English

FUJITSU Software

BS2000 OSD/BC V10.0

System Installation (SE Server)

User Guide

Edition April 2015

Comments… Suggestions… Corrections…

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Certified documentation according to DIN EN ISO 9001:2008

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Contents

1 Preface

System installation of the BS2000 operating system (BS2000 OSD/BC V10.0 or BS2000/OSD-BC V9.0) on SE servers covers all the activities involved in preparing an executable BS2000 operating system that is geared to the current hardware configuration of the Server Unit.

These activities include:

- providing the necessary volumes (disks)
- reading in / installing all relevant files
- generating installation-specific objects (e.g. IO configuration file)

System installation thus creates the prerequisites for initialization of a BS2000 operating system for the Server Unit concerned.

The system initialization itself is no longer part of system installation; it is described in the “Introduction to System Administration” [5].

Information about the various hardware components, interfaces and maximum values for the SE servers is available on the internet at: *http://www.fujitsu.com/fts/products* > *Servers* > *BS2000* > *FUJITSU Server BS2000* > *“Model selection”*.

Information about key figures and performance data of the hardware and software components is provided in the Performance Handbook [4].

1.1 Objectives and target groups of this manual

This manual deals with the topics required to enable the BS2000 operating system to be installed on the existing hardware configuration:

It is intended for use by persons who are responsible for the installation of BS2000 systems or who require information about the various generation types and facilities.

1.2 Summary of contents

This manual applies only for SE servers.
The “System Installation” manual for BS2000/OSD-BC V9.0, complemented by the Readme file for BS2000 OSD/BC V10.0, still applies for S and SQ servers.

This manual begins with an introduction of the standard installation procedures “system installation” and “version changeover”. These procedures consist of various installation steps.

These steps, which can also be used separately, are then explained in terms of practical operation with installation products (chapters “System generation” and “Installation services”).

Not described in this manual is the installation of specific objects such as REP loaders, message files, network configuration, etc. as it is dealt with in other manuals.

Architecture of the SE servers

A FUJITSU BS2000 server of the SE series (for short: SE server) consists of the following components in its maximum configuration:

- Server Units (SU /390 and SU x86)
- Application Units (AU)
- Peripherals (storage)
- Management Unit (MU) with SE Manager
- Net Unit, for SU /390 with HNC

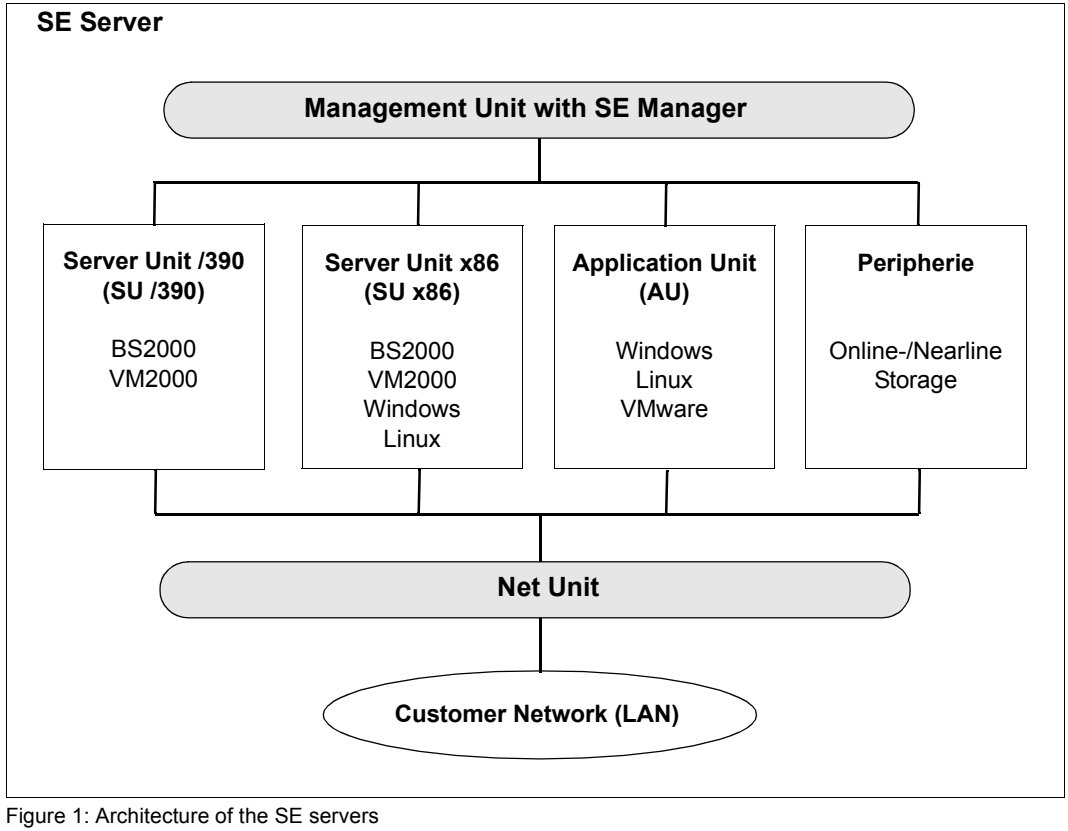

Figure 1: Architecture of the SE servers

With the SE Manager you can operate and manage all components of the SE server centrally from the Management Unit. The SE Manager offers a user-friendly, web-based user interface for this purpose.

In addition to the maximum configuration, variants are also offered which do not contain all Units.

Operation of the SE Manager is described in the online help for the SE Manager and in the “Operation and Administration” manual [6].

The Net Unit, for SU /390 with High-Speed Network Connect (HNC), offers highest performance and security for internal communication in an SE server and for the connection to customer networks (LAN).

The BS2000 operating system in the released versions serves the Server Unit /390 (/390 architecture) and the Server Unit x86 (x86 architecture).

Further configuration levels of the Server Units may be released at some point in the future. Watch out for product announcements and release information.

README file

For information on any functional changes or extensions of this manual, please refer to the product-specific Readme file.

In addition to the product manuals, Readme files for each product are available to you online at *http://manuals.ts.fujitsu.com*. You will also find the Readme files on the Softbook DVD.

Information under BS2000

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 last edition of the manual

This manual contains the following major changes compared to the last edition of the manual:

- The manual has been reoriented and applies only for SE servers.
- The device peripherals of the SU /390 are operated over Fibre Channel or LAN. Channel types 2 and S are no longer supported (exception: virtual console (VM2000) on SU /390).
- SE servers have no service and console processor SKP (as device). The functions of the SKP are implemented solely via the SE Manager.
- The IOGEN statements ADT and EVA for ADAM devices have been removed.
- The sections “IOCFCOPY subsystem” and “Remote service” have been removed.
- The device type table and volume type table have been updated.

The innovations of BS2000 OSD/BC V10.0 are provided in the relevant sales documents and in the BS2000 OSD/BC Release Notice (product `BS2CP`, Version `190`) under *http://manuals.ts.fujitsu.com*.

1.4 Notational conventions

The following typographical elements are used in this manual:

`Output` System output and examples are shown in a typewriter font

 For notes on particularly important information

[ ] References to publications are shown in the text by abbreviated titles. The complete title of each document which is refereed to by a number is listed in the Related publications section after the corresponding number.

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

BS2000 operating system when BS2000 need not be distinguished according to version and configuration.

With standard file names, `<ver>` stands for the internal name of the BS2000 version, e.g. `190` for BS2000 OSD/BC V10.0.

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

2 Initial installation

Initial installation of the BS2000 operating system (BS2000 OSD/BC V10.0 or BS2000/OSD-BC V9.0) is prepared and performed by the systems support of the SE server for the Server Unit concerned. It is largely handled on the operator terminal.

2.1 Initial installation on Server Unit x86

A new SE server is prepared by the manufacturer so that it is ready for use by the customer. The Server Unit x86 is supplied with a pregenerated BS2000 starter system preinstalled on an IPL-capable home pubset. Please refer to the manuals for SE servers.

If the BS2000 starter system cannot run, it will be created anew by customer support while BS2000 is operating.

2.2 Initial installation on Server Unit /390

If no version changeover is possible, you can perform initial installation (offline) for the Server Unit /390 from the so-called starter tape (CD). The DVD drive on the Management Unit (MU) can be used here as an emulated tape device, see note 4 on page 91.

Initial installation has certain hardware requirements:
The installed hardware configuration must comprise at least one Server Unit /390 with I/O system and operator terminal, one tape controller equipped with one tape device, and one disk controller equipped with two disk devices.

Initial installation can also be performed when all disks have been deleted.

For the Dynamic Channel Subsystem (DCS) an IO Configuration File (IOCF) must also be installed. The Server Unit /390 cannot be operated without one.

Operating system variants

In the individual procedural steps you work with a number of different operating system variants. These variants are listed in the table below, together with their application functions.

System	Default file name	Serves as basis for
Offline system	SYSPRG.FIRST.<ver>	Installation of the BS2000 starter system
BS2000 starter system	SYSPRG.BS2.<ver>	Installation of the customer systems with further software products
BS2000 customer system	SYSPRG.BS2.<ver>	Productive BS2000 operation

The BS2000 starter system is a one-disk system and restricted to the BS2000 operating system.

IOCF initial installation

Before the actual initial installation (offline) is carried out, customer support must perform an IOCF initial installation. The starter configuration (operator terminal, disk, tape device, possibly network device) is defined here.

Installation steps for initial installation of the IOCF
Create and install the starter IOCF – Customer support defines the starter configuration – If necessary, save the starter IOCF on the SVP hard disk with /WRITE-IOCF, see the “Commands” manual [2] – Load the starter IOCF

Initial installation (offline)

Initial installation (offline) for the BS2000-operating system takes place in the following steps:

1. Obtain the starter tape from your local customer support.
2. Load the offline system from the starter tape (see “Example 1” on page 17).

   The offline system then creates the runtime environment for the BS2000 starter system to be loaded in the next step:

   – Format and initialize the disk used for the BS2000 starter system. The disk’s net capacity must be at least 900 Mb (with a paging area of 500 Mb).

   – Create a pubset that consists of just this disk alone.

   – Transfer the components of the starter system from the starter tape to this pubset.

   – Convert this one-disk pubset into an IPL disk.

   – Optional: Add further disks to the pubset.
3. Load the BS2000 starter system (see “Example 2” on page 19).

   You must enter information on the first device configuration when you boot the system. The configuration data for the operator terminal and the disks of the home pubset is taken over automatically.

   On the basis of the customer configuration you can now use the IOGEN utility routine to generate an IOCF or (if this has already been done elsewhere) read in a tape containing this file. The IOCF can be stored on the SVP hard disk using `/WRITE-IOCF`, see the “Commands” manual [2].

   This step can be omitted (e.g. after a disk crash) if a valid IOCF still exists.
4. If necessary, import further customer-specific system files.
5. IMPL and load the BS2000 starter system with the customer configuration.

   Now you can extend the pubset and reconfigure the paging area, transfer the files for the BS2000 operating system, etc. (see the table on page 20). The customer-specific files on the home pubset must be brought up to date, see “Other processing steps” on page 16.

   In the case of disaster recovery (e.g. following a disk crash), it is possible to restore disks in the BS2000 starter system using FDDRL (`//RELOAD-DISK` or `//RELOAD-PUBSET`).
6. Load the customer system.

Parameters for initial installation

Initial installation (offline) is initialized by an IPL from the starter tape. The information about the new resources to be set up is conveyed by means of questions to the operator via the console:

– “Disk device type”

– “Disk mnemonic”

– “Pubset ID of the BS2000 starter system”

– “Format Y/N”

– “Disk format K/NK”

– “Allocation Unit 6/8”

– “SYS-ID of starter systems” (if pubset ID longer than one character)

– “Size of paging area”

– “Tape device type”

Optional: Add additional disks to the pubset

The procedures for operating the offline system and for specifying additional devices for startup are exactly the same as in the predecessor versions of the BS2000 operating system.

Other processing steps

When you use the BS2000 operating system for the first time you must adapt the following customer-specific files in the home pubset to the characteristics of your data center in the pregenerated BS2000 operating system with dialog capability:

- startup parameter file
- command file (CMDFILE)
- user catalog entries
- remote data processing files (SOF file)
- SJMSFILE
- ACS catalog
- GUARDS catalog (if the SECOS software product is used)
- ARCHIVE directories
- MAREN catalog

Example 1

Setting up a home pubset with the NK disk format and allocation unit 6:

```
P.NSI00E3 IPL-REPS READ: 2; EXECUTED: 2
P.NSI1235 ACTIVE IORSF GENERATED/MODIFIED BY IORGP CAN BE USED FOR
          SYSFIRST OR FIRST-START ONLY. DO YOU WISH TO CONTINUE
          SYSFIRST/FIRST-START? REPLY (Y=YES, N=NO) p.y
P.NSI1100 IPL DEVICE = TAPE; IPL PATH = 08A8 (MN= SY )
P.NSI1153 STATE OF PROCESSORS ONLINE:
P.NSI1155 CPU 00 ONLINE, ATTACHED (IPL CPU)
P.NSI1158 CPU 01 ONLINE, DETACHED
P.NSI1163 LOCAL DATE = <date>, TIME = <time> FROM SVP
P.NSI00E3 SYSFIRST-REPS READ: 0; EXECUTED: 0
P.NSI00E3 VOLIN-REPS READ: 0; EXECUTED: 0
P.NSI0050 SPECIFY SYSFIRST REP FILE OR DEVICE. REPLY ( CONS;END ) p.end
P.NSF0146 THE FOLLOWING INPUT DATA ARE NECESSARY TO INITIALIZE OR TO
          FORMAT THE STARTER DISK
P.NSF0101 ENTER DEVICE TYPE OF STARTER VOLUME p.d3435
P.NSF0102 ENTER DEVICE MNEMONIC OF STARTER VOLUME p.fdae
P.NSF0103 ENTER PUBSET-ID FOR THE STARTER SYSTEM p.sj
P.NSF0104 FORMATTING STARTER VOLUME? (Y=YES; N=NO: DEFAULT VALUE=Y) p.n
P.NSF0105 ENTER FORMAT OF THE STARTER VOLUME (NK=NONKEY; K=PAMKEY) p.nk
P.NSF0106 ENTER ALLOCATION UNIT OF THE STARTER PUBSET (6/8) p.6
P.NSF0107 ENTER SYS-ID OF THE STARTER SYSTEM. REPLY (NUMERIC VALUE 65-192)
          p.65
P.NSF0108 ENTER SIZE OF PAGINGAREA. REPLY (EOT (500 MB) OR 102 - 2048 MB)
          p.203
P.NVL0000 VOLIN VERSION <version> READY
P.NVL0042 VOLIN ACQUIRES DISK DEVICE AND DISK PACK FOR INITIALIZATION
          OF DISK 'SJ.000'
P.NVL0010 DISK 'SJ.000': STANDARD VOLUME LABEL INVALID
P.NVL0032 OVERWRITE NON-STANDARD DISK '' ON DEVICE 'FDAE' IN NEW
          FORMAT 'NK2(A-U=6)'? REPLY (Y=YES; N=NO) p.y
P.NVL0031 INITIALIZATION STARTED FOR VOLUME 'SJ.000' ON UNIT 'FDAE' IN
          FORMAT 'NK2(A-U=6)'
P.NVL0017 INITIALIZATION OF VOLUME 'SJ.000' ON UNIT 'FDAE' COMPLETED.
          VOLUME FORMAT: 'NK2(A-U=6)'
P.NSF0148 TRANSFER OF STARTER SYSTEM FROM TAPE TO DISK STARTED
P.NSF0149 TRANSFER OF STARTER SYSTEM COMPLETED
P.NSF0168 CATALOG OF HOME PUBSET SUCCESSFULLY BUILT UP
P.NSF0500 CREATE-IPL-VOLUME: PROCESSING STARTED
P.NSF0501 CREATE-IPL-VOLUME: PROCESSING TERMINATED NORMALLY
P.NSF0160 PUBSET 'SJ' INSTALLED
P.NSF0112 DO YOU WANT TO EXTEND PUBSET 'SJ' WITH ADDITIONAL VOLUME
          'SJ.001' (Y/N) ? p.y
P.NSF0101 ENTER DEVICE TYPE OF STARTER VOLUME p.d3435
P.NSF0102 ENTER DEVICE MNEMONIC OF STARTER VOLUME p.fdaf
```

```
P.NVL0000 VOLIN VERSION <version> READY
P.NVL0042 VOLIN ACQUIRES DISK DEVICE AND DISK PACK FOR INITIALIZATION
          OF DISK 'SJ.001'
P.NVL0038 DISK 'SJ.001'. ASSIGNED DISK PACK NOT EMPTY. OLD VSN 'SJ.001',
          EXISTING FORMAT 'NK2(A-U=6)'
P.NVL0024 OVERWRITE DISK 'SJ.001' IN NEW FORMAT 'NK2(A-U=6)'? REPLY
          (Y=YES; N=NO) p.y
P.NVL0031 INITIALIZATION STARTED FOR VOLUME 'SJ.001' ON UNIT 'FDAF' IN
          FORMAT 'NK2(A-U=6)'
P.NVL0017 INITIALIZATION OF VOLUME 'SJ.001' ON UNIT 'FDAF' COMPLETED.
          VOLUME FORMAT: 'NK2(A-U=6)'
P.NSF0112 DO YOU WANT TO EXTEND PUBSET 'SJ' WITH ADDITIONAL VOLUME
          'SJ.002' (Y/N) ? p.n
P.NSF0113 FOR PUBSET 'SJ' '2' VOLUMES ARE INITIALIZED
P.NSF0126 PLEASE RESET JOIN AND TSN FILE DURING NEXT STARTUP
P.NSF0199 OFFLINE SYSTEM TERMINATED SUCCESSFULLY
```

