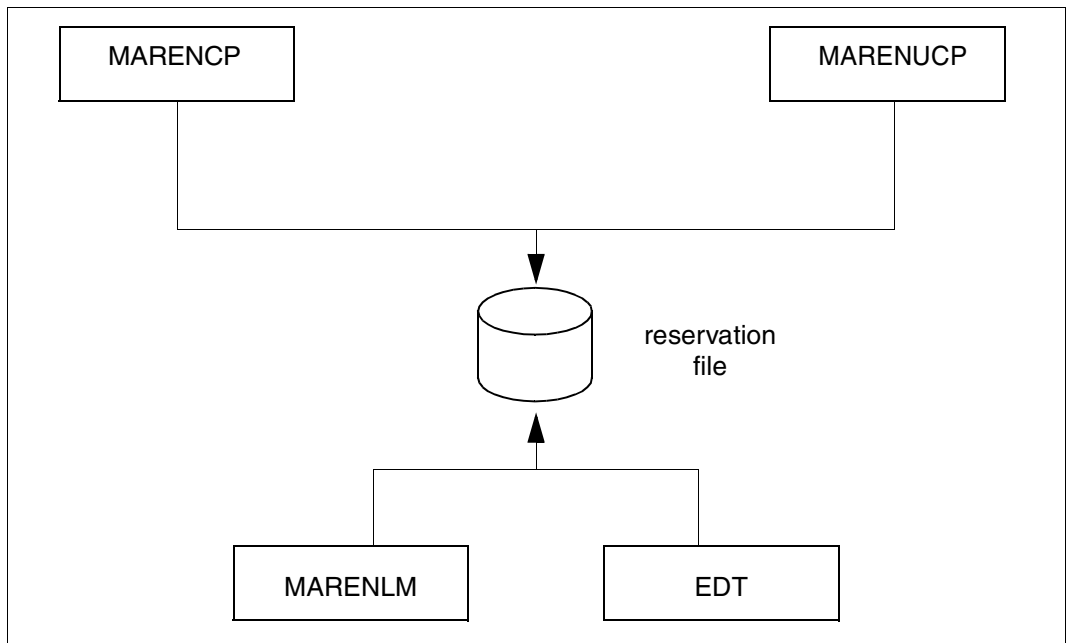


Figure 8: Use of the reservation file

Applications

A reservation file, for instance, can be used in the following situations:

- An existing archive system configuration is being extended, i.e. a second archive system is being added. The criteria which determine the archive system's behavior when selecting free volumes need to be defined. If a reservation file or the MAREN exit routines are not used, any free volumes requested would always be selected from the same archive system.
- An existing archive system configuration is retained, but its use is being altered. New MAREN exits need to be programmed or the existing exits need to be reprogrammed extensively. A reservation file greatly facilitates the necessary modifications.

Beyond that, a reservation file also offers flexible location assignment features.

7.3.1 Format of the reservation file

The reservation file contains information on the features of the volumes needed when a volume is initially reserved. The following information can be stored in each record of the reservation file:

- location
- volume number range (start and end VSN)
- Volume type
- User ID
- Jobname
- Reservation rejection
- utilization type (for an ARCHIVE directory or a file)
- File name (ARCHIVE directory or file)
- Free pool name (name of a free tape pool)

When a free volume is requested (see also [section "Evaluation of the reservation file" on page 125](#)), the reservation file is read sequentially. When an entry is found that matches the comparison criteria, the read operation is terminated. This means that the order of the entries is important. A more detailed description is provided in the [section "Evaluation of the reservation file" on page 125](#).

The entries in the reservation file have the following format (see also the [figure "Structure of the MARENLM basic form" on page 129](#) and ["Layout of the data edited for printing" on page 138](#)). Each field of an entry is defined by its position.

- Location
<alphanumeric 1..8> determines the location at which a volume or a device (SECURE-RESOURCE-ALLOCATION) is to be reserved.
*ANY (or 8 blanks) in place of a location name means that the location is defined elsewhere:
 - The location specified explicitly or implicitly in the RESERVE-FREE-VOLUME statement applies.
 - Otherwise the location specified by the user with ADD-MAREN-FILE-ENTRY LOCATION= ... or via ARCHIVE or HSMS applies. If it has not been specified in this way, the location is defined as described under [“Location definition without exit routines and reservation file”](#) on page 118.
- Start VSN
<alphanumeric 1..6> is the volume sequence number of the first volume in a range. A range of volumes is defined by specifying another volume in the field “Last- VSN”.
- End VSN
<alphanumeric 1..6> is the volume sequence number of the last volume in a range (see also “Start-VSN”).
The start VSN and end VSN must both contain a VSN or blanks.
- Vol.type
<alphanumeric 1..8> defines the type of the requested volume. This entry is evaluated by BS2000 NDM. The volume type cannot be abbreviated: For example T-C4 must be specified instead of TAPE-C4.
- Userid
<alphanumeric 1..8 with-wild> defines the user identification of the task which issued the volume request.
The user ID can be specified fully-qualified (without \$) or partially-qualified (* at the end of the substring). Beginning with *, all following characters are treated as concordant.
- Jobname
<alphanumeric 1..8 with-wild> defines the job name of the task which issued the volume request.
The job name can be specified fully-qualified or partially-qualified (* at the end of the substring). Beginning with *, all following characters are treated as concordant.
This field corresponds to the request name in HSMS statements.
- Rej.
<alphanumeric 1..1> defines whether the request is rejected.
With “R” the request is rejected.
With “O” the operator is requested to specify a VSN.
If this field contains a blank, the request is accepted.

- A/F
<alphanum 1..1> defines whether a reservation is to be allocated to an ARCHIVE directory (A) or to a file (F). If this field is not set, then the following ARCHIVE-Directory/Filename field will not be ignored, no matter what the content is.
- ARCHIVE-Directory / Filename
<filename 1..54> defines an ARCHIVE directory file if the volumes are requested with ARCHIVE or HSMS, or a file is to be created on specific volumes.
Depending on the A/F field contents, a file name with catalog ID and user ID has to be specified for an ARCHIVE directory file and a file name without catalog ID and user ID for a file.

Whether the partially-qualified specification of Archive-Directory or Filename is possible also depends on A/F:

- With A/F= A (HSMS/ARCHIVE application):
The name of the ARCHIVE directory file is a fully-qualified file name and is divided into CATID, USERID und FILENAME (e.g. :CATD:\$SYSHSMS.DIRECTORYSYSBACKUP). The parts can be individually specified as partially-qualified (with * at the end) or they can be omitted.

Possible specifications (examples) for CATID, USERID und FILENAME:

CATID	:ABC:	fully-qualified specification
	:A*:	partially-qualified specification: has to begin with A in this example (or only A)
	<empty>	will not be checked, i.e. always valid
USERID	\$ABC	fully-qualified specification
	\$A*.	partially-qualified specification: has to begin with A in this example (or only A)
	\$.	must conform to the DEFLUID of the CLASS2OP
	<empty>	will not be checked, i.e. always valid
FILENAME	ABC	fully-qualified specification
	A*.	partially-qualified specification: has to begin with A in this example (or only A)
	<empty>	will not be checked, i.e. always valid

- With A/F =F:
The filename can be specified partially-qualified (* at the end). Beginning with *, all following characters are treated as concordant.

The host-specific parameter CID-UID (see Appendix, [page 218](#)) specifies whether the catalog ID (Catid) and the user ID (Userid) have to be specified for a file.

- Free-Pool-Name
<alphanum 1..54> defines the free tape pool from which the volume requested is to be reserved. 54 blanks designate the free tape pool *NO.

The following table shows examples for the specification of partially-qualified values of the fields Userid, Jobname, Filename and ARCHIVE-Directory described above:

Field in reservation file	Valid values	Invalid values
Userid	USERID* *ANY <only blanks> * and rest with blanks	*ANYX *ANY x USER*DXX *A
Jobname	JOBNAMEX JOBNA* *ANY <only blanks> * and rest with blanks	*ANYX *ANY x JOB*XX *A
Filename	FILE.NAME FILE.NAME* FILE.* *ANY <only blanks> * and rest with blanks	FILE.NAME* A *ANY x FILE*XX *A
ARCHIVE-Directory	:X:\$USER.DIR-NAME :XAB*:\$USER*.DIR* :*\$USER.DIR-NAME* \$USERID.DIR-NAME DIR-NAME :YAB:\$DIR-NAME :CATD:DIR-NAME	:ABCDX*:\$USERID.DIR-NAME :CATD:\$USER*XXX.DIR-NAME DIR-NAME* XXX :C*TD:\$X...DIR-NAME :CAT:\$*ABC.DIR-NAME

7.3.2 Evaluation of the reservation file

Prerequisite

The enter files of MARENCPC and MARENUCP must be adapted to permit the reservation file to be evaluated.

The following line has to be inserted in the procedure files for starting the MARENCPC and MARENUCP tasks before the control program call, i.e. before the line /START-MARENCPC or /START-MARENUCP respectively:

```
/ADD-FILE-LINK LINK-NAME=MARENLMF, FILE-NAME=<lmf_name>
```

<lmf_name> Name of the reservation file which is to be used.

If the reservation file is not stored under the SYSMAREN ID, then the complete path name has to be specified and the file must have the attribute SHARE=YES. Otherwise the file cannot be found by MARENCPC (the message MARLM01 will be output and MARENCPC will be terminated).

Evaluation procedure

When a free volume is requested, the entries in the reservation file are read sequentially.

For each entry the fields defined as comparison criteria are compared with the corresponding parameters of the volume request. Which fields are defined as comparison criteria is described below for the individual statements.

If a field contains blanks or *ANY, the comparison will be positive regardless of the value of the parameter.

As soon as an entry is found which matches all the comparison criteria, the following information is transferred from the entry to MARENCPC and MARENUCP, where it is used for selecting the volume:

- location
- Number range
- Free-Pool-Name
- Reservation rejection

The read operation is terminated. No further entries in the reservation file are checked.

If no entry is found which matches all the comparison criteria, the volume request is rejected.

RESERVE-FREE-VOLUME statement

MARENCP evaluates the reservation file using the RESERVE-FREE-VOLUME statement of the MAREN or MARENADM utility routine.

Comparison criteria:

- User ID
- File name
- Volume type
- location
- Start of number range
- End of number range

If the reservation file entry contains an "A" in the "Utilization type (A/F)" field or the name of an ARCHIVE directory, the comparison is negative.

ARCHIVE statements

MARENCP evaluates the reservation file using the ARCHIVE statements POOL, SAVE and EXPORT.

Comparison criteria:

- User ID
- ARCHIVE-Directory
- Volume type
- Start of number range
- End of number range
- Jobname

SECURE-RESOURCE-ALLOCATION command

The SECURE-RESOURCE-ALLOCATION command reserves system resources such as private volumes and/or devices for private volumes. MARENCP evaluates the reservation file when this is done.

Comparison criteria:

- File name
- User ID
- Jobname
- Volume type

If the reservation file entry contains an ARCHIVE directory, the comparison is negative.

Scratch request

A volume is requested but no VSN is specified.

- File name
- User ID
- Jobname
- Volume type

7.3.3 Editing the reservation file with MARENLM

The administrator can process the reservation file with the MAREN Location Manager (MARENLM).

MARENLM does not check the validity of the values entered. The user is responsible for doing this.

MARENLM attempts to open the reservation file in “read/write” mode. If the file is write-protected, MARENLM accesses it in read-only mode. A corresponding message is issued. The reservation file is opened and the MARENLM primary mask appears containing the current data.

7.3.3.1 Starting and terminating of MARENLM

The MARENLM utility routine is loaded and started using the START-MARENLM command under an ID with the system privilege TAPE-ADMINISTRATION.

START-MARENLM	Alias: MARENLM
VERSION = *STD / <product-version mandatory-man-corr> / <product-version mandatory-man-without-corr> / <product-version without-man-corr>	
,MONJV = *NONE / <filename 1..54 without-gen-vers>	
,CPU-LIMIT = *JOB-REST / <integer 1..32767 seconds>	

VERSION =

The selected MARENLM version is used.

VERSION = *STD

Before MARENLM is called, the version is set using the SELECT-PRODUCT-VERSION command (in system mode). This set version is used as the default version.

VERSION = <product-version mandatory-man-corr>

Full version identifier.

VERSION = <product-version mandatory-man-without-corr>

Version identifier excluding the correction status.

VERSION = <product-version without-man-corr>

Version identifier excluding the release and correction status.

MONJV =

Specification of a job variable for monitoring the MARENLM run.

MONJV = *NONE

A monitor job variable is not used.

MONJV = <filename 1..54 without-gen-vers>

Explicit specification of the job variable for monitoring the MARENLM run.

CPU-LIMIT =

Maximum CPU time in seconds allocated for the program.

CPU-LIMIT = *JOB-REST

The remaining CPU time is to be used for the job.

CPU-LIMIT = <integer 1..32767 seconds>

Only the specified time is to be used.

When MARENLM is started, the MARENLM basic form appears. The reservation file can now be managed (File menu) or edited (using shortcut keys or the relevant control statements).

MARENLM can be terminated in the following four ways:

1. by selecting *Exit* from the *File* menu
2. by pressing the function key **F3**
3. by entering the control statement EXIT in the command line
4. by pressing the function key **F12** in the basic form

When you terminate MARENLM an open reservation file, is only closed and **not saved**. Modifications have to be saved explicitly (see menu options *Save* and *Save as* in the *File* menu).

7.3.3.2 The MARENLM basic form

MARENLM uses FHS forms. The [figure 9](#) shows the MARENLM basic form. Refer to the “FHS” manual [[9](#)] for further details. The interface is language-dependent. The language of the user interface can be set for a task using the MODIFY-MSG-ATTRIBUTES command. The English user interface is described here:

```

File
-----
                                The Maren Location Manager
-----
File :
                                List of location specification      More :
S   Location      Start-VSN   Last-VSN   Vol.Type   From 0 to 0 of 0
A/F      ARCHIVE-Directory / Filename   Userid  Jobname  Rej.
-----
*****End of data*****
-----

CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=FOR.  F8=BACK.  F9=MOD  F12=CANCEL
  
```

The screenshot shows the MARENLM basic form interface. It is enclosed in a box with a dashed border. The interface is divided into several sections, indicated by numbered callouts (1) through (5) on the right side:

- (1) Points to the title bar area containing "File" and "The Maren Location Manager".
- (2) Points to the status area containing "File : List of location specification More :".
- (3) Points to the work area containing a table of location specifications and a message "*****End of data*****".
- (4) Points to the command prompt area containing "CMD==>".
- (5) Points to the function key area containing "F1=HELP F3=EXIT F4=INSERT F5=ERASE F7=FOR. F8=BACK. F9=MOD F12=CANCEL".

Figure 9: Structure of the MARENLM basic form

Menu bar (1)

The menu bar contains the available menu titles. Each of which, in turn, contains a group of menu options that are displayed in a drop-down menu below the menu title. From the *File* menu in the MARENLM menu bar, you can select the functions required to manage the reservation file.

Status area (2)

The status area informations you of the form contents and names the reservation file that is currently open.

Work area (3)

The work area displays the entries in the open reservation file and/or prompts a user selection. This is where parameters are queried or messages issued. A maximum of 3 entries are displayed in the work area. If not all entries can be displayed in the work area, the user can page through the work area accordingly. Entries to be edited can be selected. The selection is made with “x”, “X”, “/”, “A” or “a” in first column (column heading “S”). “x”, “X”

or “/” selects an existing entry. The entry selected can then be changed or deleted using the function keys (or the relevant control statement in the command line). Positions for entering new entries can be selected with “x”, “X”, “/”, “a” or “A”.

If the entry is not selected, then the user cannot access the columns from “Location” to “FREE-POOL Name” (see page 139 and 140).

The end of the reservation file is indicated by the following line:

```
*****End of data*****
```

If no reservation file is open this line is displayed directly below the status area and no selection can be made in the work area. A new reservation file contains 3 “empty” entries which can be selected and edited.

Dialog boxes in which the parameters needed for an action are queried or in which messages are issued are also opened in the work area.

Command area (4)

The user can enter statements for interactive operations in the command line (see “[Shortcut keys and control statements](#)” on page 131).

Display area - key area (5)

The display area contains an overview of the current function key allocation.

Working with the MARENLM basic form

In the MARENLM basic form, menu options can be selected, commands can be issued using shortcut keys and control statements can be entered in the command area.

The functions pertaining to the management of the reservation file are all contained in the *File* menu in the menu bar.

You access the menu bar by pressing the cursor key **[POS 1]** or **[HOME]**. In order to view the menu options, the selected menu title has to be confirmed with **[DUE]**.

Within the menu, the options are numbered (starting with 1). To select an option from the menu, its number must be entered in the field in front of the first menu option. Depending on the menu and on the processing status, the field may already contain an option number. Confirm your entry by pressing the **[DUE]** key.

If MARENLM requires further information in order to execute an action, a dialog box will be opened. You can enter the parameters MAREN needs in the dialog box. This manual contains a detailed description of the parameters following the function they belong to.

Messages

MARENLM messages are issued in a dialog box. To close the dialog box again, press the **F3** or **F12** key.

Error messages

If problems occur while a reservation file is being generated or opened, a DMS message is issued. A brief error description is output together with the four-character return code. If you require further information on the meaning of the return code, enter the following statement in the command line:

```
sys /help-msg DMS<dms-returncode>
```

When the complete error description has been displayed, you can return to MARENLM by pressing the **DUE** key.

Shortcut keys and control statements

The object of shortcut keys is to speed up the entry of standard actions. The command is executed when a specific function key is pressed. The key area displays the function key allocations for various standard situations.

Control statements can be entered in the command area. For further information on control statements refer to the manual "FHS" [9].

The table below contains the MARENLM shortcut keys (function keys) and the control statements they belong to. Alternatively to the function keys, control statements can be entered in the command area.

Key	Control statement	Meaning
F1	HELP	Calls context-sensitive help from FHS.
F3	EXIT	Terminates MARENLM, closes a dialog box.
F4	INSERT	Inserts a new entry in the reservation file. The function can only be used if you marked an entry before. If you mark an entry with "X" or "/" the new entry is inserted above the marked entry, if you use "A" to mark an entry, the new entry will be inserted below the one you marked.

continued ➡

Key	Control statement	Meaning
F5	ERASE	Deletes an entry from the reservation file. The function can only be used if you marked an entry before with "X" or "/".
F7	FORWARD; +	Pages forward to the next page (3 entries).
	+n	Pages forward n entries.
	++	Pages forward to the end of the file.
F8	BACKWARD, -	Returns to the previous page (3 entries).
	-n	Pages back n entries.
	--	Pages back to the start of the file.
F9	MODIFY	Modifies an entry. The function can only be used if you marked an entry before with "X" or "/".
F12	CANCEL	Cancels a function or selection, closes a dialog box. Terminates MARENLM when called from the basic menu.
K2	SYS	Switches to BS2000 command mode. The command is executed with SYS and when you press DUE , you return to the program mode. MARENLM is interrupted by pressing K2 . You return to the program with the command RESUME-PROGRAM.
K3	RESHOW	Refreshes the screen contents. If the menu is displayed incompletely, e.g. after an interruption with K2 , this command refreshes the screen.

If no function keys are available you can allocate functions to the P keys using the SETP control statement. This allocation with SETP is only valid in the current MARENLM session.

The SETP control function is entered as follows:

$$\text{SETP}_{\left\{ \begin{array}{l} P_n \\ (P_n, \dots, P_m) \\ P_n-P_m \end{array} \right\}} \left\{ \begin{array}{l} \text{ON} \\ \text{OFF} \end{array} \right\} [, \dots]$$

Operands

- Pn the P key with the number n
(Pn,...,Pm) all P keys listed, Pn,...,Pm
(Pn-Pm) the entire range of P keys, from Pn to Pm
ON allocates the F key to the specified keys
OFF cancels the allocation

The SETP operands can be specified several times. They have to be separated by a comma, as shown in the example below. The number of blanks surrounding each comma is irrelevant.

Example

```
SETP P1 ON, P2 OFF, (P3,P7,P8) ON, (P4-P6) OFF
```

This SETP control statement allocates the keys as follows:

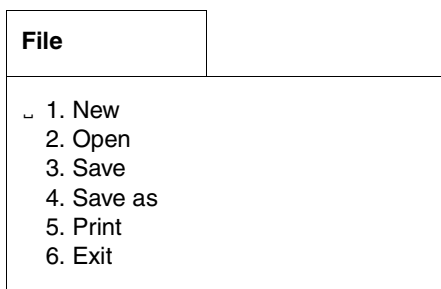
```
P1 - F1, P3 - F3, P7 - F7, P8 - F8
```

The allocation of P2 and of P4, P5 and P6 was canceled.

