

BrightStor® ARCserve® Backup for UNIX

Agent for Oracle Guide

r11.5



Computer Associates®

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Chapter 1: Introducing the Agent

BrightStor® ARCserve® Backup is a comprehensive, distributed storage solution for applications, databases, distributed servers, and file systems. It provides backup and restore capabilities for databases, business-critical applications, and network clients.

Among the agents BrightStor ARCserve Backup offers is the BrightStor® ARCserve® Backup Agent for Oracle. This agent lets you:

- Manage backups remotely
- Back up tablespaces belonging to online databases by taking advantage of the Oracle backup features
- Restore a complete database or individual database objects such as a tablespace, data files, control files, archive log, or parameter file
- Schedule your backups
- Back up to a wide array of media storage devices

The agent handles all communications between BrightStor ARCserve Backup and the Oracle database during backup and restore jobs, including preparing, retrieving, and processing the data that is sent back and forth between the Oracle database and BrightStor ARCserve Backup.

Agent Features

The Agent for Oracle offers a number of features that improve performance. Among those features are:

- **Fully Integrated with RMAN**—The agent is fully integrated with Recovery Manager (RMAN), an Oracle utility that lets you back up, restore, and recover databases. Using the agent user interface, you can access all RMAN options for the backup, restore, and recovery operations. The agent generates RMAN scripts to perform the desired operation, and lets you save and identify the RMAN scripts that are generated. For additional information about Recovery Manager, see the Oracle Backup and Recovery Guide.
- **Cross Product Interoperability**—The agent now lets you perform a restore through RMAN even if you performed a backup using the agent. Alternatively, you can perform a restore using the agent if you had performed the backup using RMAN.

- **Multistreaming**—The agent now uses the RMAN parallel input/output capabilities, namely multistreaming through multiple channels and multiplexing on a channel. In addition, the agent derives other capabilities from RMAN such as load-balancing among channels and node affinity and channel fail over in RAC environments.
- **Cross Platform Database Backups**—The agent can back up Oracle databases on UNIX platforms to BrightStor ARCserve Backup servers running Windows NT, Windows 2000, or Windows 2003. It can also back up Oracle databases on Windows NT, Windows 2000, or Windows 2003 platforms to BrightStor ARCserve Backup servers running UNIX or Linux. This provides centralized backups.

Agent Functionality

The agent and Oracle reside on the same computer. When BrightStor ARCserve Backup starts to back up a database object, it sends a request to the agent. The agent retrieves the object from Oracle and sends it to BrightStor ARCserve Backup, where the object is backed up to media. Similarly, the agent transfers the database object when the file is restored from media.

For more information about backing up databases and database objects, see the “Backing Up” chapter. For more information about Oracle backup and recovery procedures, see the *Oracle Database Administrator’s Reference*.

Note: In a Real Application Cluster (RAC) environment, a copy of the agent must reside on at least one node in the environment. In addition, this node must have access to **all** archive logs. Otherwise, the backup operation is essentially the same.

Database Backups

To perform a database back up, the Agent for Oracle generates an RMAN script based on the options you select in the agent user interface (that is, the Backup Manager). The agent then calls RMAN to execute this script. When RMAN starts, it generates other agent jobs to perform the actual backup. These agent jobs receive data blocks from RMAN and send them to BrightStor ARCserve Backup to have them backed up to the media drive.

Note: The agent and BrightStor ARCserve Backup can back up a complete database or objects within the database.

To perform "offline" database backups, the agent puts the database in a quiescent state before beginning the backup process. This quiescent state allows the database to remain accessible to RMAN throughout the backup process, but does not let anyone access the database or run transactions. For more information, see the Back Up in Offline Mode section in the "Backing Up" chapter.

Operating System Compatibility

The Agent for Oracle is compatible with the following varieties of UNIX:

- AIX
- HP-UX
- Solaris
- Tru64

The term UNIX, when used in this guide, refers to all the varieties of UNIX in the previous list unless otherwise stated. If an agent feature, function, or procedure does not work with one or more of the varieties listed, those varieties will be named explicitly.

Chapter 2: Installing the Agent

The Agent for Oracle is a client program you install on one of the following:

- The server on which Oracle Server resides
- At least one node in a Real Application Cluster (RAC) environment that has access to all archive logs

This chapter lists the installation prerequisites and considerations for the agent, and provides detailed instructions for all post installation tasks. For information about how to install the agent, see the *Getting Started*.

Installation Prerequisites

Before installing the Agent for Oracle, verify that the following applications are installed and working properly on your machines:

- BrightStor ARCserve Backup r11.5
- The appropriate variety and version of UNIX
- The appropriate version of Oracle Server

You must install the agent on the same host as the Oracle Server that you want to back up. This may or may not be the same as the host on which BrightStor ARCserve Backup is installed.

Note: For information about the appropriate version of UNIX and the appropriate version of Oracle Server for your environment, see the readme file.

Before starting the installation of the agent, you must have administrator privileges or the proper authority to install software on the machines where you will be installing the agent.

Note: Contact your BrightStor ARCserve Backup administrator to obtain the proper privileges if you do not have them.

Installation Considerations

Consider the following when you install the agent:

If you install the agent with RMAN support on the same server as an existing installation of BrightStor ARCserve Backup and you subsequently uninstall BrightStor ARCserve Backup from this server, you must reconfigure the agent by running the orasetup script so that it can work with a remote BrightStor ARCserve Backup installation.

Note: The need to stop and start the Oracle services depends on the version of Oracle you are using and whether you are relinking Oracle with our provided libobk library file. It also depends on whether a softlink was created under the lib directory in Oracle. For more information, see the Post-Installation Tasks Required for Recovery Manager (RMAN) section of this chapter.

The Agent in a RAC Environment

To configure the agent in a Real Application Cluster (RAC) environment, you must install and configure the agent on at least one node that is a part of the RAC cluster and that has access to **all** archive logs. You can install the agent on more than one node in the RAC, but each node must also have access to all the archive logs. If you do install the agent on multiple nodes, note that the backup is executed from the node selected in the Backup Manager.

To enable the Agent for Oracle to access all archive logs for the recovery process similar to the way Oracle accesses them, you need to follow Oracle's recommendation for building a RAC environment. Oracle requires access to all required archive logs, whatever their origin, in the RAC environment during recovery. To allow the Agent for Oracle access to all the archived logs, you should do one of the following:

- Put all required archive logs on a shared disk
- Put all required archive logs on a mounted NFS disk
- Use the replication of the archive logs

Agent Installation

Install the Agent for Oracle on each database server you want BrightStor ARCserve Backup to manage.

For information about how to install the agent, see the *Getting Started*.

Perform Post-Installation Tasks

After you have installed the agent, complete the following post-installation tasks:

1. Check whether Oracle Server is operating in ARCHIVELOG mode. For instructions, see [Check the ARCHIVELOG Mode](#).
2. Start ARCHIVELOG mode if it is not running. For instructions, see [Start ARCHIVELOG Mode](#).
3. Enable the database for automatic archiving. For instructions, see [Automatic Archiving](#).

Note: For an Oracle 10g database, after you start archivelog mode, Oracle enables automatic archiving for you. For all other databases, you must follow all the steps in the Automatic Archiving section to enable automatic archiving.

4. Configure the agent by running the orasetup program. For instructions, see [Configure the Agent](#).
5. If you have installed the agent in an Oracle 9i or 10g environment, you must remove the set mark html parameter if it is defined. For instructions, see [Remove the Set Mark HTML Parameter](#).
6. Although optional, we strongly recommend that you create an RMAN catalog. We also recommend that you create this catalog in a database other than the one RMAN manages. For instructions, see [Create an RMAN Catalog](#).
7. If you intend to launch backups through the agent for Oracle 8.0 and 8i, re-link Oracle Server to the proper SBT (Systems Backup to Tape) interface library.

Important! *You must perform these post-installation tasks on each machine on which you have installed the agent, including when the agent is installed on a RAC node.*

Check ARCHIVELOG mode

To check whether the ARCHIVELOG mode is on, follow these steps:

1. Log in as an Oracle user with SYSDBA equivalent privileges.
2. Enter the following command at the SVRMGR or SQLPLUS prompt:

```
ARCHIVE LOG LIST
```

This command displays the settings and status of the archive log files. The first line shows that ARCHIVELOG mode is enabled. If it is disabled, the database log mode is NOARCHIVELOG.

Start ARCHIVELOG Mode

To start ARCHIVELOG mode, follow these steps:

1. Shut down Oracle Server.
2. Depending on which version of Oracle you are running, execute the following statements:
 - At the SVRMGRl prompt:

```
CONNECT INTERNAL
STARTUP MOUNT EXCLUSIVE
ALTER DATABASE ARCHIVELOG;
ALTER DATABASE OPEN;
ARCHIVE LOG START;
```

- At the SQLPLUS prompt:

```
CONNECT SYSTEM/SYSTEM_PASSWORD AS SYSDBA
STARTUP MOUNT EXCLUSIVE
ALTER DATABASE ARCHIVELOG;
ALTER DATABASE OPEN;
ARCHIVE LOG START;
```

Automatic Archiving

To back up tablespaces from an online or "offline" database, you must configure the database for automatic archiving. For more information about offline databases, see the Back Up in Offline Mode section of the "Backing Up" chapter.

Note: For an Oracle 10g database, Oracle enables automatic archiving after you start archivelog mode. For all other databases, you must follow all the appropriate steps in this section to enable automatic archiving.

Enable Automatic Archiving for Oracle Installation Using PFILE

To configure the database for automatic archiving if your Oracle installation is configured to use PFILE, add the following log parameter lines to the INIT(SID).ORA file in your \$ORACLE_HOME/dbs directory:

```
LOG_ARCHIVE_START=TRUE
LOG_ARCHIVE_DEST=<archive log directory>
LOG_ARCHIVE_FORMAT=%t_%s.dbf
```

The following table lists each log parameter and explains its function:

Parameter	Explanation
LOG_ARCHIVE_START	Enables automatic archiving.
LOG_ARCHIVE_DEST	Specifies the path to the archived redo log files. The Agent for Oracle queries Oracle Server parameters for the archive log destination in the following order: LOG_ARCHIVE_DEST, LOG_ARCHIVE_DEST_1 and so on through LOG_ARCHIVE_DEST_10. The agent backs up the archive logs from the first local destination it finds.
LOG_ARCHIVE_FORMAT	Specifies the filename format for the archived redo log files where %S specifies the log sequence number and %T specifies the thread number. For example, "ARC%S.%T" is acceptable.

Important! *Use a separator between numerical values. For example, %S.%T. If you omit the separator, archive log file names cannot be parsed because there is no way to determine which part is %S and which part is %T. In addition, this could inadvertently create multiple archive logs with the same name.*

Enable Automatic Archiving for Oracle Installation Using SPFILE

To configure the database for automatic archiving if your Oracle installation is configured to use SPFILE, follow these steps:

1. Verify the value of the log parameters by entering the following command at the SQLPlus prompt:

```
show parameter log
```

2. If the parameters do not have the correct values, change them by entering the following commands at the SQLPlus prompt:

```
ALTER SYSTEM SET LOG_ARCHIVE_START = TRUE SCOPE = SPFILE;
ALTER SYSTEM SET LOG_ARCHIVE_DEST="c:\oracle\oradata\ORCL\archive"
SCOPE = SPFILE;
ALTER SYSTEM SET LOG_ARCHIVE_FORMAT="ARC%S.%T" SCOPE = SPFILE;
```

Note: The actual value of LOG_ARCHIVE_DEST is specific to your environment.