Example 2

Starting up a new pubset, as well as specifying additional disks and an additional tape (Log abbreviated):

```
P.NSI00E3 IPL-REPS READ: 2; EXECUTED: 2
P.NSI1235 ACTIVE IORSF GENERATED/MODIFIED BY IORGP CAN BE USED FOR
          SYSFIRST OR FIRST-START ONLY. DO YOU WISH TO CONTINUE
          SYSFIRST/FIRST-START? REPLY (Y=YES, N=NO) p.y
P.NSI2520 DEVICE MN=C2, TYPE=6400 ENTERED INTO BASIC CONFIGURATION
P.NSI2520 DEVICE MN=C3, TYPE=6400 ENTERED INTO BASIC CONFIGURATION
P.NSI2520 DEVICE MN=FDAE, TYPE=A700 ENTERED INTO BASIC CONFIGURATION
P.NSI2520 DEVICE MN=FDAF, TYPE=A700 ENTERED INTO BASIC CONFIGURATION
P.NSI2508 ANOTHER DEVICE TO BE ENTERED INTO THE BASIC CONFIGURATION?
          ENTER: <TSOS-DEVICETYPE>,<MNEMONIC>,<CHN-PATH-ID>,<CHN-TYPE> OR EOT
          (NO OTHER DEVICE) p.a5,a902,3a,2
P.NSI2520 DEVICE MN=A902, TYPE=A500 ENTERED INTO BASIC CONFIGURATION
P.NSI2508 ANOTHER DEVICE TO BE ENTERED INTO THE BASIC CONFIGURATION?
          ENTER: <TSOS-DEVICETYPE>,<MNEMONIC>,<CHN-PATH-ID>,<CHN-TYPE> OR EOT
          (NO OTHER DEVICE) p.a5,a903,3a,2
P.NSI2520 DEVICE MN=A903, TYPE=A500 ENTERED INTO BASIC CONFIGURATION
P.NSI2508 ANOTHER DEVICE TO BE ENTERED INTO THE BASIC CONFIGURATION?
          ENTER: <TSOS-DEVICETYPE>,<MNEMONIC>,<CHN-PATH-ID>,<CHN-TYPE> OR EOT
          (NO OTHER DEVICE) p.e8,sy,8f,2
P.NSI2520 DEVICE MN=SY, TYPE=E800 ENTERED INTO BASIC CONFIGURATION
P.NSI2508 ANOTHER DEVICE TO BE ENTERED INTO THE BASIC CONFIGURATION?
          ENTER: <TSOS-DEVICETYPE>,<MNEMONIC>,<CHN-PATH-ID>,<CHN-TYPE> OR EOT
          (NO OTHER DEVICE) p.
P.NSI0050 SPECIFY BS2000 REP FILE OR DEVICE. REPLY ( EOT (USE
          STANDARD FILE;FN=FILENAME,(VOL=VSN);CONS;END ) p.
P.NSI00E6 FILE SYSREP.BS2.<version> IS USED AS REP FILE
P.NSI0050 SPECIFY BS2000 REP FILE OR DEVICE. REPLY ( EOT (END);
          FN=FILENAME,(VOL=VSN);CONS;END ) p.end
TSC.NSI0077 ENTER AUTOMATIC COMMAND FILE NAME. REPLY
          (FILE NAME; N(DO NOT USE); EOT(USE STANDARD)) tsc.
Q.NSI6005 SYSTEM PARAMETER STUPTYPE = W. SHALL VALUE BE CHANGED? REPLY
          (U(NCHANGED), W(ARM), C(OLD), S(ELECTIVE), Z(IP), T(TSN FILE RESET
          ONLY), J(JOIN AND TSN FILE RESET), EOT=UNCHANGED) q.j
```

After the offline system has run, you must perform the installation steps in the table below in the specified order for initial installation.

Key to column “page” entries:

No entry:	No activity for this system type
X:	The installation step is not described in the manual.
page reference:	The installation step is mandatory. The activity is described in the section that starts on the page indicated.

Installation steps for initial installation	**page**
Load the BS2000 starter system with the starter configuration	
– Generate customer IOCF Console dialog using BCAM, see “Establish console dialog” An editor (software product EDT) is available in the starter system.	37
– Save the customer IOCF on the SVP hard disk with `/WRITE-IOCF`, see the “Commands” manual [2]	X
Load the BS2000 starter system with the customer configuration	
– IMPL for the customer configuration	
– Establish console dialog BCAM commands `/DCSTART` and `/BCIN` enable “normal” dialog mode to be established	
– Create a new pubset; the starter system can be kept as a standby pubset for backups.	
– Reconfigure the paging area if it is to be allocated to other disks.	
– Transfer the files for the BS2000 operating system to the pubset with IMON	X
– Transfer system-support software files (DCM) required for subsequent generations to the pubset using IMON	X
During installation with IMON, all files are installed on the target system and made ready for activation the next time BS2000 is started). During installation IMON automatically performs the following actions:	
– Provide and activate the message files and the syntax files)	
– Append the message files of IOGEN, SSCM and DSSM	
– Provide the necessary REP files	
– Generate the DSSM catalog with SSCM	

Installation steps for initial installation	**page**
– Create customized BS2000 Control System if necessary The Control System can also first be created in the finished customer system.	59
– Put together the STARTUP parameter file	X
– Provide the SOF file for BCAM	X
– Shutdown of the BS2000 starter system	X
Start the customer system	
– Bootstrap the customer system	
– Startup of the BS2000 customer system with DIALOG-Startup	X
– Generate the user pubsets with SIR (see the “Utility Routines” manual [1])	X
– Make user pubsets available with `/ADD-MASTER-CATALOG-ENTRY` and `/IMPORT-PUBSET [ACTUAL-JOIN=*FIRST,...]`	X
– Create the command file	X
– Create the entries in the user catalog in the various pubsets	75
– Shutdown of the customer system	X
Save the home pubset	
– Save the pubset to disk or tape	X

3 Version changeover

A version changeover refers to the process of installing the BS2000 operating system (BS2000 OSD/BC V10.0 or BS2000/OSD-BC V9.0) using a previous version of the operating system as a working basis:

- System installation of the BS2000 operating system can be initiated on a native basis on S or SQ servers with BS2000/OSD-BC V8.0 or higher and then be completed on the relevant Server Unit /390 or x86 of the SE server.
- System installation of BS2000 OSD/BC V10.0 can be performed on a native basis on a Server Unit of the SE server with BS2000/OSD-BC V9.0.
- VM2000 guest systems with BS2000/OSD-BC V8.0 or higher are similarly suitable for installation of the BS2000 operating system on all BS2000 servers.

If no BS2000 server with a BS2000 operating system BS2000/OSD-BC V8.0 or higher exists, initial installation is required, see chapter “Initial installation” on page 13.

Additional Information on the version changeover of BS2000 OSD/BC is provided in the “Migration Guide” manual [3].

System installation is prepared and carried out by systems support. When a version changeover takes place, the BS2000 services can be used in timesharing mode.

During the preparations for a version changeover on the existing BS2000 server, productive operation can be continued using the previous version.

Further prerequisites for the version changeover to BS2000 OSD/BC V10.0 described here:

- Installation of the BS2000 operating system on a new pubset
- It is possible to initialize magnetic disks in NK mode (SIR or VOLIN, code FORMAT=NK). Pubsets with NK4 disks cannot be used as home pubsets.
- A suitable IOCF must be installed for the Server Unit /390 (see chapter “System generation” on page 27). Hardware generation (IOCF) with IOGEN need only be executed if the I/O configuration is changed.
- No hardware generation is required for the Server Unit x86.

The sequence of steps involved in a version changeover is detailed in the following table.

Key to column “page” entries:

No entry:	No activity for this system type
X:	The installation step is not described in the manual.
page reference:	The installation step is mandatory. The activity is described in the section that starts on the page indicated.

Installation preparation on the existing BS2000 server (under TSOS)	page
Create a new pubset for the BS2000 operating system	
– Install `BS2GA.MIGRATE V19.0` on the current home pubset	X
– Create and make available a new pubset with a paging area for the new BS2000 operating system	X
– Save the existing user catalog (using the $SYSSRPM.BACKUP file on the home pubset) with ARCHIVE	X
– Read in the SYSSRPM.BACKUP file on the new pubset with ARCHIVE	X
– Export the new pubset	X
– Import the new pubset again with `/IMPORT-PUBSET ..., RECONSTRUCT-USERCAT=*FROM-BACKUP(*ALL)`	X
– Adjust the user catalog thus created on the new pubset with the PVSREN utility routine (see the “Utility Routines” manual [1]): `//MODIFY-JOINFILE <new_pubset>,<old_home-pubset>,<new_pubset>`	X
– Install the new BS2000 operating system on the new pubset with IMON	X
During installation IMON automatically performs the following actions:	
– Provide and activate the message files and the syntax files) – Append the message files for IOGEN, SSCM and SIR – Provide the necessary REP files – Create the DSSM catalog with SSCM	
The following installation steps must be executed on the new pubset:	
– Adapt the size of the BS2000 standard EXEC address space, if necessary	59
– Generate the hardware with IOGEN (only necessary in the event of a simultaneous I/O configuration change when transferring to the SE server, see page 27)	37
– Save the IOCF file for transfer to the SVP hard disk of the SE server	X
The following installation step must be executed with the SIR utility routine:	
– Create an IPL disk on the new pubset with SIR (see the “Utility Routines” manual [1])	X

Installation preparation on the existing BS2000 server (under TSOS)	page
Install the customer software for BS2000	
– Install further BS2000 software products on the new pubset with IMON	X
– Create the customer-specific files on the new pubset (job scheduler, SOF file for BCAM, CMDFILE, startup parameter file, ACS catalog, GUARDS catalog etc. (for SECOS), archive directory)	X
Terminate installation preparation	
– Export the new pubset	X

If required, transfer from the S or SQ server to the Server Unit /390 or x86	page
Import the new IOCF to the SVP hard disk of the SE server	X
Recable the new pubset for the BS2000 operating system for the Server Unit	X

Complete installation on the Server Unit /390 or x86 on the SE server	page
Start the customer system on the new pubset	
– Bootstrap the customer system	X
– Startup of the BS2000 customer system with DIALOG-Startup (not a first start!)	X
– Load the customer's network components	X
– Make the user pubsets of the previous version known by means of `/ADD-MASTER-CATALOG-ENTRY`	X
– Save the customer system	X
– Shut down the customer system / productive operation	X

4 System generation

The term “system generation” covers all the activities involved in generating and updating a BS2000 operating system.

4.1 System generation on Server Unit x86

The Server Unit x86 requires no system generation.

The peripherals are made known by the configuration in X2000.

The user address space is generated with 2 Gbytes and cannot be modified.

The Fibre Channel Protocol is used as the standard connection technique for MTC and disk peripherals.

4.2 System generation on Server Unit /390

Due to the fact that the I/O configuration data and the BS2000 Control System have been separated, the following objects can be generated:

- a file containing the I/O configuration data (IOCF – I/O Configuration File) with the IOGEN utility routine (hardware generation)
- a BS2000 Control System adjusted to the address space (based on the BS2000 standard EXEC)

Generating the I/O configuration data

Initial installation or a change to the I/O configuration requires (new) generation of the I/O configuration data (hardware generation) with the IOGEN utility, see page 29. IOGEN generates the I/O configuration file (IOCF), which defines the entire I/O configuration.

A hardware generation is not required for a version changeover if the I/O configuration remains unchanged.

Disk controllers and/or disk devices can be exchanged under certain circumstances without requiring a hardware generation, see page 45.

The I/O configuration (channels, controllers, devices) can be modified during operation (dynamic I/O configuration change), see page 38.

Customizing the BS2000 Control System

BS2000 Standard EXECs are available on all hardware architectures. A BS2000 control system adjusted to the address space can be generated using the procedure supplied, see the section “Customizing the BS2000 Control System” on page 59.

A customer’s own system modules can be defined and loaded as DSSM subsystems.

4.2.1 Generating the I/O configuration data (IOCF) with IOGEN

The IOGEN utility generates the file with the I/O configuration data (IOCF) which defines the entire I/O configuration.

4.2.1.1 Installing IOGEN

IOGEN is installed with IMON under a freely selectable user ID.

The IOGEN Release Unit consists of the following Release Items:

Default file name	Meaning
SYSLNK.IOGEN.<ver>	IOGEN module library
SYSMES.IOGEN.<ver>	IOGEN messages
SYSSDF.IOGEN.<ver>	SDF syntax file for /START-IOGEN
SYSSPR.IOGEN.<ver>	Procedure file for IOGEN run

4.2.1.2 Starting IOGEN

IOGEN is called with /START-IOGEN in dialog mode. The command (domain: UTILITIES) can be entered under any user ID that possesses the STD-PROCESSING privilege.

IOGEN cannot be used from a console.

START-IOGEN	Alias: **IOGEN**
INPUT-FILE = *STD / <filename 1..54> **,SELECT = 0** / <alphanum-name 1..1> **,VERSION = *STD** / <product-version> / <product-version without-corr> / <product-version without-man>	

INPUT-FILE =
Specifies the input medium for the IOGEN statements.

INPUT-FILE = *STD
The statements for IOGEN are read from SYSDTA.

INPUT-FILE = <filename 1..54>
The statements for IOGEN are read from the specified SAM or ISAM file.

SELECT = 0 / <alphanum-name 1..1>
Selects the I/O configuration for generation from the description of a computer network in the input medium, see the section “An IOGEN description for two or more Server Units” on page 55.
Permitted values: 0, 1, ..., 9, A, B, ..., F (max. 15 configurations in a network). The default value is 0, i.e. no network function is used.

VERSION =
Specifies the version of IOGEN that is to be called.

VERSION = *STD
The highest IOGEN version installed using IMON is started unless a specific version has been selected with IMON.

VERSION = <product-version> / <product-version without-corr> / <product-version without-man>
Specifies the version of IOGEN that is to be called. You can specify the version in different levels of detail. The following specifications are permitted:

nn.nann or n.nann	(e.g. 19.0A00)	full version specification
nn.na or n.na	(e.g. 19.0A)	without correction status
nn.n or n.n	(e.g. 19.0)	without correction status or release version

n is a digit and a is a letter. You can prefix the specification with the character V or enclose it in quotes.

4.2.1.3 IOGEN statements

The IOGEN statements control the IOGEN run and define the I/O configuration. The statements are read from the input medium which is assigned when IOGEN is started.

The statements for generating the I/O configuration data can be specified in any order before the END statement.

The following statements must/may be specified:

Control IOGEN run		**Function**
CPGOPT	Optional	Define generation options for IOGEN
END	Mandatory	Terminate IOGEN statements
GEN	Optional	Define program name
IOCFID	Optional	Define header text for IOCF
Describe hardware configuration		**Function**
CHN	Mandatory	Define channel
CPU	Mandatory	Define CPU
CTL	Mandatory	Define controller
DVC	Mandatory	Define device
General statements		**Function**
SYSFILE	Optional	Change assignment of the input medium
*	Optional	Insert comments

Please also note section “Rules for generating the I/O configuration data” on page 37.

A detailed description of the IOGEN statements is provided in the section “Statements for IOGEN” on page 60.

4.2.1.4 IOGEN messages

The IOGEN messages have the message code NGCnnnn. You obtain help on individual messages by means of /HELP-MSG-INFORMATION.

All messages of IOGEN and of the IOCGEN subroutine are output to SYSOUT.

An IOGEN run ends with the message NGC0A02 (IOCF generated) or with the message NGC0A44 (IOCF not generated).

4.2.1.5 IOGEN logs

IOGEN generates two logs.

The IOGEN log is written to SYSLST. It contains the following information:

- List of the input statements. All statements that are read in are logged.
- IOCF generation lists
  The I/O configuration generated is logged in three tables:
  - The “Physical Channel Listing” contains, for each channel, the generation data and the number of connected controllers and devices.
  - The “Physical Controller Listing” contains, for each controller, the generation data, the number of connected devices and the channel ports with their connection data.
  - The “Physical Device Listing” contains, for each device, the generation data and the controller ports with their connection data.

The IOCGEN log contains detailed information on the I/O units generated.

- The device table contains – sorted according to the CMPG (in order of ascending CMPG numbers) – generation information on all the devices assigned to the CMPG (in order of ascending subchannel numbers).
- Additional information for each controller is output in the controller table.

Output of the IOCGEN log can be controlled using the PROT operand of the CPGOPT statement, see page 63.

4.2.1.6 Generating the IOCF via IOGEN

After the successful IOGEN run, IOGEN generates the IOCF file SYSDAT.BS2.<ver>.IOCF[.<name>] directly with the configuration data of the channel peripherals.
<name> is the name which can be specified in the GEN statement.

Internally a further file, SYSDAT.IOGEN.<ver>.IOCF[.<name>], is generated temporarily which contains the data for the IOCGEN subroutine called.

IOGEN can store its work and result files on K or NK2 pubsets. A user ID whose standard pubset is an NK4 pubset may not be used as execution ID.

After the IOGEN run the generated IOCF file SYSDAT.BS2.<ver>.IOCF[.<name>] is saved on the SVP hard disk by the system administrator (TSOS privilege) using /WRITE-IOCF and is available for the next system startup.

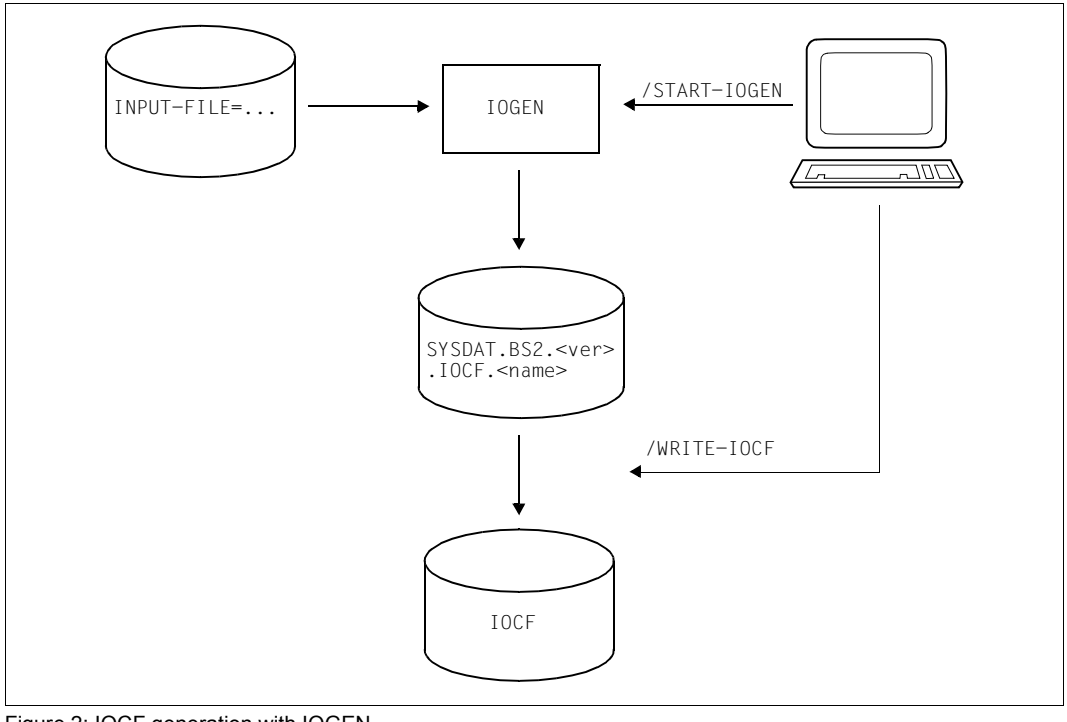

Figure 2: IOCF generation with IOGEN

4.2.2 IOCF terminology

Device number

Each I/O device is identified in the IOCF by a unique device number (0000-FFFF). During generation, this device number (four hexadecimal characters) is derived by IOGEN from the mnemonic (two alphanumeric or four hexadecimal characters) for each device.