7.3.3.3 The menu options of MARENLM

MARENLM is operated using the options of the *File* menu. Systems support staff can use the following menu options to manage the reservation file:

1. *New*
Creates a new reservation file and opens it for processing.
2. *Open*
Opens an existing reservation file for processing.
3. *Save*
Saves the current processing status in the reservation file.
4. *Save as*
Creates a backup copy of the reservation file that is currently open under a new file name.
5. *Print*
Prints the contents of the reservation file to a file.
6. *Exit*
Closes MARENLM.



1. File: New

Option *1 (New)* in the *File* menu is used to create a new reservation file and to open it for subsequent processing. The new file contains three “empty” entries, which are already selected for processing (i.e. the fields can be modified immediately).

The name of the new reservation file can be entered in the following dialog box.



Figure 10: Creating and opening a new reservation file

File name Name of the new reservation file. If the file already exists, the user is requested to specify a new name.

2. File: Open

Option 2 (*Open*) in the *File* menu opens an existing reservation file for processing. Any modifications made are not written to the file until it is saved (see options *Save* and *Save as*).

The name of the reservation file is queried in the following dialog box.

```

File
:.....:-----
:      Open a file      :
:-----:-----
:      Introduce the name of the file you want to open :
:      $sysmaren.lmf.file.1
:                                          : 0 of 0
:                                          : me   Rej.
:-----:-----
: CMD==>                               : *****
: F1=HELP  F3=EXIT  F12=CANCEL          :
:.....:-----

-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=F0R.  F8=BACK.  F9=MOD  F12=CANCEL

```

Figure 11: Opening an existing reservation file

File name Name of the reservation file. The file must already exist. If the file selected is not a reservation file (internal structure), the function is rejected.

3. File: Save

Option 3 (*Save*) in the *File* menu saves all entries in the reservation file that was opened with the menu option *Open* or *New*. The file is overwritten without a confirmation being requested.

The option *Save as* allows you to save the entries in another file.

4. File: Save as

Option 4 (*Save as*) in the *File* menu saves the current processing status of the reservation file in another file.

The name and version of the reservation file to which you want to save is queried in the following dialog box.

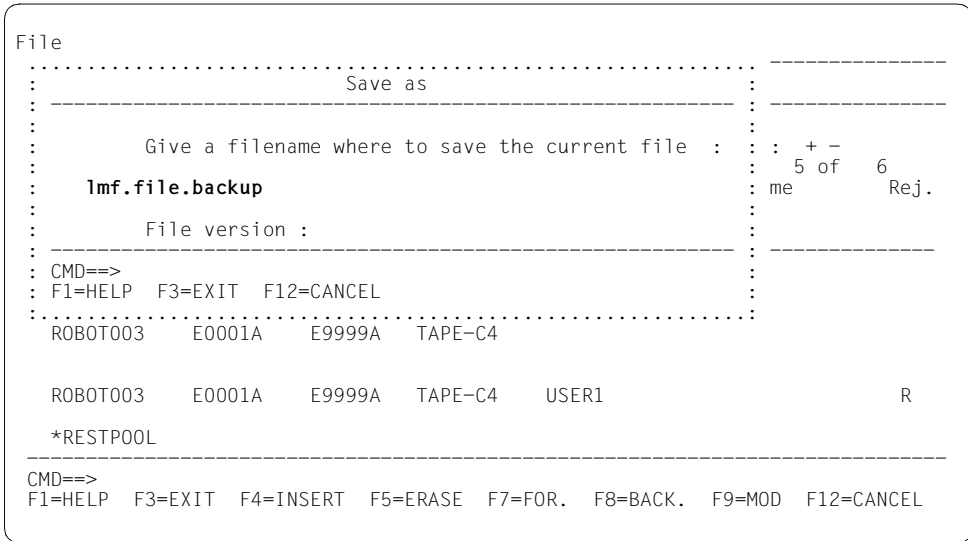


Figure 12: Saving the reservation file in another file

File name Name of the file to which the current processing status is to be saved. If the file does not as yet exist, it will be created. If the file already exists, it is overwritten without confirmation being requested.

The version number of the reservation file can be “1” or “2” (1 - without the FREE-POOL field, 2 - with the FREE-POOL field). Version number “2” is only supported by MARENLM V2.0A.

5. File: Print

Option 5 (*Print*) in the *File* menu outputs the current processing status of the reservation file to a file in the form of a table (but without printer control characters). The contents of the file can subsequently be printed out using the PRINT-DOCUMENT command (via the SYS control statement or after MARENLM has been terminated).

The name of the file to which you want to save the entries is queried in the following dialog box.

```

File
: .....:-----
:               Print               :
: .....:-----
:               Please enter the name of the print file : : + -
:               :                               : 5 of 6
:               :                               : me   Rej.
:   out.lmf.file.1                               :
: .....:-----
: CMD==>                                         :
: F1=Help  F3=Exit  F12=Cancel                  :
: .....:-----
:
:  ROBOT003   E0001A   E9999A   TAPE-C4
:
:  ROBOT003   E0001A   E9999A   TAPE-C4   USER1                               R
:
: *RESTPOOL
: .....:-----
: CMD==>                                         :
: F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=FOR.  F8=BACK.  F9=MOD  F12=CANCEL

```

Figure 13: Printing the reservation file

File name Name of the file to which the edited current processing status is to be output. If the file does not as yet exist, it will be created. If the file already exists it is overwritten without a confirmation being requested

Layout of the data edited for printing

The output begins with the heading “The Maren Location Manager”. This is followed by the name of the edited reservation file and the number of records it contains. These entries are output in a table (180 characters wide). The columns appear in the same order as in the menu (three lines are required here). The following table lists the printout columns and the relevant menu columns:

Column in the printout	Column in the menu
Loc.	location
StartVSN	First-VSN
EndVSN	Last-VSN
Vol.type	Vol. Type
Userid	Userid
Jobname	Jobname
Re	Rej.
A/F	A/F
Arch.dir./filename	ARCHIVE-directory / Filename
Free-Pool-Name	FREE-POOL name

Example

The Maren Location Manager

File name : out.lmf.file.1

Number of records : 6

Loc.	StartVSN	EndVSN	Vol.type	Userid	Jobname	Re	A/F	Arch.dir./filename	Free-Pool-Name
ROBOTER1	C0001A	C0499A	TAPE-C4	USER1			F		
ROBOTER2	D0001A	D9999A	TAPE-C4	USER2					
ROBOTER1	C0500A	C0999A	TAPE-C4	USER3					
ROBOTER3	E0001A	E9999A	TAPE-C4						
ROBOTER3	E0001A	E9999A	TAPE-C4	USER1		R			
ROBOTER3	E0001A	E9999A	TAPE-C4	USER2		R			

6. File: Exit

MARENLM is terminated with option 6 (*Exit*) in the *File* menu.

Note that the current processing status of the reservation file will not be saved. If any modifications have been made to the reservation file and you have not saved them with option 3 (*Save*) or option 4 (*Save as*), then MARENLM opens a window in which you must confirm termination.

You can also terminate MARENLM by pressing the **F3** key, by entering the control statement EXIT or by pressing the **F12** key. You will then be prompted for confirmation before MARENLM is terminated.

```

File
: ..... Confirmation to quit ..... : -----
: .....                               : -----
: Are you sure you want to quit MARENLM ? 1 1.YES :
:                                           2.NO :
:                                           : More : + -
:                                           : om   3 to 5 of 6
:                                           : Jobname      Rej.
:                                           :
:                                           : -----
:                                           :
:                                           :
:                                           :
: .....                               :
ROBOT003      E0001A      E9999A      TAPE-C4
ROBOT003      E0001A      E9999A      TAPE-C4      USER1      R
*RESTPOOL
-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=F0R.  F8=BACK.  F9=MOD  F12=CANCEL

```

Figure 14: Terminating MARENLM

7.3.3.4 Editing entries in the reservation file

MARENLAM does not perform a logical check. Not all fields of the reservation file need be assigned a value.

Modifying entry records

The fields of the entry record are write-protected. Entries that are to be modified first have to be selected by entering "X" or "/" in the selection column. The paging function can be used to page through the entries.

A selection is confirmed by pressing **DUE**. Following that, the modify function is called by pressing the **F9** key or by entering the control statement MODIFY and pressing **DUE**.

The fields of the selected entries can now be modified. When all modifications have been made, the entries are protected again against overwriting by pressing **[DUE]**.



If the reservation file is just being created (option *New* in the *File* menu) the work area contains 3 “empty” entries. The entries can be modified immediately. They only have to be selected first, if the **[DUE]** key has already been pressed or if another function has already been called.

Inserting entry records

In order to insert a new entry record, an existing entry above or below which the new entry is to be included must first be selected in the selection column. Several positions can be selected simultaneously for new records to be inserted.

The following selections are available:

- “X” or “/” means that the new entry is inserted above the selected entry
- “A” means that the new entry is inserted below the selected entry

A selection is confirmed by pressing **[DUE]**. Following that, the insert function is called by pressing the **[F4]** key or by entering the control statement INSERT and pressing **[DUE]**.

The new entries are initially empty. They can now be modified. When all modifications have been made, the entries are protected again against overwriting by pressing **[DUE]**.

Deleting entry records

Entries that are to be deleted must first be selected with “X” or “/”. The paging function can be used to page through the entries.

A selection is confirmed by pressing **[DUE]**. Following that, the delete function is called by pressing the **[F5]** key or by entering the control statement ERASE and pressing **[DUE]**.

After that the selected entries are no longer available. They cannot be undeleted. Entries that were deleted by mistake can be reconstructed by recovering the status of the last backup of the reservation file (via the *File* menu and then option *Open*).

7.3.4 Editing the reservation file with EDT

A reservation file is edited with EDT just like any other file. You need only bear in mind that the format of the file (see the table below) must be retained. A reservation file which was created with MARENLM can be edited with EDT and vice versa.

Format of the entries in the reservation file

Field content	Position	Length
location	2	8
Start VSN of the number range	10	6
End VSN of the number range	16	6
Volume type	22	8
User ID	30	8
Jobname	38	8
Reservation rejection	46	1
Utilization type (for an ARCHIVE directory or file)	47	1
File name (ARCHIVE directory or file)	48	54
Free pool name (name of a free tape pool)	102	54

7.3.5 Examples

The examples below show reservation files using MARENLM masks. They can naturally also be edited with EDT.

Example 1: Defining a location for a specific user

When issuing a scratch request, USER1 can only access volumes in the location ROBOT001 and USER2 can only access volumes in the location ROBOT002. All other users access the default location.

In this case, the parameters have the following values:

```

File
-----
                        The Maren Location Manager
-----
File : maren.lmf.1
                        List of location specification
                        From      More :
S Location  Start-VSN  Last-VSN  Vol.Type  Userid    1 to 3 of 3
A/F        ARCHIVE-Directory / Filename  Jobname   Rej.
FREE-POOL-Name
-----
ROBOT001                                USER1

ROBOT002                                USER2

*ANY

-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=F0R.  F8=BACK.  F9=MOD  F12=CANCEL

```

Example 2: Reserving a volume in a specific location for a specific user

It is also possible to make very specific allocations. For instance, it is possible to reserve a specific volume from the location allotted to an archive system for a specific user who wishes to use the volume with ARCHIVE, i.e. with a specific ARCHIVE directory.

To achieve this, the parameters have to have the following values:

```

File
-----
                        The Maren Location Manager
-----
File : maren.lmf.2
                        List of location specification
                        From 1 to 2 of 2
S Location Start-VSN Last-VSN Vol.Type   Userid   More :
A/F      ARCHIVE-Directory / Filename      Jobname  Rej.
FREE-POOL-Name
-----
ROBOT      MT0001  MT0099  TAPE-C2   ADMIN    BACKUP
A          :CAT:$ADMIN.ARCHIVE.DIR

*****End of data*****

-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=FOR.  F8=BACK.  F9=MOD  F12=CANCEL

```

The user ID ADMIN using the BACKUP job and the ARCHIVE directory ARCHIVE.DIR, can use the TAPE-C2 volumes MT0001 to MT0099 at the location ROBOT.

In case of a HSMS request, BACKUP corresponds to the request name.

Example 3: Defining a location for a specific volume type

If a scratch request is issued for volume type TAPE-C4, the location ROBOT001 is to be accessed. All other volume requests access the default location.

In this case, the parameters have the following values:

```

File
-----
                                The Maren Location Manager
-----
File : maren.lmf.3
                                List of location specification      More :
                                From 1 to 2 of 2
S Location Start-VSN Last-VSN Vol.Type Userid Jobname Rej.
A/F      ARCHIVE-Directory / Filename
FREE-POOL-Name
-----
ROBOT001                                TAPE-C4

*ANY

*****End of data*****
-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=FOR.  F8=BACK.  F9=MOD  F12=CANCEL

```


If a user issues a scratch request for the file called “TEST”, the reservation has to be made with the location ROBOT002.

In this case, the parameters would have the following values:

```

File
-----
                                The Maren Location Manager
-----
File : maren.lmf.3
                                List of location specification
                                From      More :
S Location  Start-VSN  Last-VSN  Vol.Type  Userid    1 to 3 of 3
A/F        ARCHIVE-Directory / Filename  Jobname    Rej.
FREE-POOL-Name
-----
ROBOT002           TAPE-C4
F      TEST
ROBOT001           TAPE-C4
*ANY
-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=FOR.  F8=BACK.  F9=MOD  F12=CANCEL

```

Note the order of the entries in this example: if entries 2 and 3 were to be switched around, the entry for ROBOT002 would not be read by MARENLM because the default location would be found first and the reservation made.

Example 4: Defining a number range for a user ID

A range of VSNs is to be defined for USER1 in the default location.

In this case, the parameters have the following values:

```

File
-----
                          The Maren Location Manager
-----
File : maren.lmf.4
                          List of location specification
                          More :
                          1 to 2 of 2
S Location Start-VSN Last-VSN Vol.Type Userid Jobname Rej.
A/F ARCHIVE-Directory / Filename
FREE-POOL-Name
-----
*ANY          MT0001   MT0099          USER1

*ANY

*****End of data*****
-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=F0R.  F8=BACK.  F9=MOD  F12=CANCEL

```

Example 5: Using the reject field

All scratch requests for volume type TAPE-C2 are to be rejected.

```

File
-----
                        The Maren Location Manager
-----
File : maren.lmf.5
                        List of location specification
                        More :
                        From 1 to 2 of 2
S Location Start-VSN Last-VSN Vol.Type Userid Jobname Rej.
A/F ARCHIVE-Directory / Filename
FREE-POOL-Name
-----
*ANY                                TAPE-C2                                R

*ANY

*****End of data*****
-----
CMD==>
F1=HELP F3=EXIT F4=INSERT F5=ERASE F7=FOR. F8=BACK. F9=MOD F12=CANCEL

```

Example 6: Combinations

As shown in the following example, the various application options offered by MARENLM can be combined:

```

File
-----
                        The Maren Location Manager
-----
File : maren.lmf.6
                        List of location specification
                        More : +
                        1 to 3 of 13
S Location Start-VSN Last-VSN Vol.Type Userid From Jobname Rej.
A/F ARCHIVE-Directory / Filename
FREE-POOL-Name
-----
ROBOT002 MT0001 MT0005 TAPE-C4 USER1 TEST
F FILE1
-----
ROBOT TAPE-C4 USER1 R
-----
*ANY USER2
-----
CMD==>
F1=HELP F3=EXIT F4=INSERT F5=ERASE F7=FOR. F8=BACK. F9=MOD F12=CANCEL

```

→ 1)
→ 2)
→ 3)

```

File
-----
                        The Maren Location Manager
-----
File : maren.lmf.6
                        List of location specification
                        More : + -
                        4 to 6 of 13
S Location Start-VSN Last-VSN Vol.Type Userid From Jobname Rej.
A/F ARCHIVE-Directory / Filename
FREE-POOL-Name
-----
*ANY TAPE-C2
-----
ROBOT002 MT0006 MT0010 TAPE-C3 USER3
A ARCHIVE1
-----
ROBOT003 MT2541 MT2542 TAPE-C2 TEST2
-----
CMD==>
F1=HELP F3=EXIT F4=INSERT F5=ERASE F7=FOR. F8=BACK. F9=MOD F12=CANCEL

```

→ 4)
→ 5)
→ 6)

- 1st entry: The user USER1 with the job name TEST may use the TAPE-C4 volumes from the number range MB0001 through MB0005 for the file FILE1 at location ROBOT002.
- 2nd entry: Any other requests for TAPE-C4 cartridges by the user USER1 are rejected.
- 3rd entry: All requests from the user USER2 are satisfied from the location the user has specified with ADD-MAREN-FILE-ENTRY LOCATION= ... or in ARCHIVE/HSMS, or from the DEFAULT-HOME-LOCATION.
- 4th entry: All requests for TAPE-C2 are satisfied from the location the user has specified with ADD-MAREN-FILE-ENTRY LOCATION= ... or in ARCHIVE/HSMS, or from the DEFAULT-HOME-LOCATION.
- 5th entry: Requests for TAPE-C3 cartridges for the ARCHIVE directory ARCHIVE1 by the user USER3 are satisfied from the location ROBOT002 and the number range MB0006-MB0010.
- 6th entry: This entry is meaningless as requests for TAPE-C2 were already dealt with in the 4th entry.

Example 7: Allocating the free tape pool *TSOS

It may be necessary to modify the free tape pool to restore the old behavior, since the owner of the directory determines the presetting of the free pool if MAREN is used in combination with HSMS/ARCHIVE >= V6.0.

All directories of the SYSHSMS ID shall receive free tapes out of the free tape pool FREE-POOL=*TSOS (see line 1 in the list of the following screen). All directories of the TSOS ID will be allocated to the free tape pool FREE-POOL=*TSOS by MAREN as default if this pool exists.

```

File
-----
                                The Maren Location Manager
-----
File : maren.lmf.7                List of location specification      More :
                                  From      1 to  2 of  2
S Location Start-VSN Last-VSN Vol.Type  Userid  Jobname  Rej.
A/F        ARCHIVE-Directory / Filename
FREE-POOL-Name
-----
*ANY
A          $SYSHSMS.
*TSOS
*ANY

*****End of data*****

-----
CMD==>
F1=HELP  F3=EXIT  F4=INSERT  F5=ERASE  F7=F0R.  F8=BACK.  F9=MOD  F12=CANCEL

```

All HSMS/ARCHIVE jobs shall receive their free tapes out of the free tape pool FREE-POOL=*TSOS.

```

File
-----
                        The Maren Location Manager
-----
File : maren.lmf.7
                        List of location specification
                        More :
                        From 1 to 2 of 2
S Location Start-VSN Last-VSN Vol.Type Userid Jobname Rej.
A/F ARCHIVE-Directory / Filename
FREE-POOL-Name
-----
*ANY
A
*TSOS
*ANY

*****End of data*****

-----
CMD==>
F1=HELP F3=EXIT F4=INSERT F5=ERASE F7=FOR. F8=BACK. F9=MOD F12=CANCEL
.

```

8 ARCHIVE / HSMS / FDDRL and MAREN

8.1 ARCHIVE

When MAREN and ARCHIVE are used together, information on volumes exists not only in the MAREN catalog but also in various ARCHIVE directories. This means that there is always a theoretical danger of these information sources contradicting one another. The link between MAREN and ARCHIVE is designed to avoid this problem. It fulfils the following criteria:

1. The information in the MAREN catalog must be consistent with the information in all ARCHIVE directories. I.e. a VSN should not be identified as being “free” in the MAREN catalog but still contained in an ARCHIVE directory.
2. The administration of VSNs is so simplified that a VSN only has to be entered once. A VSN which is newly added to an ARCHIVE directory needs no further MAREN command, as the MAREN catalog is automatically updated correspondingly.
3. It must be possible to allocate certain ARCHIVE applications to certain VSNs or a certain range of VSNs. For instance, the computer center save operation should always be executed on a specific set of tapes.
4. When using the automatic free tape allocation facility, it should not be necessary to enter a VSN manually. The MAREN catalog and ARCHIVE directory should be updated automatically. One way of doing this would be via the ARCHIVE parameter TAPES= OPERATOR.

The products MAREN and ARCHIVE (see the “ARCHIVE” manual [2]) can be installed in the computer center either individually or combined. If both are installed, optimal interoperation is ensured without mixing the individual functions of the two products. Both catalogs (ARCHIVE directory, MAREN catalog) remain intact.

The MAREN catalog is the central administration point for all volumes, including ARCHIVE backup tapes, in the computer center. The information on the backup volumes contained in the MAREN catalog must always accurately reflect the actual status.

MAREN makes a basic number of volumes available to ARCHIVE; these are appropriately flagged for ARCHIVE processing. These free volumes can be incorporated in the ARCHIVE free tape pool or requested via the console during save runs. This prereservation of free ARCHIVE volumes within the MAREN pool can be implemented for specific directory names or for ARCHIVE globally, and is the responsibility of the MAREN administrator.

This allows the computer center to supply the normal save runs (e.g. daily, weekly or monthly save runs, etc.) with the correct tape material in the correct directories. User save systems with their own directories can use the above mechanism or access any number of volumes from the global MAREN free tape pool for ARCHIVE.