3. Restart the Oracle instance to make the changes effective.

For more information about setting automatic archiving, see your *Oracle Database Administrator's Reference*.

ARCHIVELOG to NOARCHIVELOG Mode Comparison

The following table explains the advantages and disadvantages of ARCHIVELOG mode and NOARCHIVELOG mode.

Mode	Advantages	Disadvantage
ARCHIVELOG mode	You can perform hot backups (backups when the database is online).	It requires additional disk space to store archived log files. However, the agent offers the option to purge the logs after they have been backed up, giving you the opportunity to free disk space if you need it.
NOARCHIVELOG mode	The archive logs and the last full backup (offline or online) or an older backup can completely recover the database without losing any data because all changes made in the database are stored in the log file.	

Mode	Advantages	Disadvantage
NOARCHIVELOG mode	<p>It requires no additional disk space to store archived log files.</p> <p>Database downtime is significant because you cannot back up the database online. This limitation becomes a very serious consideration for large databases.</p>	<p>If you must recover a database, you can only restore the last full offline backup. As a result, any changes made to the database after the last full offline backup are lost.</p>

Note: Because NOARCHIVELOG mode does not guarantee Oracle database recovery if there is a disaster, the Agent for Oracle does not support this mode. If you need to maintain Oracle Server in NOARCHIVELOG mode, then you must backup full Oracle database files without the agent using BrightStor ARCServe Backup while the database is offline to ensure disaster recovery. Also note that RMAN requires that the database run in ARCHIVELOG mode.

Configure the Agent

After installing the agent, you must run the orasetup program to configure the agent properly. To run the orasetup program, follow these steps:

1. Change to the agent home directory.
2. Enter the following command to start the orasetup program:
`./orasetup`
3. The orasetup program prompts you to enter the agent home directory. The default setting is the current directory.
 - If you want to select the default, press Enter.
 - If the agent home directory differs from the current directory, enter the path name for that directory, and then press Enter.
4. The orasetup program asks you if BrightStor ARCserve Backup is installed on this machine.
 - If you are installing the agent locally, on a computer with BrightStor ARCserve Backup installed on it, enter *y* and press Enter.
 - If you are installing the agent remotely, on a different computer from BrightStor ARCserve Backup, enter *n*, and then press Enter.
5. The orasetup program prompts you for the BrightStor ARCserve Backup home directory. The default setting is:
`/opt/CA/BrightStorARCserve`
 - If you want to accept the default, press Enter.
 - If the BrightStor ARCserve Backup home directory differs from the default, enter the appropriate path, and then press Enter.
6. The orasetup program asks you if Oracle is installed on this machine. Enter *y*, and then press Enter.
7. The orasetup program asks you if a Recovery Manager catalog will be used to handle the database backups. If you intend to do this, enter *y*, and then press Enter.

Note: We recommend using an RMAN catalog when performing a backup because RMAN stores all relative backup information in this catalog, providing your data with the best protection possible.

8. If this is a new configuration, the orasetup program asks you to register all of the Oracle System IDs (SIDs) to be used with BrightStor ARCserve Backup. If this is not a new installation, the orasetup program asks you if the existing configuration files should be recreated. If you want to keep your existing instance.cfg and sbt.cfg files, enter *n*.

Note: The orasetup program creates two configuration files: instance.cfg and sbt.cfg.

 - If these files already exist when you run orasetup and you do not want to overwrite them, enter *n*. The instance.cfg file and sbt.cfg file remain unchanged and orasetup creates sbt.cfg tmpl, a template file. You can then use this template file to adjust the sbt.cfg file manually.
 - If you select to overwrite the configuration files, orasetup creates new instance.cfg and sbt.cfg files that overwrite your existing instance.cfg and sbt.cfg files.
 - The agent uses the instance.cfg file to register new instances of Oracle or to make modifications. You can configure the instance.cfg file at any time.
9. The orasetup program prompts you to print the content of the oratab file. You then choose the ones you want to configure.
10. The orasetup program prompts you to provide the Oracle instance ID to be used by the agent (for example, Database1, Database2). When finished, press Enter.
11. Enter the ORACLE_HOME environment value for the Oracle instance you entered in the previous step. When finished, press Enter.
12. If you answered yes to the question about whether you will be using an RMAN catalog to handle the database backups, enter the name of the Oracle Net service that will access the database containing the RMAN catalog for this instance.
13. The orasetup program asks you to enter the number of days the Oracle agent log files should be kept before being automatically deleted. The default value is 30 days. In response, do **one** of the following:
 - If the default is acceptable, press Enter.
 - If you want to set the number of days to a number other than 30, enter that number, and then press Enter.
 - If you do not want to have the log files deleted automatically, enter 0.

14. The orasetup program asks you enter the number of days the RMAN scripts generated by the agent should be kept before being automatically deleted. The default value is 30 days. In response, do **one** of the following:
 - If the default is acceptable, press Enter.
 - If you want to set the number of days to a number other than 30, enter that number, and then press Enter.
 - If you do not want to have the RMAN scripts deleted automatically, enter 0.
15. The orasetup program asks you to enter the name of a user who can connect to this host.
16. The orasetup program asks you to enter the password for that user.

Remove the Set Mark HTML Parameter

If you have installed the agent in an Oracle 9i or 10g environment and the set mark html parameter in the login.sql file is defined, you must remove it. To remove the set mark html parameter, follow these steps:

1. Open login.sql.
2. Check if the set mark html parameter is defined.
3. If the set mark html parameter is defined, remove it from login.sql.
4. Save and close login.sql.

Create an RMAN Catalog

We strongly recommend using an RMAN catalog when performing a backup. It offers the best protection possible because RMAN stores all relative backup information in this catalog. Without the catalog, RMAN will rely only on control files to manage backups. This is very risky because if all the control files are lost, RMAN will not be able to restore the database. In addition, you will not be able to restore your control files and your database will be lost. To remind you that you should be using the RMAN catalog, a message will display every time you run a job without a catalog.

Important! *If you are not using an RMAN catalog, you need to manage your control files on your own either by using a file system backup or by mirroring the control files for fault tolerance.*

To create an RMAN catalog, follow these steps:

Note: Because RMAN relies heavily on this catalog when restoring, you should create it in a separate database (that is, a database other than the one being backed up).

1. Create a new tablespace using this SQLPlus command:

```
* create tablespace <RMAN catalog tablespace> datafile <datafile name>
  size <datafile size> m;
```

2. Create the user who will be the owner of the RMAN catalog by entering this command:

```
* create user <RMAN catalog owner> identified by <password> default
  tablespace <RMAN catalog tablespace> quota unlimited on <RMAN catalog
  tablespace>;
```

3. Assign the correct privileges to this user by using the following command:

```
* grant recovery_catalog_owner to <RMAN catalog owner>;
```

4. For Oracle 8i and later users, create the catalog using these commands:

```
* rman catalog <RMAN catalog owner>/<RMAN catalog password>
* create catalog;
```

For Oracle 8.0 users, connect to and start the catalog using these commands:

```
* connect <RMAN catalog owner>/<RMAN catalog password>;
* start <oracle home>/rdbms/admin/catrman
```

For more information about Recovery Manager, see the *Oracle Backup and Recovery Guide*.

Post-Installation Tasks Required for Recovery Manager

To use Oracle Recovery Manager (RMAN), you must perform the following post-installation tasks:

- Use library files by performing **one** of these actions:
 - Relink Oracle to use the Computer Associates® libobk library files.
 - Create the \$ORACLE_HOME/lib/libobk.s* symbolic link to point to the Computer Associates libobk library.
 - Use the SBT_LIBRARY parameter in the RMAN script.
- Add the client host definition in the BrightStor ARCserve Backup database if not done already.
- Add the Oracle user who owns the Oracle database files as a BrightStor ARCserve Backup user equivalency.
- Set the RMAN environment variables.

About the SBT 1.1 and SBT 2.0 Interfaces

The SBT (Systems Backup to Tape) 1.1 and SBT 2.0 interfaces are the Oracle APIs (Application Programming Interfaces) that enable BrightStor ARCserve Backup to provide backup and restore capabilities to RMAN. These interfaces use the sbt.cfg parameter file and the BrightStor ARCserve Backup ca_backup and ca_restore commands to initiate backup and restore operations from RMAN.

About the sbt.cfg Parameter File

The SBT library uses the sbt.cfg parameter file to interact with the agent. This file contains various user-defined parameters that are passed to BrightStor ARCserve Backup when you submit backup and restore jobs through the ca_backup and ca_restore commands. The orasetup program creates the initial sbt.cfg configuration file during agent setup.

In addition, orasetup automatically encrypts the password and puts it in the sbt.cfg file (SBT_PASSWORD). If you want to modify the password, you must first execute cas_encr <password> to receive the ASCII encrypted value. An example result of the cas_encr command looks similar to this:

```
# cas_encr password
CAcrypt:HGJD92748HNNCJSFDHD764
```

After you receive this value, you must copy the entire value including the CAcrypt string as the value for the SBT_PASSWORD variable in the sbt.cfg file.

Important! *Before using cas_encr, you must modify the library path to include the common agent directory. For example,*

```
#LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/opt/CA/BABcmagt
```

Use the following guidelines to set the library paths specific to your operating system:

System	Library Path
AIX	LIBPATH=/opt/CA/BABcmagt:\$LIBPATH
HP-UX	SHLIB_PATH=/opt/CA/BABcmagt:\$SHLIB_PATH
Solaris	LD_LIBRARY_PATH=/opt/CA/BABcmagt:\$LD_LIBRARY_PATH
Tru64	LD_LIBRARY_PATH=/opt/CA/BABcmagt:\$LD_LIBRARY_PATH

Note: The sbt.cfg file provides default values if you choose to use RMAN directly.

About the libobk Library Files

The SBT interface is implemented through libobk library files. Oracle Server provides a default libobk.* library file. However, for your RMAN backup and restore jobs to be successful, RMAN must use one of the following Computer Associates versions of libobk.* instead of the default Oracle version:

- libobk.*.1.32 (32-bit implementation of the SBT 1.1 interface)
- libobk.*.2.32 (32-bit implementation of the SBT 2.0 interface)
- libobk.*.1.64 (64-bit implementation of the SBT 1.1 interface)
- libobk.*.2.64 (64-bit implementation of the SBT 2.0 interface)

Notes:

- Oracle 8.0 supports only SBT 1.1. It does not support SBT 2.0.
- Oracle 8i, 9i, and 10g support both SBT 1.1 and SBT 2.0. We recommend using SBT 2.0 with Oracle 8i, 9i, and 10g.
- When the agent is installed, the libobk32.* and libobk64.* symbolic links are created in the agent home directory. These symbolic links are used in the RMAN scripts generated by the agent as a value to the SBT_LIBRARY parameter. You can also use these links when you create your own scripts.