The 4-character mnemonic, whose first character may not be zero, is used as the device number.

Mapping of the 2-character mnemonic to the device number (with a leading zero) is performed in accordance with the following algorithm:

1. The mnemonic is converted into a 16-bit string.
2. Bits 2^6, 2^7 and 2^{14}, 2^{15} are deleted.
3. The 12-bit strings thus created are converted to hexadecimal characters with a leading zero.

Example

Mnemonic	Conversion process	Device number
C'10A1'		X'10A1'
C'M1'	X'D4F1' 1. B'1101 0100 1111 0001' eliminate 2. B'0101 0011 0001' 3.	 X'0531'

For the exact assignments of mnemonics to device numbers, refer to the allocation table on page 93. To simplify matters, we recommend that you assign four-digit mnemonics to disk devices.

In the case of an IPL the device number of the IPL device must be specified.

Subchannel number

The subchannel number refers to an internal numbering system by which all I/O devices are identified. A subchannel represents a device (DVC).

Subchannel numbers are assigned by IOGEN without a gap, starting at zero.

Control unit number

The control unit number represents a hardware controller. It is 16 bits long and, like the device number, is derived from the controller’s mnemonic.

Channel Control Unit Connection (CCUC)

The Channel Control Unit Connection (CCUC) represents a connection between controller and channel. A CCUC entry is created for each of these connections in the IOCF.

Communication Path Group (CMPG)

A Communication Path Group (CMPG) is a system-internal structure which comprises up to eight CCUCs. The CMPG numbers are assigned by IOGEN without a gap starting with zero.

Each device is assigned to precisely one CMPG. This CMPG must contain all controller channel ports for this device.

A CCUC may reside in only one CMPG. Here all controllers which are linked by jointly used devices are included in a CPMG with their channel ports.

A CMPG is thus the logical representation of the following controller types:

- A controller whose connected devices have no further controller ports on this server.
- Two to eight controllers which are interconnected by jointly used devices.

However, no more than eight CCUCs may be defined in a CMPG.

4.2.3 Fibre Channel

Fibre Channel (FC, fiber optic technology) is a method for setting up high-performance connections between servers and their components. This architecture uses the bit-serial transmission method for data over fibre optic cables. This enables large quantities of data to be transported at high speed over long distances.

The Fibre Channel Protocol is supported on Server Unit /390 by BS2000 via channel type IBF (MODE=FCP).

BS2000 supports connections of the type “fabric” for the storage systems attached with the Fibre Channel Protocol. Here dedicated connections are set up between Server Units and storage systems. A Server Unit sees only the storage systems assigned to it. The Server Units and storage systems form domains which are assigned to each other via switches (called “zoning”).

Information about the devices supported is provided in the Release Notice on BS2000 OSD/BC.

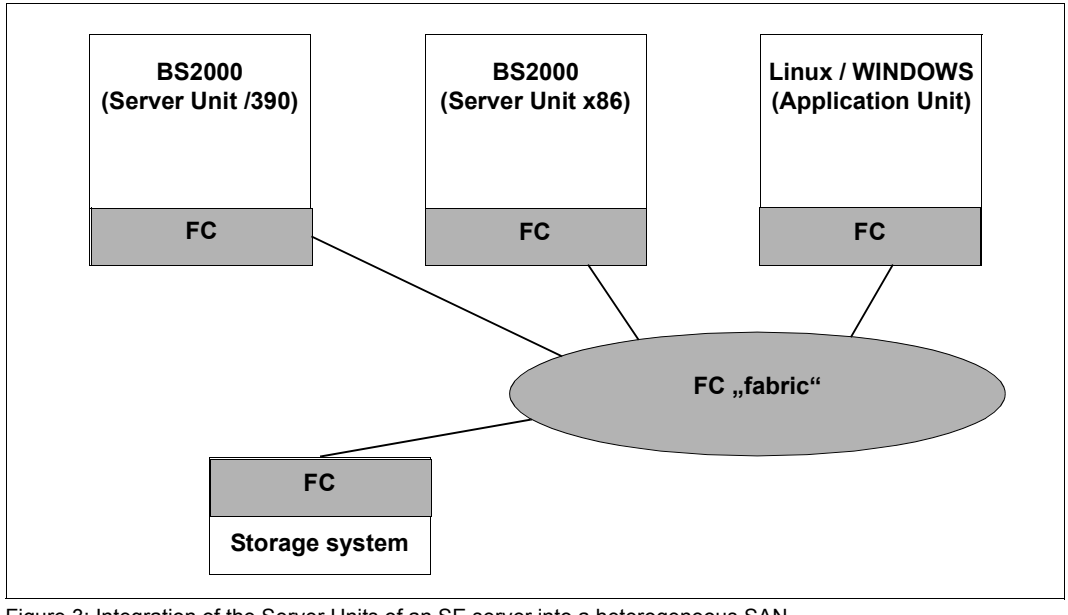

Figure 3: Integration of the Server Units of an SE server into a heterogeneous SAN

4.2.4 Rules for generating the I/O configuration data

Information about the various hardware components, interfaces and maximum values for the SE servers is available on the internet at: *http://www.fujitsu.com/fts/products* > *Servers* > *BS2000* > *FUJITSU Server BS2000* > *"Model selection"*.

IOGEN checks that the IOCF capacity limits are not exceeded.
IOGEN does not check whether the maximum number of channels has been exceeded.

4.2.4.1 I/O configuration

The I/O configuration of a Server Unit is defined by the statements for

- CPU (CPU statement)
- Channel (CHN statement)
- Controller (CTL statement)
- Device (DVC statement)

In figure 4 on page 38 you are shown the structure of the I/O configuration for a Server Unit:

Hardware units supported

CPUs

The CPUs of Server Unit /390.

Channels

Channel type IBF (MODE=FCP) is supported, see section "Fibre Channel" on page 36. When the channel type is generated, `02-FF` must be specified as the channel path identifier in the MODE operand of the CHN statement.

FCLINK channel 00 is required for hardware tests, see section "Configuration for the hardware test" on page 39

Controllers

Controllers are regarded as connections between channels and devices.

Devices

See section "Device type table" on page 91.

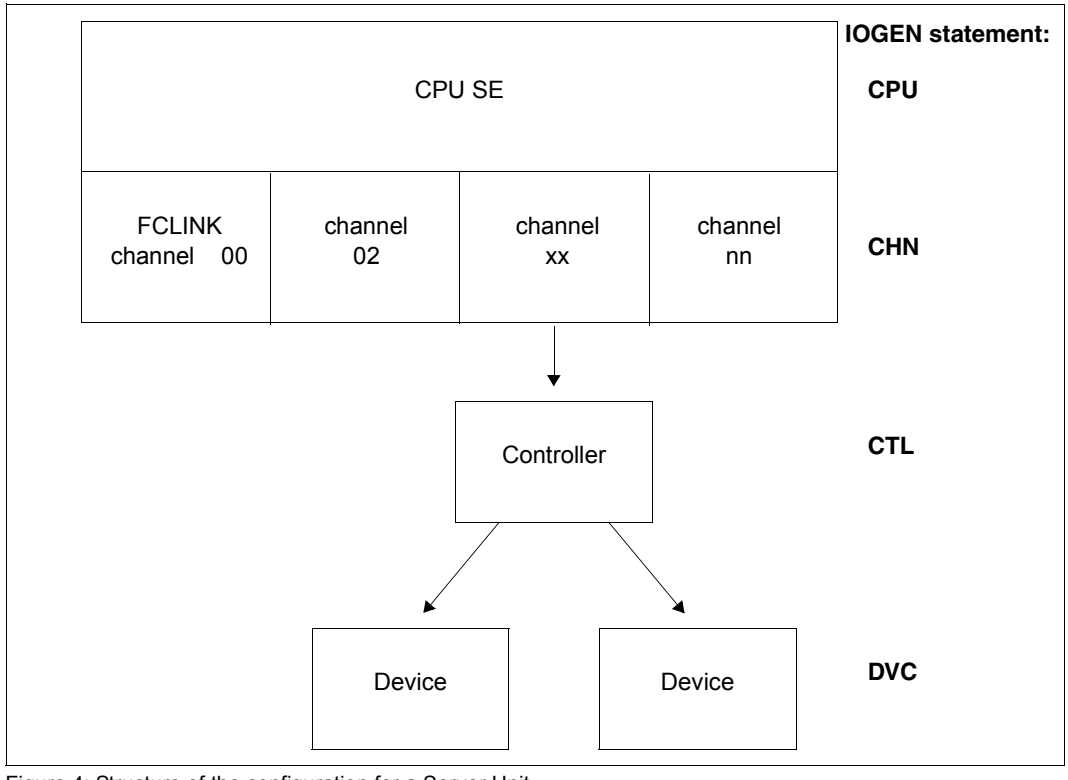

Figure 4: Structure of the configuration for a Server Unit

Dynamic modification of the I/O configuration

The I/O configuration of the Server Unit can be modified dynamically while BS2000 is operating. Channels, controllers and devices can be included in the I/O configuration or removed from it.

New units which are to be included must be defined in the IOCF. Space for up to 512 additional components (channel, controller, device, CCUC, CMPG) is provided in the IOCF. If it can be foreseen that more than 512 components will be added, these should be generated in advance. Your entries in the IOCF can then be modified later in accordance with the actual configuration.

The channels on boards which were present upon IMPL and are not yet used must also be generated in advance (without connected devices and controllers). It is otherwise not possible to place these channels in service dynamically.

Detailed information on dynamic modification of the I/O configuration is provided in the relevant sections of the manual “Introduction to System Administration” [5].

Disk controllers and devices can be replaced dynamically while BS2000 is operating, see the section “Disk device configuration” on page 45.

4.2.4.2 Configuration for the hardware test

FCLINK channel 00 is required for hardware tests (“HST”, customer support) of Server Unit /390. A controller with `CUADD=3F` and without devices must be generated on this Server Unit.

FCLINK channel 00 is reserved for hardware tests.

Example (extract from the generation example on page 51)

```
CHN 00,IBF,MODE=CNC
CTL HS,BLM,(00,0),CUADD=3F
```

4.2.4.3 Configuration of the Management Unit (MU)

The Management Unit (MU) is generated as a controller on its own channel. The mnemonic is freely selectable.

If there is a second, redundant MU, this is also generated on its own channel. This channel may not be the channel of the first MU.

Configuration of console devices connected to the MU

A console distribution program (KVP) on the MU implements and controls the BS2000 consoles. Two KVP and console devices are emulated for BS2000. Further information on this is provided in the “Operation and Administration” manual [6].

The following must be observed when generation takes place:

- Console devices are generated on the MU as devices with the device type code `64`.
- Console devices are generated with two addresses (LUNs); the second address must be 1 higher than the first address.
  In BS2000 the mnemonics C2/C3 with LUNs 00C3/00C4 are used as the IPL console in the first MU.
  If there is a second, redundant MU, by default the mnemonics C4/C5 with LUNs 00C3/00C4 are used as the IPL console in the second MU.
  The mnemonics can also be freely selected. They must then be set for the IPL using the SE Manager on the SVP.
- When generating console devices for VM2000 guest systems, the mnemonics must also be selected in such a way that the device numbers derived from them for each device pair must follow directly one after the other. This condition is not checked by IOGEN.

- The IPL console is recognized automatically by BS2000. In addition to generation, the other consoles must also be made known to the system via the parameter service (parameter record OPR, DEFINE-CONSOLE), see the “Introduction to System Administration” [5]).
- If virtual consoles are to be supported in VM2000, these must be generated with device type code 02 or 03, see the “VM2000” manual [14].
- The number of virtual consoles (VM2000) and KVP consoles (which are defined or automatically recognized using the parameter service) may not exceed 24. IOGEN checks only whether the number of virtual consoles is no higher than 24.
- The total number of all generated devices with device type code 64 and other console devices may not exceed 224. This condition is not checked by IOGEN.

Configuration of LOCLAN devices connected to the MU

Connections between the MU and BS2000 using TCP/IP can be employed via LOCLAN. Under VM2000 this connection also permits a LAN connection between the guest systems. Two LOCLAN devices must be configured for a LOCLAN connection.

LOCLAN devices are generated on the MU as devices with the device type code 6D.

On the first MU, LOCLAN devices are preconfigured with the mnemonics CC80/CC81 and LUNs 0080/0081.

When there is a second, redundant MU, the LOCLAN devices are preconfigured there with the mnemonics CD80/CD81 and LUNs 0080/0081.

Configuration of emulated tape devices connected to the MU

The CD/DVD drive of the MU is operated as an emulated tape device in BS2000.

An emulated tape device is also possible on the MU on the basis of a file (EMFILE).

Emulated tape devices are generated on the MU as devices with the device type code E8.

A CD-ROM drive with the mnemonic T0 (LUN 0060) and an EMFILE with the mnemonic T1 (LUN 0061) are preconfigured on the first MU.

When there is a second, redundant MU, a CD-ROM drive is preconfigured there with the mnemonic TA (LUN 0060) and an EMFILE with the mnemonic TB (LUN 0061).

Example with redundant MU (see the generation example on page 51)

```
CHN 40,IBF,MODE=FCP                     * CHN CONNECTED TO MU-1
CHN 09,IBF,MODE=FCP                     * CHN CONNECTED TO MU-2
*
*************************************************************************
*   MU-1 AT FCP CHN 40                                                  *
*************************************************************************
CTL CC80,BLM,(40,0,0000000000000000)    * MU-1 (DIRECT CONNECTION)
*************************************************************************
*   KVP MAIN CONSOLE MONITOR SYSTEM                                     *
*************************************************************************
DVC C2,64,A,C3,(CC80)
DVC C3,64,A,C4,(CC80)
*************************************************************************
*   KVP MAIN CONSOLE VM2000 GUEST SYSTEMS                               *
*************************************************************************
DVC C6,64,D,A0,(CC80),MULT=4            * KVP VM2-VM3
DVC CA,64,D,A4,(CC80),MULT=8            * KVP VM4-VM7
DVC CJ,64,D,AC,(CC80),MULT=8            * KVP VM8-VMB
DVC CS,64,D,B4,(CC80),MULT=8            * KVP VMC-VMF
*************************************************************************
*   MT EMULATIONS                                                       *
*************************************************************************
DVC T0,E8,D,60,(CC80)                   * CDROM
DVC T1,E8,D,61,(CC80),MULT=6            * FILE EMULATION
DVC T7,E8,D,FF,(CC80)                   * FILE EMULATION FW DUMP
*************************************************************************
*   LOCLAN EMULATION ($DIALOG)                                          *
*************************************************************************
DVC CC80,6D,A,80,(CC80),MULT=32
*************************************************************************
*   MU-2 AT FCP CHN 09                                                  *
*************************************************************************
CTL CD80,BLM,(09,0,0000000000000000)    * MU-2 (DIRECT CONNECTION)
*************************************************************************
*   KVP CONSOLE MONITOR SYSTEM                                          *
*************************************************************************
DVC C4,64,A,C3,(CD80)
DVC C5,64,A,C4,(CD80)
*************************************************************************
*   KVP CONSOLE VM2000 GUEST SYSTEMS                                    *
*************************************************************************
DVC D6,64,D,A0,(CD80),MULT=4            * KVP VM2-VM3
DVC DA,64,D,A4,(CD80),MULT=8            * KVP VM4-VM7
DVC DJ,64,D,AC,(CD80),MULT=8            * KVP VM8-VMB
DVC DS,64,D,B4,(CD80),MULT=8            * KVP VMC-VMF
```

```
*************************************************************************
*   MT EMULATIONS                                                       *
*************************************************************************
DVC TA,E8,D,60,(CD80)                    * CDROM
DVC TB,E8,D,61,(CD80),MULT=6             * FILE EMULATION
DVC TH,E8,D,FF,(CD80)                    * FILE EMULATION FW DUMP
*************************************************************************
*   LOCLAN EMULATION ($DIALOG)                                          *
*************************************************************************
DVC CD80,6D,A,80,(CD80),MULT=32
```

4.2.4.4 Network configuration

Only the LAN devices connected to the HNC must be configured.

LAN devices are generated on the HNC as devices with the device type code 6D.

The LAN connection is generated in BCAM, see the “BCAM” manual [12].

The BS2000 devices for the control LAN (MCNPR, see the “Operation and Administration” manual [6]) are also connected to the HNC.
By default the device pairs for the control LAN are configured with the LUNs 0040/0041 (MN CC40/CC41) through 005E/005F (MN CC5E/CC5F) on the HNC.
For the redundant control LAN, the device pairs are configured with the LUNs 0040/0041 (MN CD40/CD41) through 005E/005F (MN CD5E/CD5F).