There are three fundamentally different points of contact between ARCHIVE and the MAREN system:

1. ARCHIVE statements for administration of the directories
2. DMS processing of the save volumes during an ARCHIVE run
3. Free tape requests via the operator during an ARCHIVE save run.

The following sections explain in more detail how these interfaces are implemented in MAREN.

8.1.1 ARCHIVE free tape pools in the MAREN catalog

In addition to the general free tape pool in MAREN, special free tape pools exclusively for ARCHIVE applications may be created.

The overall structure of ARCHIVE free tape pools in the MAREN catalog may be as follows:

Free tape pool	Application
FREE-POOL=directoryname 1	prereserved for directory 1
...	...
FREE-POOL=directoryname n	prereserved for directory n
FREE-POOL=*TSOS	partially prereserved for other ARCHIVE applications under TSOS or, in HSMS/ARCHIVE V6.0 and higher, for applications whose directory is cataloged under the TSOS ID.
FREE-POOL=*GLOBAL	partially prereserved for all other ARCHIVE applications under any IDs or, from HSMS/ARCHIVE V6.0 on, for applications whose directory is cataloged under any ID



In earlier MAREN versions the free tape pools *TSOS and *GLOBAL were reserved for HSMS and ARCHIVE. In MAREN V9.0B and higher they can also be used by other applications.

All ARCHIVE free tape pools are optional. See [page 158](#) for how to select a pool. If an ARCHIVE free tape pool is set up, then ARCHIVE free tape requests will only be responded to by this pool. Therefore you must ensure that there are enough free tapes maintained in each of the pools.

Only the MAREN administrator can add tapes and MTCs to the ARCHIVE free tape pools. In the case of a free volume, this can be done using one of the following statements:

- if the volumes are not yet in the MAREN catalog:
ADD-FREE-VOLUMES ... , FREE-POOL=...
- if the volumes are already entered in the MAREN catalog:
MODIFY-VOLUME-ATTRIBUTES ... ,SELECT=*FREE(NEW-FREE-POOL=...)

Computer center volumes that have already been reserved can subsequently be allocated to an ARCHIVE free tape pool. This is possible by using the following statement:

```
MODIFY-VOLUME-ATTRIBUTES ... ,SELECT=*RES(NEW-FREE-POOL=...)
```

By the same token, the allocation to an ARCHIVE free tape pool for these volumes can also be canceled (NEW-FREE-POOL=*NO).

The individual values for FREE-POOL effect the following allocation to individual free tape pools in the MAREN catalog:

FREE-POOL=	Meaning
*NO	The volumes are added to the general and not the ARCHIVE related free tape pool.
*GLOBAL	The volumes will be added to the free tape pool for general ARCHIVE applications under any ID.
*TSOS	The volumes will be added to the free tape pool for ARCHIVE applications under the ID TSOS. From HSMS/ARCHIVE V6.0 on, FREE-POOL=*TSOS is the free tape pool for HSMS/ARCHIVE volumes which are cataloged under the TSOS ID.
<filename 1..54 without-gen-vers>	The volumes are added to the free tape pool in the directory specified in this statement.

The specified volume is added to the appropriate free tape pool; if this does not exist, it will be created.

Canceling ARCHIVE free tape pools

Existing ARCHIVE free tape pools can be canceled as follows:

- For free tape pools with free volumes

```
MODIFY-VOLUME-ATTRIBUTES ... ,SELECT=*FREE(FREE-POOL=<freepool> ,
NEW-FREE-POOL=*NO)
```

- For free tape pools with reserved volumes

If the free tape pool is for a directory, the following statement is sufficient:

```
MODIFY-VOLUME-ATTRIBUTES ... ,SELECT=*RES(DIR-NAME=<filename> ,
NEW-FREE-POOL=*NO)
```

If one of the *TSOS oder *GLOBAL ARCHIVE free tape pools is to be canceled, this statement must be entered for all ARCHIVE directories containing volumes from this pool. If there are also volumes which are not in a directory, these must be modified individually or as part of a number range:

```
MODIFY-VOLUME-ATTRIBUTES VOL=*INT(...),SELECT=*RES(NEW-FREE-POOL=*NO)
```

- Deletion of free tape pool when no more volumes are allocated to this free tape pool (free tape pool empty).

```
MODIFY-MAREN-PARAMETERS ... ,
FREE-POOLS=*PARAMETERS(FREE-POOL=<freepool> ,ACTION=*REMOVE)
```

8.1.2 Implicit/explicit reservation from the ARCHIVE free tape pools

The MAREN system permits the reading and writing of a volume only when the volume has been assigned to a user ID in the MAREN catalog, i.e. when it is “reserved”. The volumes in the ARCHIVE free tape pool are not reserved, however, but “prereserved”. This means a volume from an ARCHIVE free tape pool must first be reserved for the requesting user ID, before actual processing can be carried out. This reservation can be implemented either implicitly via the automatic free tape allocation facility MARENUCP or explicitly via the ARCHIVE command “POOL DIRECTORY=...,ADD=(<tvsn>,...)”.

Implicit reservation

If a computer center uses MAREN, it is advisable to leave the administration of the free ARCHIVE volumes completely to the MAREN system and to keep only the written volumes in the ARCHIVE directories. This mode of operation is automatically applied when there are no available volume serial numbers in the directory.

The existing save jobs need not be altered to reserve additional volumes, because if the pool is empty the required VSNs will be requested from the operator with the ARCHIVE command SAVE...,TAPES=POOL. Therefore, the parameter TAPES=OPERATOR need not be included.

If a free tape is requested for an ARCHIVE application, MARENUCP determines the volume serial number of an appropriate free tape and reserves this volume in the MAREN catalog for the requesting user ID.

The ARCHIVE free tape pool from which the tape is then assigned depends both on the type of request and the existence of the individual pools. This is determined by the following criteria, which are applied in the following order:

1. If a directory is being used and a free tape pool exists for this directory, the tape will be assigned from this pool.
2. If the request is output from TSOS respectively if the directory is cataloged under TSOS when using HSMS/ARCHIVE V6.0 or higher and a free tape pool for TSOS exists, the tape is assigned from this pool.
3. If a pool for general ARCHIVE applications (FREE-POOL=*GLOBAL) exists respectively if the directory is not cataloged under TSOS when using HSMS/ARCHIVE V6.0 or higher, the tape will be assigned from this pool.
4. If there is no suitable pool, the tape will be assigned from the general free tape pool in MAREN.

The free tape pool can also be determined via a reservation file, see [“Example 7: Allocating the free tape pool *TSOS” on page 150](#). If a reservation file is used, the rules 1-4 mentioned before do not apply.

If a pool empties during a session, MARENUCP does not automatically use another pool but addresses the operator. The operator must then take the appropriate steps. Until the appropriate steps are taken, all the ARCHIVE tasks are suspended.

Explicit reservation

The prereserved volumes from the ARCHIVE free tape pool in the MAREN catalog can be explicitly reserved using the ARCHIVE command `POOL DIRECTORY=...,ADD=(<tvsn>,...)`. These volumes are then allocated to a specified user ID in the MAREN catalog and entered in the ARCHIVE directory as available. This explicit reservation is not generally logical or necessary, but is nonetheless supported for reasons of compatibility or for unique situation. When using this type of reservation the given sequence for implicit reservation is compulsory. For example, if a free tape pool exists for a particular directory, only tapes from this pool can be reserved for the directory in question.

Special considerations for explicit reservation:

- The volume "<tvsn>" is prereserved for ARCHIVE in the MAREN catalog, but not in the appropriate subset (e.g. prereserved for another directory name). In this case the ARCHIVE command POOL is rejected with the corresponding error message.
- The volume "<tvsn>" is entered in the MAREN catalog as "reserved, computer center volume". This command is only accepted if the volume has already been assigned to the user's own ID, and is neither contained in a directory, nor has it been previously reserved for the ID in an ARCHIVE save run via the automatic free tape allocation. The command is also rejected if a special free tape pool exists for this directory.
- The volume "<tvsn>" is entered in the MAREN catalog as "reserved, foreign volume" (i.e. as a private tape/MTC). This command is only accepted if the volume has been assigned to its own user ID in the MAREN catalog and has not yet been included in an ARCHIVE directory, for which there is also no free tape pool.
- The volume "<tvsn>" is not contained in the MAREN catalog. If it is permitted for volumes not contained in the MAREN catalog to be processed using the MAREN parameter FOREIGN-TAPE-CHECK=N, the volumes will be included in the directory; if not, they are rejected.
- If the VSN of a free volume is specified in the course of an ARCHIVE save run (e.g. SAVE ..., TAPES=<tvsn>), this volume is likewise reserved, provided it has been allocated to a suitable ARCHIVE free tape pool.

8.1.3 Releasing ARCHIVE tapes

The “release session” in the MAREN system (FREE-VOLUMES statement) only releases those ARCHIVE volumes managed in directories which have previously been removed from the relevant directory using one of the following two ARCHIVE commands:

```
PURGE DIRECTORY=...,...
POOL DIRECTORY=...,REMOVE=(<tvsn>,....)
```

In the case of these two ARCHIVE commands, a number of important fields in the archive entry are modified:

Field name	Modifications made by ARCHIVE command
FREE-DATE	is set to the current date, provided all three of the following conditions are satisfied: <ol style="list-style-type: none"> 1. The volume involved is a reserved computer center volume (VOL-STATUS=RESERVED) 2. The ARCHIVE statement is executed under the user ID contained in the archive entry (USER-ID), under the ID TSOS or under the ID SYSHSMS. 3. The volume was reserved by the automatic free tape allocation MARENUCP.
EXPIRATION-DATE	is likewise set to the current date, provided it has not already expired.
INIT	is set to YES for reserved computer center volumes (VOL-STATUS=RESERVED) if the file expiration date has not yet been reached (for the ARCHIVE statement PURGE with the parameter FORCE=YES).
DIR-NAME	is deleted. Special feature: if the volume is assigned to a special directory free tape pool, the DIRNAME field in the archive entry (see user macro MARENA in “MAREN Volume 2” [1]) is filled with the directory name specified for FREE-POOL<filename>, as before. However, it is no longer output for SHOW-VOLUME-ATTR.
ARCH-USAGE	A flag to the effect that the volume is no longer contained in an ARCHIVE directory is set internally. Only if this PURGE indicator is set in the archive entry will the volumes be included in the next release session started by the MAREN administrator.

If for any reason volumes can no longer be removed from a directory using these commands, e.g. because they have been deleted, it must still be ensured that these volumes are included in the release session. This is possible via the MARENADM statement MODIFY-VOLUME-ATTRIBUTES. If the parameter NEW-DIRECTORY-NAME=*NONE is used, the assignment to a directory in the archive entry is reset and the tapes are released in the next release session.

ARCHIVE volumes which have been written without being allocated to a directory are only released during a release session if the volume expiration date has elapsed.

After release, the tapes are reallocated to exactly the same subset of the MAREN free tape pool as they were in before reservation took place.

Premature release of an ARCHIVE backup version

In accordance with the "ARCHIVE" manual [2], the following 4 steps are necessary to reassign a volume whose expiration date has not yet elapsed to a pool:

1. The command PURGE..., FORCE = YES command deletes the backup version in question.
2. The command POOL REMOVE = <tvsn> deletes the volume from the pool.
3. The volume must be newly initialized using the INIT utility program.
4. The command POOL ADD = <tvsn> returns the tape to the pool.

These four steps are considerably simplified by the use of a special ARCHIVE free tape pool and the "implicit reservation" procedure:

1. same as above
2. not applicable
3. the MAREN administrator starts a procedure which executes the release session and the subsequent initialization run.
4. not applicable

8.1.4 Notes

Expiration dates

When expiration dates are allocated for the MAREN catalog, the RETPD entry in the ARCHIVE command is also taken into account. This value is copied to the MAREN field "Volume Expiration Date" when a backup tape is created. The expiration date in the MAREN field "Volume Expiration Date" contains either the RETPD entry or, if it is higher, the standard expiration date set by the MAREN administrator.

The MAREN administrator can modify the expiration dates using the MARENADM statement MODIFY-VOLUME-ATTRIBUTES. A non-privileged user can only modify an expiration date using the ARCHIVE command.

In a PURGE run, the MAREN field "Volume Expiration Date" is set to the current date if the user respectively the administrator did not modify the expiration dates via MAREN.

Handling existing directories

When MAREN is first installed, already existing ARCHIVE directories may continue to be used normally. However, you must note the following:

- The volumes in these directories are not yet identified in the MAREN catalog as belonging to a directory. This means that when the expiration date has been reached, they will be released without first being removed from a directory via the ARCHIVE statement POOL or PURGE.
- If such a directory is deleted, the resetting of the directory name via the MARENADM statement MODIFY-VOLUME-ATTRIBUTES (operand NEW-DIRECTORY-NAME=*NONE) is not necessary to release the volume.
- As the directory name is not entered in the archive entry, the VSNs in the directory cannot be requested via the MARENADM statement SHOW-VOLUME-ATTRIBUTES (operand DIRECTORY-NAME).
- The tapes in these directories are not reserved in the MAREN system exclusively for ARCHIVE applications. They can be overwritten with other utility routines at any time.
- If, however, new tapes are added to such a directory via the POOL statement or the free tape allocation facility, the tapes are then flagged as belonging to a directory and will not be released from the directory until they have been removed from the directory.
- All the differences listed can be rectified if existing ARCHIVE directories are transferred in their entirety to the MAREN catalog with the aid of the MARENADM statement UPDATE-MAREN-CATALOG (INPUT=*BY-ARCHIVE operand).

Handling the tapes of a backup

In ARCHIVE, saved files are combined in a backup version which can be addressed via the `svid` in ARCHIVE statements (see sections "Save version" and "Parallel and serial processing" in the "ARCHIVE" manual [2]). However, in HSMS and consequently in MAREN also, files are combined in a save file identified by its `SAVE-FILE-ID (sfid)` (see [section "Processing backups" on page 165](#)). In MAREN, a save file created with ARCHIVE therefore has to be accessed using its `sfid`.

Access protection for ARCHIVE save tapes

If a volume is reserved in the course of an ARCHIVE save run, e.g. because the parameter `TAPES=OPERATOR` was specified in the `SAVE` statement, the archive entry field `USER-ACCESS` is set as follows as a function of the value of the `SHARE` operand in the ARCHIVE statement `SAVE` or `EXPORT`:

Value in the ARCHIVE statement	USER-ACCESS archive entry field
SHARE=YES	FOREIGN-READ-ONLY
SHARE=NO	OWNER-ONLY

If a volume is reserved by way of the ARCHIVE statement `POOL`, only the local MAREN parameter `DEFAULT-USER-ACCESS` (see [section "Overview of global parameters" on page 224](#)) is used to serve `USER-ACCESS`. The values (`ALL-USERS`, `OWNER-ONLY`, `FOREIGN-READ-ONLY`) are taken over unchanged here.

If ARCHIVE save runs are performed with an already reserved volume, the contents of `USER-ACCESS` are generally not changed.

The only exception to this rule is when `USER-ACCESS` is set to `OWNER-ONLY` and the ARCHIVE save run is executed with the parameter `SHARE=YES`. In this case, the `USER-ACCESS` value is changed to `FOREIGN-READ-ONLY`.

Moreover, the MAREN system offers a special form of access protection for ARCHIVE save tapes: these volumes can only be accessed by ARCHIVE subtasks.

8.2 HSMS

HSMS (see manual “HSMS” [10]) uses ARCHIVE tape pool processing. From the MAREN viewpoint, there is no difference between ARCHIVE and HSMS tape pools.

Two HSMS functionalities which refer to the VSNs are supported in connection with MAREN:

1. Reserving a VSN from an explicit location
2. Modifying the expiration date in the MAREN catalog. If the VSN belongs to an ARCHIVE pool, the expiration date is adjusted to the last HSMS accesses. The value can be modified by the MAREN administrator, but not by a non-privileged user.

HSMS is based on the ARCHIVE software product. HSMS offers the ARCHIVE functions, but presented through a more modern user interface and extended by additional control options.

While ARCHIVE makes no distinction between backup and long-term archiving, HSMS does so quite decisively. HSMS offers separate statements for the individual functions and also manages the volume inventories separately.

8.2.1 Creating and Modifying Archives

The HSMS archive directories are allocated in the MAREN archive entries in the same way as the ARCHIVE directory files, i.e. the name of the HSMS archive directory has to be specified in an allocation within MAREN. The archive name defined for the archive directory is not used. The description of ARCHIVE directory files in [section “ARCHIVE” on page 153](#) therefore also applies to the HSMS archive directories.

HSMS can continue data backup with the existing volume pool and the existing backup files created with ARCHIVE. An HSMS archive is created for that purpose. An existing ARCHIVE directory file can be allocated the HSMS archive as its directory file using the following HSMS statement:

```
//CREATE-ARCHIVE ARCHIVE-NAME=<archivename>,  
                DIRECTORY-NAME=<filename>(NEW-DIRECTORY=*NO)
```

The full scope of HSMS functions will then be available for the archive.

Free volumes are added to or removed from an HSMS archive with the following HSMS statement (which corresponds to the ARCHIVE statement POOL):

```
//MODIFY-ARCHIVE VOLUMES=*ADD/*REMOVE
```

HSMS backup versions are released with the following HSMS statement (which corresponds to the ARCHIVE statement PURGE):

```
//MODIFY-ARCHIVE SAVE-FILES=*DELETE
```

8.2.2 Processing backups

HSMS uses ARCHIVE to create backups on external volumes.

HSMS always writes to a backup file (HSMS operand SAVE-FILE), regardless of the type of backup involved (backup, long-term archiving, EXPORT). The backup file may occupy several tapes. With HSMS, a backup can be written to several different volumes simultaneously (HSMS operand PARALLEL-RUNS). In order to do this, HSMS starts a subtask for each of the parallel runs. Each subtask is assigned its own SUBSAVE number. Within a parallel run, each subtask may utilize several tapes, each of which receives its own SUBSEQ number.

Overview of the fields involved:

SAVE-FILE	name of the backup file
SUBSAVE	subtask number
SUBSEQ	serial number of a subtask's tape

Example 1: backup using the HSMS statement BACKUP-FILES

```
BACKUP-FILES . . . ,SAVE-FILE=*CONTINUE(SAVE-FILE-ID=S.040301.123651),
. . . ,OPERATION-CONTROL=*PARAMETERS(. . . ,PARALLEL-RUNS=3)
```

A backup with SAVE-FILE-ID S.040301.123651 and 3 consecutive backup tasks (ARCHIVE subtasks) is started.

Each subtask is assigned its own SUBSAVE number.

Subtask 1 is assigned SUBSAVE number 0
 Subtask 2 is assigned SUBSAVE number 1
 Subtask 3 is assigned SUBSAVE number 2

Subtask 1 first writes to the MTC with the VSN sich01, then to sich04 and finally to sich06.
 Subtask 2 first writes to the MTC with the VSN sich02 and then to sich05.
 Subtask 3 first writes to the MTC with the VSN sich03.

All of the MTCs (from sich01 to sich06) are assigned the same SAVE-FILE-ID because all together they contain one single backup file (SAVE-FILE).

The following table gives an overview of the SUBSAVE and SUBSEQ assignments:

VSN	SAVE-FILE-ID	SUB-SAVE	SUB-SEQ
sich01	S.040301.123651	0	1
sich02	S.040301.123651	1	1
sich03	S.040301.123651	2	1
sich04	S.040301.123651	0	2
sich05	S.040301.123651	1	2
sich06	S.040301.123651	0	3

You will find a detailed description in the "HSMS" manual [10].

All of the MTCs belong to the same backup. The utilities MAREN and MARENADM can process volumes from one backup with consecutive save runs using the following statements:

- **EXPORT-VOLUME**

This example uses the backup file form example 1:

```
EXPORT-VOLUME . . . , VOLUME=*BY-DIRECTORY(SAVE-FILE-ID=S.040301.123651)
```

- **MODIFY-VOLUME-ATTRIBUTES**

Example:

```
MODIFY-VOLUME-ATTRIBUTES . . . , SELECT=*RESERVED(DIRECTORY-NAME=FILE.X(
SAVE-FILE-ID=*LATEST))
```

- **RETURN-VOLUME (MARENADM only)**

Example:

```
RETURN-VOLUMES . . . , VOLUME=*BY-DIRECTORY(DIRECTORY-NAME=
:CATD:$SYSHSMS.DIRECTORYSYSBACKUP)
```

- **SHOW-VOLUME-ATTRIBUTES**

Example for the use of the last save file but three:

```
SHOW-VOLUME-ATTRIBUTES . . . , DIRECTORY-NAME=FILE.Y(SAVE-FILE-ID=-3))
```

You will find a detailed description of these statements in the manual "MAREN Volume 2" [1].