Oracle and Computer Associates libobk Library Files

For RMAN to use one of the Computer Associates versions of libobk, you may need to relink Oracle. The relinking procedure differs among the different UNIX operating systems and different versions of Oracle Server.

The following sections, listed in alphabetical order by operating system, contain the procedures for re-linking Oracle. To re-link Oracle, go to the section for your operating system and perform the procedure that is appropriate for your UNIX operating system and your version of Oracle Server.

Important! *By default, the symbolic link \$ORACLE_HOME/lib/libobk.s* exists and points to an existing Oracle library. Before you relink, you must redirect this link to \$CAORA_HOME/libobk.s*. For information about redirecting a link that is appropriate for your environment, see your Oracle documentation. Note, however, that if the SBT_LIBRARY variable is used from the RMAN scripts (for Oracle 9i and 10g), then you do not need to perform this procedure.*

Relink on AIX

To relink Oracle running on AIX, follow these steps:

1. Log on as oracle.
2. Change directory to \$ORACLE_HOME/rdbms/lib.
3. Perform **one** of the following actions:
 - For Oracle Server versions 8.0, 8.1.5, 8.1.6, and 8.1.7 32-bit, enter this command:

```
make -f ins_rdbms.mk ioracle LLIBOBK=libobk library LIBMM= LLIBMM=
```

- For Oracle Server 8.1.6 and 8.1.7 64-bit version, softlink the library found in \$ORACLE_HOME/lib64 directory to the agent library which is located in the agent home directory by default. Enter the following command:

```
ln -s libobk library $ORACLE_HOME/lib64/libobk.a
```

After creating the softlink, enter the following command:

```
Make -f ins_rdbms.mk ioracle
```

Note: In the previous actions, *libobk library* is the fully qualified path in which libobk.a.32 or libobk.a.64 is located. The default location is the agent home directory.

- For Oracle Server versions 9i and 10g, point to the agent library in the RMAN command. For example:

```
run {allocate channel dev1 type 'sbt_tape'  
parms='SBT_LIBRARY=agent home directory/libobk.so.64';  
...  
...}
```

- For Oracle Server versions 9i and 10g on AIX 5L, point to the agent library in the RMAN command. For sbt 1.1 specify libobk.so.1.64_5. For sbt 2.0 specify libobk.so.2.64_5. For example:

```
run {allocate channel dev1 type 'sbt_tape'  
parms='SBT_LIBRARY=<agent home directory>  
/libobk.so.1.64_5';  
...  
...  
}
```

Relink on HP-UX

To relink Oracle running on HP-UX, follow these steps:

1. Log on as oracle.
2. Change directory to \$ORACLE_HOME/rdbms/lib.
3. Perform **one** of the following actions:
 - For Oracle Server versions 8.0, 8.1.5, 8.1.6, and 8.1.7 32-bit, enter the following command:

```
make -f ins_rdbms.mk ioracle "LLIB0BK=libobk library -lc" LIBMM=LLIBMM=
```
 - For Oracle Server 8.1.6 64-bit version, softlink the library found in \$ORACLE_HOME/lib64 directory to the agent library which is located in the agent home directory by default. Enter the following command:

```
ln -s libobk library $ORACLE_HOME/lib64/libobk.sl
```
 - For Oracle Server versions 9i and 10g, point to the agent library in the RMAN command. For example:

```
run {allocate channel dev1 type 'sbt_tape'  
parms='SBT_LIBRARY=agent home directory/libobk64.sl';  
...  
...}
```

Note: In all of the actions in Step 3, libobk library is the fully qualified path in which the libobk.sl.32, libobk.sl.1.32, libobk.sl.2.32, libobk.sl.1.64, libobk.sl.2.64, libobk.sl.1.64_IA64, or libobk.sl.2.64_IA64 is located. The default location is the agent home directory.

Relink on Solaris

To relink Oracle running on Solaris, follow these steps:

1. Log on as oracle.
2. Change directory to \$ORACLE_HOME/rdbms/lib.
3. Perform **one** of the following actions:
 - For Oracle Server versions 8.0, 8.1.5, 8.1.6, and 8.1.7 32-bit, enter the following command:

```
make -f ins_rdbms.mk ioracle LLIB0BK=libobk library LIBMM= LLIBMM=
```
 - For Oracle Server 8.1.6 and 8.1.7 64-bit version, softlink the library found in \$ORACLE_HOME/lib64 directory to the agent library which is located in the agent home directory by default. Enter the following command:

```
ln -s libobk library $ORACLE_HOME/lib64/libdsbtsh8.so
```

- For Oracle Server versions 9i and 10g, point to the agent library in the RMAN command. For example:

```
run {allocate channel dev1 type 'sbt_tape'
  parms='SBT_LIBRARY=agent home directory/libobk.so.64';
  ...
  ...}
```

Note: In all of the actions in Step 3, libobk library is the fully qualified path in which the libobk.so.1.32, libobk.so.1.64, libobk.so.2.32, libobk.so.2.64, or libobk.so.2.64_AMD64 is located. The default location is the agent home directory.

Relink on Tru64

To relink Oracle running on Tru64, follow these steps:

1. Log on as oracle.
2. Change directory to \$ORACLE_HOME/rdbms/lib.
3. Perform **one** of the following actions:
 - For Oracle Server version 8.0.5, enter the following command:


```
make -f ins_rdbms.mk ioracle LLIBOBK=libobk library LIBMM= LLIBMM=
          where libobk library is the fully qualified path in which libobk.a.64 is
          located. The default location is the agent home directory.
```
 - For Oracle Server version 8.1.6, enter the following command:


```
make -f ins_rdbms.mk ioracle LLIBOBK=libobk library
          where libobk library is the fully qualified path in which libobk.a.64 is
          located. The default location is the agent home directory.
```
 - For Oracle Server 8.1.7 version, softlink the library found in
 \$ORACLE_HOME/lib directory to the agent library which is located in
 the agent home directory by default. Enter the following command:


```
ln -s libobk library $ORACLE_HOME/lib/libobk.so
          where libobk library is the fully qualified path in which libobk.so.64 is
          located. The default location is the agent home directory.
```
 - For Oracle Server versions 9i and 10g, point to the agent library in the
 RMAN command. For example:


```
run {allocate channel dev1 type 'sbt_tape'
  parms='SBT_LIBRARY=<agent home directory>/libobk.so.2.64';
  ...
  ...}
```

Note: If you must uninstall the Agent for Oracle, you may need to stop Oracle Server first. Oracle Server is relinked with a shared library included in the BrightStor ARCserve Backup agent directory. The removal of the agent may not delete the shared library if it is used by Oracle. To avoid this circumstance, we recommend that you copy the shared library to a different location (for example, /usr/lib) and relink Oracle with this copy of the library.

Add the Oracle User as a BrightStor ARCserve Backup User Equivalency

To back up, you must add the Oracle user who owns the Oracle database files as a BrightStor ARCserve Backup user equivalency.

To add the user, follow these steps:

1. Ensure BrightStor ARCserve Backup is loaded and running.
2. Go to the BrightStor ARCserve Backup command line and enter the following command:

```
ca_auth [-cahost host] -equiv add unixUser hostName BrightStor ABUser  
[BrightStor AB_username password]
```

BrightStor AB_username must be a BrightStor ARCserve Backup administrator and unixUser is the Oracle user who owns the Oracle database files.

Note: If you have installed the agent in a Real Application Cluster (RAC) environment, you must add the Oracle user who owns the Oracle database files as a BrightStor ARCserve Backup user equivalency on each node where the agent is installed and that is a part of the RAC cluster.

Remove the Agent

To remove the Agent for Oracle from your server, follow the steps on the Installation CD.

Important! *You must stop Oracle and unlink the libobk libraries before attempting to remove the agent. These steps are appropriate whether you linked Oracle with the Computer Associates libraries or whether you created a softlink in the Oracle lib subdirectory as specified in the post installation tasks.*

Chapter 3: Backing Up

This chapter provides basic information about backing up and explains how to back up Oracle Server databases using BrightStor ARCserve Backup, the Agent for Oracle, and the Oracle backup features.

Backup Basics

To *back up* is to create a copy of a database or database objects on another device (typically a tape drive). Backups are performed using BrightStor ARCserve Backup, the Agent for Oracle, and the Oracle RMAN backup features.

Using BrightStor ARCserve Backup, the agent, and Oracle RMAN, you can back up a complete Oracle Server database or individual objects within the database. To back up a complete database, you configure the backup to include all of the objects contained in the database. Typically, you must back up a complete database when you first create the database or when you change the database structure. Tablespaces and other database objects require more frequent backups.

In addition to using BrightStor ARCserve Backup and the agent to back up your database or individual database objects, you can use the Oracle Recovery Manager (RMAN) command line utility to accomplish the equivalent operations. For more information, see the RMAN Command Line Scripts section in this chapter.

Backup Strategy

You should plan your backup strategy for a database before you create the database. If you do not plan these strategies before you create a database, database recovery may not be possible in certain cases.

You should check your backup strategy in a test environment before and after you move to a production system. Testing can minimize problems before they occur in a real situation.

Develop a Good Backup Strategy

To have a good backup strategy, you should:

- Perform a full online backup of your Oracle databases.
- Perform a "cold database" backup on a regular basis by shutting down the database and performing a file system backup of the Oracle environment.
- Back up database objects to update the full database backup. Heavily used tablespaces should be backed up frequently to reduce database recovery time.
- Back up the database control files each time you make a structural change to the database.
- Mirror Oracle online redo logs. The agent does not perform this procedure. For more information about mirroring online redo logs, see the Oracle Server On-Line Generic Documentation CD-ROM.

For more information about Oracle backup and recovery procedures, see the *Oracle Database Administrator's Reference*.

Oracle Server Organization

Oracle Server is organized into databases that are subdivided into database objects. An Oracle database contains the following types of objects:

- Tablespaces that contain data. Tablespaces can consist of multiple data files.
- Data files that contain the database data. Data files are the physical files that define a tablespace.
- Online redo log files that contain records of transactions applied to the tablespaces.
- Control files that describe the structure of the database, including the tablespaces. There can be more than one control file copy for the database.
- Parameter files that contain the various initialization parameters the database uses when it starts up.
- Recovery area (for Oracle 10g) that organizes all recovery-related files and activities for an Oracle database.

Online Redo Log Files

Oracle Server uses online redo log files to record all entries to the Oracle tablespaces. However, the Agent for Oracle requires archived online redo log files to function properly. For Oracle to create archived redo log files, you must set Oracle to operate in ARCHIVELOG mode. Also, for the agent to back up and restore properly, you must set Oracle to automatically archive online redo log files.

Note: For information about setting Oracle so that it operates in ARCHIVELOG mode and automatically archives online redo log files, see *Perform Post-Installation Tasks* in the “Installing the Agent” chapter.

Multiple Databases

If your Oracle configuration has more than one database you can:

- View and log in to the databases
- View and log in to the databases you specified if you reconfigured the agent by running orasetup from the agent home directory.
- Configure the agent so that the Backup Manager window displays the objects from any specified database.
- Quickly find the database objects that you want to back up.

