

BC R/3 Database Guide: DB2/400



HELP.BCDBDB4DBA

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BC R/3 Database Guide: DB2/400

Purpose

This documentation enables you to administer your DB2/400 database with the R/3 System. It is aimed at system administrators and database administrators who have read, or have access to the IBM book *OS/400 Backup and Recovery* (document number CS-41-5304).

You are also recommended to read Note 179665. This is the Latest News Note for Release 4.6B. This Note is regularly updated with the latest information on backup and recovery.



The information contained in this documentation is intended as an SAP-specific guide only. It does not replace the information provided by the IBM books, which you should read carefully.

If you require assistance with backup and recovery issues, contact IBM.

Implementation Considerations

For information about installing the DB2/400 database with the R/3 System, see *Installing R/3 on IBM AS/400*.

Integration

SAP simplifies DB2/400 database administration for you by providing various DBA functions in the Computing Center Management System (CCMS) of the R/3 System. Refer to [SAP/DB2/400 DBA in CCMS \[Extern\]](#).

If you are using a different database, read the appropriate documentation to find out about available functions:

- [R/3 Database Guide: ADABAS for R/3 \[Extern\]](#)
- [R/3 Database Guide: DB2 Universal Database \[Extern\]](#)
- [R/3 Database Guide: Informix \[Extern\]](#)
- [R/3 Database Guide: MS SQL Server \[Extern\]](#)
- [R/3 Database Guide: Oracle \[Extern\]](#)

Features

- [Backup and Recovery \[Seite 7\]](#)

This documentation describes what you need to save for an R/3 System backup and gives procedures for saving and restoring objects.
- [SQL Package Handling \[Seite 41\]](#)

This documentation explains when you need to delete SQL packages and gives some information about naming conventions for package libraries and messages relating to packages.

See Also

- For information about reorganization, see the IBM Redbook *SAP R/3 Implementation for AS/400* (document number SG24-4672).
- For information on how to make a copy of your database, see *R/3 Homogeneous System Copy*.

Backup and Recovery

Purpose

This documentation describes what you need to save for an R/3 System backup and gives procedures for saving and restoring objects.

Background Information

[Journaling and Commitment Control \[Seite 8\]](#)

[Restrictions on Journaling and Recovery \[Seite 9\]](#)

Working Out an R/3 Save Strategy

[R/3 Save Strategies \[Seite 10\]](#)

[What Do You Need to Save? \[Seite 19\]](#)

[Automating Your Daily Backup Routine \[Seite 13\]](#)

[Backup Methods \[Seite 25\]](#)

Backup and Recovery Procedures

[Procedures for Saving Objects \[Seite 26\]](#)

[Procedures for Restoring and Recovering Objects \[Seite 36\]](#)

Journaling and Commitment Control

Journaling and Commitment Control

Before you decide on a save strategy for your R/3 System, you need to be familiar with the concepts of journaling and commitment control.

Journaling

This refers to the recording of any changes made to database files. Journaling enables commitment control (see below) to work, and it enables you to apply or roll back these changes if required.

In an AS/400 environment, journaling is used for commitment control and recovery. The system records the changes made to database files in a journal receiver.

Journaling is a requirement for R/3 Systems running on AS/400 and is automatically started when you install R/3.



We **strongly** recommend that you locate your journal receivers and the database library R3<SID>DATA in different ASPs (auxiliary storage pools). This provides the following benefits:

- Performance will be improved.
- If you keep journal receivers for recovery purposes and the ASP containing the R/3 library is damaged, you will be able to restore the R/3 library from the last backup and recover the changes made since the last backup using the journal receivers.

There are two methods of managing journal receivers. The method you choose depends on your chosen [save strategy \[Seite 10\]](#).

Commitment Control

A function allowing processing of a group of changes to resources as a logical unit of work.

For the R/3 System, AS/400 commitment control is always active. This means that the system processes a group of changes to database files as a single transaction. While journaling on its own allows you to ensure that only changes to the last record processed are lost in the case of a system failure, journal management combined with commitment control enables the system to ensure that all changes within a transaction are completed or rolled back if processing is interrupted.

Restrictions on Journaling and Recovery

Certain restrictions apply to the journaling and recovery of DDL statements (Data Definition Language statements) on DB2/400. The restrictions apply to statements for creating and changing tables, indexes, and views.

Examples of when these statements can occur:

- During Customizing
- When importing transports, Support Packages, or LCPs
- During an R/3 upgrade
- When explicit changes are made in the ABAP Dictionary

The following SQL statements are affected:

- CREATE / DROP TABLE
- ALTER TABLE ... ADD / ALTER / DROP FIELD
- ALTER TABLE ... CREATE / DROP PRIMARY KEY ...
- CREATE / DROP INDEX
- CREATE / DROP VIEW

Statements referring to indexes and views are not journaled and cannot, therefore, be recovered automatically at present. Changes to tables are journaled, but the import of the journal receivers terminates at these entries. You then have to execute the statement itself. This could, for example, be a statement that creates a table.

IBM and SAP are currently working on a tool that will completely automate the import of journals containing the DDL statements listed above.

For more information, see the IBM documentation *OS/400 Backup and Recovery* (document number SC41-5304). Of particular interest in this context are the sections *Why You Must Save Files after Starting Journaling* and *Actions of the APYJRNCHG or RMVJRNCHG Command by Journal Code*.

R/3 Save Strategies

R/3 Save Strategies

To make sure you can return your database to a consistent state after damage has occurred, you have to decide on a save strategy for your company. You have to decide whether it is sufficient for you to be able to restore your most recent backup or whether you also want to be able to recover the changes that were made after this backup was performed.