MAREN can only carry out such processing

- if the backup was performed under MAREN V9.0A or higher and ARCHIVE V6.0 or higher and/or HSMS V6.0 or higher
- or if the MAREN administrator has entered the SAVE-FILE-ID, SUB-SAVE-NUMBER and SUB-SEQUENCE-NUMBER fields for the MTCs of a backup in the MAREN catalog using the MARENADM statement MODIFY-VOLUME-ATTRIBUTES.

The SAVE-FILE-ID of a backup file can be addressed via its absolute name (in this particular example S.040301.123651) using a directory file or relative to the most recent backup. Note that MAREN operates in a network, i.e. the directory file and its absolute path must be unique within that network. Should a directory file called :CAT:\$USER.DIRECTORY, for instance, be located on System A and another directory file of the same name be located on system B within the same network, then MAREN would mix up the backups. They could not be unmistakably allocated to a specific system in that case.

Example 2: dual backup run performed by HSMS and a detailed description of the process

This extensive example shows in 7 steps how the volumes of a directory are saved using HSMS. The example depicts how information concerning the backup tapes changes in the course of a backup, backup continuation or new backup.

1. Entry of the HSMS archive MYMAREN with the directory name :POPP:\$TSOS.MYMAREN.DIR in HSMS.

```
/HSMS
//CREATE-ARCHIVE ARCHIVE-NAME=MYMAREN,ALLOWED-USAGE=*BACKUP(SAVE-FILE-
  STRUCTURE=*SEVERAL-SVID),-
//DIRECTORY-NAME=$TSOS.MYMAREN.DIR,RETENTION-PERIOD=5,S2-DEVICE-
  TYPE=TAPE-C4,LOCATION=HSMSLOC
```

2. Starting the first backup using the PARALLEL-RUNS=4 operand. The output tapes are assigned by MARENUCP.

```
//BACKUP-FILES FILE-NAMES=*FROM-FILE(LIST-FILE-NAME=HOL.PAK),ARCHIVE-
  NAME=MYMAREN,TO-STORAGE=*S2-STORAGE-LEVEL,
  OPERATION-CONTROL=*PARAMETERS(REQUEST-NAME=SFID#001,PARALLEL-RUNS=4,
  REPORT=*FULL,OUTPUT=REPORT.SFID#001)
```

```
% HSM0309 PUBSET 'SES' NOT IN SPECIFIED ENVIRONMENT. PUBSET SKIPPED
% HSM0030 REQUEST 'SFID#001' CREATED IN ENVIRONMENT 'SF' WITH DATE
'<date>' AND TIME '<time>'
% HSM0004 HSMS STATEMENT COMPLETED WITH WARNINGS
```

A section of the backup log lists information pertaining to the first backup run and indicates which SUBSAVE number is allocated to which output tape. The subtask of SUBSAVE number 3 is the only subtask to require two tapes (QE0022 and QE0024).

```

***   BACKUP - FILES                               HSMS <version>       FULL
REPORT *** <date> <time>                          PAGE      1
...
REPORT *** <date> <time>                          PAGE      2
...
%   ARC0002 STATEMENT ACCEPTED.  ARCHIVE SEQUENCE NUMBER 'A.020716.135432',
...
%   ARC0033 ARCHIVE SUBTASK TSN '0D9N' GENERATED
%   ARC0033 ARCHIVE SUBTASK TSN '0D9P' GENERATED
%   ARC0033 ARCHIVE SUBTASK TSN '0D9Q' GENERATED
%   ARC0033 ARCHIVE SUBTASK TSN '0D9R' GENERATED
%   ARC0815 SUBTASK '0' HAS TRANSFERRED '65294' PAM PAGES FOR '1' FILES
AND.. %   ARC0815 SUBTASK '1' HAS TRANSFERRED '74162' PAM PAGES FOR '1'
FILES AND..
%   ARC0815 SUBTASK '2' HAS TRANSFERRED '58558' PAM PAGES FOR '1' FILES
AND..
%   ARC0815 SUBTASK '3' HAS TRANSFERRED '148912' PAM PAGES FOR '2' FILES
AND..
SAVE FILE IDENTIFIER - S.040716.135432      SAVE-VERSION-DATE=<date> ...
      SUBSAVE
      NUMBER          VSNS
          0           QE0020
          1           QE0021
          2           QE0023
          3           QE0022, QE0024

SAVE FILE IDENTIFIER - S.040716.135432      SAVE-VERSION-DATE=<date> ...

```

- Output of information concerning the backup tapes to MAREN.
 Instead of the operand `SAVE-FILE-ID=0`, it is also possible to specify `SAVE-FILE-ID=*LATEST`, since this is the only and last backup. Specifying `SAVE-FILE-ID=S.040716.135432` would also have the same effect.

```

/MARENADM
//SHOW-VOL-ATTR DIRECTORY-NAME=:POPP:$TSOS.MYMAREN.DIR(SAVE-FILE-ID=0)
% MARM195 NO DIRECT ACCESS TO MAREN CATALOG POSSIBLE

```

```

-----
VOLUME USER-ID  REQ-NAME DIRECTORY-NAME (SHORTENED) SAVE-FILE-ID SUB-SV/SEQ
-----
QE0020 TSOS     SFID#001 :POPP:$TSOS.MYMAREN.DIR  S.040716.135432 00 001
QE0021 TSOS     SFID#001 :POPP:$TSOS.MYMAREN.DIR  S.040716.135432 01 001
QE0023 TSOS     SFID#001 :POPP:$TSOS.MYMAREN.DIR  S.040716.135432 02 001
QE0022 TSOS     SFID#001 :POPP:$TSOS.MYMAREN.DIR  S.040716.135432 03 001
QE0024 TSOS     SFID#001 :POPP:$TSOS.MYMAREN.DIR  S.040716.135432 03 002

```

```
% MARM120 TOTAL OF 5 MAREN CATALOG ENTRIES PROCESSED
```

You obtain detailed information on output tape QE0024 with:
`//SHOW-VOL-ATTR VOLUME=QE0024, INFORMATION=*MAXIMUM`

MARENADM is terminated with: `//END`

4. HSMS continues the existing backup file (operand SAVE-FILE=*CONTINUE).

```

/HSMS
//BACKUP-FILES FILE-NAMES=*FROM-FILE(LIST-FILE-NAME=HOL.PAK2),
  ARCHIVE-NAME=MYMAREN,SAVE-FILE=*CONTINUE,
  OPERATION-CONTROL=*PARAMETERS(REQUEST-NAME=SFID#002,
  PARALLEL-RUNS=4,WRITE-CHECKPOINTS=*STD,
  SHADOW-COPY= *ALLOWED,REPORT=*FULL,OUTPUT=REPORT.SFID002)
% HSM0030 REQUEST 'SFID#002' CREATED IN ENVIRONMENT 'SF' WITH DATE
'<date>' AND TIME '<time>'
//END

```

The following section of the backup log lists information pertaining to the backup run and indicates which SUBSAVE number is allocated to which output tape. The tape QE0022 is not requested again since it is already full.

```

***   BACKUP - FILES                HSMS <version>    FULL
REPORT *** <date>   <time>        PAGE    1
...
ARC0002 STATEMENT ACCEPTED. ARCHIVE SEQUENCE NUMBER 'A.040716.141454', ...
% ARCO033 ARCHIVE SUBTASK TSN 'OEGM' GENERATED
% ARCO033 ARCHIVE SUBTASK TSN 'OEGN' GENERATED
% ARCO033 ARCHIVE SUBTASK TSN 'OEGP' GENERATED
% ARCO033 ARCHIVE SUBTASK TSN 'OEGQ' GENERATED
% ARCO815 SUBTASK '0' HAS TRANSFERRED '172831' PAM PAGES FOR '4' FILES
...
% ARCO815 SUBTASK '1' HAS TRANSFERRED '549310' PAM PAGES FOR '2' FILES
AND..
% ARCO815 SUBTASK '2' HAS TRANSFERRED '122446' PAM PAGES FOR '1' FILES
AND.. % ARCO815 SUBTASK '3' HAS TRANSFERRED '309514' PAM PAGES FOR '2'
FILES AND..

SAVE FILE IDENTIFIER - S.040716.135432      SAVE-VERSION-DATE=<date>   ...
      SUBSAVE
      NUMBER          VSNS
          0          QE0020  QE0028  QE0033
          1          QE0021  QE0027  QE0032  QE0035  QE0038  QE0040
          2          QE0023  QE0029
          3          QE0024  QE0030  QE0034  QE0037

SAVE FILE IDENTIFIER - S.040716.135432      SAVE-VERSION-DATE=<date>   ...

```

5. In MAREN, we now have the following situation. Instead of the operand SAVE-FILE-ID=-0, the operand SAVE-FILE-ID= *LATEST may also be specified, since this is still the only and the last backup version. Specifying SAVE-FILE-ID= S.040716.135432 would also have the same effect.

```
//MARENADM
```

```
//SHOW-VOL-ATTR DIR-NAME=:POPP:$TSOS.MYMAREN.DIR(SAVE-FILE-ID=-0)
```

VOLUME	USER-ID	REQ-NAME	DIRECTORY-NAME (SHORTENED)	SAVE-FILE-ID	SUB-SV/SEQ
QE0020	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	00 001
QE0028	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	00 002
QE0033	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	00 003
QE0021	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 001
QE0027	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 002
QE0032	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 003
QE0035	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 004
QE0038	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 005
QE0040	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 006
QE0023	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	02 001
QE0029	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	02 002
QE0022	TSOS	SFID#001	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 001
QE0024	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 002
QE0030	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 003
QE0034	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 004
QE0037	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 005

```
% MARM120 TOTAL OF 16 MAREN CATALOG ENTRIES PROCESSED
```

The tape QE0022 was no longer requested because it is already full.

The tape QE0024 is given a new REQUEST-NAME and a new time stamp (including CR-DATE, LAST-ACC-TIME), see //SHOW-VOL-ATTR

VOLUME=QE0024, INFORMATION=*NORMAL when the backup is continued (see above).

MARENADM is terminated with: //END

6. In HSMS a second backup is stored in a new backup file.

```
//HSMS
```

```
//BACKUP-FILENAMES FILE-NAMES=*FROM-FILE(LIST-FILE-NAME=HOL.PAK3), ARCHIVE-NAME=MYMAREN, SAVE-FILE=*NEW, OPERATION-CONTROL=*PARAMETERS(REQUEST-NAME=SFID#003, PARALLEL-RUNS=2, REPORT=*FULL, OUTPUT=REPORT.SFID003)
```

```
% HSM0030 REQUEST 'SFID#003' CREATED IN ENVIRONMENT 'SF' WITH DATE '<date>' AND TIME '<time>'
```

```
% HSM0002 HSMS STATEMENT ACCEPTED
```

```
//END
```

A section of the backup log lists the information pertaining to the backup run and shows which SUBSAVE numbers are allocated to the individual output tapes.

```

***   BACKUP - FILES                      HSMS <version>          FULL
REPORT *** <date> <time>                PAGE    1
...
% ARC0002 STATEMENT ACCEPTED. ARCHIVE SEQUENCE NUMBER 'A.020716.142715',
VERSION '06.OA05'
% ARC0033 ARCHIVE SUBTASK TSN 'OEG5' GENERATED
% ARC0033 ARCHIVE SUBTASK TSN 'OEG6' GENERATED
% ARC0815 SUBTASK '0' HAS TRANSFERRED '514652' PAM PAGES FOR '3' FILES
AND..
% ARC0815 SUBTASK '1' HAS TRANSFERRED '293046' PAM PAGES FOR '2' FILES
AND..

SAVE FILE IDENTIFIER - S.040716.142715      SAVE-VERSION-DATE=<date> ...
      SUBSAVE
      NUMBER          VSNS
          0          QE0044  QE0056  QE0059  QE0061  QE0062
          1          QE0048  QE0057  QE0060

SAVE FILE IDENTIFIER - S.040716.142715      SAVE-VERSION-DATE=<date> ...
***   CATALOG - POPP          USER - SYSROOT      ***
    
```

- In MAREN, we now have the following situation. Instead of the operand SAVE-FILE-ID=-0, the operand SAVE-FILE-ID= *LATEST may also be specified, since this is still the only and the last backup version. Specifying SAVE-FILE-ID= S.040716.142715 would also have the same effect.

```

//MARENADM
//SHOW-VOL-ATTR DIR-NAME=:POPP:$TSOS.MYMAREN.DIR(SAVE-FILE-ID=-0)
% MARM195 NO DIRECT ACCESS TO MAREN CATALOG POSSIBLE
    
```

VOLUME	USER-ID	REQ-NAME	DIRECTORY-NAME (SHORTENED)	SAVE-FILE-ID	SUB-SV/SEQ
QE0044	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	00 001
QE0056	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	00 002
QE0059	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	00 003
QE0061	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	00 004
QE0062	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	00 005
QE0048	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	01 001
QE0057	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	01 002
QE0060	TSOS	SFID#003	:POPP:\$TSOS.MYMAREN.DIR	S.040716.142715	01 003

% MARM120 TOTAL OF 8 MAREN CATALOG ENTRIES PROCESSED

If the operand value SAVE-FILE-ID=-1 or SAVE-FILE-ID=S.040716.135432 is specified, the information concerning the last backup but one is output (same as the output on [page 170](#)). In each new backup using SAVE-FILE=*NEW, the SAVE-FILE-ID S.040716.135432 moves one position further back.

```
//SHOW-VOL-ATTR DIR-NAME=:POPP:$TSOS.MYMAREN.DIR(SAVE-FILE-ID=-1)
```

VOLUME	USER-ID	REQ-NAME	DIRECTORY-NAME (SHORTENED)	SAVE-FILE-ID	SUB-SV/SEQ
QE0020	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	00 001
QE0028	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	00 002
QE0033	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	00 003
QE0021	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 001
QE0027	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 002
QE0032	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 003
QE0035	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 004
QE0038	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 005
QE0040	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	01 006
QE0023	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	02 001
QE0029	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	02 002
QE0022	TSOS	SFID#001	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 001
QE0024	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 002
QE0030	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 003
QE0034	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 004
QE0037	TSOS	SFID#002	:POPP:\$TSOS.MYMAREN.DIR	S.040716.135432	03 005

```
% MARM120 TOTAL OF 16 MAREN CATALOG ENTRIES PROCESSED
```

The following output attempt is ineffective, since there is currently no last backup level but three.

```
//SHOW-VOL-ATTR DIR-NAME=:POPP:$TSOS.MYMAREN.DIR(SAVE-FILE-ID=-2)
```

```
% MARM1D8 NO VOLUME IN MAREN CATALOG MATCHES SPECIFIED SELECTION CRITERIA
% MARM171 PROCESSING OF STATEMENT '//SHOW-VOLUME-ATTRIBUTES' TERMINATED
WITH ERRORS
```

MARENADM is terminated with: //END

8.3 FDDRL

MAREN records the volumes used by the FDDRL DUMP function (see “FDDRL” [8]) in the MAREN catalog. MAREN also supplies FDDRL with new volumes (automatic allocation of free tapes).

The volumes can be retrieved from the MAREN catalog again by the user by means of a file name allocated to FDDRL.

When volumes are restored using the FDDRL statements RELOAD-DISK, RELOAD-FOREIGN-DISK and RELOAD-PUBSET, the volume type is determined automatically. The user specifies the file name of the backup in the volume catalog using the TAPE=*BY-VOLUME-CATALOG operand. MAREN accesses the volume catalog and ascertains the backup volumes required.

Management in the MAREN catalog

MAREN manages all FDDRL volumes in the MAREN catalog.

Only volumes contained in the MAREN catalog can be used in FDDRL backups.

If you want to use volumes that are not in the MAREN catalog, the MAREN parameter FOREIGN-TAPE-CHECK must be set to *NO (see MODIFY-MAREN-PARAMETERS in “MAREN Volume 2” [1]). A volume list may only contain foreign volumes or volumes from the MAREN catalog. If the list contains volumes from both, the first foreign volume will be rejected.

If volumes that are password-protected in the MAREN catalog are used, their passwords have to be entered in the task’s password list before the volume is requested (at the latest before the START-JOBS statement is issued) (see the ADD-PASSWORD command in the “Commands” manual [4]).

The following fields of the archive entry are updated in the MAREN catalog for the volumes used in the backup:

- FILE-NAME (backup file name, see “MAREN tape set” on page 174)
- VOLUME-SEQUENCE (VSN in the tape set)
- FIRST-VOLUME (VSN of the first volume in the tape set)
- CREATION-DATE and CREATION-TIME
- EXPIRATION-DATE (calculated on the basis of the specified RETENTION-PERIOD)
- CLOSE-INDICATOR (for valid backup volumes CLOSED)
- LAST-CLOSE-DATE and LAST-CLOSE-TIME
- CREATION-CATALOG-ID (catalog ID of the home pubset)
- CREATION-USER-ID (user ID of the backup task)
- CREATION-JOB-NAME (job name of the backup task)
- OPEN-MODE
- RESERVATION-DATE

- USER-ACCESS
- PASSWORD (*NONE, i.e. no password)

MAREN tape set

If several volumes are needed for a recovery unit, they are grouped to form a MAREN tape set under one file name (for a definition, see [section “File version in the MAREN catalog” on page 80](#)). The volumes of a MAREN tape set have the following features:

- They all have the same file name (FILE-NAME).
- For all volumes, the FIRST-VOLUME field contains the VSN of the first volume in the tape set.
- The order of the volumes within the tape set is defined by ascending VOLUME-SEQUENCE numbers (from 0001 to 0255) and ascending creation dates (CREATION-DATE and CREATION-TIME).

When the backup is completed, the volumes of the tape set are all marked as valid backup volumes (CLOSE-INDICATOR=CLOSED). The first volume of a tape set is only marked as valid after the backup has been completed successfully. Consequently the first volume of a tape set indicates that all volumes of a tape set have been successfully created.

Allocation of free tapes

In a backup using the FDDRL statement DUMP-PUBSET, MARENUCP reserves a free volume in the MAREN catalog and allocates it. This also applies in the event of a backup with the FDDRL statement DUMP-DISK with the operand TAPE=*ANY. The following file names are entered for FILE-NAME in the archive entries for these volumes:

- For the single disk recovery unit:
 - **FDDRL.D.<vsn_1..6>** with //DUMP-DISK or //DUMP-FOREIGN-DISK
 - **FDDRL.P.<catid_1..4>.<vsn_6..6>** with //DUMP-PUBSET
- For the disk set recovery unit (in FDDRL V16.0 or higher):
 - **FDDRL.D.<vsn_1..6>-1** with //DUMP-DISK or //DUMP-FOREIGN-DISK
 - **FDDRL.P.<catid_1..4>.<date>.<time>.<disk-set-no>** with //DUMP-PUBSET

Meaning:

FDDRL.P	Prefix for backing up a pubset disk (in the case of DUMP-PUBSET)
FDDRL.D	Prefix for backing up single disks
<catid_1..4>	Pubset ID, 1 to 4 positions (catalog ID)
<vsn_6..6>	VSN of a pubset disk, 6 positions
<vsn_1..6>	VSN of a single disk, 1 to 6 positions
<date>	Date of the backup (format yyyy-mm-dd)
<time>	Time of the backup (format hhmm00)
<disk-set-no>	Number of the disk set (depends on NUMBER-OF-DISK-SETS)

8.4 AVAS

MAREN can be linked to the AVAS software products (see the “AVAS” manual [3]) by means of the MARENAV module. This module is connected to AVAS via the computer center exits used for SUBMIT-NET processing and calls MAREN as a subprogram. For each network to be released, AVAS sends the procedure or ENTER files of all jobs to MARENAV for analysis. On the basis of the DMS commands they contain, MARENAV determines the VSNs of the volumes required by the network (magnetic tapes and MTCs). It then carries out the following actions:

- Volume checks

MARENAV checks whether all the volumes required by the network are available, i.e. whether their VSN is in the MAREN catalog and the volumes are reserved.

- Entering VSNs in the procedure or ENTER files

The dummy input and output tapes entered in the DMS commands are replaced with actual VSNs.

- Generating volume lists

MARENAV generates three files for each network:

- a) Transport list, which is used to compile the set of tapes accessed in a network and, if necessary, transport it to the system.
- b) Tape mounting list for the operator, which indicates which volumes are required in which order when the individual jobs of a network are run.
- c) Storage procedure for the archive This procedure file updates the locations in the MAREN archive entry for all volumes required by a network.

MARENAV is not an installation component of MAREN but is supplied with the software product AVAS.

9 Archive systems and MAREN

MAREN supports the following archive systems:

- the real archive systems from Quantum Corp.
- the virtual archive system ETERNUS CS HE from Fujitsu Ltd.

9.1 Archive systems

Archive systems can physically access the volumes in their inventory (archive) using mechanical installations. They can react to mount requests without the manual intervention of a human operator. For the process of mounting volumes to be automated, the mount requests have to be evaluated by a software program and converted into control commands which the archive system can interpret.