Configure a Backup Session for Multiple Database Environment

To set up your backup session to view and log in to the databases you specified during installation on an Oracle configuration containing multiple databases, follow these steps:

1. Start BrightStor ARCserve Backup.
2. Open the Backup Manager.
3. On the Source tab, expand the UNIX/Linux Agents.
4. Under the UNIX/Linux Agents, click the green square to the left of the host on which Oracle is installed. The Login dialog appears.
5. Enter the system user name and password, and then click OK.
6. Expand the host.
7. Click the green square to the left of the Oracle database. The Database Login dialog appears.
8. Enter the Oracle dba user name and password.
9. Click OK. You can now expand the database and select the database objects you want to back up.

Backups

Using the agent, you can back up complete Oracle databases and individual Oracle database objects, such as tablespaces, data files, archived redo log files, control files, parameter files, and the recovery area.

You should back up all of the objects in a database immediately after you create the database and maintain a regular backup schedule to ensure smooth recovery in case of database or media failure. BrightStor ARCserve Backup allows you to set and maintain a schedule of automatic backups.

Agent backups are performed through scripts the agent sends to the Oracle Recovery Manager (RMAN). These scripts are generated automatically based on the options you choose on the Backup Manager, and are saved under <oracle agent home dir>/rman_scripts. They are saved for the amount of time you specify in the environment variable <DAYS_RMAN_SCRIPTS_RETAINED> in the agent.cfg file.

Recovery Manager (RMAN)

Recovery Manager (RMAN) is an Oracle utility used to back up, restore, and recover database files. RMAN performs important backup and recovery procedures and greatly simplifies the tasks that administrators perform during these procedures. For more information about the Recovery Manager, see the Oracle Backup and Recovery Guide.

Using RMAN and BrightStor ARCserve Backup, you specify your own RMAN scripts to perform backups. You can also use RMAN directly to back up any online database object by connecting directly to RMAN with or without a recovery catalog at the command line.

Note: When using the agent or RMAN to back up, we recommend you use a recovery catalog installed in a separate database. For more information, see the Create an RMAN Catalog section in the "Installing the Agent" chapter.

After backing up an Oracle database using RMAN, you can restore the database using either the agent or RMAN. Similarly, if you back up an Oracle database using the Agent for Oracle, you can restore the database using either RMAN or the agent.

RMAN Prerequisites

Before you can back up with RMAN and the agent, you must:

- Use the Computer Associates libobk library files by performing **one** of these actions:
 - Relink Oracle
 - Create the \$ORACLE_HOME/lib/libobk.* symbolic link
 - Use SBT_LIBRARY in the RMAN script (depending on the platform and Oracle version)
- Add the Oracle user who owns the Oracle database files as a BrightStor ARCserve Backup user equivalency.

For information about performing these tasks, see Post-Installation Tasks Required for Recovery Manager in the "Installing the Agent" chapter.

Types of Backups

Using BrightStor ARCserve Backup and the agent, you can perform several types of backups:

- Offline backups
- Online backups
- Multistreaming (or multi-channels) backups
- Launch backups by loading your own RMAN scripts in the Backup Manager

Note: You can also use RMAN directly to launch backups at the command line level. For more information, see the RMAN Command Line Scripts section in this chapter.

Back Up in Offline Mode

Performing an "offline" backup through the agent puts the database in a quiescent state before the backup process begins. The reason for this is that RMAN must be able to connect to the database; therefore, the database processes must be running and accepting connection. Performing a true offline backup does not allow this connection to occur. The only way to allow RMAN to connect to the database and not have it online is to use the quiescent state, which prevents all user transactions from occurring.

Note: To perform a true offline backup, use the agent to back up your database after manually shutting it down. To restore your database, use the agent again, and then manually start up your database.

Perform a Backup in Offline Mode

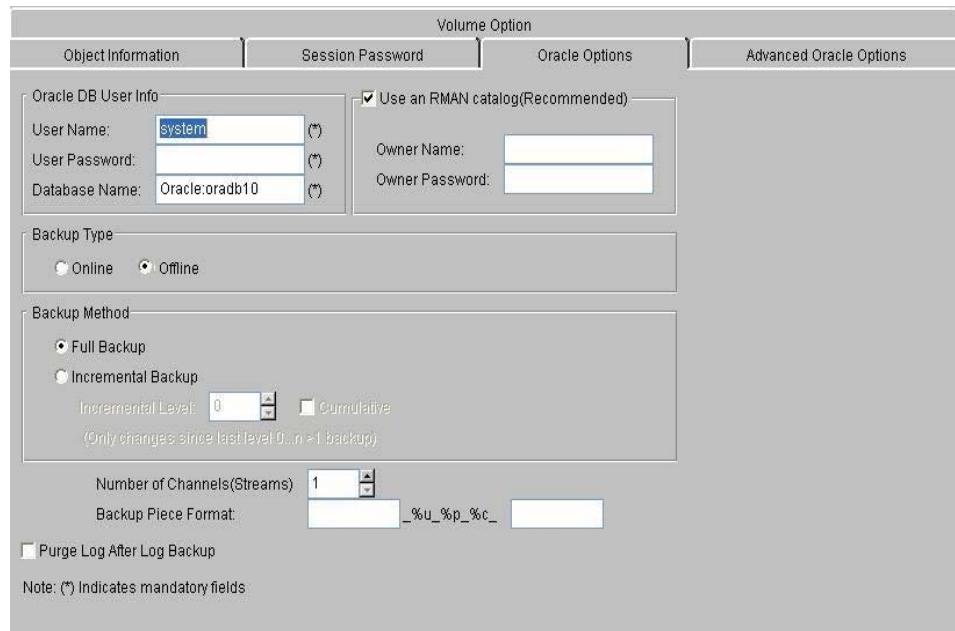
To perform a backup of an Oracle database in offline mode, follow these steps:

Note: Before opening the Backup Manager, ensure that Oracle Server is running, and be sure to start BrightStor ARCserve Backup and the agent.

1. Open the Backup Manager, select the Source tab, and expand the UNIX/Linux Agents.
2. Under UNIX/Linux Agents, click the green square to the left of the host on which Oracle is installed. The Login dialog appears.
3. Enter the host user name and password, and then click OK. The host expands.
4. Click the green square next to the Oracle database you want to back up. The Login dialog appears.
5. Enter the Oracle database dba user name and password, and then click OK. The green square becomes entirely green.

Note: Be sure that the Oracle user name and password you use to connect to Oracle has the permission to connect to Oracle using the as sysdba clause. You must be able to connect with and without this clause.

6. To set backup options, select the Source tab and then click the Oracle Options tab:



You can complete these fields:

- Enter the database name, if different from the instance name, in the Database Name field.
- Ensure the Use an RMAN catalog (Recommended) check box is selected.

Note: We recommend that you use the RMAN catalog, otherwise RMAN will rely only on the control files to manage backups. Using only the control files presents a risk in that if the database and all control files are somehow lost, it will prevent RMAN from being able to restore the database. By using the RMAN catalog option, you prevent the possibility of losing the control files backup-related information as well as other valuable information. Also note that if you do not use the RMAN catalog, you limit the possibility of performing a point-in-time recovery.

If you choose not to select this option, a warning message displays reminding you of the importance of using the RMAN catalog.

- Enter the catalog owner name and owner password.
- Select the offline mode.
- Choose one the following Backup Methods:

Full Backup - This method typically minimizes the number of tapes you will need when restoring the database, but takes more time during the backup.

Incremental Backup - This method reduces the backup time, but restoring typically requires more time and tapes to be loaded (that is, the last full backup plus all the incremental ones).

Differential Backup - This method is an intermediate solution between the other two methods. It backs up all the data changed since the last full backup. Restoring the database requires you to mount the tapes of the last full backup and the latest differential one.

7. (Optional) Select the Advanced Oracle Options tab and complete any of these fields if you want to modify the performance of your backup:

- Enter a number (in KB) in the Backup Piece Size field if you want RMAN to generate more than a single backup piece.
- Enter the maximum number of buffers per second in the Read Rate (# Buffers) field that you want RMAN to use when reading data from the disk.
- Enter a number in the Number of Files per Backup Set field to limit the number of backup pieces that RMAN should use per backup set.
- Enter a number in the Maximum Number of Opened Files field to limit the total number of files that RMAN will open at the same time. Leaving this field empty allows RMAN to use the default value.

- Enter a number in the Backup Set Size (KB) field to limit the amount of data that should go into a backup set. We recommend that you leave this field empty.

- Enter a value in the Block Size (Bytes) field to allow RMAN to determine the size of the data blocks to send to the agent when performing a backup.

Note: If you enter a value in this field, you must also enter the same value when restoring your backup to avoid receiving an error message during the restore process.

- Enter a number between one and four in the Number of Copies field to indicate how many copies of the backup pieces RMAN should generate.

Note: To be able to generate more than one copy, you must enable the BACKUP_TAPE_IO_SLAVES option in either your init<sid>.ora or SPFILE file; otherwise you will receive an error message.

8. Select the Destination tab, and then select the media device group and media in which you want to store the back up.

Important! *Do not select a specific media or media device group on the Destination tab if you set the Number of Channels option to a number higher than one.*

9. Click the Method/Schedule tab, and choose one of these Schedule Types:

- Custom
- Rotation
- GFS Rotation

10. Click Start. The Submit Job dialog appears.

11. Schedule the job to run now or at another time. Click OK. The Job Submission dialog appears.

12. Click OK. The Backup Manager has submitted the job to the queue. You can monitor the job on the Job Status Manager.

Refer to the Backup Limitations section of this chapter for information about restrictions related to monitoring your backups.

Note: A backup can take up multiple sessions on the media even if you choose only one object. For example, if you enter a limit on the Backup Set Size field on the Advanced Oracle Options tab, it will create multiple sessions.

Back Up Oracle Database Online

Using the Agent for Oracle, you can back up individual Oracle database objects, such as tablespaces, data files, archived redo log files, parameter files, control files, and the recovery area.

Perform a Backup in Online Mode

To back up an Oracle database online using the agent, follow these steps:

Note: Before opening the Backup Manager, ensure that Oracle Server is running and that all of the tablespaces in the databases you want to back up are online. Also, be sure to start BrightStor ARCserve Backup and the agent.

1. Open the Backup Manager, select the Source tab, and expand the UNIX/Linux Agents.
2. Under the UNIX/Linux Agents, click the green square to the left of the host on which Oracle is installed.

The Login dialog appears.

Note: If you click the plus sign next to the host, it will expand automatically after you log in successfully.

3. Enter the host user name and password, and then click OK.

Note: Expand the host if it did not expand automatically.

4. Select an Oracle database by clicking the green square to its left.

The Database Login dialog appears.