Restoring from a backup tape is normally only necessary after a media error. In most instances, that is after logical errors, it will be sufficient to remove journal changes to return your database to a consistent state.

You need to decide on one of the following save strategies:

[Save Strategy 1: Restoring and Recovering \[Seite 11\]](#)

Use this save strategy for production systems.

[Save Strategy 2: Restoring Only \[Seite 12\]](#)

This save strategy can be used for test, demonstration or training systems. This strategy is not appropriate for production systems.

Save Strategy 1: Restoring and Recovering

Purpose

Use this save strategy for production systems.

Prerequisites

This strategy requires both journal receivers and data to be backed up. We recommend that you save your database library and journal receivers daily on production systems. Ideally, you should save the database library and journal receivers to separate tapes. Save journal receivers manually after they have been detached. (For a description of how to automate saving of journal receivers with the `SAVDLTRCV` command, see Note 82079.)

This strategy requires journal receivers both for recovery and for commitment control. You need to back them up regularly between data backups. The current journal receiver is detached and a new receiver is created and attached automatically. This takes place when the current journal receiver reaches a defined size (default value: 500 MB).

Process Flow

Saving and deleting can be done manually or automatically. (For a description of how to automate the saving and deleting of journal receivers, see Note 82079.) If you are saving your journal receivers manually, it is important that you do the following:

- After installation, ensure that parameter `MNGRCV` (Manage receivers) on the `CHGJRN` (Change Journal) screen for the R/3 journal is set to `*SYSTEM` and that parameter `DLTRCV` (Delete receivers) is set to `*NO`. **This is a requirement.**
- Plan your backup procedure.
After the old journal receiver has been detached and a new one has been created and attached, you need to save the old journal receiver. Once the old journal receiver has been backed up, you can delete it to free space in the user ASP.
- Plan your storage management.
It is important to select the size of the journal receiver carefully. The default size is 500 MB, which should be sufficient for most systems. There are exceptions to this, such as when large background jobs are run. With careful planning, however, you can avoid the risk of the journal receiver overflowing into the system ASP (ASP 1). When you begin working with the R/3 System, you should check to see how fast your journal receiver reaches the maximum value. On the basis of your observations, you can then decide how often your journal receivers need to be changed and saved.
- Plan your procedure for recovery in case of ASP overflow.

See Also

For more information, see the IBM documentation *OS/400 Backup and Recovery* (document number SC41-5304).

Save Strategy 2: Restoring Only

Save Strategy 2: Restoring Only

Purpose



This strategy is not suitable for production systems! This strategy is appropriate only for test, demonstration or training systems.

In this save strategy, only the data is backed up and not the journal receivers.

Process Flow

This strategy requires very frequent backups of the R/3 library as there is no way to recover information entered after the last backup. With this type of strategy, journal receivers are needed only for commitment control. Each journal receiver is needed only for as long as it is attached. Journal receiver management can be done automatically. Given the right parameters, the system will not only change journal receivers automatically, but will also delete each one after it is detached.

After installation, ensure that parameter **MNGRCV** (Manage receivers) on the **CHGJRN** (Change Journal) screen is set to ***SYSTEM** for the R/3 journal and that parameter **DLTRCV** (Delete receivers) is set to ***YES**.

Automating Your Daily Backup Routine

Process Flow

To automate your daily backup routine, you can enter the IFS objects to be saved into [Table SPTH \[Seite 14\]](#) and run your backup routine using the command [SAVR3SYS \[Seite 15\]](#).

During normal operation of R/3 on AS/400, journal receivers are detached when they reach a certain size. When this happens, a new journal receiver is created and attached. You should save and delete these detached journal receivers periodically to prevent your disk space from being exhausted. For information on how to automate this procedure, see Note 82079.

Table SPTH**Table SPTH**

You can enter the IFS objects that you want to be included in your backup routine into the table SPTH. The command [SAVR3SYS \[Seite 15\]](#) then feeds the contents of table SPTH into your regular backup routine.

For more information on table SPTH, see [General Check before File Access \[Extern\]](#) in the documentation *BC - ABAP Programming*.

The SAVR3SYS Command

Definition

The `SAVR3SYS` (Save an R/3 System) command saves all the information required for an R/3 System. You can use the command for your daily R/3 System backup. It is not, however, suitable for making a backup after installation or upgrade as at this time you need a full backup including any PTFs (program temporary fixes) that may have been applied, and so on.

Use

Run the command on the central R/3 System (that is, the R/3 System containing the R/3 database and the critical SAP IFS files such as `/usr/sap/trans`). Since integrated file system (IFS) files can be on any R/3 System, make sure that any IFS files maintained in [table SPTH \[Seite 14\]](#) have been mounted. Provided this is the case, you only have to run the `SAVR3SYS` command on the central R/3 System.

The `SAVR3SYS` command operates as follows:

1. It ends R/3 or disconnects R/3 from the database (depending on the `R3STS` parameter).
2. It saves the IFS as specified by the `IFS`, `REFDATE`, and `REFTIME` parameters.
3. It saves the work management objects, as specified by the `SAVCFG`, `REFDATE`, and `REFTIME` parameters.
4. It saves the SQL packages, as specified by the `SAVCFG`, `REFDATE`, and `REFTIME` parameters.
5. It saves the database, as specified by the `SAVDB`, `REFDATE`, and `REFTIME` parameters.
6. Once the checkpoint is reached, SAP is restarted or reconnected to the database, depending on the `R3STS` parameter.

Structure

The parameters for the `SAVR3SYS` command are as follows:

Parameter	Description
<code>SID</code>	3-character SAP system ID
<code>DEV</code>	Device to save to. Specify the device in IFS format. The device must be a physical device. A save file is not supported.
<code>PMTCMD</code>	Specifies whether the user is to be prompted for each of the save commands. The user can use this to specify parameters other than the defaults for the command. Values: *NO - Do not prompt the user. (This is the default value.) *YES - Prompt the user on each save command.