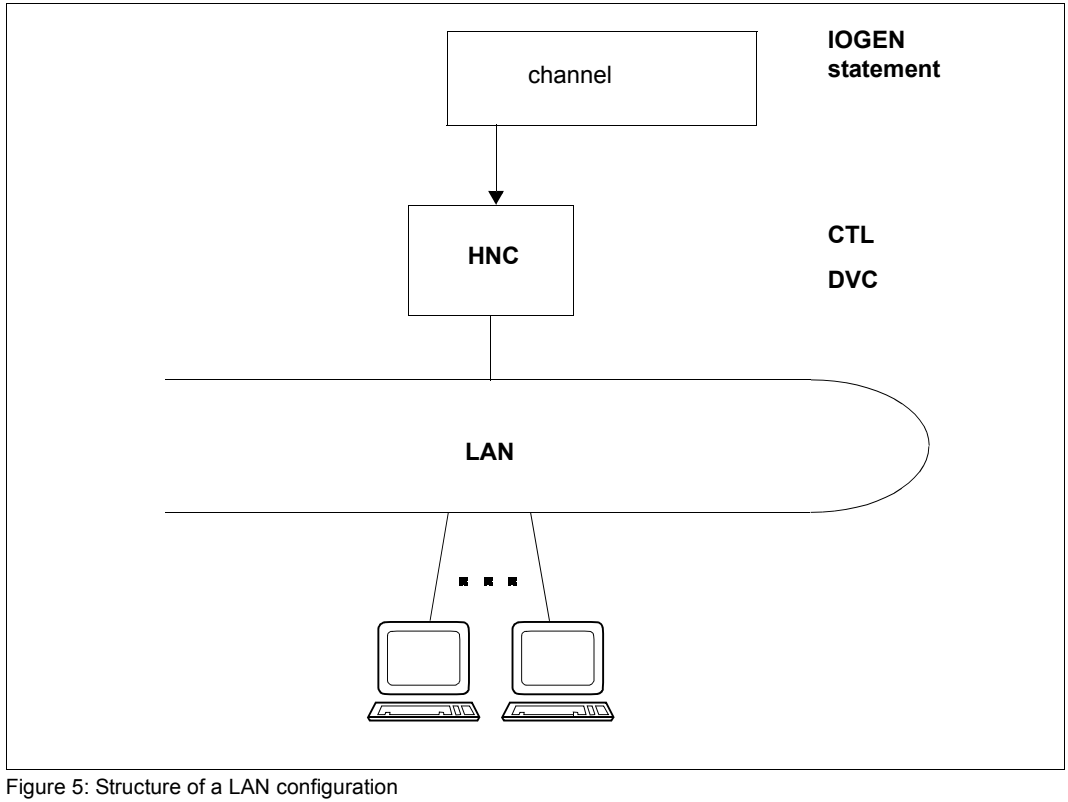

Figure 5: Structure of a LAN configuration

Example with two HNCs (see the generation example on page 51)

```
CHN 08,IBF,MODE=FCP                     * CHN CONNECTED TO HNC-1
CHN 41,IBF,MODE=FCP                     * CHN CONNECTED TO HNC-2
*
*************************************************************************
*   HNC-1 AT FCP CHN 08                                                 *
*************************************************************************
CTL CC00,BLM,(08,0,0000000000000000)    * HNC-1 (DIRECT CONNECTION)
*************************************************************************
*   DATA LAN                                                            *
*************************************************************************
DVC CC00,6D,A,0000,(CC00),MULT=64
*************************************************************************
*   CONTROL LAN                                                         *
*************************************************************************
DVC CC40,6D,A,0040,(CC00),MULT=32
*************************************************************************
*   HNC-2 AT FCP CHN 41                                                 *
*************************************************************************
CTL CD00,BLM,(41,0,0000000000000000)    * HNC-2 (DIRECT CONNECTION)
*************************************************************************
*   DATA LAN                                                            *
*************************************************************************
DVC CD00,6D,A,0000,(CD00),MULT=64
*************************************************************************
*   CONTROL LAN                                                         *
*************************************************************************
DVC CD40,6D,A,0040,(CD00),MULT=32
```

4.2.4.5 Disk device configuration

Disk devices are generated as devices with the device type code A5 or AA on a disk controller.

When you attach a disk device, the attributes of the device are ascertained dynamically and used to update the BS2000 device tables regardless of the generated device type code (within the device type codes for disk devices).

The device and controller ports and the operating mode of the controllers are defined during generation with IOGEN and entered in the IOCF.

For information on “dynamic I/O configuration modification”, see page 38.

Parallel Access Volume (PAV)

The generation of Parallel Access Volumes (PAVs) is recommended for ETERNUS DX disk storage systems, see page 45 and the “Introduction to System Administration” [5].

Changing disk controllers and/or devices

A previously generated (i.e. old) disk controller can be replaced by a new one without requiring regeneration with IOGEN provided the IOCF remains unchanged if the the new disk controller fulfills the following conditions:

- it has the same channel ports
- the devices connected to the new disk controller have the same addresses (LUNs) as the devices connected to the old disk controller

Generating virtual devices (SNAP disks)

In BS2000 for SU /390, virtual devices or SNAP disks must be generated as disks of the same type as the original disks. When a pubset with snapsets is to be used on more than one BS2000 system, the same number of SNAP disks must be generated on all of these systems.

For information on generating virtual devices on SU x86, see the “SHC-OSD” manual [13].

4.2.4.6 Creating device addresses

The device address determines the access path to a device. A device can have up to eight access paths/device addresses on a Server Unit.

The device addresses must be unique within the configuration.

The device address consists of

– the channel path identifier,

– the 8-byte World-Wide Port Number of the port to which the controller is connected (`wwpn` operand of the CTL statement),

– the 2-byte Logical Unit Number via which the device is reached by the controller (`lun` operand of the DVC statement) and

Restrictions

1. A maximum of 256 devices (including the PAV alias devices) may be connected to a logical controller; their Logical Unit Numbers must be identical in the high-order byte. The alias addresses must differ from each other and from the low-order byte of all Logical Unit Numbers of the devices on this controller.
2. If multiple logical controllers are connected to the same port, i.e. with the same World-Wide Port Number, all the devices connected to these controllers must have different Logical Unit Numbers (exception: XPAV, see the “Introduction to System Administration”) [5].
   This can be achieved by devices connected to different logical controllers with the same World-Wide Port Number having a different high-order byte in their Logical Unit Number.
   It is, however, also possible to distribute devices whose Logical Unit Numbers are identical in the high-order byte over several logical controllers with the same World-Wide Port Number. They must then differ in the low-order byte of the Logical Unit Number.
3. In the case of a direct connection (WWPN='0000000000000000'), up to 256 devices can be generated on the channel.
4. Different access paths/device addresses for the same device must differ in the channel path identifier.

Generating a controller with more than 256 devices on one port

The hardware controller is divided into multiple logical controllers each with a maximum of 256 devices. The Logical Unit Numbers of the devices connected to it differ in their high-order byte. The first logical controller thus has ports 0000 - 00FF, the second logical controller ports 0100 - 01FF, and so on. This satisfies the first and second restrictions.

All logical controllers are reached via the same World-Wide Port Number.

Example of generating a controller with 2048 devices and 4 ports

The IOGEN statements are, for example:

```
*
* 4 channels (F0 through F3)
*
CHN F0,IBF,MODE=FCP
CHN F1,IBF,MODE=FCP
CHN F2,IBF,MODE=FCP
CHN F3,IBF,MODE=FCP
*
* 8 logical controllers (C0 through C7) each with 4 channel ports
* via 4 ports with World-Wide Port Numbers (wwpn1 through wwpn4);
* 256 devices per logical controller
*
CTL C0,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F000,A5,D,0000,(C0),MULT=256          * Devices F000 ... F0FF *
*
CTL C1,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F100,A5,D,0100,(C1),MULT=256          * Devices F100 ... F1FF *
*
CTL C2,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F200,A5,D,0200,(C2),MULT=256          * Devices F200 ... F2FF *
*
CTL C3,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F300,A5,D,0300,(C3),MULT=256          * Devices F300 ... F3FF *
*
CTL C4,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F400,A5,D,0400,(C4),MULT=256          * Devices F400 ... F4FF *
*
CTL C5,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F500,A5,D,0500,(C5),MULT=256          * Devices F500 ... F5FF *
*
CTL C6,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F600,A5,D,0600,(C6),MULT=256          * Devices F600 ... F6FF *
*
CTL C7,,(F0,0,wwpn1),(F1,0,wwpn2),(F2,0,wwpn3),(F3,0,wwpn4)
DVC F700,A5,D,0700,(C7),MULT=256          * Devices F700 ... F7FF *
```

4.2.4.7 General conditions for hardware generation

Mnemonic names (mnemonics, MNs)

Mnemonic names must be unique within a given configuration level (controllers, devices).

Two-character alphanumeric or four-character hexadecimal mnemonic names designate devices and controllers. Channels are generated with their channel path identifier.

For each controller, a two-character alphanumeric or four-character hexadecimal mnemonic name can be chosen.

A two-character alphanumeric mnemonic name can always be selected for devices. A four-character hexadecimal device mnemonic (1000 - FFFF) is permitted for all disk and tape devices as well as for network and LOCLAN devices.

Channel or controller without device connection

The channels on boards which were present upon IMPL and are not yet used must also be generated in advance (without connected devices and controllers). It is otherwise not possible to place these channels in service dynamically, see the section “Dynamic modification of the I/O configuration” on page 38.

Channels can therefore also be generated without the controllers connected to them.

Generation is aborted when a hardware unit is defined for which no device connection has been defined. Exception: the controller for the hardware test, see page 39.

Configuration statuses of the hardware units

Neither detached indicators for channel and controller nor removed indicators for controller and device have any effect (they can still be specified for compatibility reasons).

Channels and controllers are generated as “attached”. The Configuration status of a device is specified in the DVC statement.

Paths between channels, controllers and devices are generated as “included”.

The generated Configuration statuses can be modified during system initialization via the startup parameter service (IOCONF parameter record) or while BS2000 is operating using the reconfiguration commands.

The plausibility of the configuration defined and possibly modified using the startup parameter service is checked in the course of system initialization. The rules applied to test this are based in the hardware of the system.

In the course of system initialization, the hardware configuration is checked and made consistent from the channel level to the device level in accordance with the following rules:

- A path is marked as removed (r) if the superordinate hardware unit is detached (d).
- A hardware unit is marked as detached (d) when all paths to superordinate hardware units are removed (r).

Example

A device is attached to only one controller, and this controller is detached. The path from this device to the controller is marked as “removed” (r) and the device itself is marked as “detached” (d).

At generation time, the following rules should be observed during system initialization:

– BS2000 consoles from which the system is to be started must be attached and

– the path to the devices for the home pubset and the paging pubsets must be included. The device may be detached, it will be attached automatically during system initialization.

Parallel Access Volume (PAV)

Parallel Access Volume (PAV) can be used for ETERNUS DX disk storage systems, see the “Introduction to System Administration” [5].

IOGEN is used during hardware generation or the `/ADD-IO-UNIT` command is used during ongoing operation to generate one or more alias devices for a PAV with the following properties and restrictions:

- The base device and alias device(s) represent the same volume in the disk storage system
- For the alias devices the low-order byte of the LUN must differ from the alias address (see the `pav-addr` operand of the DVC statement, page 67)
- An alias device must have a higher device number than the associated base device

Standard PAV

A standard PAV is characterized by the following properties:

- The base device and alias device(s) are generated on the same controller (see the CTL statement, page 65)
- The base device and alias device(s) have an identical LUN

Extended PAV (XPAV)

For the base controller with the base devices for the real volumes, an alias controller is supported with alias devices and the following properties:

- Only alias devices are connected to the alias controller
- XPAV variant 1
  - The base controller and alias controller are generated on the same controller port
  - The base device and alias device(s) have an identical LUN
- XPAV variant 2
  - The base controller and alias controller are generated on different controller ports
  - The base device and alias device(s) can also have different LUNs, but the low-order bytes of the LUNs must be identical

4.2.5 Generation example (IOGEN statements)

```
GEN IOCONF,NAME=SU700
CPGOPT PROT=*FILE
CPU SE
IOCFID 'SU700'
*************************************************************************
*   FCLINK CHN FOR HST                                                  *
*************************************************************************
CHN 00,IBF,MODE=CNC                     * HARDWARE TEST CHN
*************************************************************************
*   DIRECT FCP CHN                                                      *
*************************************************************************
CHN 08,IBF,MODE=FCP                     * CHN CONNECTED TO HNC-1
CHN 09,IBF,MODE=FCP                     * CHN CONNECTED TO MU-2
CHN 40,IBF,MODE=FCP                     * CHN CONNECTED TO MU-1
CHN 41,IBF,MODE=FCP                     * CHN CONNECTED TO HNC-2
*************************************************************************
*   FCP CHN FABRIC1                                                     *
*************************************************************************
CHN 0A,IBF,MODE=FCP                     * DISK
CHN 0B,IBF,MODE=FCP                     * TAPE
CHN 0C,IBF,MODE=FCP                     * DISK
*************************************************************************
*   FCP CHN FABRIC2                                                     *
*************************************************************************
CHN 0D,IBF,MODE=FCP                     * DISK
CHN 0E,IBF,MODE=FCP                     * TAPE
CHN 0F,IBF,MODE=FCP                     * DISK
*************************************************************************
*   CONTROL UNIT HST                                                    *
*************************************************************************
CTL HS,BLM,(00,0),CUADD=3F              * HARDWARE TEST
*************************************************************************
*   MU-1 AT FCP CHN 40                                                  *
*************************************************************************
CTL CC80,BLM,(40,0,0000000000000000)    * MU-1 (DIRECT CONNECTION)
*************************************************************************
*   KVP MAIN CONSOLE MONITOR SYSTEM                                     *
*************************************************************************
DVC C2,64,A,C3,(CC80)
DVC C3,64,A,C4,(CC80)
```

```
*************************************************************************
*   KVP MAIN CONSOLE VM2000 GUEST SYSTEMS                               *
*************************************************************************
DVC C6,64,D,A0,(CC80),MULT=4            * KVP VM2-VM3
DVC CA,64,D,A4,(CC80),MULT=8            * KVP VM4-VM7
DVC CJ,64,D,AC,(CC80),MULT=8            * KVP VM8-VMB
DVC CS,64,D,B4,(CC80),MULT=8            * KVP VMC-VMF
*************************************************************************
*   MT EMULATIONS                                                       *
*************************************************************************
DVC T0,E8,D,60,(CC80)                   * CDROM
DVC T1,E8,D,61,(CC80),MULT=6            * FILE EMULATION
DVC T7,E8,D,FF,(CC80)                   * FILE EMULATION FW DUMP
*************************************************************************
*   LOCLAN EMULATION ($DIALOG)                                          *
*************************************************************************
DVC CC80,6D,A,80,(CC80),MULT=32
*************************************************************************
*   MU-2 AT FCP CHN 09                                                  *
*************************************************************************
CTL CD80,BLM,(09,0,0000000000000000)  * MU-2 (DIRECT CONNECTION)
*************************************************************************
*   KVP CONSOLE MONITOR SYSTEM                                          *
*************************************************************************
DVC C4,64,A,C3,(CD80)
DVC C5,64,A,C4,(CD80)
*************************************************************************
*   KVP CONSOLE VM2000 GUEST SYSTEMS                                    *
*************************************************************************
DVC D6,64,D,A0,(CD80),MULT=4            * KVP VM2-VM3
DVC DA,64,D,A4,(CD80),MULT=8            * KVP VM4-VM7
DVC DJ,64,D,AC,(CD80),MULT=8            * KVP VM8-VMB
DVC DS,64,D,B4,(CD80),MULT=8            * KVP VMC-VMF
*************************************************************************
*   MT EMULATIONS                                                       *
*************************************************************************
DVC TA,E8,D,60,(CD80)                   * CDROM
DVC TB,E8,D,61,(CD80),MULT=6            * FILE EMULATION
DVC TH,E8,D,FF,(CD80)                   * FILE EMULATION FW DUMP
*************************************************************************
*   LOCLAN EMULATION ($DIALOG)                                          *
*************************************************************************
DVC CD80,6D,A,80,(CD80),MULT=32
```

```
*************************************************************************
*   HNC-1 AT FCP CHN 08                                                 *
*************************************************************************
CTL CC00,BLM,(08,0,0000000000000000)    * HNC-1 (DIRECT CONNECTION)
*************************************************************************
*   DATA LAN                                                            *
*************************************************************************
DVC CC00,6D,A,0000,(CC00),MULT=64
*************************************************************************
*   CONTROL LAN                                                         *
*************************************************************************
DVC CC40,6D,A,0040,(CC00),MULT=32
*************************************************************************
*   HNC-2 AT FCP CHN 41                                                 *
*************************************************************************
CTL CD00,BLM,(41,0,0000000000000000)    * HNC-2 (DIRECT CONNECTION)
*************************************************************************
*   DATA LAN                                                            *
*************************************************************************
DVC CD00,6D,A,0000,(CD00),MULT=64
*************************************************************************
*   CONTROL LAN                                                         *
*************************************************************************
DVC CD40,6D,A,0040,(CD00),MULT=32
*************************************************************************
*   VMAX-20K, EMC-37                                                    *
*************************************************************************
*   LUN 0000 - 00FF
CTL 8000,BLM,(0A,0,5000097208132110),(0D,0,5000097208132124)
CTL 8001,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
DVC 8000,A5,D,0000,(8000),(8001),MULT=256
*   PAV ALIAS 00XX
CTL 8800,BLM,(0A,0,5000097208132110),(0D,0,5000097208132124)
CTL 8801,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
DVC 8800,A5,D,0000,(8800),(8801),PAV=01,MULT=256
*   LUN 0100 - 01FF
CTL 8100,BLM,(0A,0,5000097208132110),(0D,0,5000097208132124)
CTL 8101,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
DVC 8100,A5,D,0100,(8100),(8101),MULT=256
*   PAV ALIAS 01XX
CTL 8900,BLM,(0A,0,5000097208132110),(0D,0,5000097208132124)
CTL 8901,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
DVC 8900,A5,D,0100,(8900),(8901),PAV=01,MULT=256
*   LUN 0200 - 02FF
CTL 8201,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
DVC 8200,A5,D,0200,(8201),MULT=256
*   PAV ALIAS 02XX
CTL 8A01,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
```

```
DVC 8A00,A5,D,0200,(8A01),PAV=01,MULT=256
*   LUN 0300 - 03FF
CTL 8301,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
DVC 8300,A5,D,0300,(8301),MULT=256
*   PAV ALIAS 03XX
CTL 8B01,BLM,(0C,0,500009720813211C),(0F,0,5000097208132114)
DVC 8B00,A5,D,0300,(8B01),PAV=01,MULT=256
*************************************************************************
*   SYMMETRIX VMAX EMC-38                                               *
*************************************************************************
CTL 5100,BLM,(0C,0,5000097208132515)
CTL 5101,BLM,(0F,0,5000097208132521)
DVC 516C,AA,D,000A,(5100),(5101),MULT=25
*************************************************************************
*   SYMMETRIX DMX-4, EMC-39                                             *
*************************************************************************
CTL B400,BLM,(0C,0,5006048C52AA2F67)
CTL B401,BLM,(0F,0,5006048C52AA2F68)
DVC B430,AA,D,0030,(B400),(B401),MULT=112
*************************************************************************
*   ETERNUS DX8700 S2, 4541142001                                       *
*************************************************************************
CTL 3400,BLM,(0A,0,500000E0D4301C80),(0C,0,500000E0D4301C92)
CTL 3401,BLM,(0D,0,500000E0D4301CA1),(0F,0,500000E0D4301CB3)
DVC 3400,A5,D,0000,(3400),(3401),MULT=256
*************************************************************************
*   ETERNUS DX600 S3                                                    *
*************************************************************************
CTL FC00,BLM,(0C,0,500000E0D4006690)
CTL FC01,BLM,(0F,0,500000E0D4006680)
DVC FC0A,AA,D,000A,(FC00),(FC01),MULT=25
*************************************************************************
*   TAPES AT CHN 0B, FABRIC1                                            *
*************************************************************************
*   LTO-U6, SCALAR I6000                                                *
CTL A002,BLM,(0B,0,500308C001415020)
DVC A002,D1,D,0000,(A002)
*   ETERNUS CS, STAR-ICP1                                               *
CTL L0,BLM,(0B,0,10000000C94CBC42)
DVC AB00,CE,D,0000,(L0),MULT=8
DVC AB08,C4,D,0008,(L0),MULT=120
*************************************************************************
*   TAPES AT CHN 0E, FABRIC2 (LTO-U6, SCALAR I500)                      *
*************************************************************************
CTL A001,BLM,(0E,0,500308C09798E095)
DVC A001,D1,D,0000,(A001)
END
```

4.2.6 An IOGEN description for two or more Server Units

The hardware configuration for two or more Server Units /390 can be defined in a shared IOGEN description. This description then provides the input for generating each individual Server Unit.