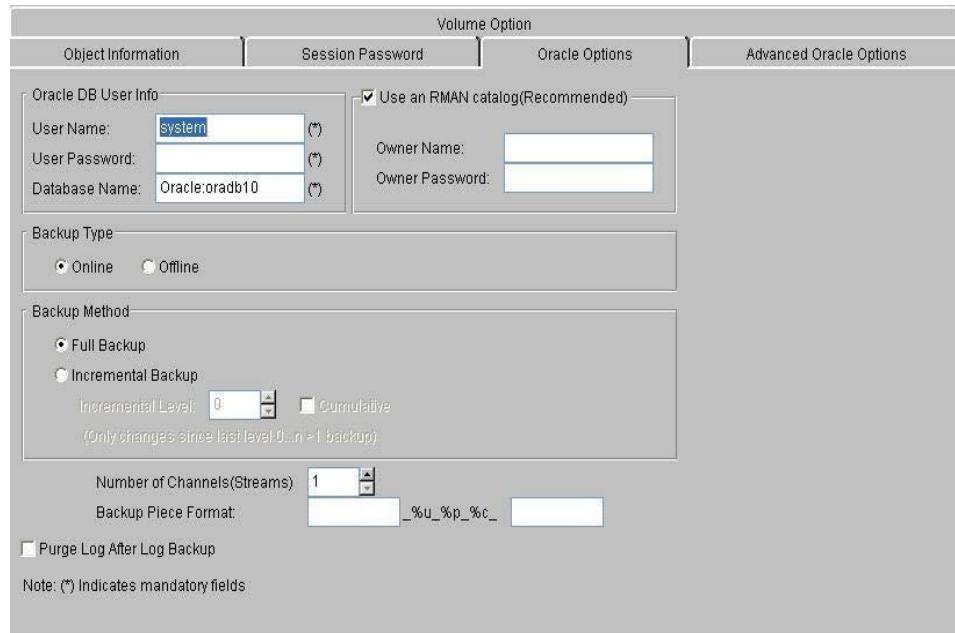
5. Enter the Oracle dba user name and password.

Note: Be sure that the Oracle user name and password you use to connect to Oracle has the permission to connect to Oracle using the as sysdba clause. You must be able to connect with and without this clause.

6. When backing up a database, a single job called the master job is created in the queue. When the backup begins, the master job calls RMAN, which launches the child jobs.

The sub-jobs appear in the job queue.

7. If you want to set options for your backup job, select the Source tab and then click the Oracle Option tab:



You can select the following options:

- Enter the database name, if different from the instance name, in the Database Name field.
- Ensure that the Use an RMAN Catalog (Recommended) check box is selected.

Note: We recommend that you use the RMAN catalog, otherwise RMAN will rely only on the control files to manage backups. Using only control files presents a risk in that if the database and all control files are somehow lost, it will prevent RMAN from being able to restore the database. By using the RMAN catalog option, you prevent the possibility of losing the control files backup-related information as well as other valuable information. Also note that by using the RMAN catalog, you will be able to perform a point-in-time recovery if desired.

If you choose not to select this option, a warning message displays reminding you of the importance of using the RMAN catalog.

- Enter the catalog owner name and owner password.
- Select the online mode.
- Choose one the following Backup Methods:

Full Backup - This method typically minimizes the number of tapes you will need when restoring the database, but takes more time during the backup.

Incremental Backup - This method reduces the backup time, but restoring typically requires more time and tapes to be loaded (that is, the last full backup plus all the incremental ones).

Differential Backup - This method is an intermediate solution between the other two methods. It backs up all the data changed since the last full backup. Restoring the database requires you to mount the tapes of the last full backup and the latest differential one.

Note: Available options pertain to the specific database only. Each database has its own set of options.

8. (Optional) Select the Advanced Oracle Options tab and complete any of these fields if you want to modify the performance of your backup:

- Enter a number (in KB) in the Backup Piece Size field if you want RMAN to generate more than a single backup piece.
- Enter the maximum number of buffers per second in the Read Rate (# Buffers) field that you want RMAN to use when reading data from the disk.
- Enter a number in the Number of Files per Backup Set field to limit the number of backup pieces that RMAN should use per backup set.
- Enter a number in the Maximum Number of Opened Files field to limit the total number of files that RMAN will open at the same time. Leaving this field empty allows RMAN to use the default value.
- Enter a number in the Backup Set Size (KB) field to limit the amount of data that should go into a backup set. We recommend that you leave this field empty.
- Enter a value in the Block Size (Bytes) field to allow RMAN to determine the size of the data blocks to send to the agent when performing a backup.

Note: If you enter a value in this field, you must also enter the same value when restoring your backup to avoid receiving an error message during the restore process.

- Enter a number between one and four in the Number of Copies field to indicate how many copies of the backup pieces RMAN should generate.

Note: To be able to generate more than one copy, you must enable the BACKUP_TAPE_IO_SLAVES option in either your init<sid>.ora or SPFILE file; otherwise you will receive an error message.

9. Click the Destination tab, and select the backup destination.

Important! *Do not select a specific media or media device group on the Destination tab if you set the Number of Channels option to a number higher than 1.*

10. Click the Method/Schedule tab, and choose one of these Schedule Types:

- Custom
- Rotation
- GFS Rotation

11. Click Start. The Submit Job dialog appears.

12. Schedule the job to run now or at another time.

13. Click OK. The Job Submission dialog appears.

14. Click OK. The Backup Manager submits the job to the queue. You can monitor the job on the Job Status Manager.

Refer to the Backup Limitations section of this chapter for information about restrictions related to monitoring your backups.

For further information about customizing your backup, see the *Administrator Guide*.

Multistreaming Backups

If you have more than one drive and volume in your system, you can use the Number of Channels (Streams) option on the Backup Manager to enhance the performance of your backups. After you allocate a certain number of channels to be used for the backup, the agent and RMAN determine how the multiple channels are organized and distributed, and whether all the channels you specified are necessary. In some cases, RMAN may determine that instead of using all the channels you specified, the backup job could be better accomplished by sequentially packaging more than one job (backup piece) per channel, and as a result will use a smaller number of channels for the job.

Note: Previous releases of the agent used the Multistreaming option on the Destination tab to accomplish this type of backup. The Number of Channels (Streams) option replaces the Multistreaming option and provides better integration with RMAN, which allows RMAN to handle the multistreaming process rather than the agent. Beginning with this release, the Multistreaming option in the Backup Manager is ignored for Oracle jobs.

Important! *After specifying more than one channel in the Backup Manager, avoid selecting a specific media or media device group on the Destination tab as this prevents multistreaming from occurring.*

The number of devices or device groups available on your system dictates the number of jobs RMAN runs *simultaneously*. For more information about multistreaming, see the *Administrator Guide*.

Back Up with the Number of Channels (Streams) Option

In the following example, you are backing up data to a changer with two tape drives. If you have several single tape drives of the same type and you want to use them all for a multistreaming backup job, ensure that you assign tapes to different device groups.

To back up using multistreaming in this example, follow these steps:

1. On the Backup Manager Source tab, select two tablespaces.
2. On the Oracle Options tab, specify a number higher than one in the Number of Channels (Streams) option. Keep in mind that RMAN will determine the actual number of channels needed for the backup job. The value you enter on the Oracle Options tab is the *maximum* number of channels used by RMAN.
3. (Optional) Specify a name for the Media Pool. You can use either an existing Media Pool name or a new Media Pool you create for the multistreaming job.
Note: Do not select a specific media or media device group. Doing so prevents multistreaming from occurring.
4. Click Start to submit the job. You can monitor the job on the Job Status Manager.

Back Up Using RMAN Scripts in the Agent

You can create RMAN scripts and launch them from the BrightStor ARCserve Backup GUI. To back up Oracle database using the agent with your RMAN script, follow these steps:

1. Open the Backup Manager, select the Source tab, and expand the UNIX/Linux Agents.
2. Under the UNIX/Linux Agents, click the green square to the left of the host on which Oracle is installed. The Login dialog appears.
Note: If you click the plus sign next to the host, it will expand automatically after you log in successfully.
3. Enter the host user name and password, and then click OK.
Note: Expand the host if it did not expand automatically.

4. Select an Oracle database by clicking the green square to its left. The Database Login dialog appears.
5. Enter the Oracle dba user name and password.
6. Click the Advanced Oracle Options tab, and enter the full path of your RMAN script in the Load RMAN Script field.

Notes:

- The script must be present on the agent's node and be accessible by the user who is running RMAN (usually the owner of the Oracle instance).
- Any scripts you provide will override all options you selected in the Backup Manager.
- If you do not begin the path name with a slash (/), the agent automatically looks in the \$CAORA_HOME/rman_scripts directory for the file.

7. Click the Destination tab, and select the backup destination if desired.
8. Click OK. The Backup Manager submits the job to the queue. You can monitor the job on the Job Status Manager.

For further information about customizing your backup, see the *Administrator Guide*.

Back Up Manually with RMAN

To start RMAN with a recovery catalog and back up a database, follow these steps:

1. Open a Command Prompt window and enter the following command to start RMAN:

```
rman target dbuser/dbuserpassword rvcvat catowner  
/catownerpassword@rman service name
```

where:

dbuser is the user with dba privileges.

dbuserpassword is the *dbuser* password.

catowner is the Oracle user name of the RMAN catalog owner.

catownerpassword is the catalog owner password.

rman database is the database where the RMAN catalog is installed.

2. Enter the following commands to back up a database:

```
RMAN> connect target system/manager

RMAN> run {

2> allocate channel dev1 type 'sbt_tape';

3> backup database format '_%u_%p_%c';

4> release channel dev1;

5> }
```

RMAN Command Line Scripts

To make using RMAN easier to use and more efficient, you can write and execute your own RMAN scripts. The following is an example of an RMAN script allocating a single channel to back up a particular data file on a single tape device:

```
run {
allocate channel dev1 type 'sbt_tape';
backup (datafile '/oracle/oradata/demo/users01.dbf' format '_%u_%p_%c');
release channel dev1;
}
```

Note: To use the Agent for Oracle as a back-end, you must:

1. Use sbt_tape as the channel type (for Oracle 9i).
2. We suggest using the `_%u_%p_%c` format to ensure that the object that is backed up has a unique name.

The following is an example of an RMAN script that uses multistreaming in a backup. It allocates two channels to back up the data to two different tape devices in parallel:

```
run {
allocate channel dev1 type 'sbt_tape';
allocate channel dev2 type 'sbt_tape';
backup fileserset 1 format '_%u_%p_%c' (datafile
'/oracle/oradata/demo/users01.dbf', '/oracle/oradata/demo/tools01.dbf');
release channel dev1;
release channel dev2;
}
```

For more information about using RMAN and RMAN scripts, see your Oracle documentation.

Back Up Using Command Line

You can use the ca_backup command line utility to back up Oracle database objects. For more information about using the ca_backup command line utility, see the appendix "Using Command Line Utilities" in the *Administrator Guide*.

Backup Limitations

The following table contains a list of backup limitations:

Limitation	Explanation
Catalog database SID	Do not duplicate the Catalog database SID or share it with any other SID name.
No estimation of the backup	This is not supported by Oracle RMAN, and there is no way to pre-determine how much data RMAN will back up.
Master job does not show progress.	The master job (the one submitted through the Backup Manager) does not show any progress except for the PARAMETER_FILES if they are included in the backup. Opening the monitoring window will not show any progress of the master job, even if sub-jobs are in progress. However, it will show when the master job is complete. Opening the monitoring window of a sub-job will show its progress, but it does not include the progress of other sub-jobs.