The SAVR3SYS Command

R3STS	<p>Specifies the status of R/3 while the save is running.</p> <p>Values:</p> <ul style="list-style-type: none"> *DSCDB - Disconnect from the database. This allows all work processes to reach a commitment boundary within 5 minutes, does the save, and allows the work processes to continue once a save-while-active checkpoint has been reached. Work processes that do not reach the commit within 5 minutes are rolled back. *END - End R/3, do the save, then restart R/3 after the save while the active checkpoint is being reached. *RUN - Allow R/3 to run while the save is going on. (This value is not recommended while saving IFS files.)
IFS	<p>Specifies which IFS files are to be saved.</p> <ul style="list-style-type: none"> *SPTH - Saves the files that are specified in the SPTH table or the list of IFS directories to save or omit. (This is the default value.)
SAVDB	<p>Specifies whether or not the R/3 database is to be saved.</p> <ul style="list-style-type: none"> *YES - Save the R/3 database. (This is the default value.) *NO - Do not save the R/3 database.
SAVCFG	<p>Specifies whether or not to save the R/3 configuration objects (such as the subsystem descriptions and classes).</p> <ul style="list-style-type: none"> *NO - Do not save the configuration objects. (This is the default value.) *YES - Save the configuration objects.
SAVPKG	<p>Specifies whether or not the R/3 packages (prepared SQL packages) are to be saved.</p> <ul style="list-style-type: none"> *NO - Do not save the R/3 packages. (This is the default value.) *YES - Save the R/3 packages.
REFDATE	<p>Specifies the reference date for saving only changed objects. Only objects that have been changed since the date (and time - parameter REFTIME) specified are saved.</p> <ul style="list-style-type: none"> *ALL - Save all objects regardless of the last change date. (This is the default value.) *LASTSAVE - Save all objects that have changed since the last save date.

The SAVR3SYS Command

<p>REFTIME</p>	<p>Specifies the reference time for saving all objects that have changed since the time specified (used with this REFDATE parameter above).</p> <p>*ALL - Save all objects regardless of the last change date. (This is the default value.)</p> <p>*LASTSAVE - Save all objects that have changed since the last save date.</p>
<p>SAVACTWAIT</p>	<p>Specifies the amount of time (in seconds) that the save operation should wait for the save synchronization point. This only affects the database save operations.</p> <p>1200 - The system waits for up to 20 minutes for the database to reach its synchronization point. (This is the default value.)</p> <p>Number of seconds - The system waits for the specified number of seconds for the database to reach its synchronization point.</p>
<p>VOL</p>	<p>Specifies up to 75 volumes to be used for the save operations. If volume names are given, the volumes must be mounted in the order specified.</p> <p>*MOUNTED - Use the mounted volumes regardless of the volume name. (This is the default value.)</p> <p>Volume name - Use the specified volume names only.</p>

Saving Your R/3 System with BRMS

Saving Your R/3 System with BRMS

Purpose

The information given here applies only to online backups.

Prerequisites

Before you can save the R/3 database library with BRMS (Backup Recovery and Media Services), you must have activated the save-while-active parameter (`SAVACT`) by setting the value `*SYNCLIB`.

Process Flow

We do not recommend that you use the command `SAVR3SYS` directly in BRMS. Instead, we recommend that you enter two user exits into the backup control group immediately in front of the save entry for the database library:

```
DSCR3SYS SID (<SID>)
```

```
MONSWABRM LIB (R3<SID>DATA) CMD (RCNR3SYS SID (<SID>))
```

1. Command `DSCR3SYS` (Disconnect R/3 System) forces all R/3 jobs to reach a commitment boundary within 5 minutes. If jobs fail to reach a boundary within 5 minutes, a rollback is executed. At the end of the 5 minutes, all R/3 jobs have reached a commitment boundary and have to wait for command `RCNR3SYS` to be executed.
2. Command `MONSWABRM` (Monitor Save While Active) executes the specified command as soon as the commitment boundary has been reached.
3. Command `RCNR3SYS` (Reconnect R/3 System) signals to all R/3 jobs that work can continue immediately. If you want to be on the safe side, you can add a further user exit containing the command `RCNR3SYS SID (<SID>)` after the entry for saving the database library in the backup control group. If the command `RCNR3SYS` is actually executed twice, the second call returns the message BFC0007, which you can ignore.
4. The commands `DSCR3SYS` and `RCNR3SYS` are R/3 commands. To avoid authorization problems, execute the commands under user profile `<SID>OFR` or as a privileged user. Set the library list without specifying the kernel library name directly by calling the program `R3<SID>400/R3INLPGM`:

```
CALL PGM (R3<SID>400/R3INLPGM)
```

The commands `DSCR3SYS` and `RCNR3SYS` use IBM program `QBFCDBBK`. For more information about this program and about error messages starting with BFC that are issued by this program, see the IBM documentation.

What Do You Need to Save?

This topic provides an overview of the objects that you need to save to make sure that you can restore your data to a consistent state in case of system failure.

The following table lists the objects that you need to save and specifies how frequently you need to save them.