The hardware units which occur only once physically (e.g. devices, controllers) should only be described once. The physically available channels comprise the channels from all Server Units in the network.

The operand `SELECT=n` (n = 1, ... , 9, A, ... ,F) in `/START-IOGEN` specifies the Server Unit for which the description is to be used as the basis for generation.
If the `SELECT` operand is not specified or if `SELECT=0` is specified, then the generation applies for one Server Unit.

If `SELECT=n` (`n>0`) applies, the nth GEN statement and the CPU and IOCFID statements following it are evaluated. A different sequence of GEN, CPU, IOCFID statements (for generating a different Server Unit) is ignored.

Channel path identifiers are assigned to the Server Units as follows:

- channel path identifier n0xx represents the channel xx in server n (n = 1,...,9,A,...,F)
- channel path identifier 00xx or xx is used as a general channel for all Server Units.

The statements CHN, CTL and DVC, extended by this new assignment, are used to define hardware units.

In the case of the CHN statements, all n0xx, 00xx and xx channels for the Server Unit n are evaluated, all others are ignored as “remote channels”.

In the case of the CTL statements, the attachments relating to “remote channels” are removed from the controllers described. Controllers on “remote channels” alone are completely ignored.

In the case of DVC statements, the devices on “remote controllers” (only connected to other Server Units) are removed from the devices described.

A precondition for this is that the CTL statements be specified **before** the associated DVC statements in the sequence of statements for the IOGEN run.

Furthermore, the `PREP` operand for “remote channels” is filtered out in DVC statements. The filter operation is performed for each statement (CHN, CTL, DVC). The customary checks are then performed.

Example of a network generation

For the sake of clarity, this example contains a small extract from an I/O configuration. The advantage of an IOGEN description for two or more Server Units only becomes obvious in a large configuration with several shared disk peripherals.

The generation for Server Unit 2 is started using `/START-IOGEN ...,SELECT=2`.

```
*************************************************************************
* SERVER UNIT 1: SU700-1
* SERVER UNIT 2: SU700-2
*************************************************************************
CPGOPT REPLACE=YES
*************************************************************************
* SYSTEM 1: CHN 1XXX, OXXX, XX                                         *
*************************************************************************
GEN IOCONF,NAME=SU700-1 ------------------------------------------------  (1)
CPU SE
IOCFID 'SU700-1 / EXAMPLE'
*************************************************************************
* SYSTEM 2: CHN 2XXX, OXXX, XX                                         *
*************************************************************************
GEN IOCONF,NAME=SU700-2 ------------------------------------------------  (2)
CPU SE
IOCFID 'SU700-2 / EXAMPLE'
*************************************************************************
* CHANNEL          SYSTEMS 1 AND 2
*************************************************************************
CHN 00,IBF,MODE=CNC                  * FCLINK NATIVE MODE ----------  (3)
CHN 40,IBF,MODE=FCP                  * MU DIRECT (KVP)
*************************************************************************
*   FCP CHANNELS                     * SYSTEM 1                      *
*************************************************************************
CHN 1008,IBF,MODE=FCP                * HNC DIRECT ------------------  (4)
CHN 100A,IBF,MODE=FCP                * DISK
CHN 100B,IBF,MODE=FCP                * DISK
CHN 100C,IBF,MODE=FCP                * DISK
CHN 100D,IBF,MODE=FCP                * DISK
*************************************************************************
*   FCP CHANNELS                     * SYSTEM 2                      *
*************************************************************************
CHN 2041,IBF,MODE=FCP                * HNC DIRECT ------------------  (5)
CHN 201A,IBF,MODE=FCP                * DISK
CHN 201B,IBF,MODE=FCP                * DISK
CHN 201C,IBF,MODE=FCP                * DISK
CHN 201D,IBF,MODE=FCP                * DISK
```

```
*************************************************************************
*   CONTROL UNIT HST                                                    *
*************************************************************************
CTL HS,BLM,(00,0),CUADD=3F              * CUADD 3F ————————————————  (6)
*************************************************************************
*   MU FCP CHANNEL 40                                                   *
*************************************************************************
CTL CC80,BLM,(40,0,0000000000000000)    * DIRECT ——————————————————  (7)
*************************************************************************
*   KVP MAIN-CONSOLE MONITOR SYSTEM                                     *
*************************************************************************
DVC C2,64,A,C3,(CC80)
DVC C3,64,A,C4,(CC80)
*************************************************************************
*
*************************************************************************
*   HNC FCP CHANNEL 08 SYSTEM 1                                         *
*************************************************************************
CTL CC00,BLM,(1008,0,0000000000000000)    * DIRECT ——————————————————  (8)
*************************************************************************
DVC CC00,6D,A,0000,(CC00),MULT=2
*************************************************************************
*
*************************************************************************
*   HNC FCP CHANNEL 41 SYSTEM 2                                         *
*************************************************************************
CTL CD00,BLM,(2041,0,0000000000000000)    * DIRECT ——————————————————  (9)
*************************************************************************
DVC CD00,6D,A,0000,(CD00),MULT=2
*************************************************************************
*
*************************************************************************
*   DISKS                                                               *
*************************************************************************
CTL 8001,BLM,(100A,0,5000097208132110),(100D,0,5000097208132124) ———— (10)
CTL 8002,BLM,(201A,0,5000097208132110),(201D,0,5000097208132124)
CTL 8003,BLM,(100C,0,500009720813211C),(201B,0,5000097208132114)
CTL 5100,BLM,(100B,0,5000097208132515)
CTL 5101,BLM,(201C,0,5000097208132521)
*************************************************************************
DVC 8000,A5,D,0000,(8001),(8002),(8003),MULT=64 ——————————————————— (11)
DVC 5100,AA,D,000A,(5100),(5101),MULT=16
DVC 5110,AA,D,001A,(5100),MULT=16
DVC 5120,AA,D,002A,(5101),MULT=16
END
```

(1) The GEN, CPU, IOCFID sequence of statements (to generate Server Unit 1) is ignored.

(2) The second GEN statement (...,. . . ,`SELECT=2`) and the CPU and IOCFID statements following it are evaluated.

(3) Channel 00 is generated on both Server Units.

(4) The statements for the “remote channels” (`chn-path-id 1xxx`) are ignored.

(5) All `chn-path-id 2xxx` are replaced by `0xxx` in the following statements.

(6) This CTL statement is taken into consideration for both Server Units (since it refers to channel 00).

(7) This CTL statement is taken into consideration for both Server Units (since it refers to channel 00), as are the DVC statements following it.

(8) This CTL statement is ignored (because of the “remote channel 1008”), as are the DVC statements following it.

(9) This CTL statement (on the non-remote channel) and the statements following it are executed.

(10) The following applies for the CTL statements (here for disk controllers):

- the statements for 8001 and 5100 are ignored (only with “remote channels”)
- the statements for 8002 and 5101 are accepted (only with non-remote channels)
- the attachments for “remote channels” are removed from the statement for 8003, which is then accepted

(11) The attachments for “remote controllers” (8001 and 5100, see (10)) are removed from the available devices.

(12) This means that the devices 5110 through 511F connected solely via 5100 are omitted.

4.2.7 Customizing the BS2000 Control System

A hardware-dependent standard EXEC is supplied with BS2000 OSD/BC.

Changing the size of the virtual address space

In the standard EXEC of the BS2000 operating system the size of the virtual address space is pregenerated with 1808 MB of user address space. This results in 240 MB of system address space (SYSSIZE). The following procedure is supplied for adjusting this value: SYSPRC.BS2000-EXEC.<ver>

Before the SYSPRC.BS2000-EXEC.<ver> procedure is called, the standard EXEC SYSPRG.BS2.<ver> must be copied to SYSPRG.BS2.<ver>.STD or renamed. SYSPRG.BS2.<ver>.STD is the input file for the procedure.

The following SYSSIZE values can be set using the procedure. The procedure can also be used to change the program name of the standard EXEC.

Address space	**Values in MB** [1]					
System address space set (<syssize>)	240	256	and so on, in steps of 16 MB		496	512
Resulting user address space	1808	1792	and so on, in steps of -16 MB		1520	1536
Resulting address space	2048	2048	2048	2048	2048	2048

[1] If necessary, input values are rounded up to a multiple of 16 MB

The name of the output file is: SYSPRG.BS2.<ver>.STD[.<syssize>][.<program_name>]. This output file must be renamed SYSPRG.BS2.<ver>, or its name must be specified in the BS2000 parameter file.

A specific EXEC generated by the procedure cannot be used as the input file for another procedure run.

4.2.8 Statements for IOGEN

IOGEN statements enable users to control generation of the I/O configuration data according to their individual needs. A description of the functional application of the IOGEN statements can be found in the section “Rules for generating the I/O configuration data” on page 37.

IOGEN statements consist of an operation field and an operand field. The operation field gives the statement name, which indicates the operation to be carried out. This field can contain any number of leading blanks.

The operand field can contain any number of operands, separated by commas. The first operand in the operand field must be separated from the statement name by at least one blank.
Keyword operands of a statement can be in any order, but keyword operands must not be specified before positional operands.
Commas indicating the absence of positional operands can be omitted if no further positional or keyword operands follow.
This rule also applies to operand groups in parentheses. The last operand can be followed by comments, which must be separated from the operands by at least one blank.

An IOGEN statement which is read in from a terminal or from a file must not exceed 1024 characters in length.
An IOGEN statement which is read in from a file can contain any number of continuation lines, but must likewise not exceed a total of 1024 characters. If a line is to be continued, data is written up to column 71 and a hyphen (-) is entered in column 72 as a continuation character. The continuation line must begin in column 1.

The syntax display of the IOGEN statements is based on the SDF syntax (see the “Commands” manual [2]) with the following exceptions:

Notation Notation	**Meaning**	**Example**
Lowercase letters	Lowercase letters denote variables, for which the user must enter appropriate values upon input, i.e. their contents may vary from one application to the next.	IOCFID 'text'
[ ]	Square brackets enclose optional entries, i.e. entries which may be omitted. (Parentheses must be specified!)	CPU base [, MODEL= ...]

This manual only describes components of the IOGEN statements which are relevant for Server Unit /390.

Control IOGEN run

Statement	Meaning
CPGOPT	Define generation options for IOGEN
END	Terminate IOGEN statements
GEN	Define program name
IOCFID	Define header text for IOCF

Statements for defining the hardware configuration

Statement	Meaning
CHN	Define channel
CPU	Define CPU
CTL	Define controller
DVC	Define device

General statements

Statement	Meaning
SYSFILE	Change assignment of the input medium
*	Insert comments

CHN - Define channel

The CHN statement (CHaNnel) defines the channel properties.

A CHN statement is required for each channel.

CHN
chn-path-id, type [,MODE=FCP/CNC]

chn-path-id
Channel path identifier.
Value: two or four hexadecimal digits, also combined in different CHN statements: 00 - FF or 0000 - 00FF.

type
Type of channel.

Value: IBF Fibre Channel Protocol

MODE
Mode in which the channel operates.

MODE=FCP
Channel operated with the FC-SCSI protocol

MODE=CNC
FCLINK channel (hardware test)

Examples

```
CHN F0,IBF,MODE=FCP
```

CPGOPT - Define generation options for IOGEN

The CPGOPT statement (Control Program Generator OPTions) defines the options for generating the IOCF file.

Several CPGOPT statements can be issued for the same IOGEN run. For operands that are specified more than once, it is the latest valid value that applies. No comma may be specified for the operand named first.

CPGOPT
[,REPLACE=Y / N] [,PROT=*FILE / *PRINT / *SPOOL]

REPLACE
Controls overwriting of the SYSDAT.BS2.<ver>.IOCF[.<name>] and SYSDAT.IOGEN.<ver>.IOCF[.<name>] files. In this case <name> is the name from the GEN statement.

REPLACE=Y
The files are to be overwritten.

REPLACE=N
The files are not to be overwritten (default value).
I.e. generation is canceled if the SYSDAT.BS2.<ver>.IOCF[.<name>] file or the (temporary) file SYSDAT.IOGEN.<ver>.IOCF[.<name>] exists.

PROT
Controls the logging of the subroutine IOCGEN.

PROT=*FILE
The log of the IOCGEN run is output to the SYSLST.IOGEN.<ver>.IOCF[.<name>] file (default). If this file already exists then it is overwritten.

PROT=*PRINT
The log of the IOCGEN run is written to the current SYSLST file (after the IOGEN log). At the end of the program, the SYSLST file is output at the printer.

PROT=*SPOOL
The log of the IOCGEN run is written to the current SYSLST file (after the IOGEN log). You can control the use of the SYSLST file or permit control by the operating system for example, printing on /EXIT-JOB).

CPU - Define CPU

The CPU statement specifies the type of CPU involved. Only one CPU statement needs to be specified per hardware generation. There is only ever one CPU statement for a Server Unit, irrespective of the number of CPUs.

CPU
base

base
Specifies the CPU type. There is no prescribed default value.
Value: SE (Server Unit /390)

CTL - Define controller

The CTL statement (ConTroLler) defines a controller and its channel ports. Up to eight channel ports are possible.

CTL
ctl-mn, [type], (chn-path-id,ctl-no, [wwpn]) [,(chn-path-id,ctl-no, [wwpn])] [,(chn-path-id,ctl-no, [wwpn])] [,(chn-path-id,ctl-no, [wwpn])] [,(chn-path-id,ctl-no, [wwpn])] [,(chn-path-id,ctl-no, [wwpn])] [,(chn-path-id,ctl-no, [wwpn])] [,(chn-path-id,ctl-no, [wwpn])] [,CUADD=3F]

ctl-mn
Mnemonic name of the controller.
Value: two alphanumeric characters (A...Z, 0...9) or
four hexadecimal digits 1000 ≤ ctl-mn ≤ FFFF

type
Operating mode of the controller.
Value: BLM for all controllers (default value).

chn-path-id
Channel path identifier of the channel to which the controller is connected.
Value: channel path identifier as specified in the associated CHN statement.
For a description of the CHN statement, see page 62.

ctl-no
Physical controller number.
Value: Controllers connected to channel type `IBF,MODE=FCP`: only 0

wwpn
World-Wide Port Number (target ID) of the controller port if the controller is connected to a channel with the FC-SCSI protocol.
Value: 16 hexadecimal digits

CUADD=3F
Mandatory specification only for the controller connected to FCLINK channel 00 for the hardware test, see section “Configuration for the hardware test” on page 39.

Notes

- Concurrent operation of disk and tape devices on the same channel can cause considerable disturbances in disk I/O operations.
- Multiple logical controllers must be defined for a controller with more than 256 device ports on channel type `IBF,MODE=FCP`. A separate CTL statement with a different CTL mnemonic must be used for each logical controller. See the example on page 47.

DVC - Define device

The DVC statement (DeViCe) defines the devices of an I/O configuration. A DVC statement is normally required for each device.

Several DVC statements must be specified if the following devices are connected (for device type codes, see page 91):

- Console devices (device type code 64), see page 39
- Network and LOCLAN devices (device type code 6D), see page 40 and page 43

DVC
dvc-mn, type, [A / D], lun, (ctl-mn) [,(ctl-mn)] [,(ctl-mn)] [,(ctl-mn)] [,(ctl-mn)] [,(ctl-mn)] [,(ctl-mn)] [,(ctl-mn)] [,PREP=chn-path-id] [,MULT=n] [,PAV=pav-addr]

dvc-mn
Mnemonic device name.
Value: two alphanumeric characters (A...Z, 0...9) or
four hexadecimal digits 1000 ≤ dvc-mn ≤ FFFF
(see section “General conditions for hardware generation” on page 48).

type
Device type code.
Value: see page 91.