Chapter 4: Restoring and Recovering

This chapter explains how to restore and recover Oracle Server databases using BrightStor ARCserve Backup, the Agent for Oracle, and the Oracle RMAN restore and recovery features.

Restore and Recovery Basics

To *restore* is to load a database or one or more database objects from a backup of that database or the objects. A restore overwrites any information in the database with the backed up information. After you restore a database, you must recover it.

To *recover* is to bring a restored database to a consistent point-in-time prior to the point of failure or damage. An Oracle Server database must first be restored and then recovered. After the database has been both restored and recovered successfully, then it is ready for use. You can perform either automatic or manual recoveries.

Restore

Using BrightStor ARCserve Backup, the agent, and Oracle RMAN, you can restore database objects such as tablespaces, data files, archive log files, and parameter files, either individually or in groups, and restore the control files when you restore a database.

Restore Types

Using BrightStor ARCserve Backup and the agent, you can perform several types of restore operations:

- Restore from backups made through the current release of the agent, using either the Backup Manager or the RMAN command line.
- Restore from online backups made with a previous release of the agent (through the Backup Manager only).
- Restore from offline backups made with a previous release of the agent (through the Backup Manager only).
- Restore from backups made with the RMAN command line with a previous release of the agent (through RMAN only).

Restore Manager

The Oracle Options tab on the Restore Manager provides the following restore and recovery options:

- Number of Channels (Streams)
- Restore From Latest Backup
- Restore From Backup Made On
- Restore From Backup Tag

Note: These restore options are detailed in the Restore Options section of this chapter.

- Recovery Types:

Important! *When using one of these recovery methods, all logs are reset to the last registered date in the control file causing any data after this date to be lost and unrecoverable:*

- Recover Until SCN
- Recover Until Log Sequence Number
- Recover Until Time

Because the logs have been reset, you must perform a full offline backup to ensure that you have a record of the database at that precise moment in time.

- No Recovery - Selecting this option restores the data but does not perform any recovery. You must recover the database yourself and then put it back online. You generally use this option when you already know that a restore cannot be recovered, such as when additional restore jobs are required or you need to set up before starting the recovery process.
- Recover Until the End of Logs - RMAN recovers the database, tablespaces, and data files up to the current time.
- Recover Until SCN - RMAN recovers the database up to the specified System Change Number (that is, a checkpoint number). This recovery is valid for the entire database only. The database is opened with the resetlogs option.

- Recover Until Log Sequence Number - RMAN recovers the database up to the specified Archived Log Sequence. This recovery is valid for the entire database only. The database is opened with the resetlogs option.
- Recover Until Time - RMAN recovers the database up to the specified point in time. This recovery is valid for the entire database only. The database is opened with the resetlogs option.
- Put Restore Object(s) Online after Recovery - When selected, this option puts the tablespaces and data files online and opens the database after the recovery has been performed.

In addition, the Advanced Oracle Options tab includes the following options:

- Archived Logs Selection:
 - Do Not Restore - Selecting this option does not restore any of the archived logs.
Note: This option is checked automatically.
 - Pattern Based - This option restores only those archived logs with a name that matches the string pattern.
 - Time Based - This option restores the archived logs based on the time they were created, and not on the time they were backed up. If you are using this option, you must also enter a value either in the From Time field or in the Until Time field.
 - Thread - This option lets you specify the thread number used to identify the Oracle server that generated the archived logs. This option is useful only for OPS or RAC; otherwise, the value will always be one.
 - SCN Based - This option restores the range of archived logs by SCN (System Change Number).
 - Log Sequence Based - This option restores the archived logs by the archived log sequence number.
- Include Control File - Select this option if you want to restore the control files. Keep in mind that you should restore the control files only if they are corrupted or lost.
Important! Restoring a control file resets all the logs causing you to lose the most recent data once the database is started. There is no way to recover this data.
- Block Size (Oracle 8, 8i, and 9) - If you use this option, the size of the data blocks must match the block size used during backup; otherwise, the restore will fail.

- List Backup Sets for Selected Objects - When selected, it sends a request to list all backup sets that include the objects you selected.
Note: This option does not restore the selected objects. To restore the selected objects, you must submit another restore job.
- Validate Backup Set Number - This option asks RMAN to validate the integrity of a backup without actually restoring it.
- Load RMAN Script - Use this option to enter the path of your RMAN script.
Important! *Using this option overrides all options you may have selected in the Restore Manager.*

Restore Options

There are several types of restore options available on Source tab of the Restore Manager. Details about each option are listed in the following sections.

Number of Channels (Streams) Option

When you enter a number in the Number of Channels (Streams) option, the agent tells RMAN the maximum number of channels to use. RMAN then determines how many channels it actually allocates to the restore operation. RMAN submits the jobs in parallel, one for each channel.

Note: Because RMAN determines the appropriate number of channels to use, RMAN may use less than the number of channels you specify.

Restore From Latest Backup Option

When you select the Restore From Latest Backup option, the agent tells RMAN to use the latest available backup.

Note: No Recovery is the default selection in the Recovery Types section of the Oracle Options tab. Be sure to select one of the other Recovery Types if you want to recover your database after restoring it.

Restore From Backup Made On Option

When you select the Restore From Backup Made On option, you specify the date and time as the upper time limit of the backup from which you want to restore. RMAN will perform the operation on files up to, but not including, the specified time. This option is useful when you have a database that you must bring back to a known state (consistency level).

Another time you may want to use this option is when you know the latest backup is inaccessible. In that case, you can use this option in conjunction with the Until End of Logs recovery option to restore the database from an older backup set and "replay" all transactions to bring the database to its latest state.

Avoid confusing this option with the Recover Until Time field that was available in previous releases of the agent. It does not refer to which point in time the database will be recovered to. It is used simply to select from which backup the data will be restored (Restore Until Time).

Note: No Recovery is the default selection in the Recovery Types section of the Oracle Options tab. Be sure to select one of the other Recovery Types if you want to recover your database after restoring it.

Restore From Backup Tag Option

When you select the Restore From Backup Tag option, you specify the tag that was used during backup to indicate which backup sessions to restore. The tag is the logical name assigned to a particular backup (for example, Monday Morning Backup).

Note: No Recovery is the default selection in the Recovery Types section of the Oracle Options tab. Be sure to select one of the other Recovery Types if you want to recover your database after restoring it

Until the End of Logs Option

When you select the Until the End of Logs option, the agent restores and recovers databases and database objects automatically, in one operation, if you also select the Put Restored Object(s) Online After Recovery option. When the restore and recovery is complete, the agent then opens the database.

WARNING! *If you select the Until the End of Logs option, do not include the control files in the restore unless it is missing or corrupted. If you include the control files in the restore, the agent recovers the database using the restored control files. As a result, all transactions made in the database that occurred after the last transaction recorded in the restored backup files are lost.*

Restore Views

For any type of restore, you will use the default restore view on the Restore Manager. The Restore by File System view displays a tree of the hosts backed up by BrightStor ARCserve Backup. To run a restore, expand the host to display databases and objects, and then select the specific databases or objects you want to restore. The databases displayed are from the most recent backup sessions.

Note: The Restore by Session and Restore by Backup Media views are not supported for Agent for Oracle session restores. If you select the Restore by Media method, the session is skipped and the job will fail. You should refer to the BrightStor ARCserve Activity log to determine the exact cause.

Restore Databases and Database Objects

To restore a complete database backed up offline or online, follow these steps:

Note: Before starting the Restore Manager, be sure to start BrightStor ARCserve Backup.

1. Open the Restore Manager, select the Source tab, and then select the Restore by File System view.
2. Expand the UNIX/Linux Agents, and then expand the Oracle host under the UNIX/Linux Agents.
3. Select the database you want to restore, or select the database objects to restore.
4. Select the Destination tab, and expand the UNIX/Linux Agents.
5. Click the plus sign to the left of the Oracle SID under the UNIX/Linux Agents. The Login dialog appears.

Notes:

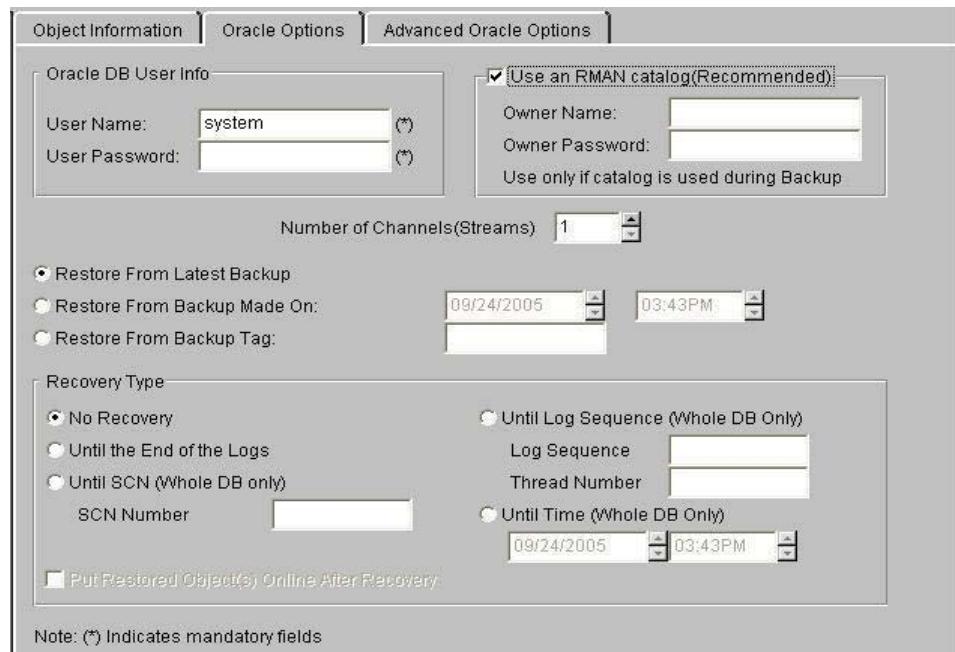
If you did not click the plus sign to the left of the Oracle SID and you clicked directly on Oracle SID instead, you must enter the Oracle User Name and Password on the Oracle Options tab. These two fields are mandatory. In addition, since the Use RMAN catalog (Recommended) option is checked by default, you must enter the Owner Name and Owner Password of the RMAN catalog, unless the box is unchecked.

If information from one of the mandatory fields is missing during the registration of the job, a dialog will display allowing you to enter the missing information. If you do not enter the missing information, the job will not be registered.

6. Enter the system user name and password and click OK.
7. Click the plus sign to the left of the Oracle database you want to restore. The database Login dialog appears.
8. Enter the Oracle dba user name and password and click OK.

Note: Be sure that the Oracle user name and password you use to connect to Oracle has the permission to connect to Oracle using the as sysdba clause. You must be able to connect with and without this clause.

9. To set restore options, select the Source tab and then click the Oracle Options tab:



You can select the following Restore Options:

Note: You can choose any combination of the options.