Objects to Be Saved	Frequency
R/3 database library R3<SID>DATA, IFS objects	Daily. In addition to the normal daily backup, make a backup before major transports are imported. Always save the database library and the IFS objects together. Exception: Since IFS journaling is currently not available, you can additionally choose to save the IFS objects after background processing. (See the section <i>IFS Objects</i> below.)
R/3 journal receiver library R3<SID>JRN (save strategy 1 only)	If you are using save strategy 1, do not delete the journal receivers until after you have saved them. Save journal receivers manually after they have been detached. (You can save journal receivers automatically. For information, see Note 82079.)
R/3 executables library R3<REL>OPT	Before and after each change.
Libraries for RFC-SDK and CPI-C-SDK (R3<REL>RFC, R3<SID>CPIC)	Before and after each change.
Entire AS/400 system (including R/3)	See the IBM documentation.
OS/400 operating system	See the IBM documentation.
SQL packages (optional)	Saving them is not necessary because they rebuild themselves fairly quickly.
Work library for the R/3 System R3<SID>400	Each time you create a new R/3 System.

The following sections provide background information about the objects to be saved, explaining why they need to be saved and, in some cases, why they need to be saved at particular intervals.

R/3 Database Library

To secure all the data in the R/3 database, save the R/3 database library R3<SID>DATA daily. We recommend that you save the database library together with its access paths to speed up restoring and recovery.

IFS Objects

R/3 application components do not necessarily only write to the database, but can also generate sequential files in the integrated file system (IFS). This happens both when you write directly to the IFS and if you store your spool data in the IFS rather than in the database.

The following scenarios exist:

What Do You Need to Save?

- An application generates a sequential file after (possibly very time-consuming) background processing.
- An application sets a flag in the database indicating that a sequential file has been generated. Once the flag has been set, you might not be able to regenerate the sequential file. For example, if you export a transport request, the request will be flagged as exported in the R/3 System. If data is lost in the IFS, you will not be able to export it again by straightforward means.

If sequential files are produced for one of the above reasons, we recommend that you make a backup of them as they are generated.

If you have any other directories for IFS data produced by ABAP programs, you must remember to save the objects in these directories too (see [Table SPTH \[Seite 14\]](#)).

We recommend that you save this data each time you back up the R/3 database library (that is, daily and after importing transport requests), especially if you have located your spool data outside the R/3 database library.

Save integrated file system (IFS) objects (profiles, logs and traces, spool data, transport data) with "Save Menu" option 11 (objects in directories).

The following table gives the path names to be entered to save specific types of data:

Type of Data	Path Name
System-specific data	'/sapmnt/<SID>*'
Instance-specific data	'/usr/sap/<SID>/<inst>*'
Transport files	'/sapmnt/trans*'



You cannot save objects via symbolic links. If you save a path such as `'/usr/sap/trans'` which is actually a symbolic link to another directory, you save only the path to that directory. To save the contents of the directory or directories, you also have to save the physical objects.

R/3 Journal Receiver Library

If you decide to implement R/3 save strategy option 1, you need to save library R3<SID>JRN.

In order to be able to recover as well as restore, you need an uninterrupted chain of journal receivers going all the way back to the last backup. Depending on receiver size, it could make sense to save receivers in between R/3 database library backups. For information about how to automate the procedure for saving (and deleting) your journal receivers, see Note 82079.

R/3 Executables Libraries and Work Management Libraries

Save the executables libraries R3<REL>OPT, R3<REL>RFC, R3<REL>CPIC and the work management library R3<SID>400 before and after each change. You will probably not need to do this once you have made your full R/3 System backup after installation or upgrade, unless you apply patches from one of the SAP support servers (for example, sapserv3).

Entire AS/400 System

You should make frequent backups of the entire AS/400 system, including the R/3 software.

OS/400 Operating System

You might sometimes need to backup and recover the OS/400 operating system. For information about how to do this, refer to the IBM documentation *OS/400 Backup and Recovery* (document number SC41-5304).

SQL Packages

You can optionally save the SQL packages. (However, only do this if the SQL packages are recent.) The advantage of doing this is that the R/3 System will be much faster after a restore or recovery if the packages already exist. The time it takes you to import the packages is more than compensated for by the time you save in not having to rebuild the packages when you start using the R/3 System again.

The frequency with which you need to save the SQL packages will vary according to the type of system, that is, whether it is a development or a production system. In your production system the packages can remain unchanged over long periods of time because the statements in the transactions that are used remain unchanged and because the transactions themselves are used according to routines that do not change. Therefore, you do not need to save the packages daily in a production system. If you need to restore, it is sufficient to import the packages from your last full backup.



You must make sure that the packages you restore are at least as old as your database library.

Other Objects

You must also save **any other objects you may need to recover after a problem situation**.

See Also

[R/3 Directories Relevant for an R/3 System Backup \[Seite 22\]](#)

[Which Objects Should NOT be Saved or Restored \[Seite 24\]](#)