A
Specifies that the device is available to the system (ATTACHED, default value);

D
Specifies that the device is not available to the system (DETACHED).

lun
Logical Unit Number of a device on the channel.
Value: two or four hexadecimal digits.

(ctl-mn)
The operand group in parentheses must be specified more than once if the device is accessible within the server via multiple controllers.
Up to eight controller ports and up to eight access paths are possible.

Value: mnemonic name of the controller as used in the assigned CTL statement.

PREP=chn-path-id
Channel path identifier of the channel via which the device is to receive privileged service during I/O operations. This should only be specified if the device can be accessed via more than one channel. By default, the privileged channel is selected with the help of a defined algorithm.

MULT=n
Group declaration for devices.
One statement defines “n” devices with the mnemonic device names `dvc–mn` through `dvc–mn + n–1` and the Logical Unit Numbers from `lun` through `lun + n–1`.

In the case of alias devices (PAV), all alias addresses from `pav–addr` through `pav–addr + n–1` are created. Alias addresses must be different from the low-order bytes of the Logical Unit Numbers of non-alias devices with the same controller ports.

This operand is permitted with two- and four-character mnemonics. In the case of two-character mnemonics, the subsequent mnemonics are created in ascending lexicographical order, in other words letters before digits (A, B, ..., Z, 0, 1, ..., 9).

PAV=pav-addr
Defines a PAV alias device.
`pav–addr` is the alias address of the alias device.
It must be different from the low-order byte of the `lun`.
It must also be different from the low-order byte of the `lun` of all non-alias devices with the same controller ports.
It must also be different from the alias addresses of other alias devices with the same controller ports.

Value: Two hexadecimal digits.

Example of a configuration with alias devices

```
************************************************************************
*   CHN                                                                *
************************************************************************
CHN 08,IBF,MODE=FCP        * DISK D3435
CHN 0A,IBF,MODE=FCP        * DISK D3435
************************************************************************
*   DISK D3435 (CHN 08 + 0A)                                           *
************************************************************************
*
*WWPN 500000E0D4011180 <> CM0/PORT0
*WWPN 500000E0D4011190 <> CM1/PORT0
*
CTL F000,BLM,(08,0,500000E0D4011180)
CTL F001,BLM,(0A,0,500000E0D4011190)
*   LUN 0000 - 007F
DVC F000,A5,D,0000,(F000),(F001),MULT=128          * BASE:  F000-F07F
DVC F080,A5,D,0000,(F000),(F001),PAV=80,MULT=128   * ALIAS: F080-F0FF
```

Notes

The following default values apply:

- “shared” for disk devices
- “switchable” for tape devices (MTCs)
- neither “shared” nor “switchable” for all other devices

Disks are thus assigned as “system-shareable” by default. If a device was generated with a private disk and the pool attribute NO (not shareable) and was thus assigned system-exclusive status, in future it can also be made system-exclusive with:
`/SET-DISK-PARAMETER ...,SYSTEM-ALLOCATION=*EXCLUSIVE`

END - Terminate IOGEN statements

The END statement terminates the input of all IOGEN statements.

END

If the end criterion `EOF` is detected when reading in the IOGEN statements without the END statement having been issued, recourse is made to the preceding input medium if this is available (as for `SYSFILE SYSDTA=(LAST)`). If 'EOF' is detected in the primary input source without the END statement having been issued, the messages `NGC0A36` and `NGC0A42` are output. Generation is continued with the data of the statements read in so far.

GEN - Define program name

The GEN statement (GENerate object) defines the program name. It can occur anywhere in the statement sequence. The GEN statement can be omitted if the default names are to be used. If multiple GEN statements are issued, the first correct GEN statement is valid.

In the case of network generation, the GEN statement initiates the associated CPU and IOCFID statements.

GEN
[NAME=name]

NAME=name
Alphanumeric string which can be divided into several partial strings separated by a hyphen; first character: A...Z; maximum of eight characters.
Character set: A...Z, 0...9, $, #, @, - (hyphen)

`name` has the following meanings:

- Program name for the generated objects
  Default value: `IOV<ver>`
- Part of the file name of the I/O configuration file `SYSDAT.BS2.<ver>.IOCF.<name>`
  Default value for the file name: `SYSDAT.BS2.<ver>.IOCF`
- Part of the file name of the log file `SYSLST.IOGEN.<ver>.IOCF.<name>`
  Default value for the file name: `SYSLST.IOGEN.<ver>.IOCF`
- Part of the file name of the temporary file `SYSDAT.IOGEN.<ver>.IOCF.<name>`
  Default value for the file name: `SYSDAT.IOGEN.<ver>.IOCF`

`name` is also entered in the IOCF comment field (first eight characters from the comment which can be entered using the IOCFID statement). It is also displayed using the `/SHOW-IOCF` command, see the “Commands” manual [2].

`name` can also be used for the hardware-dependent selection of the parameter file by startup, see page 87.

IOCFID - Define header text for IOCF

The IOCFID statement (Input/Output Configuration File IDentifier) defines a text field which is transferred to the data set identification block (DSID) of the IOCF and taken over as the header in the IOCF configuration report.

IOCFID
'text'

'text'
Header text serving to identify the IOCF configuration report and title serving to identify the IOCF.

The text must be enclosed in single quotes and may have up to 56 characters.

Notes

- This statement is optional. If it is specified several times, only the last one is evaluated.
- If the NAME operand of the GEN statement was used, its value is entered in the first eight bytes of the IOCF comment field in the DSID, otherwise the default value `IOV<ver>` is entered. It is used for the automatic selection of the parameter file by startup. This entry is made even if the IOCFID statement is not used.
- The text of the IOCFID statement is entered after the first eight bytes of the IOCF comment field.

SYSFILE - Change assignment of input medium

The SYSFILE statement (system file) changes the assignment of the input medium from which the IOGEN statements are read. The maximum number of files which can be processed by SYSFILE statements is 255.

SYSFILE
SYSDTA=filename / (LAST) / (PRIMARY)

SYSDTA=filename
Specifies the name of a cataloged SAM or ISAM file which is to be read by the IOGEN statements.

SYSDTA=(LAST)
Further IOGEN statements are preceded by the SYSFILE statement of the previous input medium.

SYSDTA=(PRIMARY)
All further IOGEN statements are read from `SYSDTA=*PRIMARY`.

Notes

- The SYSFILE statement can be specified as the first statement for an IOGEN run.
- Further SYSFILE statements can be input via the specified input medium. This enables the user to input all the IOGEN statements in succession from different input media. To prevent the risk of loops, no more than 10 nested SYSFILE statements may be specified. The SYSFILE statement cannot reference a file which has already been assigned.
- Input from SYSDTA is terminated when the end condition 'EOF' is given by SYSDTA or when an END statement is encountered.
- If an end condition is encountered, the next record is read from the file from which the last SYSFILE statement was read.
  If the record was read from SYSCMD, input is terminated.

* Insert comments

The * statement enables comments and headers to be inserted in the IOGEN listing.

*
text

text
Any character string.

5 Installation services

5.1 Disk organization with pubsets

Pubsets (public volume sets, PVS) are sets of shared volumes and are used in BS2000 together with private volumes and Net-Storage for storing files (see also the “Introduction to System Administration” [5]).

Pubset is the general name for a set of disks irrespective of the pubset type (SF or SM pubset).

A pubset is identified by a unique pubset identifier (or pubset ID). A pubset is addressed by the user for the purposes of file access using its (syntactically identical) catalog ID (or catid).

The DMS function Multiple Public Volume Sets (MPVS) supports the use of several independent pubsets on a single Server Unit. Management information on the various pubsets of a server is stored in the MRS catalog MRSCAT.

There is a “preferred” pubset (home pubset) which is required for loading, operating and shutting down the system and which must be available throughout the entire session.

In addition to this home pubset, it is possible to import other pubsets. The disks of an imported pubset are regarded as a single unit by the system and managed as such. By calling on the logical DMS functions, users can create, process and delete files and job variables on an imported pubset, provided they are authorized to do so.

Home pubset

This pubset contains the files required for startup (and automatic restart) (see the “Introduction to System Administration” [5]).

A home pubset is imported automatically during BS2000 system initialization.

Standby pubset

This pubset, which contains the same files as the home pubset, can carry out the functions performed by the home pubset when the home pubset fails, i.e. the BS2000 operating system can be loaded and operated from this standby pubset.

The home pubset can then be reconstructed in the following BS2000 session.

Shared pubset (SPVS)

If the software product HIPLEX MSCF and a suitable hardware configuration are used, simultaneous access to a shared pubset is possible from more than one system.

Up to 16 systems linked in a shared HIPLEX MSCF network can access this shareable pubset as “sharers” via a direct hardware path. One of the participants in the network is designated the temporary owner of this pubset and handles the functions for file, user and access management for the other sharers. All management requests from subordinate participants (“pubset slaves” or “slave sharers”) must be forwarded to the owner (“pubset master”) via HIPLEX MSCF.

If the pubset master crashes, a pubset-specific job variable (see the “Job Variables” manual [10]) is set on all pubset slaves. In this case one of the current pubset slaves can take over the role of the pubset master without having to export the pubset because of this. If this so-called master switch is not configured or fails, systems support must either export the pubset to all the remaining pubset slaves or (after the problem has been corrected) declare one of the remaining pubset slaves to be the new pubset master by means of `/IMPORT-PUBSET ...,SHARER-TYPE=*MASTER(MASTER-CHANGE=*YES)`.

The whole concept of shared pubsets (hardware configuration, pubset management, data access) is described in detail in the “HIPLEX MSCF” manual [8].

Paging pubset

During the session the paging area can be dynamically extended (`/EXTEND-PAGING-AREA`). It is essential here that the associated pubset is imported and the maximum size of the paging area (4 TByte) is observed.

Pubset organization

In order to use pubsets efficiently, the following disk organization is recommended:

- A pubset must be ready to be used as the home pubset. In other words all the users authorized to access the system must be entered in the user catalog for this pubset (LOGON validation via the home pubset). This pubset generally corresponds to the one created as a result of system installation.
- It is possible to install a second pubset as a standby, so that the session can be continued on this standby pubset should the home pubset crash.
- All the user files should be distributed over further pubsets. In this context, one of these pubsets is assigned to each user as the user default pubset.
- The paging areas should be distributed over several pubsets, but should not be located on pubres, the first disk of a pubset.
- A paging area of at least 200 Mbytes should be set up in the home pubset.

Recommended disk organization

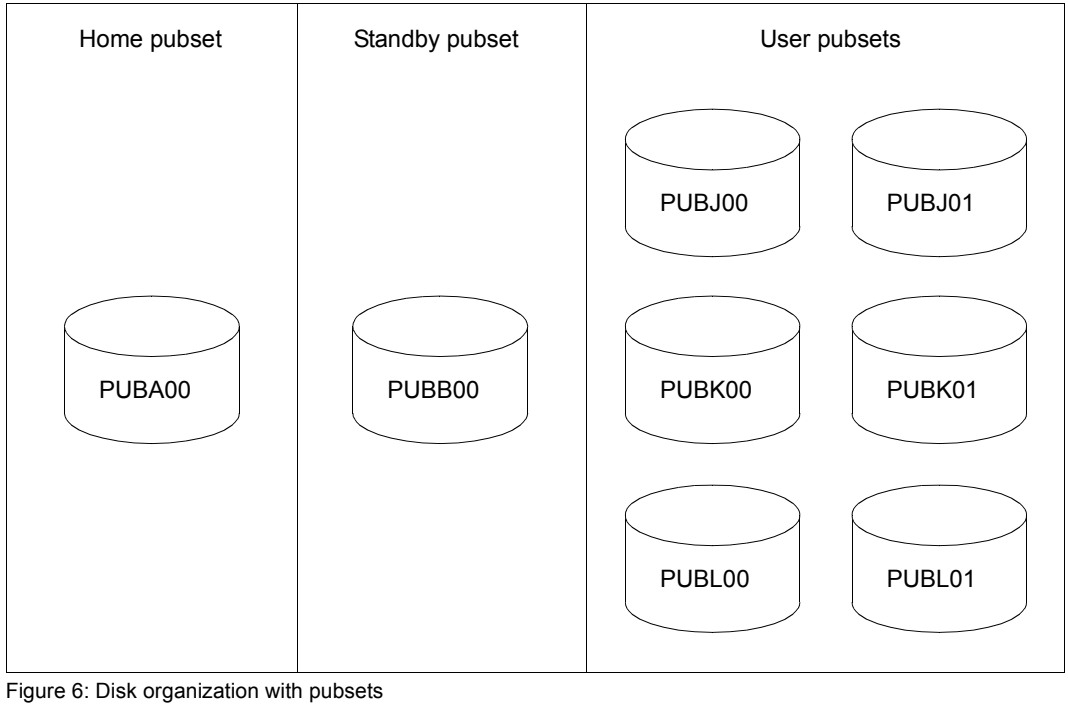

Figure 6: Disk organization with pubsets

- One disk comprises the home pubset: PUBA00.
- One disk forms the standby pubset: PUBB00.

  In all configurations it is important to ensure that the home pubset and the standby pubset do not reside on the same disk storage unit.
- Three further user pubsets (here: SF pubsets) are set up in addition on the disks PUBJ00 and PUBJ01, PUBK00 and PUBK01, PUBL00 and PUBL01.
- Further pubsets can be set up; these have to be imported when required.
- Up to “system ready”, at least one paging area is needed in the home pubset. Paging areas on the pubsets J, K and L for startup can be specified in the BS2000 parameter file.
  Other paging areas of pubsets J, K and L can be added from “system ready”, e.g. via the CMDFILE.
- The home pubset is always the default pubset of the TSOS user ID. All standard files that are required for fast startup and automatic restart, for example, are to be stored on this pubset.
  The home pubset should not be assigned to any user as the default pubset, but should only contain the files of all of the system identifiers.
- Since the standby pubset is to assume the home pubset function, it must contain the same files as the home pubset.
  The standby pubset should therefore not be assigned to any users as the default pubset and should, if possible, be used only by the operating system (reduced update requirements).
- Since there is not just a single catalog, but one catalog for each pubset, the size of each catalog must be seen in relation to the size of the pubset or the file volume. The catalog size is influenced by:
  - the number of files that reside on the pubset
  - the number of private files that have to be cataloged in the pubset
  - the number of job variables that reside on this pubset.
- TSOSCAT, MRSCAT and SYSSRPM are created during installation or `/IMPORT-PUBSET ACTUAL-JOIN=*FIRST,...`, without the user having any say in the matter (exception: TSOSCAT size).

The files on the pubsets may be distributed as follows:

Pubsets	Disks	Files
Home pubset	PUBA00	TSOSCAT SYSTEM.MRSCAT SYSTEM.MRSCAT.COPY SYSSRPM SYSEAM SYS.PAGING.PUBA00 Startup files In addition: ID of system administration for current session all utility routines message files language processors libraries
Standby pubset	PUBB00	TSOSCAT SYSTEM.MRSCAT SYSTEM.MRSCAT.COPY SYSSRPM SYSEAM SYS.PAGING.PUBB00 Startup files In addition: all files that are on the home pubset must be created and maintained on the standby pubset.
User pubset	PUBJ00 PUBJ01 PUBK00 PUBK01 PUBL00 PUBL01	TSOSCAT SYSSRPM SYS.PAGING.PUBJ01 TSOSCAT SYSSRPM SYS.PAGING.PUBK01 TSOSCAT SYSSRPM IPL files (optional) In addition: user/file distribution organized according to areas of activity

Structure of /ADD-USER for the user ID COMPILER and four users:

- Entries for the home pubset A:

```
/ADD-USER USER-ID=COMPILER,...,PUBSET=A,DEFAULT-PUBSET=A, ...
/     ...,PUBLIC-SPACE-LIMIT=n

/ADD-USER USER-ID=USER1,...,PUBSET=A,DEFAULT-PUBSET=J, ...
/     ...,PUBLIC-SPACE-LIMIT=0

/ADD-USER USER-ID=USER2,...,PUBSET=A,DEFAULT-PUBSET=K, ...
/     ...,PUBLIC-SPACE-LIMIT=0

/ADD-USER USER-ID=USER3,...,PUBSET=A,DEFAULT-PUBSET=K, ...
/     ...,PUBLIC-SPACE-LIMIT=0

/ADD-USER USER-ID=USER4,...,PUBSET=A,DEFAULT-PUBSET=L, ...
/     ...,PUBLIC-SPACE-LIMIT=0
```

- Entries for the standby pubset B:

```
/ADD-USER USER-ID=COMPILER,...,PUBSET=B,DEFAULT-PUBSET=B, ...
/     ...,PUBLIC-SPACE-LIMIT=n

/ADD-USER USER-ID=USER1,...,PUBSET=B,DEFAULT-PUBSET=J, ...
/     ...,PUBLIC-SPACE-LIMIT=0

/ADD-USER USER-ID=USER2,...,PUBSET=B,DEFAULT-PUBSET=K, ...
/     ...,PUBLIC-SPACE-LIMIT=0

/ADD-USER USER-ID=USER3,...,PUBSET=B,DEFAULT-PUBSET=K, ...
/     ...,PUBLIC-SPACE-LIMIT=0

/ADD-USER USER-ID=USER4,...,PUBSET=B,DEFAULT-PUBSET=L, ...
/     ...,PUBLIC-SPACE-LIMIT=0
```

  Entries in the user catalog are in “back-to-front” order to the home pubset. As a result of this, it is not necessary to make any modifications when pubset B is used for loading.

- Entries for user pubset J:

```
/ADD-USER USER-ID=USER1,...,PUBSET=J,...,PUBLIC-SPACE-LIMIT=n

/ADD-USER USER-ID=USER4,...,PUBSET=J,...,PUBLIC-SPACE-LIMIT=0
```

  If the system parameter FSHARING=0, USER1 and USER4 can access files of this pubset; USER2 and USER3 cannot. If FSHARING=1 is set, all users are granted access.

- Entries for user pubset K:

```
/ADD-USER USER-ID=USER2,...,PUBSET=K,...,PUBLIC-SPACE-LIMIT=n

/ADD-USER USER-ID=USER3,...,PUBSET=K,...,PUBLIC-SPACE-LIMIT=n
```

- Entries for user pubset L:

```
/ADD-USER USER-ID=USER4,...,PUBSET=L,...,PUBLIC-SPACE-LIMIT=n
```

The system finds the default allocations of the individual users by virtue of the entries in the current home pubset. When a file is addressed via '$userid.', the file is sought in the pubset that is the default pubset for 'userid'.