- If you want RMAN to speed up the restore process when there are numerous tapes involved, choose the Number of Channels (Streams) option. Select more than one channel and RMAN will accept this value as the maximum number of channels to use during the restore.
- If you want to restore using the latest available backup, choose the Restore From Latest Backup option.
- If you want to restore a backup with a specific date and time, select the Restore From Backup Made On option. Note that RMAN will perform the operation on files up to, but not including, the specified time.
- If you want to restore a backup with a tag you used during the backup process, select Restore From Backup Tag option.
- If the archived redo logs are damaged or were removed as a result of a previous backup that used the Purge Log option, select one of the options (except Do Not Restore, which is the default) in the Archived Logs Selection section of the Advanced Oracle Options tab. This overwrites the archived redo logs.

Note: If your archived redo log files are not lost or corrupted, generally you should not overwrite them. By keeping the archived redo logs, you can recover your database to the latest usable version that existed before your system or database failed.

- If you want to restore the control files, you must select the Include Control File option on the Advanced Oracle Option tab.

Note: Restore control files only when necessary, such as when they are missing or corrupted.

In addition to the Restore Options, you can select these Recovery Options:

- If you do not want to perform a recovery after restoring the data, select the No Recovery option.
Note: This option is checked automatically.
- If you want to recover the database as closely as possible to the present time, select the Until the End of Logs option.
- If you want your database objects to be available as soon as recovery is complete, select the Put Restored Object(s) Online After Recovery option.

Note: For more information about other recovery types, see the Restore Manager section of this chapter.

10. Click Start. The Submit dialog appears.
11. Schedule the job to run now or at a later time.
12. Click OK to submit the job. The Job Submission dialog appears.
13. Click OK. The Restore Manager submits the job to the queue. You can monitor the sub-job on the Job Status Manager.

When the job is completed, the database objects are restored to the Oracle server. For instructions on recovering the Oracle database, see Recovery in this chapter. For more information about submitting a restore job, see the *Administrator Guide*.

Archived Logs and Control Files Restoring

If your control files or archived log files have been lost or corrupted, you can restore them by selecting them on the Source tab of the Restore Manager when you configure a restore.

Important! *If you selected the Purge Logs after Backup option during backup, you must select one of the Archived Logs options (except Do Not Restore) on the Advanced Oracle Options tab to ensure that RMAN triggers the restore of the required logs. If you do not select one of the Archived Logs options, the recovery phase will not function properly since the necessary logs may be missing. If you are using Oracle 9i and above, however, RMAN automatically restores the needed archived logs when you select one of the Recover options.*

If your archived redo log files are not damaged, generally you should not include them in a restore. By keeping the archived redo log, you can restore your database to the latest usable version that existed before your system or database failed.

If you select the Until the End of Logs option when you configure a restore, do not include the control files in the restore unless missing or corrupted. If you include the control files in the restore, the agent recovers the database using the restored control files. As a result, all transactions made in the database that occurred after the last transaction recorded in the restored backup files are lost.

For the appropriate procedure, see *Restore Databases and Database Objects* section in this chapter.

Control Files Restores

When restoring control files, consider the following points:

- You should not restore control files unless they are lost or corrupt.
- If you need to restore the control files, you can restore them at the same time you restore the database.

Note: We recommend that you mirror the control files for fault tolerance. Doing so protects against losing the control files and the consequences of restoring older control files. For more information, see your Oracle administrator.

When you restore the control files OR when you select one of these recovery options:

- Until SCN
- Until Log Sequence
- Until Time

the automatic recovery process reopens the database with the `resetlogs` option set. In this case, you must back up the entire database as soon as possible because the archive logs are reset and can no longer be used for point-in-time recovery.

For more information about restoring control files, see the *Oracle Database Administrator's Reference*.

Parameter File Restoring

You can restore parameter files to a specific version using the Restore Manager. To restore a specific version of a parameter file, follow these steps:

1. Select the parameter file you want to restore (such as, orapwfile).
2. Click the Version History button at the top of the Source tab.
3. At the resulting dialog, select the exact version of the parameter file you want to restore.
4. Click OK.

Parameter files are the only type of database objects that you can restore to a specific version. Restoring your parameter files this way uses the BrightStor ARCserve Backup agent directly and does not involve RMAN.

Note: If the SQLNET.AUTHENTICATION_SERVICES option (set to "none") is in the init.ora file for any instance that you intend to backup and restore, you should comment it out before attempting to restore the orapwfile (included in the PARAMETER-FILES). Leaving it as it is prevents further sysdba database connections, and prevents normal management activities (such as recovery, shut down, and start up).

Point-in-Time Restoring

To restore a database or tablespace to a point-in-time, follow the procedures to restore a complete database and the associated archive log files. For the appropriate procedure, see the Restore Databases and Database Objects section and the Archive Logs and Control Files Restores section in this chapter.

For more information about restoring or recovering the database or tablespace to a point-in-time, see the *Oracle Database Administrator's Reference*.

Note: The Until the End of Logs option, which automatically recovers a database after it has been restored, does not support point-in-time recoveries. If you want to perform a point-in-time recovery, you must perform the recovery steps manually.

Recovery Manager (RMAN) and Restoring a Database to Another Host

To restore a database to another host using RMAN directly, you must:

- Have installed the RMAN catalog in a separate database, not in the source or destination database.
- Define and use a catalog with RMAN for both the backup and restore operations.
- Restore the whole database.

Note: The scenario used in the following procedure assumes that the database backed up from <host1> will be restored to <host2>, and that the database name will be preserved. It also assumes that the directory structure of the original and destination hosts are different. In addition, this scenario assumes you are using Oracle 8.

Restore a Database to Another Host Using RMAN

To restore a database to another host using RMAN, follow these steps:

1. Enter the following commands to obtain the db_id value (database ID) of the database you want to restore from the RMAN catalog:

```
sqlplus <rman user>/<rman password>@<rman service>
SQL> select db_key, db_id, bs_key, recid, stamp, backup_type,
start_time, status from rc_backup_set;
```
2. Identify the db_id value corresponding to the database you want to restore.
3. Enter the following command to determine the file number and location of each data file in the source database:

```
SVRMGR> select file#, name from v$data_file;
```
4. Copy the init<\$ORACLE_SID>.ora file from \$ORACLE_HOME/dbs on <host1> to <host2>.
5. Edit the \$ORACLE_HOME/dbs/init<\$ORACLE_SID>.ora and adjust all paths to reflect the new directory structure on <host2>.
6. Perform SQL*Net configure to ensure that the RMAN catalog is visible from both databases installed on <host1> and <host2>.
7. Set up the Oracle password file on <host2> by entering the following command:

```
orapwd file=$ORACLE_HOME/dbs/orapw$ORACLE_SID password=kernel".
```

8. Enter the following command to start the destination database with the nomount option:

```
SVRMGR> startup nomount pfile=$ORACLE_HOME/dbs/init<$ORACLE_SID>.ora
```

9. Enter the following commands to restore the control file:

Note: You will need the db_id you obtained in Step 2.

```
rman rvcat <rman username>/<rman password>@<rman service>
RMAN> set dbid=<source database db_id value>
RMAN> connect target <username>/<password>;
RMAN> run {
  RMAN> allocate channel dev1 type 'sbt_tape';
  RMAN> restore controlfile;
  RMAN> release channel dev1;
RMAN> }
```

10. Enter the following command to mount the destination database:

```
SVRMGR> alter database mount;
```

11. Determine the new locations for each data file within the RMAN script using the locations you determined in Step 3.

12. Enter the following commands to restore the database using the new locations you determined in Step 11:

```
rman target <username>/<password> rvcat <rman username>/<rman
password>@<rman service>
RMAN> run {
  RMAN> allocate channel dev1 type 'sbt_tape';
  RMAN> set newname for data file 1 to '<new path>'
  RMAN> set newname for data file 2 to '<new path>'
  ...
  RMAN> restore database;
  RMAN> switch data file all;
  RMAN> release channel dev1;
```

13. Enter the following command to recover the database using the restored control files:

```
SVRMGR> recover database using backup controlfile until cancel;
```

14. Enter the following command to open the database using the resetlogs option:

```
SVRMGR> alter database open resetlogs;
```

15. If the error ORA-00344: unable to re-create online log %s occurs:

a. Enter the following commands to rename each online redo log:

```
SVRMGR> alter database rename file <online redo log #1 path>  
to <online redo log #1 new path>;
```

...

```
SVRMGR> alter database rename file <online redo log #n path>  
to <online redo log #n new path>;
```

b. Enter the following command to open the database:

```
SVRMGR> alter database open resetlogs;
```

Restore Using Command Line

You can use the ca_restore command line utility to restore Oracle database objects. For more information about using the ca_restore command line utility, see the appendix "Using Command Line Utilities" in the *Administrator Guide*.

Recovery

After restoring a database or database objects to the server, you must recover them. You can recover the database or database objects automatically using the Restore Manager or you can perform a manual recovery using the Oracle Server Manager Console. The following sections provide information and instructions for each of these methods.

Restore Manager Recovery

You can use the Restore Manager to restore and recover databases in one operation, automatically, by selecting one of these recovery options when you configure a restore job:

- Until the End of Logs
- Until SCN
- Until Log Sequence Number
- Until Time

Perform a Database Recovery

To recover the database or database objects using the Restore Manager, follow these steps:

1. Start BrightStor ARCserve Backup.
2. Open the Restore Manager and select the Restore by File System view.
3. On the Source tab, expand the UNIX/Linux Agents.
4. Expand the Oracle host under the UNIX/Linux Agents.
5. Select the database or database objects you want to restore and recover.

Note: To perform a complete media recovery of the database, you must restore all required archive log files.

6. Select the Destination tab and expand the UNIX/Linux Agents.
7. Click the plus sign next to the Oracle host under the UNIX/Linux Agents. The Login dialog appears.
8. Enter the system user name and password, and click OK. The Oracle host expands.
9. Click the plus sign next to the Oracle database you want to restore. The database Login dialog appears.
10. Enter the Oracle dba user name and password and click OK.

Note: Be sure that the Oracle user name and password you use to connect to Oracle has the permission to connect to Oracle using the as sysdba clause. You must be able to connect with and without this clause.

11. Select the Source tab, click the Oracle Options tab, and then select one of the recovery options.
12. Click Start. The Submit dialog appears.
13. Schedule the job to run now or at a later time.
14. Click OK to submit the job. The Job Submission dialog appears.
15. Click OK. The Restore Manager submits the job to the queue. You can monitor the sub-job on the Job Status Manager.

The agent automatically recovers the files after all the files have been restored.

Files the Agent Cannot Recover

When you use one of the Recovery Type options, the Agent for Oracle **cannot** recover the following files:

- Corrupted or missing online redo logs
- Corrupted or missing data files that were not backed up by the agent
- Corrupted or missing control files that were not backed up by the agent
- Corrupted or missing archive logs that were not backed up by the agent
- Files belonging to a database running in the no archive log mode

Oracle Constraints on Recovery Operations

The following Oracle constraints affect the recovery operations you can perform on a database:

- When recovering data files and old control files, you must recover the entire database. You cannot perform a data file level recovery.
- When performing a full database recovery and some tablespaces are already offline prior to the restore operation, they will not be recovered automatically. You must recover data files manually before putting them back online.
- After you perform a point-in-time recovery or restore old control files, the redo logs can no longer recover data files restored from previous backups. Consequently, you must open the database with the resetlogs option. You must also run a full backup as soon as possible.