R/3 Directories Relevant for an R/3 System Backup

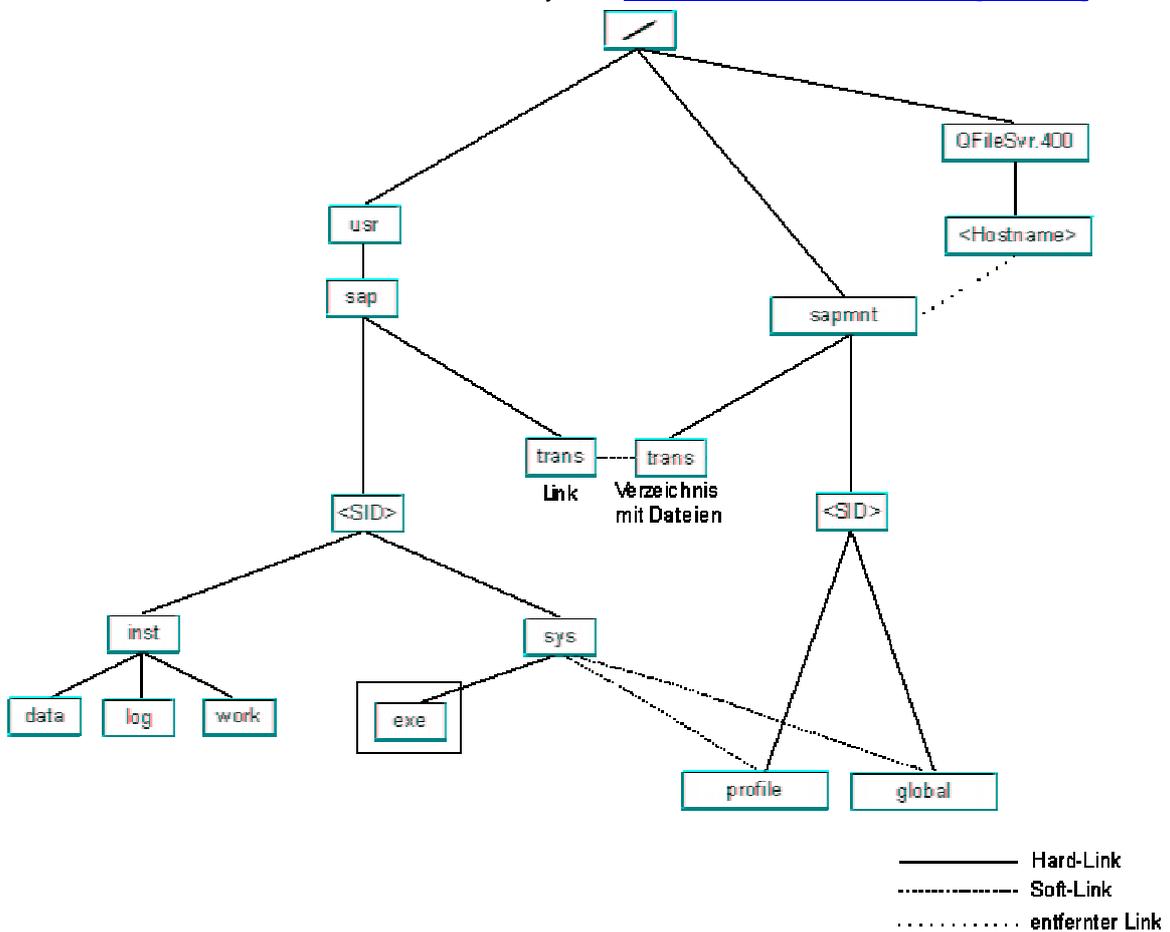
R/3 Directories Relevant for an R/3 System Backup

The objects you need to save include libraries and integrated file system (IFS) objects. The following graphic shows the R/3 directories relevant for making backups.

The graphic shows the standard R/3 directory structure. Remember that you also need to take into account any objects or paths that you might have entered into [table SPTH \[Seite 14\]](#).



Saving the file system `/usr/sap/<SID>/sys/exe` does **not** save the objects of the executable library. It only saves the symbolic links. For more information about how to save the executable library, see [What Do You Need to Save? \[Seite 19\]](#)



R/3 Directories Relevant for Saving

R/3 Directories Relevant for an R/3 System Backup

Although file system `/usr/sap/<SID>/sys/exe` is not strictly relevant for saving, it



is shown here for the sake of completeness. However, as it is softlinked to a library that gets saved, it does not need to be saved here.

Which Objects Should You NOT Save or Restore ?**Which Objects Should You NOT Save or Restore ?****Individual Objects in the R/3 Database Library**

You should not save or restore individual objects in the R/3 database library (R3<SID>DATA). You should always save the library in its entirety.

Objects Changed by R/3 Transactions

R/3 transactions change data in many objects simultaneously. There is no easy way to obtain a complete list of all objects changed by a particular R/3 transaction, let alone application. This means that there is no way to save or restore individual database objects without producing inconsistencies.

Backup Methods

There are two methods of saving objects:

- Offline backup
- Online backup with R/3 down until the checkpoint is reached

Before deciding on a backup method, you should weigh up the advantages and disadvantages of each method.

Offline Backup

Advantages	Disadvantages
It is easy to do.	A large save window is needed.
There are no synchronization considerations.	
It can be scheduled to run in the background and left to run unattended.	

Online Backup with R/3 Down Until the Checkpoint is Reached

Advantages	Disadvantages
<p>The save window needed is very small compared to that needed for an offline backup.</p> <p>For example, a test run with a save operation that took 75 minutes in total only took 15 minutes to reach its checkpoint. After the 15 minutes had expired, the R/3 System became available again.</p>	<p>24x7 availability cannot quite be achieved with this type of backup. This can only be achieved in combination with a High Availability solution where backups are made on a second system (that is, with no interruption to work on the first system).</p>
<p>Recovery is as easy as for an offline backup because synchronization is ensured by the system being down until the checkpoint has been reached.</p>	<p>An operator is needed to shut down the R/3 System and start it up again after the checkpoint message (unless <code>SAVR3SYS</code> is used).</p>

Summary of Backup Methods

- An **offline backup** would be suitable for companies with a large save window.
- An **online backup with R/3 down until the checkpoint is reached** does not call for sophisticated operating skills, since the recovery procedure is as simple as for an offline backup, and only requires a small save window.

Procedures for Saving Objects

The following procedures describe how to:

- [Perform an offline backup of the entire AS/400 system including the R/3 System \[Seite 28\]](#).

You should do this at regular intervals. However, you do not need to do this quite as often as the backup of all R/3 components.

- [Perform a backup of all R/3 components \[Seite 32\]](#) and of library R3<SID>JRN.

This should be done frequently at regular intervals. This involves making a backup of system- and instance-specific integrated file system (IFS) objects and of R/3 libraries R3<SID>DATA and R3<SID>JRN.