A BS2000 host can be linked to an archive system in two different ways:

1. The control commands are sent to the archive system through the data interface of the BS2000 system (channel).
2. After the console messages have been evaluated, the control commands are output to the archive system through an interface.

These two methods are supported by two subsystems which complete MAREN volume management for physical volume processing.

MAREN identifies an archive system through its location name and operating mode. I.e. the location tells MAREN whether a volume belongs to the inventory of a specific archive system and how communication with the archive system must be realized.

In the MAREN catalog, the volumes are listed by their VSNs and in the archive system by the bar code labels attached to them. Since the VSN (volume serial number) must be identical with the VSL (volume software label) in BS2000 the volume has to be started with a VSL in the archive system which is identical with the VSN of the volume requested.

Support via ROBAR

The ROBAR-DCAM non-privileged BS2000 application was developed to support archive system control via a specific link.

ROBAR is installed as a client/server subsystem. The client is installed as a BS2000 DCAM application to query the console messages and the server is installed on a separate computer (UNIX platform). The server converts the host requests sent by the client into control commands which the archive system can interpret.

In the standard shipment, ROBAR supports control commands for the real archive systems from Quantum Corp. and for the archive system ETERNUS CS HE from Fujitsu Ltd.

ROBAR processes the console messages sent by the host to the console directly. MAREN is not a prerequisite.

If MAREN is available, ROBAR also supports MAREN messages which the archive system allocated to volume processing.

9.2 Real archive systems with ROBAR

Adding volumes

The volumes in the archive system are entered in the database. In the MAREN catalog, the database has to be mapped with the archive system's location using the appropriate MAREN statements for volume entry.

Removing volume

Volumes that are exported by the archive system have to be reported to MAREN. Depending on the VOLUME-STATUS and the type of export, the volume is either deleted (EXPORT-VOLUME for foreign volumes) or it is relocated (TEMP-LOCATION=CENTRAL).

Importing volumes

Volumes can be imported into the archive system via the import/export unit. When the archive system finds new volumes in the import/export unit, it adds them to the volume inventory and informs the host via ROBAR. ROBAR then updates the location of the new volumes in the MAREN catalog.

MAREN does not update the location of volumes that are not included in the catalog.

Exporting volumes

Volumes can be exported from the archive system via the import/export unit. If MAREN is used, they have to be exported using a MAREN statement which causes the location to be changed (export or location modification in the archive entry).

If MAREN is not used, a volume export can be requested at the ROBAR console (UNIX-based system).

While the volume is exported from the archive system, it is flagged as not available or it is deleted from the archive record (archive system database).

9.2.1 Exporting volumes

MAREN causes volumes to be exported in the following events:

- **Exporting a volume**

The user (or the MAREN administrator on behalf of the user) borrows a volume to another user and exports it as follows:

```
//EXPORT-VOLUME VOLUME=...,EXPORT-ADDRESS=...
```

The volume leaves the computer center.

MAREN checks whether the user is authorized to export the volume. Following this, MAREN instructs the archive system to move the volume to the import/export unit.

The computer center staff can then remove the volume from the import/export unit.

Reserved computer center volumes are marked as exported in the MAREN catalog, i.e. the EXPORT-DATE is set to the current date.

Private volumes are removed from the MAREN catalog.

Free volumes (VOLUME-STATUS=FREE) cannot be exported.

- **Relocating a volume**

The MAREN administrator can move the volumes from the archive system in a MARENADM clear-up session.

To do this, the MAREN administrator or the user enters the target location:

```
//MODIFY-VOLUME-ATTRIBUTES VOLUME=...,
      LOCATION=PARAMETERS(HOME-LOCATION=<target-location>)
```

The administrator then starts the relocation with:

```
//RETURN-VOLUMES VOLUME=...,
      FROM-LOCATION=<robot-location>,TO-LOCATION=<target-location>,
      MESSAGE-DESTINATION=...
```

MAREN displays a corresponding transport message at the output device specified with the MESSAGE-DESTINATION operand.

In order to accelerate execution, the range of volumes affected should be limited by means of the operand VOLUME=*INTERVAL(...).

The usual request for relocation (MAR4164) is displayed for each volume to which the conditions apply, and the archive system is instructed to move the volume into the import/export unit.

9.2.2 Returning volumes

Volumes which have been exported or sent to another location can be returned to the archive system as follows:

The volumes are placed in the import/export unit. Then the archive system is instructed via the ROBAR statement IMPORT-ROBAR-VOLUME to fetch the volumes from the import/export unit.

The corresponding entry in the MAREN catalog is updated as soon as the volume has been placed in the rack:

EXPORT-DATE is cleared

INITIALIZATION is set to YES

TEMPORARY-LOCATION
is supplied with the archive system's location name

9.2.3 Relocating volumes

Reserved, private and free volumes can be moved to an archive system in a MARENADM clear-up session. To do this, the following MARENADM statements must be entered:

```
//MODIFY-VOLUME-ATTRIBUTES VOLUME=...,  
    LOCATION=PARAMETERS(HOME-LOCATION=<robar-location>)  
  
//RETURN-VOLUMES VOLUME=...,  
    FROM-LOCATION=<current-location>,TO-LOCATION=<robar-location>,  
    MESSAGE-DESTINATION=...
```

MARENADM displays a transport message at the output device specified with the MESSAGE-DESTINATION operand. When the volume is inserted in the input area of the archive system's import/export unit, ROBAR causes MAREN to update the MAREN catalog entry with the temporary storage location.

9.2.4 Implicit/explicit volume import

ROBAR informs MAREN when a volume is placed in the an archive system's import/export unit. The entry is only modified if it already exists. The volume is not implicitly added to the MAREN catalog.

Explicit import of a volume

If the volume is to be added to the MAREN catalog as a free volume, then it must first be cataloged by means of the MARENADM statement ADD-FREE-VOLUMES (see the following example „Adding free volumes“).

If the volume is to be added to the MAREN catalog as a reserved volume, then it must first be cataloged by means of the MARENADM statement ADD-RESERVED-VOLUME (see the following example „Adding reserved volumes“).

If the volume is to be entered in the MAREN catalog as a private volume but with different attributes, the desired attributes can first be defined using the MARENADM statements ADD-PRIVATE-VOLUME and MODIFY-VOLUME-ATTRIBUTES.

Adding free volumes

Free volumes are added to an archive system using the following MARENADM statement:
`//ADD-FREE-VOLUMES VOLUME=... ,FREE-LOCATION=<location-name>`

<location-name> is the storage location name of the archive system. In contrast to manual operation, MARENADM sets the temporary storage location to “CENTRAL”. This way, the volume cannot be reserved before it is actually present in the archive system. The MAREN catalog entry for the current location is automatically updated when the volume is inserted in the import/export unit.

Adding reserved volumes

Reserved volumes are added to an archive system using the following MARENADM statement:

```
//ADD-RESERVED-VOLUME VOLUME=... , USER-ID=<userid> ,  
    LOCATION=PARAMETERS(HOME-LOCATION=<location-name>)
```

<userid> is the user ID for the volume. <location-name> is the name of the default storage location of the volume in the archive system. When the volume is then inserted in the archive system's import/export unit, the MAREN catalog entry for the temporary storage location will be updated. The volume can now be requested.

Adding private volumes

During archiving, volumes not currently in the MAREN catalog will be archived as private volumes.

If these volumes are to have catalog attributes which differ from those for automatic new entries, then they must first be cataloged as private volumes. The desired attributes can be assigned using the MARENADM statement ADD-PRIVATE-VOLUME.

Example

If the volume TAPE01 is to be allocated to the user ID ROBUSER, and not to SYSMAREN, the following MARENADM statement must be issued before the volume is placed in the import/export unit of the archive system with the location name "ROBAR":

```
//ADD-PRIVATE-VOLUME VOLUME=TAPE01 , USER-ID=ROBUSER , LOCATION=ROBAR
```

When the volume is then inserted in the archive system's import/export unit, the MAREN catalog entry for the temporary storage location will be updated. The volume can now be requested.

If there is already a volume with the same VSN as the private volume, this volume can be migrated. But archive system volume must first be exported.

9.2.5 Deleting archive entries

The following applies to MARENADM statements when deleting archive entries for the volumes of the archive system:

- REMOVE-USER-VOLUMES

The volume must first be exported from the archive system (see [section “Exporting volumes” on page 180](#)). Only then can it be deleted from the MAREN catalog. If this is not done, the following message will be displayed for the relevant volume:

```
MARM015 VOLUME '(&00)' NOT AVAILABLE FOR THIS STATEMENT
```

- REMOVE-FREE-VOLUMES

The archive system’s free volumes can be removed from the MAREN catalog using this statement.

- DELETE-VOLUME-ENTRY

This statement deletes MAREN catalog entries for volumes without any checks. The statement is intended for repair use only. If the corresponding volumes are still located in the archive system, there will be discrepancies between the MAREN catalog and the archive system.

9.3 Virtual archive system ETERNUS CS HE with ROBAR

Adding volumes

The same procedure is used as for real archive systems, but the virtual volumes are defined at the operator interface for the virtual archive system. However, no physical volumes are included in the virtual archive system.

Removing volume

This operation must be supported in a virtual archive. Removing a virtual volume, however, does not mean that any physical volumes are truly relocated. A virtual volume is deleted from the virtual archive system via the operator interface.

Importing and exporting volumes

Since no physical operations are performed for virtual volumes, these operations are not supported for virtual archive systems. MAREN does not allow virtual volumes to be relocated from a virtual location.

MAREN supports the ETERNUS CS HE virtual archive system, which is controlled through the ROBAR software product, as is the real archive system. In contrast to a real archive system, however, the volumes used by ETERNUS CS HE are virtual volumes. They are managed by MAREN in the same way as real TAPE-C4 volumes.

Virtual volumes contained in the ETERNUS CS HE cache can be accessed directly for read and write operations, i.e. a device does not need to be requested.

ETERNUS CS HE exports virtual volumes to real volumes. ETERNUS CS HE determines the point in time when this is done. Only ETERNUS CS HE knows which real volume a virtual volume is allocated to. When a volume is accessed, ETERNUS CS HE has to retrieve it from the real volume and relocate it in the cache, if it no longer exists there.

9.3.1 Configuration

The virtual ETERNUS CS HE volumes must be allocated to a location of their own with the ROBAR-2 operating mode for them to be distinguished from real MTCs. The following steps must be performed:

1. The location for virtual volumes is defined in MAREN:

The new location is added to the MAREN catalog with the MARENADM statement **MODIFY-MAREN-PARAMETER**. The location name can be freely selected, e.g.:

```
//MODIFY-MAREN-PARAMETERS LOCATION-ENTRIES=*PARAMETERS
      (LOCATION-NAME=CENTSTOR, ACTION=*ADD(OPERATING-MODE=*ROBAR-2))
```

If several virtual archive systems are used, a separate location must be defined for each of them.

2. The virtual archive system is defined in the device administration of the BS2000 systems of the computers concerned:

The virtual ETERNUS CS HE devices are included in the I/O configuration with device type code C4. The virtual devices are allocated to a location defined in MAREN for the virtual ETERNUS CS HE volumes with the command **ADD-DEVICE-DEPOT** input via the console, for instance to the location **CENTSTOR**:

```
/ADD-DEVICE-DEPOT UNIT=(V1,V2,V3),LOCATION=CENTSTOR
```

The allocation is only valid in the current system session.

Unconditional unloading of virtual volumes should be set for virtual tape operation with ETERNUS CS HE (as it should also be for real archive systems):

```
/MODIFY-MOUNT-PARAMETER
      UNLOAD-REL-TAPE=*REGARDLESS-OF-USER-REQUEST(TAPE-FAM=*MBK)
```

3. The virtual archive system is defined in ROBAR:

1. The location must be defined in the ROBAR configuration file using the same name:
LOCATION=CENTSTOR
2. When the ROBAR rule file is installed, the version for ETERNUS CS HE must be used. The `rrf_dir` parameter must not be used.

For further details, refer to the “ROBAR” manual [12].

4. The virtual volumes are defined:

The virtual volumes must be defined both in ETERNUS CS HE and in the MAREN catalog.

The desired number of virtual volumes is defined in ETERNUS CS HE using the OCI (Operator Console Interface). Refer also to the “ETERNUS CS HE” manual [7]).

ETERNUS CS HE's virtual volumes are added to the MAREN catalog as free volumes of the type TAPE-C4 using MARENADM:

```
//ADD-FREE-VOLUMES . . . ,FREE-LOCATION=CENTSTOR,DEVICE-TYPE=TAPE-C4
```

If a ETERNUS CS HE archive system and its already existing virtual volumes is to be included in a MAREN configuration, the virtual volumes must be added to the MAREN catalog as reserved volumes (you must find the VSNs in ETERNUS CS HE):

```
//ADD-RESERVED-VOLUMES vsn1(USER-ID=. . . ,DEVICE-TYPE=TAPE-C4 ,
    LOCATION=*PAR(HOME-LOCATION=CENTSTOR, FREE-LOCATION=CENTSTOR,
    TEMP-LOCATION=CENTSTOR))
```

9.3.2 Working with virtual volumes

A virtual volume cannot be relocated, i.e. the attributes HOME-LOCATION, FREE-LOCATION and TEMP-LOCATION must all be the same. Any actions causing a relocation are rejected by MAREN and MARENADM.

A virtual volume cannot be exported: The EXPORT-VOLUME statement is rejected with the message MARM015 if the current location (TEMP-LOCATION) and the ROBAR-2 operating mode are defined.

The RETURN-VOLUME statement is not executed for a virtual volume because the current location (TEMP-LOCATION) and the home location (HOME-LOCATION) must always be the same.

Changing the location

The location of a virtual volume (and of other volumes, too) can be changed using the MODIFY-VOLUME-ATTRIBUTES statement. To do this, the HOME-LOCATION, FREE-LOCATION and TEMPORARY-LOCATION operands must be modified to indicate the same location. This new location must offer the operating mode ROBAR-2 (ETERNUS CS HE). Parallel to the location being changed in MAREN, corresponding modifications must be made in ETERNUS CS HE.

Support of the fast mount attribute

After a virtual volume has been defined in ETERNUS CS HE or after it has been initialized, it is implicitly given the "fast mount" attribute. "Fast mount" means that the volume is immediately available for processing. The times required for mounting, etc., are not required for "fast mount" volumes.

If user data is written to the volume, ETERNUS CS HE will make sure that it is saved on a real volume. Once this has been done, the reserved cache area can be released and another virtual volume can be used. The volume is no longer a "fast mount" volume once its data has been overwritten in the cache.

The "fast mount" attribute only describes a virtual volume's status in ETERNUS CS HE. It cannot be assigned as a volume attribute in the MAREN catalog.

When MAREN or ROBAR determines that the next access to a virtual volume can only be a write operation from the beginning of the tape, they cause ETERNUS CS HE to assign the "fast mount" attribute to the volume. This happens in the following situations:

- The virtual volume was initialized either using the INIT-VOLUMES statement or the INIT utility routine. Since ROBAR recognizes whether a virtual volume is initialized or not, it causes the attribute to be modified.
- The virtual volume was released by systems support using the FREE-VOLUMES statement. MAREN causes the attribute to be modified, i.e. MAREN sends console message `MARM1S1` to ROBAR. The message requests a confirmation of whether the attribute modification has taken place.
If the answer is negative, MAREN cancels the FREE-VOLUMES statement. If the statement included a list of VSNs, the cancellation applies to all the volumes in the statement. The release will have to be repeated for the VSNs that are not affected.

Differences in the release of virtual volumes and real volumes

- A console message that requires a response is sent to ROBAR for each virtual volume that is to be released. Therefore releasing virtual volumes may take somewhat longer than releasing real volumes.
- The data on a virtual volume cannot be recovered following the release of the volume with FREE-VOLUMES. In the case of a real volume, the data will not be lost until the volume is reinitialized or overwritten.
- If a virtual volume is not initialized, the next access must be a write operation at the beginning of the tape. Otherwise the volume will not be consistent and system errors may occur. For that reason, the archive entry for virtual volumes should contain `INIT=YES`.

9.3.3 Deleting archive entries

The following applies to MARENADM statements when deleting archive entries for the volumes of the archive system:

- REMOVE-USER-VOLUMES

Since virtual volumes can not be removed, this statement causes the following message for the volume concerned:

```
MARM015 VOLUME '(&00)' NOT AVAILABLE FOR THIS STATEMENT
```

- REMOVE-FREE-VOLUMES

The archive system's free volumes can be removed from the MAREN catalog using this statement.

- DELETE-VOLUME-ENTRY

This statement deletes MAREN catalog entries for volumes without any checks. The statement is intended for repair use only. If the corresponding volumes are still located in the archive system, there will be discrepancies between the MAREN catalog and the archive system.

9.4 Location for archive systems

A separate location must be defined for each archive system for the archive systems to be supported by MAREN. That means:

- The archive system must be defined on all hosts to which it is connected using the LOCATION-ENTRIES= operand in the MODIFY-MAREN-PARAMETERS statement. The archive system must be set up as the local location with the correct operating mode.
- All cartridges in the archive system must be contained in the MAREN catalog with that location as their HOME-LOCATION, FREE- LOCATION and TEMP-LOCATION.
- The cartridge's VSN and its bar code must be the same in the archive system. If the VSN differs from the bar code, then the cartridge should be given the proper bar code. If the VSN and the bar code are contained in the MAREN catalog, then it is also possible to modify the VSN to match the bar code. This has the same effect as reinitializing the volume with the following statement:

```
//INITIALIZE-VOLUMES *NONE(VOL=<barcode_vsn>,OLD-VSN=<current_vsn>)
```

If several archive systems are used, each has to have its own location name.

In contrast to volumes that are mounted manually, the name of the computer is not entered in the TEMP-LOCATION field for the volumes in an archive system.

9.5 Initializing volumes in an archive system

In conjunction with an archive system, MAREN allows volumes to be initialized fully automatically. This also applies to virgin volumes and volumes that do not have a VOL1 label.

The VSN from the bar code label is used.

The following steps are required for the initialization:

1. A device must be allocated on which the archive system is to mount the volumes:

An explicit reservation is not necessary. MAREN automatically requests a device that is allocated to the location for the initialization. The location is determined either using the VSN explicitly specified or using the INIT-LOCATION operand. If no device is available the initialization is rejected.

If a device <mn> was explicitly reserved using SECURE-RESOURCE-ALLOCATION UNIT=<mn>, MAREN uses that device. If the device is not allocated to the location, the initialization is rejected and the device continues to be reserved.

2. Start MARENADM:

```
/START-MARENADM
```

3. Perform a “release session” for the new volumes in order to create the INIT file required for the initialization:

```
//FREE-VOLUMES VOLUME=*INT(FROM=...,TO=...)
```

Restrict the range of numbers using the FROM and TO operands in order to speed up the process.

4. Start the initialization:

```
//INITIALIZE-VOLUMES DEV=...,INIT-LOC=ROBOLOC1
```

Each volume in turn is initialized.

5. Terminate MARENADM:

```
//END
```

6. The allocated device is released again:

```
/SECURE-RESOURCE-ALLOCATION
```

9.6 Automatic free volume allocation with MARENUCP

If the location for an archive system is contained in the location table (when MARENUCP is started), MARENUCP reserves all volumes requested from the pool of volumes with the attributes HOME-LOCATION=<archivsystem_location> FREE-LOCATION=<archivsystem_location>, TEMP-LOCATION=<archivsystem_location>.

If several archive systems are used, the location which is first in the location table is taken as the standard location (e.g. "ROBOLOC1").

In mixed mode with manually operated cartridge devices and/or several archive systems, the MAREN administrator must specify via a reservation file (see [section "Location management via a reservation file" on page 120](#)) or in the computer center exit routine MARENEX1 (see [page 200](#)) whether another storage location is to be used instead of the default one.

If a computer center exit routine is used, the following points should be borne in mind:

- In the archive entry passed to the computer center exit routine, the default location "ROBOLOC1" is preset for the HOMELOC field.
- If a volume from the manual archive is to be used, a different location must be entered (e.g. "CENTRAL").
- If a volume from a different archive system is to be used, the name of its storage location must be used (e.g. "VTLSLOC").

After the reservation, the archive system is requested to mount the volume.

10 Foreign volume types

MAREN also supports volume types which cannot be processed in BS2000. It is therefore possible to store administrative data on these volumes in the MAREN catalog. The MAREN catalog can thus be used as a central administrative instrument for all volume types.

For these foreign volume types MAREN supports all functions which do not perform tape processing.

The fields in the MAREN catalog are assigned appropriate values (e.g. with the MODIFY-VOLUME-ATTRIBUTES statement). The user is responsible for entering meaningful values.