`/ADD-USER` is described in the "Commands" manual [2].

Notes on organizational division:

- Paging areas outside the home pubset for startup are specified in the BS2000 parameter file.
- When the system is in operation, the paging area can be extended with `/EXTEND-PAGING-AREA`.
- The entries in the user catalog should be up-to-date and should be saved regularly (see the "Introduction to System Administration" [5]).
- The startup parameter service can be called with the help of the dialog startup in order to change the default values (see the "Introduction to System Administration" [5]).
- The software product DRV (Dual Recording by Volume) supports mirror disk mode for home pubsets and pubsets with paging areas, which increases the reliability (see the "DRV" manual [7]).

Advantages

- Reliability
  - Failure of the IPL on PUBA00:
    By virtue of a double IPL (IPL also on PUBB00) or a triple IPL (IPL also on PUBB00 and PUBL01), the system can be loaded at any time.
  - Failure of the user/file catalog or the entire pubset A:
    By distributing the entries in the user catalog judiciously ("back to front") over PUBB00 and selectively updating the files and catalog entries maintained there, the system can be loaded via PUBB00 at any time without impairing operation for the user.
  - Failure of pubset L (without paging):
    The system can continue to be used. Only USER4 will be affected in his work.
  - Failure of pubset B (standby pubset):
    The system can continue to be used as usual. The standby pubset can be reconstructed online.

- Version changeover

  A system of the new version can be created on pubset B under the BS2000 operating system from pubset A. Pubset X can then be appended to the current system by means of `/IMPORT-PUBSET ACTUAL-JOIN=*FIRST`. After all required files or procedures have been readied (online), a startup of the new version can be effected. If the changeover is not successful, a loadable pubset (PUBA00) ready for operation is available as a fallback solution, i.e. the downtime of the system is reduced to a minimum.

A “first start” is not necessary if SIR had already imported the pubset using `ACTUAL-JOIN=*FIRST`, e.g. in order to create paging files or to copy files onto it. In this case `/IMPORT-PUBSET-ACTUAL-JOIN=*FIRST` is already performed under SIR.

5.2 The software product SIR

The software product SIR (System Install and Restore) is used to install a pubset during system installation or in ongoing opeeration.

In addition, SIR offers facilities for initializing and, if necessary, formatting disks (VOLIN utility routine).

The SIR utility routine allows you to install home pubsets for operation under the current version of the BS2000 operating system (target version), and to upgrade to the current BS2000 version (target version) from various execution versions of BS2000. The following applies here: execution version ≤ target version Normally the two predecessor versions of the target version are supported as the execution version.

In BS2000 OSD/BC V10.0 an upgrade can take place to Server Units /390 and x86 from the **execution version BS2000/OSD-BC V9.0**.

On Server Unit x86 it is possible to install a (further) home pubset with SIR.

In general, each SIR version is linked to a particular BS2000 version. This means that SIR can only generate BS2000 systems of a particular target version.

Downgrading is not possible. Instead, the systems support can either keep an appropriate boot disk to hand, or create a starter system on a disk with the help of the self-loading initial installation tape of the corresponding BS2000 version (software product FIRST).

SIR supports the coexistence of two SIR versions (subsystem coexistence). This means that one SIR version constantly coexists with other SIR versions in the **same** BS2000 version.

You should bear in mind that only device types belonging to the device spectrum of BS2000 (both in the execution version and in the target version) are supported.

For a detailed description of the SIR utility routine see the “Utility Routines” manual [1].

6 Handling important system files

The following files are protected against migration by HSMS via the file attribute MIGRATE=*INHIBIT or *FORBIDDEN:

- files required to load BS2000
- files of the optional subsystems (RSO, ...)
- important files of products of the software configuration (SYSLNK., SYSLIB., ...).

Migration protection should not be changed except for important reasons (`/MODIFY-FILE-ATTRIBUTES` operand `MIGRATE`).

Further files can be excluded from migration using the following HSMS statement by specifying an except file (see the “HSMS” manual [9]):
`//MODIFY-HSMS-PARAMETERS MIGRATION-CONTROL=*PARAMETERS(EXCEPT-FILE=filename)`

The following sections briefly describe the system files which can be created or have their size or position modified in the course of system installation (see the “Introduction to System Administration” [5]).

6.1 Startup files

The generated BS2000 operating system on its own is not a loadable unit. It must be loaded by bootstrapping via other files. The same applies for the dump generator SLED.

The following startup files which are created by SIR are available, anchored in the SVL of the IPL disk:

SYSPRG.BOOT.DSKnnn.SAVE	Save area for IPL
SYSPRG.IPL.DSKnnn	IPL routine, initialization routine for EXEC, SLED dump routine (orig. SYSPRG/SKMPRG.IPL.<ver>)
SYSREP.IPL.DSKnnn	Object corrections for IPL (orig. SYSREP.IPL.<ver>)
SYSPRG.SLED.DSKnnn.SAVE	Save area for SLED
SYSREP.SLED.DSKnnn	Object corrections (REPs) for SLED (orig. SYSREP. SLED.<ver>)
SYSDAT.IPL-CONF.DSKnnn	Save area for the startup configurations (created by SIR). Several startup configurations, even from different servers, can be stored in this file.

At startup, these files are searched for on the disk via address chaining only. Address chaining is performed in the standard volume label (SVL) of the IPL disk by the appropriate SIR run (see the “Utility Routines” manual [1]).

The “nnn” in DSKnnn stands for the nnn-th disk of the pubset. During the SIR run, the SYSPRG/SKMPRG.IPL.<ver>, SYSREP.IPL.<ver> and SYSREP.SLED.<ver> delivery files are copied to the appropriate DSKnnn files.
DSKnnn is replaced by vsn in private disks.

The DSKnnn files must not be copied or relocated (e.g. in the course of reorganization measures), since the only way they can be referenced during startup is via pointers in the SVL. SIR catalogs them at backup level ‘E’ before address chaining is carried out. This excludes them from implicit save operations (e.g. ARCHIVE), but the delivery files are backed up and restored by ARCHIVE. To protect these files against migration by HSMS, they have the file attribute MIGRATE=*FORBIDDEN.

Address chaining (see above) must be carried out to update these files (see above).

If several IPL disks are installed within one pubset in order to increase availability, the file names must be different, regardless of the content of the data objects. SIR guarantees this via the disk-specific file name suffix DSKnnn.

If CREATE-IPL-VOLUME or MODIFY-IPL-VOLUME is specified for a pubset, SIR creates the SYS.NSI.SAVEREP file in order to save system corrections during system initialization.

The table lists the files which should be present on the home pubset under the TSOS ID in addition to the startup files anchored in the SVL.

File name	Utilization
SYSPRG/SKMPRG.STRT.<ver>	Load object SYSSTART
SYSREP.STRT.<ver>	Object corrections for SYSSTART
SYSREP.BS2.<ver>	Object corrections (REPs) for BS2000 [1]
SYSPAR.BS2.<ver>	Parameter settings [1]
SYSPRG.BS2.<ver>	Load object “BS2000 CLASS1/2 EXEC” [1]

[1] These file names can be modified via the startup parameter service

Automatic selection of the parameter file by startup

If a system is to be operated on alternating Server Units, a different parameter file can be used depending on the Server Unit involved.

Automatic selection of this parameter file is implemented by BS2000 in FAST and AUTOMATIC startup and in DIALOG startup when the standard parameter file is selected (entry of P.) in the following sequence:

- In Native mode and in the VM2000 monitor system:

  1. The $TSOS.SYSPAR.BS2.<ver>.<name> file (for SU /390).
     <name> is the value of the NAME operand from the GEN statement of IOGEN which is entered in the first eight characters of the IOCF comment field of the active IOCF (see page 71).
  2. The $TSOS.SYSPAR.BS2.<ver>.<system-name> file (for SU x86).
     <system-name> is the system name which was assigned in the X2000 or BS2000 configuration; it can be modified again in the IPL menu.

  

  <name> and <system-name> must be different when different parameter values are to be defined for the Server Units.

- In a VM2000 guest system:

  The $TSOS.SYSPAR.BS2.<ver>.<vm-name> file.
  <vm-name> is the VM name of the guest system.

- If no specific parameter file is found, the file with the default name $TSOS.SYSPAR.BS2.<ver> is searched for.

- If none of the above-mentioned parameter files is found, a FAST or AUTOMATIC startup is interrupted and DIALOG startup is switched to while the parameter is read in.

6.2 File catalog TSOSCAT

The file catalog TSOSCAT is located on every pubset together with an MRSCAT entry for the user's own pubset. TSOSCAT contains the administrative information on files (see the "Introduction to System Administration" [5]).

The TSOSCAT file is set up by means of the SIR statement `//CREATE-CATALOG` when a new pubset is created.

6.3 Paging area

The paging area is the sum of all `SYS.PAGING.<vsn>` files. The paging area acts as an external storage area for non-resident areas of memory (see the "Introduction to System Administration [5]).

The disk area used for paging (paging file) is set up by means of the SIR `//CREATE-PAGING-FILE` statement or using the `/CREATE-PAGING-FILE` command.

6.4 SYSEAM files

The SYSEAM system files contain all the users' EAM files (system work files), see the "Introduction to System Administration" [5].

The name of a SYSEAM file is defined when a pubset is imported. A home pubset is imported during the startup phase.

6.5 User catalog

The user catalog contains the user entries (user ID, account number, password, mailing address etc.) on all users with system access authorization. It is generated during a first start (see the "Introduction to System Administration" [5]).

7 Appendix

7.1 Disk organization

Meaning of the columns:

1 Device type as it is to be specified in BS2000 commands

2 Product name of the disk storage unit

3 Device type code

4 Change in utilization in the case of 2K when using PAM keys
N requires no formatting
Y requires formatting

5 Utilization:
K with PAM keys
NK without PAM keys

6 Minimum transfer unit between disk and main memory

7 Net capacity in 2 Kbyte units (PAM blocks) per volume

8 Track format

1	2	3	4	5	6	7	8
D3435	Disks in standard FBA format [1] [2]	A5	N	K	2K	variable	FBA
				NK	2K		
D3475-8F	Disks in BS2000 FBA format [2] [3]	8F	Y	K	2K	variable	FBA
				NK	2K		
					4K		

Table 1: Disk organization

[1] These disks with standard FBA format are visible for BS2000 as disks with a block size of 512 bytes, e.g. disks connection to the channel of the Server Unit /390, external disks connected to the Server Unit x86.

[2] These disks are preformatted. VOLIN simply provides them with labels.
For Server Unit x86: The size and BS2000 format (K, NK2, NK4) must be defined in X2000 regardless of the preformatting and prior to initialization with VOLIN (see the “Operation and Administration” manual [6]).
Following configuration of the disk under X2000, an initialization run should always be performed using VOLIN to avoid possible discrepancies.

[3] These disks with BS2000 FBA format are visible for BS2000 as disks with a block size of 2048, 2064 or 4096 bytes, e.g. internal disks connected to the Server Unit x86. Disks of the type D3475-8F are only supported on the Server Unit x86 via X2000.

Notes

- Changing the transfer unit always means that formatting is required.
- Changing the allocation unit without a change of the TU is always possible without formatting.
- The following entries are only permissible for public volumes:

```
FORMAT=NK(PHYSICAL-BLOCK-SIZE=4K(...))
FORMAT=NK(PHYSICAL-BLOCK-SIZE=2K(ALLOCATION-UNIT=8))
FORMAT=NK(PHYSICAL-BLOCK-SIZE=2K(ALLOCATION-UNIT=64))
```

7.2 Device type table

The table below contains all the codes required for the BS2000 operating system. For information on which devices are currently supported, please refer to the Release Notice.

Device family	Family name	F-C [1]	T-C [1]	Device type	Device / Product designation
BS2000 consoles	CONSOLE	00			Virtual consoles, see the “VM2000” manual [14]
			64	SKP2	Controller emulated for console operation
Network	TD	60	6D	HNC	Network devices on HNC (SU /390) LOCLAN devices on MU (SU /390) Network/LOCLAN devices connected/emulated via X2000 (SU x86)
Disk storage devices	DISK	80/ A0			
		80	8F	D3475-8F	Internal disks on SU x86
		A0	A5	D3435	
			AA	STDDISK	Standard disk type [2] (internal type code AA00)
Tape devices	TAPE	C0/ D0/ E0			
Magnetic tape cartridge devices	MBK	C0	C4	3590E	3590 (ETERNUS CS)
			CB	LTO-U1	LTO-Ultrium 1
			CC	LTO-U2	LTO-Ultrium 2
			CD	LTO-U3	LTO-Ultrium 3
			CE	LTO-U4 [3]	LTO-Ultrium 4
			CF	LTO-U5	LTO-Ultrium 5
		D0	D1	LTO-U6	LTO-Ultrium 6
Bimodal tape devices	BIMTAPE	E0	E8	BM1662FS	Emulated tape drive on the basis of a CD/DVD drive or a file [4]

Table 2: Device type table

[1] F-C = family code; T-C = device type code

[2] Each disk type code can be replaced by the standard disk type code AA to facilitate the changeover of disk controllers and disk devices. The exact disk type is determined dynamically during the attachment operation. See also section “Disk device configuration” on page 45.

[3] Also for virtual volumes in the ETERNUS CS disk storage system.

[4] The Management Unit's DVD drive is operated as an emulated tape device.

7.3 Volume type table

Volume type code	Volume type	Meaning
A9	NETSTOR	Net-Storage volume in DMS commands and macros (there is no device type code for this)
B4	T6250 / T9G	(Emulated) long tape with a recording density of 6250 bpi (CD, DVD or file) (device type code: E8)
BB	TAPE-C3	36-track magnetic tape cartridge (device type code: C4)
BC	TAPE-C4	36-track magnetic tape cartridge, compressed (device type code: C4)
C7	TAPE-U4E	896-track magnetic tape cartridge. Data is written in encrypted form, see the “MAREN” manual [11] (device type code: CE)
C8	TAPE-U5E	1280-track magnetic tape cartridge. Data is written in encrypted form, see the “MAREN” manual [11] (device type code: CF)
C9	TAPE-U6E	2176-track magnetic tape cartridge. Data is written in encrypted form, see the “MAREN” manual [11] (device type code: D1)
CB	TAPE-U1	384-track magnetic tape cartridge (device type code: CB)
CC	TAPE-U2	512-track magnetic tape cartridge (device type code: CC)
CD	TAPE-U3	704-track magnetic tape cartridge (device type code: CD)
CE	TAPE-U4	896-track magnetic tape cartridge Data is written in unencrypted form, see the “MAREN” manual [11] (device type code: CE)
CF	TAPE-U5	1280-track magnetic tape cartridge Data is written in unencrypted form, see the “MAREN” manual [11] (device type code: CF)
D1	TAPE-U6	2176-track magnetic tape cartridge, data is written in unencrypted form, see the “MAREN” manual [11] (device type code: D1)

Table 3: Volume type table

7.4 Allocation table: mnemonic name - device number

The device number of the device must be set in the loading procedure for the Server Unit /390.

During generation, IOGEN derives the device number from the mnemonic name for each device.

The following table shows the allocation of all 2-character mnemonic names (in ascending order) to the device numbers.