The above procedures do not contain any instructions about how to back up and recover the OS/400 operating system. For more information, see the IBM documentation *OS/400 Backup and Recovery* (document number SC41-5304).

See also:

[Save-While-Active Function \[Seite 27\]](#)

Save-While-Active Function

Use

This function allows you to continue using applications while they are being backed up.

To request the save-while-active function, specify the save-while-active (**SAVACT**) parameter on save commands. The value ***SYNCLIB** must be set.

See Also

For more information, see chapter 7, topic 2.6 in the IBM book *OS/400 Backup and Recovery* (SC41-5304). For information about this and other parameters that can be used with save commands, see chapter 7, topic 2.6.3 in the same book.

Performing an Offline Backup of the Entire AS/400 System Including R/3

Prerequisites

- All users have signed off.
This is important since, before starting this type of backup, the AS/400 system will bring down all subsystems.
- Working from the console, you are signed on as QSECOFR or as a user with *SAVSYS rights and authorization to start and end subsystems.

Procedure

1. Initialize a sufficiently large tape (using command INZTAP).
2. Go to the **SAVE** menu (using command GO **SAVE**) and enter option 21 (Entire system) in the command line.
3. Refer to the IBM documentation for recommendations on tape labeling and safe-keeping practices.
4. Start up R/3 again.

Performing an Online Backup Using SAVR3SYS

To back up the R/3 database online, use command `SAVR3SYS` with the `R3STS (*DSCDB)` (Disconnect from database) option. (For information on the other options available for `SAVR3SYS`, see [The SAVR3SYS Command \[Seite 15\]](#).)

The disconnect from database option ensures that a commitment boundary is reached during save-while-active checkpoint processing. Without this option, the AS/400 system may never be able to reach a commitment boundary.

The contents of the R/3 buffers are not lost, because the R/3 System is not stopped to do the save.

Disconnecting the R/3 jobs from the database consists of:

1. Waiting for up to 5 minutes for the R/3 jobs reach a commitment boundary
2. Temporarily disallowing R/3 jobs from running any SQL statements
3. Save-while-active checkpoint processing
4. Allowing the R/3 jobs to run SQL statements again

Usually, many R/3 jobs will be at a commitment boundary, so that it will not take long to reach (1). If there are R/3 jobs running in the background that commit rarely, these R/3 jobs may be forced to a commitment boundary by rolling back the current transaction.

During the time when the R/3 jobs are disallowed from running SQL statements, they will enter DLYW (delay wait) job status and will retry the SQL statement every 60 seconds. (2) will take the time needed to reach the checkpoint (3). No work is allowed during this time and SAPguis will be deactivated.

When the save-while-active checkpoint (3) is reached, a message CPI3712 "Save-while-active checkpoint processing complete" is sent to the SAVR3<SID> message queue in QUSRSYS library.

Once the checkpoint has been reached, all R/3 jobs can resume their work (4). Those jobs that were rolled back during (1) receive error message SQL0901.

For more information on the save-while-active function (such as performance and storage considerations), see the IBM documentation *OS/400 Backup and Recovery* (SC41-5304).

Backing Up All R/3 Components

There are two ways of doing this:

- [Using the SAVR3SYS command \[Seite 31\]](#)
- [Manually \[Seite 32\]](#)

Backing Up the R/3 Components with the SAVR3SYS Command

1. Working from the console, sign on as user <SID>OFR.
2. At the command prompt, enter the command `SAVR3SYS` and choose F4 to obtain command prompting.
3. For *System ID*, enter your 3-character SAP System ID, for example "C11".
4. For *Device*, enter the name of the device to save to in IFS format.
5. For help on the remaining parameters, see [The SAVR3SYS Command \[Seite 15\]](#).

Backing Up the R/3 Components Manually

Backing Up the R/3 Components Manually



This procedure assumes that you are doing an online backup with R/3 down until the checkpoint is reached.

Prerequisites

- Working from the console, you have signed on as user <SID>OFR.
- You have initialized a sufficiently large tape (using command `INZTAP`).
- You have ended the R/3 subsystem (using command `STOPSAP`).
- You have made sure that no user can start R/3 again until you do so after the checkpoint has been reached, and that no other applications are changing data in the R/3 System.

Procedure



We recommend that you run the backup in the background using the `SBMJOB` (Submit Job) command.

1. Start a backup of the database library `R3<SID>DATA` using the command `SAVLIB`.
2. In the *Library* field, enter the name of your database library, that is `R3<SID>DATA`.
3. On the next line, enter the name of your journal receiver library, that is `R3<SID>JRN`.
4. In the *Device* field, enter the name of your tape device (for example, `TAP01`).
5. Accept the default values for the fields *Volume identifier*, *Sequence number*, *Label*, *File expiration date* and *End of tape option*.
6. In the *Update history* field, accept the default value `*YES`.
7. In the *Clear* field, accept the default value `*NONE`.
8. In the *Object pre-check* field, enter the value `*YES`.
9. In the *Save active* field, enter the value `*SYNCLIB`.
10. In the *Save active wait time* field, enter the value `*NOMAX`.
11. In the *Save active message queue* field, enter the name of your `<SID>OFR` user, for example `C11OFR`.
12. In the *Library* field, accept the default value `*LIBL`.
13. In the *Save access paths* field, enter the value `*YES`.
14. In the *Save file data* field, accept the default value `*YES`.
15. In the *Storage* field, accept the default value `*KEEP`.
16. In the *Data compression* field, enter the value `*YES`.

Backing Up the R/3 Components Manually

17. In the *Data compaction* field, accept the default value *DEV.
18. In the *Output* field, enter the value *PRINT.
19. In the *Library* field for the parameter *File to receive output*, accept default value *LIBL.