The following statements are available to the administrator for administering the foreign volume types:

- ADD-FOREIGN-DEVICE
- REMOVE-FOREIGN-DEVICE
- RENAME-FOREIGN-DEVICE
- SHOW-FOREIGN-DEVICES

When domains are used, the ADD-FOREIGN-DEVICE, REMOVE-FOREIGN-DEVICE and RENAME-FOREIGN-DEVICE statements are available only to the All-Domain Administrator, SHOW-FOREIGN-DEVICES also to the Domain Administrator.

Up to 16 foreign volume types can be included in the MAREN catalog. MAREN encrypts the types internally in the following order: The first entry is encrypted with X'0001', the second with X'0002', the tenth X'000A' and the sixteenth with X'0010' in the ARCHIV entry field DEVICE (MARENA macro).

Restrictions

When working with foreign volume types the following restrictions must be taken into consideration:

- Only names which are not known to BS2000/OSD may be used for the foreign volumes. Abbreviations must also be taken into account.
- The MARENADM statement FREE-VOLUMES does not evaluate the INIT flag.
- The MARENADM statement FREE-VOLUMES releases volumes after the expiration date has been reached without any further check.
- The free tape administrator MARENUCP does not support foreign device types.
- The MARENADM statement INIT-VOLUME rejects a foreign device type in the case of the DEVICE-TYPE operand.

Example

CDs are to be added to the MAREN catalog. The MAINT ID administers the CDs and the PC service stores them. These CDs are START CDs for WINDOWS PCs. The administrator proceeds as follows:

1. Load MARENADM. If (as in this example) domains are being used, the administrator then switches to the role of the ADA (here without entering a password).

```
/START-MARENADM
% MARM100 MARENADM VERSION '<version>' STARTED
% MARM091 MARENADM is working in 'DOMAIN-MODE'

//MODIFY-ADMINISTRATION-SCOPE DOMAIN=*ALL
% MARM091 MARENADM is working in 'ALL-DOMAIN-MODE'
```

2. Add volume type CD:

```
//ADD-FOREIGN-DEVICE-TYPE DEVICE-TYPE=CD
% MARM030 The foreign-device-type 'CD' is announced to MAREN with the
volume-type x'0001'.
```

3. Permit volume type CD for reservations:

```
//MODIFY-MAREN-PARAMETERS
RESERVE-DEVICE-TYPES=*PARAMETERS(DEVICE-TYPE=CD)
% MARM170 STATEMENT '//MODIFY-MAREN-PARAMETERS' PROCESSED
```

4. Add free volumes of the type CD to the catalog:

```
//ADD-FREE-VOLUMES VOLUME=*INTERVAL(FROM=CD0001,TO=CD0003),
FREE-LOCATION=PCSERVIC,DEVICE-TYPE=CD
% MARM108 MAREN CATALOG ENTRY 'CD0001'/'0001' ADDED
% MARM108 MAREN CATALOG ENTRY 'CD0002'/'0001' ADDED
% MARM108 MAREN CATALOG ENTRY 'CD0003'/'0001' ADDED
% MARM120 TOTAL OF 3 MAREN CATALOG ENTRIES PROCESSED
```

5. Reserve two volumes of the type CD:

Here a non-existent file name START-CD is stored. This can be used later to ascertain all start CDs in the catalog simply and efficiently. Furthermore, two additional remarks are entered.

```
//RESERVE-FREE-VOLUME USER-IDENTIFICATION=MAINT,
NUMBER-OF-VOLUMES=2,SELECT=*BY-ATTRIBUTES(VOLUME=*ALL,
DEVICE-TYPE=CD,HOME-LOCATION=PCSERVIC),FILE-NAME=
START-CD,REMARK=C'WINDOWS REGISTRY',REMARK-2=C'PC-NAME'
% MARM127 VOLUME 'CD0001' RESERVERD FOR USERID 'MAINT'
% MARM127 VOLUME 'CD0002' RESERVERD FOR USERID 'MAINT'
```

6. Modify the attributes of the volumes, for instance by entering the date in the USER-FIELD operand (CR-DATE could also be selected):

```
//MODIFY-VOLUME-ATTRIBUTES VOLUME=CD0001,USER-FIELD=C'BACKUP'
% MARM121 MAREN CATALOG ENTRY 'CD0001'/'0001' MODIFIED
```

7. Display the attributes of volume CD0001:

```
//SHOW-VOLUME-ATTRIBUTES VOLUME=CD0001,INFORMATION=*NORMAL
VOLUME      = CD0001          FILE-SEQ      = 0001          DEV-TYPE     = CD
USER-ID     = MAINT          HOME-LOCATION = PCSERVIC    RESERV-DATE  = <date>
ACCOUNT     =                FREE-LOCATION  = PCSERVIC    FREE-DATE   = <date>
USER-ACC    = OWNER-ONLY    TEMP-LOCATION = PCSERVIC    EXPORT-DATE =
PASSWORD    = NONE
REMARK      = C'WINDOWS REGISTRY '
EXPORT-AD   = C ' '
USER-FIELD  = C'BACKUP '
FILE-NAME   = START-CD
FREE-POOL   = *NO
OPEN-MODE   =                CR-DATE       =                LAST-ACC-DATE =
DEV-NAME    =                CR-TIME        =                LAST-ACC-TIME =
VOL-SEQ     = 0001          CR-CAT-ID   =                LAST-ACC-USER-ID =
FIRST-VOL   =                CR-USER-ID    =                LAST-ACC-ACCOUNT =
CLOSE-IND   =                CR-JOB-NAME   =                LAST-ACC-JOB-NAME=
EXPIR-DATE  =                LAST-CL-DATE  =                LAST-ACC-TSN    =
AUDIT       = NO           LAST-CL-TIME =                LAST-ACC-SNO    =
VOL-STATUS  = RESERVED    RESERV-COUNT = 0002          LAST-ACC-CPU-NAME=
INIT        = NO           ACCESS-COUNT = 00000000    LAST-ACC-FUN-NAME= MODIFY1
ADM-FIELD   = C ' '      'CHECK-COUNT = 06          LAST-ACC-FUN-FLAG= 23
```

11 Computer center exits in the MAREN system

MAREN computer center exits are routines which are called by individual MAREN components at certain stages in processing. These routines allow specific processes in the MAREN system to be monitored and logged. They also allow the normal behavior of the MAREN system to be changed and certain steps in processing to be prevented.

MAREN provides the following computer center exits:

- Reserve-request exit MARENEX1 and reserve-return exit MARENEX3, for the function “new volume reservation”
- Write-request exit MARENEX2 and write-return exit MARENEX4 for the function “modify archive entry”
- Read exit MARENEX5 for the function “access archive entry”
- Device depot exit MARENEX6 for the function “device selection and location definition”

11.1 Provision of computer center exits

All the computer center exits used on any computer in a MAREN network must be made available as object modules in a module library. This library must be assigned using the link name MARENLIB before the programs MARENCP and MARENUCP are called. When the MAREN system is started up, these modules, if they are available, are dynamically linked to the control program MARENCP and to MARENUCP via the BIND macro. If one or all of the computer center exits are missing from the object module library, the MAREN system starts normally and no error message is issued. If an exit routine is changed and added to the object module library, this change only takes effect when the object module library is closed.

The computer center exits can be switched during ongoing operation by checking whether the assigned object module library has been modified in the case of each request in MARENCP, MARENUCP and MARENADM. When a modification takes place, all loaded computer center exits are unloaded using the UNBIND macro and reloaded using the BIND macro. If an error occurs with the BIND macro (e.g. if the element is locked), BIND is repeated.

If the MARENADM administration program is used with direct access to the MAREN catalog, a number of the exit routines are also executed. In this event, however, it is not necessary to assign the computer center exit library explicitly as MARENADM fetches the name via a call to the control program. If this library is under a user ID other than the administrator ID, it must be cataloged with `USER-ACCESS=*ALL-USERS`.

11.2 Programming rules

The exit routines are executed, partially or completely under the system administrator ID TSOS (depending on the organizational structure). For this reason, special care must be taken while programming. The following rules must be strictly adhered to:

- The program must conform to BS2000 conventions for program linkage, i.e. the start and end must be structured as follows

```
MARENEXn CSECT
          STM 14,12,12(13)
          :
          :
          LM  14,12,12(13)
          BR  14
```

- In an XS environment, the exit routines must contain `AMODE ANY` and `RMODE ANY` and conform to the XS programming rules.
- Fields marked in the archive record (macro `MARENA dsect`) as “unused”, “reserved” or as “MAREN-internal field” must not be used by the exit routines. In particular, the fields `LAFUNKNM` and `LAFUNKFL` must not be modified.

- Most computer center exits are not permitted to change certain fields in the archive entry, since correct processing would not otherwise be guaranteed. If this nevertheless happens, the loaded program is terminated with the message

```
MARCP27 ADMINISTRATOR'S EXIT ROUTINE FOR MAREN IS INVALID;
          ERROR IN FIELD '(&00)'. MARENCP TERMINATED WITH DUMP
```

The fields affected are indicated in the descriptions of the individual computer center exits.

- Programming rules are described in the BS2000 “System Exits” manual [5].

Modification of date fields

Data fields can only be edited in ISO4 format (with four-digit year specification).

11.3 Exits for reserving volumes

There are two different exits for the MAREN function “volume reservation”:

- the request exit allows the reservation request to be checked and rejected if necessary
- the return exit only allows evaluations, since the reservation has already taken place.

The following function names are possible when calling the computer center exits for new reservations:

LAFUNKNM	Action involved
MARENFA2	Implicit reservation by specification of the VSN of a free tape in the ARCHIVE statements SAVE, EXPORT and POOL ADD=<tvsn>.
MARENUCP	Reservation via the automatic free tape allocation facility of the MAREN system.
RESERVE	MAREN statement RESERVE-FREE-VOLUME
RESERVE1	MARENADM statement RESERVE-FREE-VOLUME

Passing parameters

The following information is passed to the individual computer center exits:

Register 1	A(parameter area) The parameter area comprises a word containing the address of the archive entry. The individual archive entry fields can be addressed symbolically via the dummy section MARENA.
Register 13	A(Savearea) The save area provided by the MAREN system is 18 words long.
Register 14	A(return) For returning directly to the MAREN system.
Register 15	A(computer center exit routine) Start address of the called computer center exit routine.

All other registers are set to “binary zero”.

11.3.1 Reserve-request exit MARENEX1

The reserve-request exit is executed before a volume is reserved.

This allows the MAREN administrator to perform some of the following actions, for example:

- define a range of numbers
- determine locations
- preset or modify entries in the archive entry
- reject free tape requests in certain circumstances
- prevent the reservation of volumes under certain user IDs.



A reservation file created with MARENLM is evaluated before the reserve-request exit.

The following fields must not be changed by the reserve-request exit:

LAFUNKFL	Flag for the action to be performed by the program
LAFUNKNM	Name of the calling MAREN components or abbreviated name of the MAREN or MARENADM statement entered
ERRORKEY	error message key

If a reservation request is issued for a volume determined by ARCHIVE as a result of one of the ARCHIVE statements POOL, SAVE or EXPORT (LAFUNKNM= C'MARENFA2'), the following fields must also not be changed:

NUMMANFV	internal field for start of number range (volume serial number)
NUMMANFF	internal field for start of number range (FSEQ)
NUMMEND	internal field for end of number range

If one of these fields is changed by the request exit, the loaded program is terminated with message MARCP27.

After control has been returned from the computer center exit, and before the archive entry is output to the MAREN catalog, certain other archive entry fields are changed. This means that any presettings relating to these fields performed in the computer center exit have no effect. The following list shows the fields involved:

TEMPLOC	current location
INITFLAG	initialization flag
ARCHIVNR	VSN
FSEQ	File sequence number
PRUEFZ	Check digit
RESCOUNT	Reservation counter
VSEQ	File section number
STATUS	Volume status
ARCHLEN	length of archive entry
ACCOUNT	Access counter
DOMAIN	domain

Return codes

The reserve-request exit returns the following information via register 15:

Register contents	Meaning/reaction from MARENCP or MARENUCP
0	The request should be granted. Reservation is carried out. Any changes to the archive entry made by the computer center exit are taken into account.
4	The request is to be rejected. Reservation is not carried out. The caller receives message MARCP24 (REQUEST REJECTED BY MAREN ADMINISTRATOR) and the action (e.g. an ADD-FILE-LINK command) or statement involved (e.g. RESERVE-FREE-VOLUMES) is aborted.
8	This value is only evaluated by MARENUCP. The request is rejected by the automatic free tape allocation facility. The operator is responsible for dealing with the corresponding console messages. MARENCP responds in the same way as when return code '4' is passed
other	The system responds in the same way as when return code '4' is passed.

Preset archive entry fields

When the archive entries are transferred to the exit routine, some of the archive entry fields are preset. This presetting is to a certain extent dependent on whether a free tape is to be transferred via the RESERVE-FREE-VOLUME statement, via the automatic free tape allocation or via an ARCHIVE command.

The preset fields and their contents are shown in the following table. Archive entry fields not listed only contain blanks when the exit routine is called.

The structure of the archive entry and the contents of the individual archive entry fields is described in [section "Volume catalog" on page 71](#). The allocation of the archive entry fields to the field names of the dummy section of the MARENA macro is described in the appendix on [page 225](#).

Presettings for the RESERVE-FREE-VOLUME statement (MAREN and MARENADM)

Archive entry field	Contents passed to the reserve-request exit
OWNERID	In MAREN: ID of caller In MARENADM: USER-ID setting
OWNERACC	In MAREN: Account number of caller In MARENADM: USER-ID setting
XARCHDAT	Current date in ISO4 format
XFREIDAT	FREE-DATE setting in ISO4 format If <integer> , the date is calculated as current date + specified expiration period. If STD*, the date is calculated as current date + host-specific MAREN parameter DEFAULT-FREE-DATE
FILENM41	FILE-NAME setting; if *NONE (default): blanks
DEVICE	DEVICE-TYPE setting; if *STD (default): setting for host-specific MAREN parameter DEFAULT-DEVICE-TYPE or DEFAULT-DENSITY
HOMELC	HOME-LOCATION setting; if *STD (default): setting for host-specific MAREN parameter DEFAULT-HOME-LOCATION
FREELOC	See HOMELC
TEMPLOC	See HOMELC
SHARE	USER-ACCESS setting
PASSWORD	In MAREN: PASSWORD setting; if NONE (default): 4X'00' In MARENADM: 4X'00' (PASSWORD operand not supported)
FASTATUS	X'40', the encryption of the contents of the FREEPOOL field. The FASTATUS field is not to be used anymore.
FREEPOOL	Value for the free tape pool.
BEMERKG	REMARK setting; if NONE: blanks
USERFELD	In MAREN: USER-FIELD setting; if NONE (default): blanks In MARENADM: blanks (USER-FIELD not supported)
NUMMANFV	FROM setting; if *FIRST (default): blanks
NUMMANFF	CL4'0001'
NUMMEND	TO setting; if *LAST (default): CL6' 999999'
LATSN	Caller' s TSN
CRJOB	Caller's job name or blanksn (if job name is not specified)
LAFUNKFL	CL2'17' (field must not be modified by the exit)
LAFUNKNM	In MAREN: CL8'RESERVE' In MARENADM: CL8' RESERVE1' (Field must not be modified by the exit)

Presettings for automatic free tape allocation

Archive entry field	Contents passed to the reserve-request exit
OWNERID	Caller's user ID; exception: in the case of HSMS tasks, ID under which the HSMS directory is cataloged.
OWNERACC	Caller's account number; exception: in the case of HSMS tasks, first account number in the TSOSJOIN entry of the ID under which the HSMS directory is cataloged. In case of SPOOL output to tape: blanks
XARCHDAT	Current date in ISO4 format
XFREIDAT	Date in ISO4 format calculated from current date + host-specific MAREN parameter DEFAULT-FREE-DATE
FILENM41	File name
CRCATID	Catalog ID from file's path name if host-specific MAREN parameter CID-UID is set; otherwise blanks
CRUSERID	User ID from file's path name if host-specific MAREN parameter CID-UID is set; otherwise blanks
DIRNAME	In the case of an ARCHIVE backup with a directory - alternative to these three fields (FILENM41, CRCATID and CRUSERID) Path name of ARCHIVE directory used
DEVICE	Specified device type
HOMELOC	<ul style="list-style-type: none"> - Value of the host-specific MAREN parameter DEFAULT-HOME-LOCATION or - Name of the first archive system entered or - Location specification from the MAREN command ADD-MAREN-FILE-ENTRY or location specification from ARCHIVE or HSMS
TEMPLOC	BCAM name of the local host
SHARE	value of the SHARE operand in the ARCHIVE statement
PASSWORD	4X'00'
FASTATUS	X'40', the encryption of the contents of the FREEPOOL field. The FASTATUS field is not to be used anymore.
FREEPOOL	Value for the free tape pool.
NUMMANFV	blanks
NUMMANFF	CL4'0001'
NUMMEND	CL6'999999'
LATSN	Caller's TSN
CRJOB	Caller's job name or blanks; with HSMS: REQUEST-NAME

continued ➡

Archive entry field	Contents passed to the reserve-request exit
LAFUNKFL	CL2'17' (field must not be modified by the exit)
LAFUNKNM	CL8'MARENUCP' (field must not be modified by the exit)
VOLGROUP	Name of the volume group from the MAREN command ADD-MAREN-FILE-ENTRY

Presettings for one of the ARCHIVE statements

- a) POOL DIRECTORY = ..., ADD = (<tvsn>,...)
- b) SAVE or EXPORT with TAPES = (<tvsn>,...) or TAPES = POOL and there are still free ("AVAILABLE") volumes in the directory's tape pool (if TAPES = POOL was specified and the tape pool is empty, reservation takes place via the automatic free tape allocation facility; see the table above).

Archive entry field	Contents passed to the reserve-request exit
OWNERID	Caller' s user ID
OWNERACC	Caller' s account number
XARCHDAT	Current date in ISO4 format
XFREIDAT	Date in ISO4 format calculated from current date + host-specific MAREN parameter DEFAULT-FREE-DATE
FILENM41	File name
CRCATID	Catalog ID from file' s path name if host-specific MAREN parameter CID-UID is set; otherwise blanks
CRUSERID	User ID from file' s path name if host-specific MAREN parameter CID-UID is set; otherwise blanks
DIRNAME	In the case of an ARCHIVE backup with a directory - alternative to these three fields (FILENM41, CRCATID and CRUSERID) Path name of ARCHIVE directory used
DEVICE	Specified device type
SHARE	value of the SHARE operand in the ARCHIVE statement
PASSWORD	4X'00'
FASTATUS	X'40', the encryption of the contents of the FREEPOOL field. The FASTATUS field is not to be used anymore.
FREEPOOL	Value for the free tape pool.
NUMMANFV	Volume' s VSN (field must not be modified by the exit)

continued ➔

Archive entry field	Contents passed to the reserve-request exit
NUMMANFF	CL4'0001' (field must not be modified by the exit)
NUMMEND	Volume' s VSN (field must not be modified by the exit)
LATSN	Caller' s TSN
CRJOB	Caller' s job name or blanks
LAFUNKFL	CL2'17' (field must not be modified by the exit)
LAFUNKNM	CL8'MARENFA2' (field must not be modified by the exit)

11.3.2 Reserve-return exit MARENEX3

The reserve-return exit is executed when a reservation has been performed. This exit is not executed if the reservation request was rejected for any reason, such as no free volume was available in the specified range of numbers or the reservation was not permitted by the reserve-request exit.

The complete archive entry for the reserved volume is passed to the return exit, where it can be evaluated. This allows the VSN of the reserved volume (field ARCHIVNR) to be used as the VSN in DMS commands.

The return exit must not make any changes to the archive entry, otherwise MARENCP is terminated with message MARCP27.

Return codes

The return codes are not evaluated for the reserve-return exit for reservation.

11.4 Exits for writing an archive entry

There are two different exits for the MAREN function “modify archive entry”:

- the request exit allows the intended modification to be checked and rejected if necessary
- the return exit only allows evaluations, since the modification has already taken place.