00 : 0C30	10 : 0C70	20 : 0CB0	30 : 0CF0	40 : 0D30
01 : 0C31	11 : 0C71	21 : 0CB1	31 : 0CF1	41 : 0D31
02 : 0C32	12 : 0C72	22 : 0CB2	32 : 0CF2	42 : 0D32
03 : 0C33	13 : 0C73	23 : 0CB3	33 : 0CF3	43 : 0D33
04 : 0C34	14 : 0C74	24 : 0CB4	34 : 0CF4	44 : 0D34
05 : 0C35	15 : 0C75	25 : 0CB5	35 : 0CF5	45 : 0D35
06 : 0C36	16 : 0C76	26 : 0CB6	36 : 0CF6	46 : 0D36
07 : 0C37	17 : 0C77	27 : 0CB7	37 : 0CF7	47 : 0D37
08 : 0C38	18 : 0C78	28 : 0CB8	38 : 0CF8	48 : 0D38
09 : 0C39	19 : 0C79	29 : 0CB9	39 : 0CF9	49 : 0D39
0A : 0C01	1A : 0C41	2A : 0C81	3A : 0CC1	4A : 0D01
0B : 0C02	1B : 0C42	2B : 0C82	3B : 0CC2	4B : 0D02
0C : 0C03	1C : 0C43	2C : 0C83	3C : 0CC3	4C : 0D03
0D : 0C04	1D : 0C44	2D : 0C84	3D : 0CC4	4D : 0D04
0E : 0C05	1E : 0C45	2E : 0C85	3E : 0CC5	4E : 0D05
0F : 0C06	1F : 0C46	2F : 0C86	3F : 0CC6	4F : 0D06
0G : 0C07	1G : 0C47	2G : 0C87	3G : 0CC7	4G : 0D07
0H : 0C08	1H : 0C48	2H : 0C88	3H : 0CC8	4H : 0D08
0I : 0C09	1I : 0C49	2I : 0C89	3I : 0CC9	4I : 0D09
0J : 0C11	1J : 0C51	2J : 0C91	3J : 0CD1	4J : 0D11
0K : 0C12	1K : 0C52	2K : 0C92	3K : 0CD2	4K : 0D12
0L : 0C13	1L : 0C53	2L : 0C93	3L : 0CD3	4L : 0D13
0M : 0C14	1M : 0C54	2M : 0C94	3M : 0CD4	4M : 0D14
0N : 0C15	1N : 0C55	2N : 0C95	3N : 0CD5	4N : 0D15
0O : 0C16	1O : 0C56	2O : 0C96	3O : 0CD6	4O : 0D16
0P : 0C17	1P : 0C57	2P : 0C97	3P : 0CD7	4P : 0D17
0Q : 0C18	1Q : 0C58	2Q : 0C98	3Q : 0CD8	4Q : 0D18
0R : 0C19	1R : 0C59	2R : 0C99	3R : 0CD9	4R : 0D19
0S : 0C22	1S : 0C62	2S : 0CA2	3S : 0CE2	4S : 0D22
0T : 0C23	1T : 0C63	2T : 0CA3	3T : 0CE3	4T : 0D23
0U : 0C24	1U : 0C64	2U : 0CA4	3U : 0CE4	4U : 0D24
0V : 0C25	1V : 0C65	2V : 0CA5	3V : 0CE5	4V : 0D25
0W : 0C26	1W : 0C66	2W : 0CA6	3W : 0CE6	4W : 0D26
0X : 0C27	1X : 0C67	2X : 0CA7	3X : 0CE7	4X : 0D27
0Y : 0C28	1Y : 0C68	2Y : 0CA8	3Y : 0CE8	4Y : 0D28
0Z : 0C29	1Z : 0C69	2Z : 0CA9	3Z : 0CE9	4Z : 0D29

```
5O : 0D70    6O : 0DB0    7O : 0DF0    8O : 0E30    9O : 0E70
51 : 0D71    61 : 0DB1    71 : 0DF1    81 : 0E31    91 : 0E71
52 : 0D72    62 : 0DB2    72 : 0DF2    82 : 0E32    92 : 0E72
53 : 0D73    63 : 0DB3    73 : 0DF3    83 : 0E33    93 : 0E73
54 : 0D74    64 : 0DB4    74 : 0DF4    84 : 0E34    94 : 0E74
55 : 0D75    65 : 0DB5    75 : 0DF5    85 : 0E35    95 : 0E75
56 : 0D76    66 : 0DB6    76 : 0DF6    86 : 0E36    96 : 0E76
57 : 0D77    67 : 0DB7    77 : 0DF7    87 : 0E37    97 : 0E77
58 : 0D78    68 : 0DB8    78 : 0DF8    88 : 0E38    98 : 0E78
59 : 0D79    69 : 0DB9    79 : 0DF9    89 : 0E39    99 : 0E79
5A : 0D41    6A : 0D81    7A : 0DC1    8A : 0E01    9A : 0E41
5B : 0D42    6B : 0D82    7B : 0DC2    8B : 0E02    9B : 0E42
5C : 0D43    6C : 0D83    7C : 0DC3    8C : 0E03    9C : 0E43
5D : 0D44    6D : 0D84    7D : 0DC4    8D : 0E04    9D : 0E44
5E : 0D45    6E : 0D85    7E : 0DC5    8E : 0E05    9E : 0E45
5F : 0D46    6F : 0D86    7F : 0DC6    8F : 0E06    9F : 0E46
5G : 0D47    6G : 0D87    7G : 0DC7    8G : 0E07    9G : 0E47
5H : 0D48    6H : 0D88    7H : 0DC8    8H : 0E08    9H : 0E48
5I : 0D49    6I : 0D89    7I : 0DC9    8I : 0E09    9I : 0E49
5J : 0D51    6J : 0D91    7J : 0DD1    8J : 0E11    9J : 0E51
5K : 0D52    6K : 0D92    7K : 0DD2    8K : 0E12    9K : 0E52
5L : 0D53    6L : 0D93    7L : 0DD3    8L : 0E13    9L : 0E53
5M : 0D54    6M : 0D94    7M : 0DD4    8M : 0E14    9M : 0E54
5N : 0D55    6N : 0D95    7N : 0DD5    8N : 0E15    9N : 0E55
5O : 0D56    6O : 0D96    7O : 0DD6    8O : 0E16    9O : 0E56
5P : 0D57    6P : 0D97    7P : 0DD7    8P : 0E17    9P : 0E57
5Q : 0D58    6Q : 0D98    7Q : 0DD8    8Q : 0E18    9Q : 0E58
5R : 0D59    6R : 0D99    7R : 0DD9    8R : 0E19    9R : 0E59
5S : 0D62    6S : 0DA2    7S : 0DE2    8S : 0E22    9S : 0E62
5T : 0D63    6T : 0DA3    7T : 0DE3    8T : 0E23    9T : 0E63
5U : 0D64    6U : 0DA4    7U : 0DE4    8U : 0E24    9U : 0E64
5V : 0D65    6V : 0DA5    7V : 0DE5    8V : 0E25    9V : 0E65
5W : 0D66    6W : 0DA6    7W : 0DE6    8W : 0E26    9W : 0E66
5X : 0D67    6X : 0DA7    7X : 0DE7    8X : 0E27    9X : 0E67
5Y : 0D68    6Y : 0DA8    7Y : 0DE8    8Y : 0E28    9Y : 0E68
5Z : 0D69    6Z : 0DA9    7Z : 0DE9    8Z : 0E29    9Z : 0E69
```

A0 : 0070	B0 : 00B0	C0 : 00F0	D0 : 0130	E0 : 0170
A1 : 0071	B1 : 00B1	C1 : 00F1	D1 : 0131	E1 : 0171
A2 : 0072	B2 : 00B2	C2 : 00F2	D2 : 0132	E2 : 0172
A3 : 0073	B3 : 00B3	C3 : 00F3	D3 : 0133	E3 : 0173
A4 : 0074	B4 : 00B4	C4 : 00F4	D4 : 0134	E4 : 0174
A5 : 0075	B5 : 00B5	C5 : 00F5	D5 : 0135	E5 : 0175
A6 : 0076	B6 : 00B6	C6 : 00F6	D6 : 0136	E6 : 0176
A7 : 0077	B7 : 00B7	C7 : 00F7	D7 : 0137	E7 : 0177
A8 : 0078	B8 : 00B8	C8 : 00F8	D8 : 0138	E8 : 0178
A9 : 0079	B9 : 00B9	C9 : 00F9	D9 : 0139	E9 : 0179
AA : 0041	BA : 0081	CA : 00C1	DA : 0101	EA : 0141
AB : 0042	BB : 0082	CB : 00C2	DB : 0102	EB : 0142
AC : 0043	BC : 0083	CC : 00C3	DC : 0103	EC : 0143
AD : 0044	BD : 0084	CD : 00C4	DD : 0104	ED : 0144
AE : 0045	BE : 0085	CE : 00C5	DE : 0105	EE : 0145
AF : 0046	BF : 0086	CF : 00C6	DF : 0106	EF : 0146
AG : 0047	BG : 0087	CG : 00C7	DG : 0107	EG : 0147
AH : 0048	BH : 0088	CH : 00C8	DH : 0108	EH : 0148
AI : 0049	BI : 0089	CI : 00C9	DI : 0109	EI : 0149
AJ : 0051	BJ : 0091	CJ : 00D1	DJ : 0111	EJ : 0151
AK : 0052	BK : 0092	CK : 00D2	DK : 0112	EK : 0152
AL : 0053	BL : 0093	CL : 00D3	DL : 0113	EL : 0153
AM : 0054	BM : 0094	CM : 00D4	DM : 0114	EM : 0154
AN : 0055	BN : 0095	CN : 00D5	DN : 0115	EN : 0155
AO : 0056	BO : 0096	CO : 00D6	DO : 0116	EO : 0156
AP : 0057	BP : 0097	CP : 00D7	DP : 0117	EP : 0157
AQ : 0058	BQ : 0098	CQ : 00D8	DQ : 0118	EQ : 0158
AR : 0059	BR : 0099	CR : 00D9	DR : 0119	ER : 0159
AS : 0062	BS : 00A2	CS : 00E2	DS : 0122	ES : 0162
AT : 0063	BT : 00A3	CT : 00E3	DT : 0123	ET : 0163
AU : 0064	BU : 00A4	CU : 00E4	DU : 0124	EU : 0164
AV : 0065	BV : 00A5	CV : 00E5	DV : 0125	EV : 0165
AW : 0066	BW : 00A6	CW : 00E6	DW : 0126	EW : 0166
AX : 0067	BX : 00A7	CX : 00E7	DX : 0127	EX : 0167
AY : 0068	BY : 00A8	CY : 00E8	DY : 0128	EY : 0168
AZ : 0069	BZ : 00A9	CZ : 00E9	DZ : 0129	EZ : 0169

F0 : 01B0	G0 : 01F0	H0 : 0230	I0 : 0270	J0 : 0470
F1 : 01B1	G1 : 01F1	H1 : 0231	I1 : 0271	J1 : 0471
F2 : 01B2	G2 : 01F2	H2 : 0232	I2 : 0272	J2 : 0472
F3 : 01B3	G3 : 01F3	H3 : 0233	I3 : 0273	J3 : 0473
F4 : 01B4	G4 : 01F4	H4 : 0234	I4 : 0274	J4 : 0474
F5 : 01B5	G5 : 01F5	H5 : 0235	I5 : 0275	J5 : 0475
F6 : 01B6	G6 : 01F6	H6 : 0236	I6 : 0276	J6 : 0476
F7 : 01B7	G7 : 01F7	H7 : 0237	I7 : 0277	J7 : 0477
F8 : 01B8	G8 : 01F8	H8 : 0238	I8 : 0278	J8 : 0478
F9 : 01B9	G9 : 01F9	H9 : 0239	I9 : 0279	J9 : 0479
FA : 0181	GA : 01C1	HA : 0201	IA : 0241	JA : 0441
FB : 0182	GB : 01C2	HB : 0202	IB : 0242	JB : 0442
FC : 0183	GC : 01C3	HC : 0203	IC : 0243	JC : 0443
FD : 0184	GD : 01C4	HD : 0204	ID : 0244	JD : 0444
FE : 0185	GE : 01C5	HE : 0205	IE : 0245	JE : 0445
FF : 0186	GF : 01C6	HF : 0206	IF : 0246	JF : 0446
FG : 0187	GG : 01C7	HG : 0207	IG : 0247	JG : 0447
FH : 0188	GH : 01C8	HH : 0208	IH : 0248	JH : 0448
FI : 0189	GI : 01C9	HI : 0209	II : 0249	JI : 0449
FJ : 0191	GJ : 01D1	HJ : 0211	IJ : 0251	JJ : 0451
FK : 0192	GK : 01D2	HK : 0212	IK : 0252	JK : 0452
FL : 0193	GL : 01D3	HL : 0213	IL : 0253	JL : 0453
FM : 0194	GM : 01D4	HM : 0214	IM : 0254	JM : 0454
FN : 0195	GN : 01D5	HN : 0215	IN : 0255	JN : 0455
FO : 0196	GO : 01D6	HO : 0216	IO : 0256	JO : 0456
FP : 0197	GP : 01D7	HP : 0217	IP : 0257	JP : 0457
FQ : 0198	GQ : 01D8	HQ : 0218	IQ : 0258	JQ : 0458
FR : 0199	GR : 01D9	HR : 0219	IR : 0259	JR : 0459
FS : 01A2	GS : 01E2	HS : 0222	IS : 0262	JS : 0462
FT : 01A3	GT : 01E3	HT : 0223	IT : 0263	JT : 0463
FU : 01A4	GU : 01E4	HU : 0224	IU : 0264	JU : 0464
FV : 01A5	GV : 01E5	HV : 0225	IV : 0265	JV : 0465
FW : 01A6	GW : 01E6	HW : 0226	IW : 0266	JW : 0466
FX : 01A7	GX : 01E7	HX : 0227	IX : 0267	JX : 0467
FY : 01A8	GY : 01E8	HY : 0228	IY : 0268	JY : 0468
FZ : 01A9	GZ : 01E9	HZ : 0229	IZ : 0269	JZ : 0469

K0 : 04B0	L0 : 04F0	M0 : 0530	N0 : 0570	O0 : 05B0
K1 : 04B1	L1 : 04F1	M1 : 0531	N1 : 0571	O1 : 05B1
K2 : 04B2	L2 : 04F2	M2 : 0532	N2 : 0572	O2 : 05B2
K3 : 04B3	L3 : 04F3	M3 : 0533	N3 : 0573	O3 : 05B3
K4 : 04B4	L4 : 04F4	M4 : 0534	N4 : 0574	O4 : 05B4
K5 : 04B5	L5 : 04F5	M5 : 0535	N5 : 0575	O5 : 05B5
K6 : 04B6	L6 : 04F6	M6 : 0536	N6 : 0576	O6 : 05B6
K7 : 04B7	L7 : 04F7	M7 : 0537	N7 : 0577	O7 : 05B7
K8 : 04B8	L8 : 04F8	M8 : 0538	N8 : 0578	O8 : 05B8
K9 : 04B9	L9 : 04F9	M9 : 0539	N9 : 0579	O9 : 05B9
KA : 0481	LA : 04C1	MA : 0501	NA : 0541	OA : 0581
KB : 0482	LB : 04C2	MB : 0502	NB : 0542	OB : 0582
KC : 0483	LC : 04C3	MC : 0503	NC : 0543	OC : 0583
KD : 0484	LD : 04C4	MD : 0504	ND : 0544	OD : 0584
KE : 0485	LE : 04C5	ME : 0505	NE : 0545	OE : 0585
KF : 0486	LF : 04C6	MF : 0506	NF : 0546	OF : 0586
KG : 0487	LG : 04C7	MG : 0507	NG : 0547	OG : 0587
KH : 0488	LH : 04C8	MH : 0508	NH : 0548	OH : 0588
KI : 0489	LI : 04C9	MI : 0509	NI : 0549	OI : 0589
KJ : 0491	LJ : 04D1	MJ : 0511	NJ : 0551	OJ : 0591
KK : 0492	LK : 04D2	MK : 0512	NK : 0552	OK : 0592
KL : 0493	LL : 04D3	ML : 0513	NL : 0553	OL : 0593
KM : 0494	LM : 04D4	MM : 0514	NM : 0554	OM : 0594
KN : 0495	LN : 04D5	MN : 0515	NN : 0555	ON : 0595
KO : 0496	LO : 04D6	MO : 0516	NO : 0556	OO : 0596
KP : 0497	LP : 04D7	MP : 0517	NP : 0557	OP : 0597
KQ : 0498	LQ : 04D8	MQ : 0518	NQ : 0558	OQ : 0598
KR : 0499	LR : 04D9	MR : 0519	NR : 0559	OR : 0599
KS : 04A2	LS : 04E2	MS : 0522	NS : 0562	OS : 05A2
KT : 04A3	LT : 04E3	MT : 0523	NT : 0563	OT : 05A3
KU : 04A4	LU : 04E4	MU : 0524	NU : 0564	OU : 05A4
KV : 04A5	LV : 04E5	MV : 0525	NV : 0565	OV : 05A5
KW : 04A6	LW : 04E6	MW : 0526	NW : 0566	OW : 05A6
KX : 04A7	LX : 04E7	MX : 0527	NX : 0567	OX : 05A7
KY : 04A8	LY : 04E8	MY : 0528	NY : 0568	OY : 05A8
KZ : 04A9	LZ : 04E9	MZ : 0529	NZ : 0569	OZ : 05A9

P0 : 05F0	Q0 : 0630	R0 : 0670	S0 : 08B0	T0 : 08F0
P1 : 05F1	Q1 : 0631	R1 : 0671	S1 : 08B1	T1 : 08F1
P2 : 05F2	Q2 : 0632	R2 : 0672	S2 : 08B2	T2 : 08F2
P3 : 05F3	Q3 : 0633	R3 : 0673	S3 : 08B3	T3 : 08F3
P4 : 05F4	Q4 : 0634	R4 : 0674	S4 : 08B4	T4 : 08F4
P5 : 05F5	Q5 : 0635	R5 : 0675	S5 : 08B5	T5 : 08F5
P6 : 05F6	Q6 : 0636	R6 : 0676	S6 : 08B6	T6 : 08F6
P7 : 05F7	Q7 : 0637	R7 : 0677	S7 : 08B7	T7 : 08F7
P8 : 05F8	Q8 : 0638	R8 : 0678	S8 : 08B8	T8 : 08F8
P9 : 05F9	Q9 : 0639	R9 : 0679	S9 : 08B9	T9 : 08F9
PA : 05C1	QA : 0601	RA : 0641	SA : 0881	TA : 08C1
PB : 05C2	QB : 0602	RB : 0642	SB : 0882	TB : 08C2
PC : 05C3	QC : 0603	RC : 0643	SC : 0883	TC : 08C3
PD : 05C4	QD : 0604	RD : 0644	SD : 0884	TD : 08C4
PE : 05C5	QE : 0605	RE : 0645	SE : 0885	TE : 08C5
PF : 05C6	QF : 0606	RF : 0646	SF : 0886	TF : 08C6
PG : 05C7	QG : 0607	RG : 0647	SG : 0887	TG : 08C7
PH : 05C8	QH : 0608	RH : 0648	SH : 0888	TH : 08C8
PI : 05C9	QI : 0609	RI : 0649	SI : 0889	TI : 08C9
PJ : 05D1	QJ : 0611	RJ : 0651	SJ : 0891	TJ : 08D1
PK : 05D2	QK : 0612	RK : 0652	SK : 0892	TK : 08D2
PL : 05D3	QL : 0613	RL : 0653	SL : 0893	TL : 08D3
PM : 05D4	QM : 0614	RM : 0654	SM : 0894	TM : 08D4
PN : 05D5	QN : 0615	RN : 0655	SN : 0895	TN : 08D5
PO : 05D6	QO : 0616	RO : 0656	SO : 0896	TO : 08D6
PP : 05D7	QP : 0617	RP : 0657	SP : 0897	TP : 08D7
PQ : 05D8	QQ : 0618	RQ : 0658	SQ : 0898	TQ : 08D8
PR : 05D9	QR : 0619	RR : 0659	SR : 0899	TR : 08D9
PS : 05E2	QS : 0622	RS : 0662	SS : 08A2	TS : 08E2
PT : 05E3	QT : 0623	RT : 0663	ST : 08A3	TT : 08E3
PU : 05E4	QU : 0624	RU : 0664	SU : 08A4	TU : 08E4
PV : 05E5	QV : 0625	RV : 0665	SV : 08A5	TV : 08E5
PW : 05E6	QW : 0626	RW : 0666	SW : 08A6	TW : 08E6
PX : 05E7	QX : 0627	RX : 0667	SX : 08A7	TX : 08E7
PY : 05E8	QY : 0628	RY : 0668	SY : 08A8	TY : 08E8
PZ : 05E9	QZ : 0629	RZ : 0669	SZ : 08A9	TZ : 08E9

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