For more information about the parameters that can be specified on the SAVLIB command, see chapter 7, topic 2.6.3.1 in the IBM book *OS/400 Backup and Recovery* (SC41-5304).

Restarting R/3 After the Checkpoint Has Been Reached

To be able to start R/3 again after the checkpoint, you need a message telling you the checkpoint has been reached.

To achieve this, specify your user ID in the *Save active message queue* SAVACTMSGQ parameter (see above) and check that your user ID has *BREAK in the DLVRY parameter.

Proceed as follows:

1. Call the *Change User Profile* screen with the command CHGUSRPRF.
2. In the *Delivery* field, enter the value *BREAK.
3. Leave all the other values unchanged.
4. When the checkpoint message appears, start up R/3 again.
5. Refer to the IBM documentation for recommendations for tape labeling and safe-keeping practices.

To save integrated file system (IFS) objects, carry out the steps described in [Saving IFS Objects \[Seite 34\]](#).

Saving IFS Objects

Saving IFS Objects



You cannot save objects via symbolic links. If you save a path such as `'/usr/sap/trans'` which is actually a symbolic link to another directory, you save only the path to that directory. To save the contents of the directory or directories, you also have to save the physical objects.

Procedure



We recommend that you run this save procedure in the background using the `SBMJOB` command.

1. Go to the `SAVE` menu (using command `GO SAVE`).
2. In the command line, enter option 11 (Objects in directories).
3. In the *Device* field, enter `'/qsys.lib/<tape_device_name.devd>'`.
Example: `\qsys.lib/TAP01.devd'`
4. In the *Name* field, enter the path name of the objects to save.
Example, `\sapmnt/<SID>*''`.
5. In the *Include or omit* field, accept the default value `*INCLUDE`.
6. In the *Directory subtree* field, accept the default value `*ALL`.
7. In the *Save active* field, accept the default value `*NO`.
8. In the *Output* field, enter the value `*PRINT`.
9. In the *Volume identifier* field, enter the value `*MOUNTED`.
10. In the *Label* field, accept the default value `*GEN`.

Entering the Additional Parameters

1. Choose `F10` to obtain the Additional Parameters.
2. In the *System* field, accept the default value `*LCL`.
3. In the *Time period for last change* field (and in the fields *Start date*, *Start time*, *End date*, *End time*), accept the default value `*ALL`.
4. In the *Object pre-check* field, enter the value `*YES`.
5. In the *Target release* field, accept the default value `*CURRENT`.
6. In the *Update history* field, enter the value `*YES`.
7. In the *Clear* field, accept the default value `*NONE`.
8. In the *Data compression* field, accept the default value `*DEV`.

Saving IFS Objects

9. In the *Data compaction* field, accept the default value *DEV.
10. For instance-specific IFS objects, enter path `/usr/sap/<SID>/<instance>` and ensure that the subdirectories and files are also saved.
11. For transport data, enter path `/sapmnt/trans`.
12. Remember to save the objects in your own IFS files.



As there is a link between some IFS objects and R/3 and, as it is not possible for the IFS objects and the R/3 library to reach a checkpoint together, the IFS objects should be saved first while R/3 is still down to ensure consistency.

The time needed to save the IFS objects will be only a small fraction of that needed to save the R/3 library, so their impact on the size of the save window will be negligible.

13. Continue with step 2 of the procedure for [Backing Up the R/3 Components Manually \[Seite 32\]](#).

Procedures for Restoring and Recovering Objects

Procedures for Restoring and Recovering Objects

[Restoring/Recovering the Entire AS/400 System Including R/3 \[Seite 37\]](#)

[Restoring/Recovering All R/3 Components \[Seite 38\]](#)

Restoring/Recovering the Entire AS/400 System Including R/3

Prerequisites

- You have deleted the ASP data using DST (the dedicated service tool).
- All users have signed off.
 - This is important since, before starting the restore job, the AS/400 system will bring down all subsystems.
- Working from the console, you have signed on as QSECOFR or as a user with *SAVSYS rights and authorization to start and end subsystems.

Procedure

1. Insert the tape with the latest complete system backup.
2. Go to the RESTORE menu (using command GO RESTORE) and take option 21.
3. For the recovery phase, refer to [Restoring/Recovering All R/3 Components \[Seite 38\]](#).
4. Start up R/3 again.

Restoring Private Authorities

To restore private authorities for objects, use the command RSTAUT USRPRF (*ALL) . For more information, see the IBM documentation *OS/400 Backup and Recovery* (SC41-5304).

Restoring/Recovering All R/3 Components



The sequence of restoring is important. Make sure that the journal receiver library R3<SID>JRN is restored before the database library. If the database library is restored first, the journal receivers will be located in the database library!

Prerequisites

- This procedure assumes that you have a tape with an offline backup or with an online backup with R/3 down until the checkpoint is reached. If you have a tape with an online backup with R/3 running before the checkpoint was reached, please refer to the IBM documentation.
- Before restoring, delete the contents of the database library.

Procedure

1. Stop the R/3 subsystem (using command `STOPSAP`).
2. Make sure that no user can start up R/3 again until you do so after the restore/recovery.
3. Insert the tape containing the most recent backup of library R3<SID>DATA (and system- and instance-specific integrated file system (IFS) objects and journal receivers, if required).
4. Check whether the Integrated File System is consistent. If so, continue with step 5. If not, proceed as described in [Restoring IFS Objects \[Seite 40\]](#)
5. Delete the objects you want to restore, if required.

Advantages:

- The procedure is simple.
- You will not have to deal with any R/3 objects that may be broken.