The following function names are possible when calling the computer center exit for changing archive entries:

LAFUNKNM	Action involved
CHECK	MAREN statement CHECK-TSOSCAT TYPE-OF-FILES=*FGG
CHECK1	MARENADM statement CHECK-TSOSCAT TYPE-OF-FILES=*FGG
FREE	MARENADM statement FREE-VOLUMES
GET	MAREN statement EXPORT-VOLUME
GET1	MARENADM statement EXPORT-VOLUME
RECEIVE	MARENADM statement IMPORT-VOLUME
INIT	MARENADM statement INITIALIZE-VOLUMES
MARARCHU	Program MARENADM.ARCHIVE
MARENFA2	Modification of an archive entry as a result of one of the ARCHIVE statements SAVE, EXPORT, POOL and PURGE.
MARENFA3	Modification of an archive entry as a result of an ARCHIVE SAVE/EXPORT statement.
MARENUCP	Modification of archive entries as a result of the automatic free tape allocation facility in certain cases.
MAREN0C1	DMS CLOSE
MAREN0E1	DMS volume swap
MAREN0E2	DMS volume swap
MAREN0NR	Nucleus Device Management (NDM)
MAREN0NS	Nucleus Device Management (NDM)
MAREN0O2	DMS OPEN
MODIFY	MAREN statement MODIFY-VOLUME-ATTRIBUTES
MODIFY1	MARENADM statement MODIFY-VOLUME-ATTRIBUTES
MODTSET	MAREN statement MODIFY-TAPE-SET-ATTRIBUTES

continued ➡

LAFUNKNM	Action involved
MODTSET1	MARENADM statement MODIFY-TAPE-SET-ATTRIBUTES
MOUNT	MAREN statement MOUNT-VOLUME
RETURN	MARENADM statement RETURN-VOLUMES
SECFREE	MARENADM statement SECURE-FREE-VOLUMES

Passing parameters

The following information is passed to the write exits:

Register 1	A(parameter area) The parameter area comprises a word containing the address of the archive entry. The individual archive entry fields can be addressed symbolically via the dummy section MARENA.
Register 13	A(Savearea) The save area provided by the MAREN system is 18 words long.
Register 14	A(return) For returning directly to the MAREN system.
Register 15	A(computer center exit routine) Start address of the called computer center exit routine.

All other registers are set to “binary zero”.

11.4.1 Write-request exit MARENEX2

The write-request exit is called before an archive entry is modified. It permits the following activities, for example:

- check what change is to be performed and the action initiating the change
- change additional fields in the archive entry
- reject modification according to special criteria.

The following fields must not be changed by the write-request exit:

LAFUNKFL	Flag for the action to be performed by the program
LAFUNKNM	Name of the calling MAREN components or abbreviated name of the MAREN or MARENADM statement entered
ARCHIVNR	VSN of the volume
FSEQ	File sequence number
VSEQ	File section number
NUMMANF	Internal field for passing ISAM keys
ACCOUNT	Access counter
RESCOUNT	Reservation counter
PRUEFZ	Check digit
DEVICE	Device type
STATUS	Volume status
DOMAIN	domain

If one of these fields is changed by the request exit, the loaded program, e.g. MARENCP, is terminated with message MARCP27.

If any of the following fields is filled with dollar (\$) characters, the field is restored to its original value or filled with blanks (LATSN only):

PASSWORD	Volume password
LAUSERID	User ID of the last access
LAACC	Account number of the last access
LATSN	TSN of the last access

Return codes

The write-request exit returns the following information via register 15:

Register contents	Meaning/reaction from MARENUCP
0	The request should be granted. The archive entry is modified using any preset values from the computer center exit.
4	The request is to be rejected. The archive entry is not modified. The caller receives message MARCP24 and the action (e.g. a ADD-FILE-LINK command) or statement involved (e.g. MODIFY-VOLUME-ATTRIBUTES) is aborted.
other	The system responds in the same way as when return code "4" is passed.

11.4.2 Write-return exit MARENEX4

The write-return exit is only executed if a modification has taken place. This exit is not executed if a modification was rejected for any reason, such as the archive entry is password-protected and the password was not specified or the modification was not permitted by the write-request exit.

The return exit can perform the following action:

- evaluate the changes made.

The return exit must not make any changes to the archive entry, otherwise the loaded program, e.g. MARENCP, is terminated with message MARCP27.

Return codes

The return code is not evaluated for the write-return exit for modification.

11.5 MARENEX5 - exit for reading an archive entry

The read exit is called after an archive entry has been read. It can perform actions such as the following:

- reject transfer of the archive entry to the caller.
- delete or replace individual items in the archive entry to be passed to the user. However, these changes only affect the data passed. No changes are made to the archive entry.
- In the event of a restart, the file release date can be set.

The read exit is only used in the MARENCP program and, if direct access to the MARENCAT is possible, by the MARENADM and MARENUCP programs. A list of the function names possible when calling the read exit can be found in "MAREN Volume 2" [1].

The following fields are supplied with values in the caller area:

LATSN	TSN of the calling task
LAUSERID	User ID of the calling task
LAACC	Account number of the calling task
LAJOB	Job name of the calling task
LACPU	Name of the computer on which the call was issued (HOSTNAME from the MARENCP start procedure)
LAFUNKFL	C'09'
LAFUNKNM	Name of the calling routine (see "MAREN Volume 2" [1])
NUMMANFV	VSN
NUMMANFF	File sequence number

If LAFUNKNM=MOUNT (MAREN statement MOUNT-VOLUME) is specified, then the following also applies:

OPENTYP	C'IN' (ACCESS-READ) or C'OU' (ACCESS-WRITE)
---------	---

If LAFUNKNM=MARENO01 (DMS call OPEN REQUEST) is specified, then the following also applies:

OPENTYP	Mode in which the file is opened
FILENM41	File name
CRCATID	File's catalog ID (only if host-specific MAREN parameter CID-UID is set)
CRUSERID	File's user ID (only if host-specific MAREN parameter CID-UID is set)

Passing parameters

The following information is passed to the read exits:

Register 1	A(parameter area) The parameter area comprises two words, the first containing the address of the archive entry and the second word containing the address of an area containing information passed to MARENCP by the caller. Both areas can be addressed symbolically via the Dsect MARENA.
Register 13	A(Savearea) The save area provided by the MAREN system is 18 words long.
Register 14	A(return) For returning directly to the MAREN system.
Register 15	A(computer center exit routine) Start address of the called computer center exit routine.

All other registers are set to “binary zero”.

Return codes

The read exit returns the following information via register 15:

Register contents	Meaning
0	The request should be granted. The archive entry read is passed to the caller with any changes made by the computer center exit.
4	The request is to be rejected. The archive entry read is not passed to the caller. The caller receives message MARCP24 and the action (e.g. a ADD-FILE-LINK command) or statement involved (e.g. SHOW-VOLUME-ATTRIBUTES) is aborted.
other	The system responds in the same way as when return code “4” is passed.

11.6 Device depot exit MARENEX6

With the introduction of support for archive systems it became necessary to differentiate between automatically operated devices and devices controlled manually by a human operator. For this reason, device depots were introduced to BS2000 (NDM); these can be managed with the aid of the operator commands ADD-DEVICE-DEPOT, SHOW-DEVICE-DEPOT and REMOVE-DEVICE-DEPOT.

When volumes are requested, the device depot must be specified in addition to the volume type; an appropriate device must be used by NDM. In the case of a scratch application, MARENUCP must also know which location (archive system or manually operated archive) the volume must be selected from for processing.

This computer center exit makes it possible, to define the device depot in which a device is to be used and set the HOME-LOCATION with the same name for tape selection.



A reservation file created with MARENLM is evaluated immediately before the exit for the device depot.

The device depot exit is called in the following cases:

- a BS2000 command `SECURE-RESOURCE-ALLOCATION DEVICE` without a `LOCATION` parameter was called
- a scratch request is being processed.

When the call is issued, the following information is passed to the computer center exit or returned by it in the form shown below:

FILENAME	File name (either the file name as specified via a new parameter in the <code>SECURE-RESOURCE-ALLOCATION</code> command, or the DMS file name in case of a DMS scratch request)
LATSN	TSN of the calling task
OWNERID	User ID of the calling task
OWNERACC	Account number of the calling task
CRJOB	Job name of the calling task
LACPU	Name of the computer on which the call was issued (<code>HOSTNAME</code> from the <code>MARENCP</code> start procedure)
HOMELOC	Value of the host-specific parameter <code>DEFAULT-HOME-LOC</code>

The field USERFELD passes or returns the following (see Note):

DEVTYPE	8 Byte	Device type as specified in request
NUMDEV	1 Byte	Number as specified in request
DEPOT1	8 Byte	Suggested device depot
NUM1	1 Byte	Number of devices as specified in request
DEPOT2	8 Byte	empty
NUM2	1 Byte	empty
DEPOT3	8 Byte	empty
NUM3	1 Byte	empty
DEPOT4	8 Byte	empty
NUM4	1 Byte	empty



DEVICE-DEPOT/HOME-LOCATION is defined by the device depot exit. If two or more devices are requested (only possible with the SECURE-RESOURCE-ALLOCATION command), the devices can belong to different device depots. If more than one device is to be reserved, this is done device by device, because of the internal processing in NDM. The NUMDEV field always has the value 1. Fields DEPOT2/NUM2 through DEPOT4/NUM4 currently have no meaning.

If blanks are returned instead of the location, MARENUCP determines the location from the number range (fields NUMMANFV and NUMMEND). MARENUCP determines the first volume in the number range and designates the volume's FREE-LOCATION as the required location.

The following additional conditions apply:

- Only one number range can be returned for device depot exit MARENEX6, even if more than one device is requested.
- If no volume is found in the number range, message MARUP97 is output.

Passing parameters

The following information is passed to the device depot exit:

Register 1	A(parameter area) The parameter area comprises a word containing the address of the archive entry. The individual archive entry fields can be addressed symbolically via the dummy section MARENA.
Register 13	A(Savearea) The save area provided by the MAREN system is 18 words long.
Register 14	A(return) For returning directly to the MAREN system.
Register 15	A(computer center exit routine) Start address of the called computer center exit routine.

All other registers are set to “binary zero”.

Return codes

The device depot exit returns the following return codes in register 15:

Register contents	Meaning/reaction from MARENUCP
0	The values contained in the USERFELD field in Depot1-4 and NUM1-4 are to be used. For the format of USERFELD, see above.
other	The following rule applies: <ul style="list-style-type: none"> – If a magnetic tape cartridge is specified in DEVTYPE and an archive system is available, the name of the archive system’s location is used as the depot name. If more than one archive system is available, the one specified first in the MAREN location table is used. – Otherwise the location specified in the host-specific DEFAULT-HOME-LOC parameter is used.

Notes

- When a free volume is requested, the computer center exit MARENEX1 is called after MARENEX6. If a location is specified in both cases, the information must not be contradictory.
- Only MARENEX1 can refuse a request (not MARENEX6).
- The location names returned by MARENEX6 must be compatible with the existing device depots.
- The USERFELD archive entry field is reset to its original contents after the return.

11.7 Example of a computer center exit routine

The example below illustrates how an exit routine specific to the computer center and fulfilling the following three particular requirements can be implemented:

1. Under the ID USERID01 no free volumes are to be newly reserved; any request to this effect is to be rejected.
2. The user ID USERID02 should only be assigned those free volumes whose VSNs begin with the number '3'. For these archive entries, the user field should be predefined with the string '** EXIT-TEST **'. Since the range of numbers cannot be changed for any new reservations via the MAREN-ARCHIVE link (LAFUNKNM=MARENFA2), reservation must be aborted for a VSN which does not begin with the number '3'.
3. For all new reservations, the computer center administration field should be predefined with the 'MAREN' string.

```

MARENEX1 CSECT
          STM 14,12,12(13)
          USING MARENEX1,15
          L 7,0(.1) GET @(ARCHREC)
          USING MARENA,7
          CLC OWNERID,CANUID
          BE CANCEL
          CLC OWNERID,=CL8'USERID02'
          BNE RETURN
          CLC LAFUNKNM,=CL8'MARENFA2' CALLER=ARCHIVE EXIT?
          BNE CONTINUE IF NOT ->
          CLI NUMMANFV,C'3' VSN O.K.?
          BNE CANCEL IF NOT - REJECT
          B UPDATE
CONTINUE MVC NUMMANFV,=CL6'3' SET FROM-OPERAND
          MVC NUMMEND,=CL6'399999' SET TO-OPERAND
UPDATE MVC USERFELD,=CL54'** EXIT-TEST **'
RETURN MVC RZFELD,RZTEXT
          LM 14,12,12(13)
          XR 15,15
          BR 14 NORMAL-RETURN
CANCEL LM 14,12,12(13)
          LA 15,4 INDICATE ERROR
          BR 14 REQUEST CANCEL
CANUID DC CL8'USERID01'
RZTEXT DC CL8'MAREN'
          LTORG
          MARENA LAYOUT=V8
          END

```


12 Appendix

12.1 Overview of MAREN system global parameters

A detailed description of the host-specific MAREN parameters see the MODIFY-MAREN-PARAMETERS statement in “MAREN Volume 2” [1].

Host-specific parameter	Value range	Default setting	Description / Meaning
ALL-DOMAIN-ADMIN	UNCHANGED/ ALLOWED / NOT-ALLOWED	UNCHANGED	Controls whether an ADA may work on the host
ARCHIVES-WORK-TIME	0..24	00002400	Time the central archive is open <ul style="list-style-type: none"> – Format: hhmmhhmm – First half = opening time – Second half = closing time Volumes can only be exported or requested from the central archive during the specified time interval.
AUDIT	YES / NO / OPTIONAL	YES	This parameter controls the volume-specific checks. <ul style="list-style-type: none"> – YES: All volumes entered in the MAREN catalog are always monitored. – NO: Checks are carried out and any errors detected are reported, but the action involved is not aborted. – OPTIONAL: Checks are carried out and any errors detected are reported, but the action involved is only aborted if the AUDIT flag is set in the archive entry for the volume involved or if no archive entry exists for the volume.

(section 1 of 7)

Host-specific parameter	Value range	Default setting	Description / Meaning
BATCH-EXEC-TIME	0..32767	100	Batch task execution time: This wait time specifies (in seconds) how long a batch task is to wait for the execution of a MAREN transaction (maximum).
BATCH-REQUEST-TIME	0..32767	1800	Batch task request time: This wait time specifies (in seconds) how long a batch task is to wait for the acceptance of a MAREN transaction (maximum).
CID-UID	UNCHANGED / YES / NO	UNCHANGED	CID-UID in the archive entry: When creating tape output files, this parameter causes the catalog ID of the pubset and the user ID under which the file was created to be included in the archive entry together with the job name, date and time.
DEFAULT-ADMIN-SCOPE	OWN-DOMAIN / ALL-DOMAIN	OWN-DOMAIN	Preset administration scope when MARENADM is started
DEFAULT-DENSITY	T800 / T1600 / T6250	T6250	Standard recording density: For a free tape allocation with DEVICE-TYPE=TAPE or without explicit specification of a recording density, the default recording density is entered.
DEFAULT-DEVICE-TYPE	<name>		Device type for new reservations: If this parameter is not set, volumes of the device type defined in DEFAULT-DENSITY are reserved by default.
DEFAULT-FREE-DATE	0..9999	365	Default volume expiration date: For a free tape allocation without explicit specification of an expiration date, the default volume expiration date is entered in days.
DEFAULT-HOME-LOC	<name> / HOST	CENTRAL	Default home (permanent) location: For a free tape allocation without explicit specification of a permanent location the default home location is entered. *HOST implies that the host name is used by default as the standard permanent location for each system.

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Host-specific parameter	Value range	Default setting	Description / Meaning
DEFAULT-USER-ACCESS	UNCHANGED / OWNER-ONLY / FOREIGN-READ- ONLY / ALL-USERS	UNCHANGED	Default shareability: Defines whether volumes are shareable by default
DEVICE-COMPLETION	YES / NO	NO	DEVICE parameter completion – YES: A file assignment for a tape file using the parameter VOLUME=<vsn>, but without a DEVICE specification, leads to incorporation of the device type from the MAREN catalog entry into the FILE parameter list. – NO: The FILE parameter list is not modified.
DIALOG-EXEC-TIME	3..32767	50	Dialog task execution time: This wait time specifies (in seconds) how long an interactive task is to wait for the execution of a MAREN transaction (maximum).
DIALOG-REQUEST-TIME	3..32767	180	Dialog request time: This wait time specifies (in seconds) how long an interactive task is to wait for the acceptance of a MAREN transaction (maximum).
EXPORT-ADDRESS-ACK	YES / NO	NO	Confirmation of mailing address: This parameter indicates whether the mailing address is to be acknowledged by the operator via the MAREN statement EXPORT-VOLUME when a tape is exported.
EXPORT-FOREIGN-TAPES	YES / NO	NO	Foreign tape export: This parameter indicates whether it is permissible to export foreign tapes with the specification USER-ACCESS=ALL- USERS.
EXPORT-PROCESSING	YES / NO	YES	Export permission: This parameter indicates whether use of the EXPORT-VOLUME statement is permitted for the user.

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Host-specific parameter	Value range	Default setting	Description / Meaning
EXPORT-RECEIPT	CONSOLE/ PRINTER / FILE / NO	NO	Export receipt output control: This parameter defines the output medium for the statement EXPORT-VOLUME.
FOREIGN-TAPE-CHECK	YES / NO	YES	Foreign tape check <ul style="list-style-type: none"> – YES: All tapes must be entered in the MAREN catalog before they can be processed. – NO: In the case of tapes not entered in the MAREN catalog, MAREN does not perform any checks.
FREE-POOLS	NO / GLOBAL / TSOS / <name>		Free tape pool
HOST			BCAM name of the local host
INPUT-FILE-CHECK	YES / NO	NO	Check of input file names (see also AUDIT in this table) <ul style="list-style-type: none"> – YES: In the case of input tapes, the volumes from the DMS command IMPORT-FILE or the FILE macro and the MAREN archive entry are checked for consistency. When not identical, processing is aborted and an appropriate error message issued. – NO: No check for consistency of the input files is made.
INPUT-TAPE-CHECK	YES / NO	YES	Check of input tapes (see also AUDIT in this table) <ul style="list-style-type: none"> – YES: All MAREN checks are performed for the input tapes, regardless of whether or not they are cataloged, locally available, exported, currently reserved, etc. – NO: No checks of any kind are made for input tapes.
LOCATION-NAME	<name>		Name of a location

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Host-specific parameter	Value range	Default setting	Description / Meaning
LOGGING	UNCHANGED / YES / NO	UNCHANGED	Definition of logging: This parameter causes a record to be written to a logging file each time a change is made to an archive entry in the MAREN catalog.
MAREN-PASSWORD	<c-string> / <x-string> / <integer> / NONE / SECRET	NONE	MAREN password: This password protects the whole MAREN system in addition to the TAPE-ADM privilege and authorizes administrator functions. It must be entered using the BS2000 command ADD-PASSWORD before the program MARENADM is invoked.
MOUNT-CHECK-INTERVAL	<integer 9..9999>	60	Time in seconds which MARENUCP should wait before checking whether a tape has been mounted. The wait time begins when the mount request has been issued to the operator.
OPERATING-MODE	MANUAL / ROBAR-1 / ROBAR-2 / EXTERNAL	MANUAL	Operating mode of a location or archive system <ul style="list-style-type: none"> – MANUAL: Manually operated location – ROBAR-1: real archive systems – ROBAR-2: ETERNUS CS HE – EXTERNAL: External group of tape stations which is to be operated manually
OPERATOR-ROLE	<name 1..8>	SYSMAREN	Operator role which is required when MARENUCP executes and when the MARENADM statement INITIALIZE-VOLUMES is called.
PRIVILEGED-USER-ID	<userid> / NONE	blanks	User privileges: Here a special user ID can be specified, which is to be privileged; the notes on the TSOS-PRIVILEGED parameter apply here.

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Host-specific parameter	Value range	Default setting	Description / Meaning
RESERVATION-SEQUENCE	BY-VSN / BY-RESERVATION-COUNT / BY-LAST-ACCESS-DATE / BY-FREE-DATE	BY-VSN	MARENUCP allocates free tape according to the regularity of their use. Tapes that are used less frequently are proposed first. The following criteria can be used to determine regularity of use: <ul style="list-style-type: none"> – BY-VSN: The sequence is determined by the VSNs. Tapes with the lower alphanumeric VAN are proposed first . – BY-RESERVATION-COUNT: The sequence is determined by the value of RESERVATION-COUNT. Tapes with low values are proposed first. – BY-LAST-ACCESS-DATE: The sequence is determined by the value of LAST-ACCESS-DATE. Tapes with an earlier date are proposed first. – BY-FREE-DATE: The sequence is determined by the value of FREE-DATE. Tapes with an earlier date are proposed first.
RESERVE-DEVICE-TYPES	<name>	T6250	Table of reservable volume types (max. 20 entries): This table lists the types of volumes permitted for new reservations. The first entry is T6250 by default; further entries are padded with blanks.
RETPD-CHECK	YES / NO	YES	Check of the expiration date (see also AUDIT in this table): This specifies whether the file expiration date in the archive entry field EXPIRATION-DATE is to be checked in the case of output files. <ul style="list-style-type: none"> – YES: If the date has not yet been reached, each overwrite attempt is rejected with an error message. – NO: No check is made.
SYMBOLIC-NAME	SAME / <name>	SAME	Symbolic name of a location: When SAME is specified, the symbolic name matches the LOCATION-NAME

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Host-specific parameter	Value range	Default setting	Description / Meaning
TESTMODE	UNCHANGED / YES / NO	UNCHANGED	Enables/disables test mode: When test mode is enabled only tasks of the MAREN subsystem and MARENUCP with the job name MARENTST are processed. For all other tasks, both checks and the updating of the MAREN catalog are suppressed. In test mode, the MARENCPP task must always be started first, i.e. before starting the MAREN subsystem and MARENUCP.
TSOS-PRIVILEGED	YES / NO	NO	TSOS privileges <ul style="list-style-type: none"> – YES: The TSOS identification is exempted from all MAREN system exit checks during tape processing. Nevertheless, all updates of the MAREN catalog are executed. – NO: The MAREN subsystem treats the system administrator ID TSOS like any other ID. Checks and updates are executed by the MAREN and MARENADM programs and the MARENUCP free tape allocation facility, independent of the current parameter value.
TYPE	REMOTE / LOCAL	LOCAL	Location ID: Specifies whether the location is in the area of the computer room (LOCAL) or not (REMOTE).