Disadvantages:

- Deleting the objects takes time.
 - Restoring takes longer if objects were deleted, since access paths have to be set up again.
6. Restore the objects in the libraries R3<SID>DATA and R3<SID>JRN using command `RSTLIB` (Restore Library). It is important that the library R3<SID>JRN is restored before R3<SID>DATA, if a restore of the journals is necessary.
 7. In the *Saved library* field, enter your database library R3<SID>DATA. If the journals also have to be restored, you have to enter the library R3<SID>JRN first.

Restoring/Recovering All R/3 Components



The journals are located on the tape mostly behind the database. This is why `ENDOPT (*REWIND)` is necessary.

8. In the *Device* field, enter the name of your tape device, for example `TAP01`.
9. In the *Volume identifier* field, accept the default value `*MOUNTED`.
10. In the *Sequence number* field, accept the default value `*SEARCH`.
11. In the *Label* field, accept the default value `*SAVLIB`.
12. In the *End of tape option* field, accept the default value `*REWIND`, if it is the last library on the tape. Otherwise use `*LEAVE` to avoid unnecessary spooling.

Additional Parameters

1. In the *Option* field, accept the default value `*ALL`.
2. In the *Data base member option*, accept the default value `*MATCH`.
3. In the *Allow object differences* field, accept the default value `*NONE`.
4. In the *Force object conversion: Convert during restore* field, accept the default value `*SYSVAL`.
5. In the *Restore to library* field, accept the default value `*SAVLIB`.
6. In the *Auxiliary storage pool ID* field, accept the default value `*SAVASP`.
7. In the *Output* field, enter the value `*PRINT`.
8. In the *File to receive output, Library* field, accept the default value `*LIBL`.
9. In the *Output member options: Member to receive output* field, accept the default value `*FIRST`.
10. In the *Output member options: Replace or add records* field, accept the default value `*REPLACE`.
11. In the *Type of output information* field, accept the default value `*OBJ`.



There will be a message at the end telling you how many objects could not be restored.

If any objects other than journals or journal receivers could not be restored, your R/3 System will no longer be consistent. In this case, use an older backup tape.

12. To recover changes made since the last backup, use command `APYJRNCHG` (Apply Journalled Changes) for the journal used for library `R3<SID>DATA`. For information about restrictions, see [Restrictions on Journaling and Recovery \[Seite 9\]](#).
13. Start up R/3 again.

Restoring IFS Objects

Restoring IFS Objects

1. Delete the objects you want to restore.
2. Go to the *Restore* menu (using command `GO RESTORE`).
3. In the command line, enter option 9 (Objects in directories).
4. In the *Device* field, enter `'/qsys.lib/<tape_device_name>'`.
Example: `'/qsys.lib/TAP01.devd'`
5. In the *Objects: Name* field, enter the path for the objects you want to restore.
For example, to restore system-specific IFS objects, enter the path `/sapmnt/<SID>*`.
6. In the *Include or omit* field, accept the default value `*INCLUDE`.
7. In the *New object name* field, accept the default value `*SAME`.
8. In the *Directory subtree* field, accept the default value `*ALL`.
9. In the *Output* field, enter the value `*PRINT`.
10. In the *Volume identifier* field, accept the default value `*MOUNTED`.
11. For the remaining parameters, accept the default values.

To save instance-specific IFS objects, enter path `/usr/sap/<SID>/<inst>*`. To save transport data, enter path `/sapmnt/trans`.



As there is a link between some IFS objects and R/3 and, as it is not possible for the IFS objects and the R/3 library to reach a checkpoint together, the IFS objects should be restored while R/3 is down to ensure consistency.

12. Continue with step 5 of [Restoring/Recovering All R/3 Components \[Seite 38\]](#)

SQL Package Handling

Use

Before an SQL statement can be executed on a database, a PREPARE operation has to run. The PREPARE operation analyzes the syntax of the SQL statement and does some of the request optimization. Since PREPARE is generally a comparably expensive operation, you should try to keep the number of PREPAREs as low as possible. To assist you in this, DB2/400 gives you the option of saving prepared statements in "SQL packages" for reuse at a later time. This option, which is made use of by R/3, provides considerable performance benefits.

Features

Naming Conventions for SQL Package Libraries

The SQL packages (OS/400 objects of type *SQLPKG) are held in special package libraries with names that start with 'R3' followed by the SAP system ID. By looking at the library name, you can see the area of R/3 in which the SQL statements are used. For example, there are libraries for statements from reports, screens or the R/3 kernel. These naming conventions make it possible for you to relocate prepared statements.

If the last character in the library name is not '0', the library is an overflow library. There should not be too many overflow libraries in an R/3 System, since accessing these libraries affects performance.

Messages Relating to SQL Packages

When statements have not been prepared, the messages SQL0204 and SQL0514 appear in the AS/400 job log. The reason for these messages is to inform R/3 when a statement has to be prepared. These messages can be ignored.

Activities

Deleting SQL Packages

There are certain situations where you have to delete SQL packages.

In some instances, this is done automatically. For example, when you upgrade to a higher R/3 release, all the packages are deleted and when you start the main instance, any packages that are no longer required are deleted.

In some cases, however, you have to delete the packages manually. You can do this with the command `DLTR3PKG`. When you restore a database, for example, you have to delete all the SQL packages manually.

You sometimes have to delete the packages when you switch to a more recent version of the R/3 kernel. For more information, see the relevant Note describing how to apply the kernel.

Apart from these exceptions, you should not normally delete the SQL packages as doing so will temporarily affect R/3 System performance.

SQL Package Handling**Monitoring SQL Packages from R/3**

To look at SQL packages from within R/3, call the *Database Performance: DB2/400 Overview* screen (transaction ST04) and choose *Detail analysis menu*. On the next screen, choose *SQL packages*.