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12.2 Overview of global parameters

For a detailed description of the global parameters, see the MODIFY-GLOBAL-PARAMETERS statement in “MAREN Volume 2” [1].

Global parameter	Value range	Default setting	Description / Meaning
ACCESS-MODE	UNCHANGED / SHARED / EXCLUSIVE	UNCHANGED	mode of access to the MAREN catalog (shared or exclusive)
ALL-DOMAIN-ADM-PASSW	UNCHANGED / <c-string> / <x-string> / <integer> / NONE / SECRET	UNCHANGED	password for the All-Domain Administrator
DOMAIN-PROTECTION	UNCHANGED / ACTIVE / NON-ACTIVE	UNCHANGED	controls whether domains are used

12.3 Overview of domain-specific parameters

For a detailed description of the domain-specific parameters, see the MODIFY-DOMAIN-PARAMETERS statement in “MAREN Volume 2” [1].

Domain-specific parameter	Value range	Default setting	Description / Meaning
FREE-VOLUMES	UNCHANGED / FROM-OWN- DOMAIN / FROM-STD- DOMAIN	UNCHANGED	defines whether free volumes are taken from the user’s own domain or the standard domain.

12.4 Archive entry fields

The following table lists the archive entry fields (see description of the record structure in [section “Volume catalog” on page 71](#)) in alphabetical order and their allocation to the relevant field name in the dummy section of the MARENA macro or in the SYSOUT output of an archive entry with SHOW-VOLUME-ATTRIBUTES (see “MAREN Volume 2” [1]):

Archive entry field	Field name in the DSECT of the MARENA macro	Field name for the output with SHOW-VOLUME-ATTRIBUTES	Variable name for output in an S variable with SHOW-VOLUME-ATTRIBUTES
ACCESS-COUNT	ACCOUNT8	ACCESS-COUNT	ACCESS-COUNT
ACCOUNT	OWNERACC	ACCOUNT	USER-ACCOUNT
ADMINISTRATOR-FIELD	RZFELD	ADM-FIELD	ADM-FIELD
ADMINISTRATOR-FIELD 2	RZFELD2	ADM-FIELD /2	ADM-FIELD-2
ARCHIVE-USAGE	FSTATUS	FREE-POOL	FREE-POOL
CHECK-COUNT	PRUEFZ	CHECK-COUNT	CHECK-COUNT
CLOSE-INDICATOR	CLOSEIND	CLOSE-IND	CLOSE-INDICATOR
CREATION-CAT-ID	CRCATID	CR-CAT-ID	CRE-CAT-ID
CREATION-DATE	XCRDATE	CR-DATE	CRE-DATE
CREATION-JOB-NAME (other cases) REQUEST-NAME (HSMS)	CRJOB	CR-JOB (other cases) / REQUEST-NA (HSMS)	CRE-JOB-NAME
CREATION-TIME	CRTIME	CR-TIME	CRE-TIME
CREATION-USER-ID	CRUSERID	CR-USER-ID	CRE-USER-ID
DEC# OF SAVED PAM-PAGES	PAMPAG#	LAST-WRITE-BLK-CNT	LAST-WRT-BLOCK-CNT
DEVICE-NAME	MNEMONI4	DEV-NAME	DEV-NAME
DEVICE-TYPE	DEVICE	DEV-TYPE	DEV-TYPE
DIRECTORY-NAME	DIRNAME	DIRECTORY-NAME	DIR-NAME
DIRECTORY-ON-VOLUME	DIRONVOL	DIR-ON-VOL	DIR-ON-VOL
DOMAIN-NAME	XYDOMAIN	DOMAIN	DOMAIN
EXPIRATION-DATE	XEXDATE	EXPIR-DATE	EXPIR-DATE
Only for S variable	Only for S variable	Only for S variable	EXPORTED
EXPORT-ADDRESS	LEIHADR	EXPORT	EXPORT-ADDR
EXPORT-DATE	XLEIHDAT	EXPORT-DATE	EXPORT-DATE
FILENAME	FILENM41	FILE-NAME	F-NAME

(section 1 of 3)

Archive entry field	Field name in the DSECT of the MARENA macro	Field name for the output with SHOW-VOLUME-ATTRIBUTES	Variable name for output in an S variable with SHOW-VOLUME-ATTRIBUTES
FILE-SEQUENCE#	FSEQ	FILE-SEQ	F-SEQ
FIRST-VOLUME	ERSTVSN	FIRST-VOL	FIRST-VOL
FREE-DATE	XFREIDATE	FREE-DATE	FREE-DATE
FREE-LOCATION	FREELC	FREE-LOCATION	FREE-LOCATION
FREE-POOL	FREEPOOL	FREE-POOL	FREE-POOL
FROM (INTERVAL)	NUMMANFV	Only internal	Only internal
FROM-FSEQ (INTERVAL)	NUMMANFF	Only internal	Only internal
HOME-LOCATION	HOMELOC	HOME-LOCATION	HOME-LOCATION
INDICATOR 1 (AUDIT)	ARCHIND1	AUDIT	AUDIT
INITIALIZATION	INITFLAG	INIT	INIT
LAST-ACCESS-ACCOUNT	LAACC	LAST-ACC-ACCOUNT	LAST-ACCESS-ACCOUNT
LAST-ACCESS-CPU-NAME	LACPU	LAST-ACC-CPU-NAME	LAST-ACCESS-CPU-NAM
LAST-ACCESS-DATE	XLADATE	LAST-ACC-DATE	LAST-ACCESS-DATE
LAST-ACCESS-FUNCTION-FLAG	LAFUNKFL	LAST-ACC-FUN-FLAG	LAST-ACC-FUNC-FLAG
LAST-ACCESS-FUNKTION-NAME	LAFUNKNM	LAST-ACC-FUN-NAME	LAST-ACC-FUNC-NAME
LAST-ACCESS-JOB-NAME	LAJOB	LAST-ACC-JOB-NAME	LAST-ACCESS-JOB-NAM
LAST-ACCESS-SNO	LASNO	LAST-ACC-SNO	LAST-ACC-SESSION-NR
LAST-ACCESS-TIME	LATIME	LAST-ACC-TIME	LAST-ACCESS-TIME
LAST-ACCESS-TSN	LATSN	LAST-ACC-TSN	LAST-ACCESS-TSN
LAST-ACCESS-USER-ID	LAUSERID	LAST-ACC-USER-ID	LAST-ACCESS-USER-ID
LAST-CLOSE-DATE	XCLDATE	LAST-CL-DATE	LAST-CLOSE-DATE
LAST-CLOSE-TIME	CLTIME	LAST-CL-TIME	LAST-CLOSE-TIME
MESSAGE-KEY	ERRORKEY	Only internal	Only internal
OPEN-TYPE	OPENTYP	OPEN-MODE	OPEN-MODE
PASSWORD	PASSWORD	PASSWORD	PASS
RECORD VERSION	ARCHMAVE	Only internal	Only internal

(section 2 of 3)

Archive entry field	Field name in the DSECT of the MARENA macro	Field name for the output with SHOW-VOLUME-ATTRIBUTES	Variable name for output in an S variable with SHOW-VOLUME-ATTRIBUTES
REGISTRATION-DATE	VOLRGDAT	REG-DATE	REG-DATE
REMARK	BEMERKG	REMARK /1	REMARK
REMARK 2	BEMERKG2	REMARK /2	REMARK-2
REMARK 3	BEMERKG3	REMARK /3	REMARK-3
RESERVATION-COUNT	RESCOUNT	RESERV-COUNT	RESERV-COUNT
RESERVATION-DATE	XARCHDATE	RESERV-DATE	RESERV-DATE
RETURN-INFORMATION	RETURNFLAG	Only internal	Only internal
SUB-SAVE-NUMBER	SUBSAV#	SUBSAVE	SUBSAVE
SUBSEQUENCE-NUMBER	SUBSEQ#	SEQ	SUBSEQ
SVID/SFID FROM ARCHIVE/HSMS	SAVEVER	SAVE-FILE	SFID
TEMPORARY-LOCATION	TEMPLOC	TEMP-LOCATION	TEMP-LOCATION
TO (INTERVAL)	NUMMEND	Only internal	Only internal
USER ACCESS	SHARE	USER-ACC	USER-ACCESS
USER-FIELD	USERFELD	USER-FIELD	USER-FIELD
USER-IDENTIFICATION	OWNERID	USER-ID	USER-ID
VOLUME	ARCHIVNR	VOLUME	VOL
VOLUME-GROUP	VOLGROUP	VOL-GROUP	VOL-GROUP
VOLUME-SEQUENCE	VSEQ	VOL-SEQ	VOL-SEQ
VOLUME-STATUS	STATUS	VOL-STATUS	VOL-STA (for a volume) VOL-STA-1 (for a volume list)

(section 3 of 3)

Glossary

This glossary explains some of the terms used frequently in this manual and the terms are listed in alphabetical order. Cross-references are indicated by *italics*.

Administrator without domains

An administrator who works in the MAREN network without domains (see also *MAREN administrator*).

All-Domain Administrator (ADA)

see *MAREN administrator*.

archive entry fields

An archive entry consists of several fields containing the various attributes (e.g. the FREE-DATE field contains the volume expiration date).

archive record (archive database)

Database with logical and physical information about cartridges, MTC devices, and robots. The archive table allocates the VSNs (volume sequence numbers) of a cartridge to its location.

archive system

One of the MTC archive systems supported by MAREN if no further distinction need be made between the archive systems.

archive system (real)

The real archive systems from Quantum Corp. consist of the components archive computer, robots, and storage systems for MTCs. They are linked to a BS2000 system and receive jobs from BS2000 via *ROBAR*.

computer center volume

This volume is the property of the computer center; it is made available to a user for a limited period of time.

data key

A key (256-bit long bit string) which an LTO drive uses for encryption/decryption of the tape contents. The data key is generated by MAREN and supplied to the drive by means of PTAM.

The data key is stored in the metadata of the encrypted tape and can therefore only be lost together with the tape.

To protect the tape contents from being read by unauthorized persons, MAREN encrypts the data key using the *encryption key*.

domain

A domain is a group of hosts within a MAREN network. A domain consists not only of the hosts, but also of the volumes which are processed on these hosts. The information on the domains is stored in the MAREN catalog.

Domains represent a protection mechanism: Access to volumes is only possible within the domain involved. This applies on the one hand for accesses to data stored on the volumes. On the other hand also for accesses to the MAREN catalog, in other words to the data about the volumes.

Domain Administrator (DA)

see *MAREN administrator*.

Encryption key

MAREN requires the encryption key to encrypt/decrypt the *data key*.

The encryption key consists of the *key value* and *key ID*.

Only with the encryption key can the data key of a tape be decrypted and the tape contents read again.

MAREN stores the encryption keys in a *key box* and fetches the required encryption key from the key box when a volume is read.

ETERNUS CS HE

The ETERNUS CS HE archive system is an archive of virtual volumes. The virtual volumes are created on a RAID disk system and are swapped out asynchronously to real magnet tape cartridges or retrieved from there, as the necessity occurs. Virtual volumes in the disk system can be accessed quickly. The real volumes and devices are transparent to the operating system. MAREN, on the other hand, only manages the virtual volumes.

file expiration date

This is the expiration date for a file on a *volume*. It corresponds to field 10 (expiration date) in the HDR1 label on the tape when a tape file has been generated. This date is defined when the file is created using the RETENTION-PERIOD parameter in the ADD-FILE-LINK command. The MAREN system internally ensures that the *volume expiration date* will always be at least as high as the value for the file expiration date.

foreign volume

This volume is not the property of the computer center. It is imported to the *MAREN catalog* by a user via the administrator with the purpose of being processed in the computer center for a limited period of time.

free volume

This is a volume which belongs to the computer center (*computer center volume*) and which can be reserved by a user as required.

Free volume pool (Free-Pool)

This is the set of free volumes available for new reservations.

Key box

This is a special ISAM file in which MAREN stores the *encryption keys*. The system key box \$SYSMAREN.MAREN.KEY-BOX on the host's home pubset must contain the encryption keys of all tapes which may be decrypted on this host. A maximum of one encryption key of the system key box is defined as the write encryption key for writing encrypted tape contents. "Private" key boxes are used for storing copied keys or for backup copies. MAREN uses a transfer key box specifically for exporting/importing encrypted volumes .

key ID

The key ID is assigned by MAREN and is used to find the *encryption key*, which is required for decryption. It is assigned by MAREN and is globally unique, the encryption key administrator being able to specify the first 4 characters on a user-specific basis.

key value

The key value can be up to 256 bytes in length and is used to encrypt the *data key*. The encryption key administrator specifies the key value when the *encryption key* is generated.

locally available

A volume is locally available if the catalog entry field TEMP-LOCATION in the *volume catalog* indicates a location in the vicinity of the machine room. Locations of this kind are defined in the MAREN parameter set with "L".

location

Archive with volumes and devices. A location is identified by its name, type and *operating mode*.

MAREN administrator

The MAREN administrator monitors and manages the complete MAREN system. MAREN administrators identify themselves by entering the MAREN password. When the software product SECOS is used, the user ID (SYSMAREN) of the MAREN administrator should have the TAPE-ADMINISTRATION system privilege.

When domains are used two different administrator roles exist:

- The Domain Administrator (DA)
DAs are permitted to execute statements of the MARENADM administration program within their own domain. They may not work in other domains.
- The All-Domain Administrator (ADA)
ADAs administer the domains using special statements of the MARENADM administration program. Furthermore they are permitted to perform DA tasks in all domains. To do this they can explicitly adopt the role of the DA. The default domain- and host-specific parameters then apply for the ADA. The ADA must have authorization to execute statements on at least one host in the MAREN network.

MAREN catalog

Central database of the MAREN system containing all information on the volumes. The MAREN catalog comprises the *volume catalog* with the archive entry fields, secondary index files and possibly logging files (if any).

MAREN encryption key administrator

When data volume encryption is used, the encryption key administrator manages the *encryption keys* of his/her domain. The user ID with the system privilege TAPE-KEY-ADMINISTRATION has the authorization for this task.

The administrator's tasks comprise:

- creating *encryption keys*
- defining the *encryption key* for encryption
- managing *key boxes*
- importing the *encryption keys* of foreign volumes
- Additional storage of the encryption data at a secure location to enable it to be reconstructed in the event of a disaster

MAREN network

A MAREN network consists of all the hosts which access the same *MAREN catalog*.

MAREN parameters

The MAREN parameters control execution of MAREN and the control programs MARENCP and MARENUCP. The following types of MAREN parameter exist:

- Host-specific parameters which are defined with the MARENADM statement MODIFY-MAREN-PARAMETERS.
- Domain-specific parameters which are defined with the MARENADM statement MODIFY-DOMAIN-PARAMETERS.
- Global parameters which are defined with the MARENADM statement MODIFY-GLOBAL-PARAMETERS.

MAREN transaction

Access to the *MAREN catalog* via the control program MARENCP.

MAREN user

Generic term. The term refers to both the privileged *MAREN administrator* and the nonprivileged *MAREN user*.

MTC

Magnetic tape cartridge. A synonym used for MTCs is volume.

nonprivileged MAREN user

He has no special privileges and employs the MAREN user program to manage the volumes which are reserved for his/her user ID in the MAREN catalog.

Offline logging

If the *MAREN catalog* is not available for any reason, offline logging can be activated. This means that processing continues without the MAREN catalog but that logging records continue to be written. This is only possible if the control task MARENCP continues to run. Once the error has been recovered, a current MAREN catalog can be generated using the UPDATE-MAREN-CATALOG statement. Offline logging is activated if a MARENCP ENTER file without the link name MARENCAT is started.

operating mode

MAREN determines the archive system to which it is to send its jobs not only from the locations and the archive systems, but also from the operating mode of the *location*. The operating modes are “EXTERNAL”, “ROBAR-1” and “ROBAR-2”.

Parameters

see *MAREN parameters*.

reserved volume

This is a volume which *belongs to the computer center* and which is assigned to a certain user (and therefore a user ID) for a limited period of time. The reservation can be made explicitly using the RESERVE-FREE-VOLUME statement or implicitly, e.g. via the *scratch request*. Reservation is terminated when the *volume expiration date* is reached.

ROBAR

Software product for controlling MTC archive systems by means of BS2000 systems (**Robotarchive**).

Scratch request

Mount job for a volume without specification of an volume serial number (VSN).

secondary indexes

The MAREN catalog contains secondary indexes for the user ID and the file name in addition to the volume-related ISAM index. ISAM access to an archive entry is therefore now also possible via the secondary indexes for the user ID and the file name.

spin-off

If MARENADM rejects a statement because of a syntax error, or if the statement is aborted or not executed due to a processing error, all subsequent statements through to the next //STEP statement are skipped. If the sequence of statements contains no further //STEP statement, MARENADM triggers the spin-off mechanism when the program is ended (END). All commands through to the next /SET-JOB-STEP or the end of the procedure or ENTER file are skipped.

Standard domain (STD-DOM)

A standard domain contains the volumes which can be processed on all hosts. Hosts do not generally belong to the standard domain.

tape encryption

A hardware feature of LTO drives (LTO-4 and higher) with which data is written to a volume in encrypted form or the data is decrypted again when a volume is read.

tape set

The volumes belonging to a file version form a MAREN tape set in the MAREN catalog. However, the term is independent from the term as it is used in various BS2000 commands (e.g. CREATE-TAPE-SET).

User's own domain (Own Domain)

The user's own domain is the domain on the host in which the ADA or DA is currently working.

virtual volume

A virtual *volume* is not a real storage medium. This storage area is reserved for it on a real storage medium. The storage area is processed in the same way as a real volume. From the viewpoint of the user, only the virtual volume exists, the real one is transparent.

The ETERNUS CS HE archive system, for instance, uses virtual volumes.

volume

Magnetic disks, MTCs, CDs etc.

Each volume must have its own unique VSN.

In the context of archive systems in particular, the terms "data storage medium" and "MTC" are used synonymously.

volume

Data storage medium from the operating systems' point of view. Each volume is managed by the operating system under its own unique VSN.

In the context of archive systems in particular, the terms "volume" and "MTC" are used synonymously.

Volume catalog

File of the *MAREN catalog*. The volume catalog comprises the global parameter set, the host-specific parameters sets and the archive records containing information on every volume managed in the MAREN system.

Volume expiration date

Until this date is reached, a *reserved volume* is available for the user (to be more precise: the user ID) which has been entered. Afterwards it is transferred to the pool of *free volumes*.

volume group

Logically related volumes are combined by the *MAREN user* to form a volume group. Via a name the user has selected, he/she addresses the volumes of a volume group in particular MAREN and MARENADM statements. The volume group is an additional archive entry field in the volume catalog, not a separate administrative unit. All files on a volume belong to the same volume group.

volume status

A volume's availability which is stored in the *MAREN catalog* as an attribute. A volume can be freely available (FREE) or reserved for a particular user (RESERVED). Foreign volumes are assigned the volume status PRIVATE.

write encryption key

An *encryption key* with which the relevant data key is encrypted when encrypted adata is written. The encryption key administrator defines which encryption key from the system *key box* is used as the write encryption key.

Related publications

You will find the manuals on the internet at <http://manuals.ts.fujitsu.com>. You can order printed versions of manuals which are displayed with the order number.

- [1] **MAREN** (BS2000/OSD)
Volume 2: User Interfaces
User Guide
- [2] **ARCHIVE** (BS2000/OSD)
User Guide
- [3] **AVAS** (BS2000/OSD)
Functions
User Guide
- [4] **BS2000/OSD-BC**
Commands
User Guide
- [5] BS2000/OSD-BC
System Exits
User Guide
- [6] BS2000/OSD-BC
System Installation
User Guide
- [7] **ETERNUS CS HE**
Operating and Administering the ETERNUS CS High End
User Guide
- [8] **FDDRL** (BS2000/OSD)
User Guide
- [9] **FHS** (BS2000/OSD)
User Guide

- [10] **HSMS** (BS2000/OSD)
Hierarchical Storage Management System
User Guide
- [11] **RFA** (BS2000/OSD)
Remote File Access
User Guide
- [12] **ROBAR** (BS2000/OSD)
Controlling MTC Archiving Systems
User Guide
- [13] **SECOS** (BS2000/OSD)
Security Control System - Access Control
User Guide

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