Manual Recovery

You can manually recover a complete database when the control files have been lost or become corrupted. The following section provides the details for performing this type of database recovery.

Recover Databases with Lost or Corrupted Control Files

If a control file has been lost or corrupted, you must first shut down the database and recover the control files before recovering the database. To shut down the database, recover the control files, and then recover the database, follow these steps:

1. Shut down the database by entering the following command at the SVRMGR or SQLPLUS prompt:

```
SHUTDOWN;
```
2. At the appropriate prompt, start and mount the database and begin the recovery process.
 - At the SVRMGR prompt, enter the following command:

```
CONNECT INTERNAL;  
STARTUP MOUNT;  
RECOVER DATABASE USING BACKUP CONTROLFILE;
```
 - At the SQLPLUS prompt enter, enter the following command:

```
CONNECT SYSTEM/SYSTEM_PASSWORD AS SYSDBA;  
STARTUP MOUNT;  
RECOVER DATABASE USING BACKUP CONTROLFILE;
```
3. Oracle prompts you to enter the log file names. Oracle first looks for the archive log files and automatically supplies the correct names for those that exist. If Oracle cannot find the necessary archive log files, you must manually apply the online redo logs it needs.

When you apply the online redo logs manually, you must supply the full path and file name. If you enter an incorrect log, re-enter the command:

```
RECOVER DATABASE USING BACKUP CONTROLFILE;
```

Supply the correct online redo log file name at the prompt. Continue this procedure until Oracle has applied all logs successfully.

4. Enter the following command at the SVRMGR or SQLPLUS prompt to bring the database back online and reset the logs:

```
ALTER DATABASE OPEN RESETLOGS;
```

5. Go to the directory where the archived redo logs are stored and delete all of the log files.
6. If any tablespaces are still offline, enter the following command at the SVRMGR or SQLPLUS prompt to bring them back online:

```
ALTER TABLESPACE TABLESPACE_NAME ONLINE;
```
7. If you are using RMAN to recover your complete database with backed up control files, resynchronize the database information in RMAN to reflect the newly recovered database. To resynchronize the database information, follow these steps:
 - a. Login as oracle.
 - b. Enter the following command to set oracle SID to the recovered database SID:

```
ORACLE_SID=database SID
```
 - c. Enter the following commands to complete the process:

```
rman target dbuser/ dbuserpassword rvcvcat catowner/catowner
password@rman service name
reset database
```

where:
 - *dbuser* is the user with dba privileges for the recovered database.
 - *dbuserpassword* is the *dbuser* password.
 - *catowner* is the Oracle user name of the Oracle Recovery Manager catalog owner.
 - *rman service name* is the name of the service used to access the database where the rman catalog is installed.

Recover From Offline Full Backups

If you backed up your database in offline mode, you will use the same process to recover it as if you had backed up the database in online mode. This is because the offline backup actually puts the database in a quiescent state, which means that the database is still online (although you cannot access it or process transactions). For more information about offline backups, see the Back Up in Offline Mode section of the "Backing Up" chapter. For more information about recovering databases, see Perform a Database Recovery in this chapter.

Restore and Recovery Limitations

The following are restore and recovery limitations:

Limitation	Explanation
Restoring online redo logs	The online redo logs are not backed up; consequently, they cannot be restored.
Restoring job fails if users are logged into database	If any users are logged into the database when a restore job is scheduled to begin, the job fails if you are restoring either a system tablespace or a tablespace containing rollback segments. To avoid this, set the ORACLE_SHUTDOWN_TYPE variable to immediate in the /opt/CA/BABcmagt /agent.cfg file.
Catalog database SID	The Catalog database SID should not be duplicated or shared with any other SID name.

Appendix A: Locating Directories and Files

This appendix contains the locations of Oracle and BrightStor ARCserve Backup Agent for Oracle directories and files.

Agent Directory Locations

The following directories are located under the home directory of the agent:

- **data**—Internal data (Release Specific info)
- **lib**—Runtime Libraries
- **logs**—Log files
- **nls**—Messages files
- **rman_scripts**—Scripts automatically created by the agent

Agent File Locations

The following files are located in the home directory of the agent:

- **ca_auth**—the program used to automatically register the user@host with BrightStor ARCserve Backup
- **ca_backup**—the program used to submit backup jobs
- **ca_restore**—the program used to submit restore jobs
- **ckyorn**—the program used to read user information while performing setup
- **instance.cfg**—the file where all of the instances are listed at setup time
- **libobk.so.1.32**—the library to link Oracle with (SBT 1 | 32 bits)
- **libobk.so.1.64**—the library to link Oracle with (SBT 1 | 64 bits)
- **libobk.so.2.32**—the library to link Oracle with (SBT 2 | 32 bits)
- **libobk.so.2.64**—the library to link Oracle with (SBT 2 | 64 bits)
- **libobk.so.2.64_AMD64**—the library to link Oracle with Solaris (AMD Opteron support)
- **libobk.sl.1.64_IA64**—the library to link Oracle with HP-UX (Itanium support)

- **libobk.sl.2.64_IA64**—the library to link Oracle with HP-UX (Itanium support)
- **oraclebr**—the program used to run the browser
- **oragentd**—the program that is called by the common agent to perform the job
- **orasetup**—the script used to perform setup of the agent
- **sbt.cfg**—the parameter file created while performing setup

These library link files are located in \$CAORA_HOME:

- **libobk32.s***
- **libobk64.s***

For AIX, these library link files are also located in \$CAORA_HOME:

- **libobk.a.1.32**
- **libobk.a.1.64**
- **libobk.a.2.32**
- **libobk.a.2.64**
- **libobk.a.1.64_5I** (for AIX 5L)
- **libobk.a.2.64_5I** (for AIX 5L)
- **libobk.so.1.64_5I** (for AIX 5L)
- **libobk.so.2.64_5I** (for AIX 5L)

Agent Files Under Data Directory

The RELVERSION file, which stores the BrightStor ARCserve Backup build number that the agent was built against, is stored under the Data directory.

Agent Files Under Logs Directory

The following log files are located under the Logs directory:

- **ca_backup.log**—logs the output of the latest ca_backup command
- **ca_restore.log**—logs the output of the latest ca_restore command
- **oragentd_<jobid>.log**—logs the agent's activity
- **oraclebr.log**—logs the browser's activity

Appendix B: Frequently Asked Questions

This appendix contains a list of frequently asked questions.

When I try to expand a database, it does not expand and oraclebr.log says that the database is not running in ARCHIVELOG mode. How do I fix this?

Set the database to run in ARCHIVELOG, as documented in the agent guide.

When I try to run a backup or restore with RMAN, RMAN exits with an error right away. What should I do?

Try the following steps only if you are performing a manual RMAN job:

Note: If you used Restore Manager to start RMAN, these steps are performed automatically for you.

- Make sure that you have created the caroot equivalency with BrightStor ARCserve Backup for the user who runs RMAN.
- Make sure that you have followed the steps to link the libobk library to the Oracle binaries, as explained in the agent guide.

My RMAN job exited and I got an error saying that the agent has not been started. How do I correct this?

If the job stays inactive in the BrightStor ARCserve Backup job queue for more than the number of minutes specified by the SBT_TIMEOUT parameter in sbt.cfg (because the tapes are not available, for instance), then RMAN will time out. Increase the SBT_TIMEOUT to accommodate your environment.

For some reason, the Until End of Logs option does not work. How do I get it to work?

Make sure that you have restored all the necessary archive logs. If it still does not work, try to perform a manual recovery on the restored files.

When I submit a backup or restore job from BrightStor ARCserve Backup, it fails and there is no log produced for oragentd. How can I get the job to run?

The agent has probably not been started. Check the common agent log (caagentd.log) for possible errors. If this log does not show anything special, make sure that the LD_LIBRARY_PATH, SHLIB_PATH, or LIBPATH entries in agent.cfg contain the right directories. If everything seems to be correct, consult the other BrightStor ARCserve Backup logs for errors.

I have too many oragentd_<job id>.log files accumulating in the Logs directory. Is there a way to clean it up?

After completing a backup or restore operation, the oragentd process checks the value of the DAYS_ORAGENTD_LOGS_RETAINED parameter in agent.cfg of the common agent and deletes log files older than the number of days specified. To have a more frequent clean up, change this value and run the caagent update command (as root user). The default value is 30 days.

While trying to perform a restore operation with the Until End of Logs option enabled, I get Oracle permission errors. How can I prevent the errors?

Ensure that the Oracle user name and password you use to connect to Oracle through the Restore Manager has the permission to connect to Oracle using the as sysdba clause. You must be able to connect with and without this clause.

You can verify your permissions by running the following commands:

```
sqlplus /nolog
connect username/password as sysdba
```

If you do not have permission, ask the Oracle DBA to configure the security for you.

How do I perform a BrightStor ARCserve Backup GUI restore operation to restore the Oracle data files in a different directory?

You cannot do this. Although it is possible to restore a database to a different node, the whole directory structure where the database will be restored must be identical to the one on the source node.

I am trying to run a backup or restore job, and the agent fails with the error "Oracle password is missing in the job." How can I fix this?

Make sure that the password is entered in the proper field in the Oracle Options tab.

I get error messages when I try to run concurrent backups on the same database. Should this happen?

Yes. It is normal. Parallel operations that are handling the same Oracle objects at the same time are not supported.

The performance of the restore operation is slow. How can I speed it up?

The shared memory apportioned between the child and the oragentd parent process uses a multi-buffering queue to parallelize as much of the transferred data as possible during the restore. The default number of blocks is 80. You can increase the number of blocks and speed up restore operations by editing the agent.cfg file in the common agent directory. Assign the new value to CA_ENV_NUM_OF_REST_BUFF, then uncomment this variable and make it active with the command caagent update.

If you find that increasing the number of blocks does not help, you may want to try decreasing them instead. In some circumstances and on some platforms (such as OSF), reducing the number of blocks actually helped increase the performance. You will need to test different values to see what works for your particular situation.

Appendix C: Troubleshooting

This appendix contains a list of troubleshooting tips and a list of the most common messages for the agent on the UNIX platform.

Tips

The following is a list of tips for the Agent for Oracle:

- If the database you want to back up is not listed in the BrightStor ARCserve Backup Source tab, check the *instance.cfg* file. For every database instance handled by the agent, there should be an entry for it in the *instance.cfg* file. This file is in the agent home directory.
- If you have trouble browsing a database, check the Oracle Browser Log (*oraclebr.log*) for possible errors. Also, make sure that the values corresponding to ORACLE_SID and ORACLE_HOME in the agent/*instance.cfg* file are set properly.
- We recommend there be only one RMAN catalog database for a local area network.
- If you are using RMAN, every host on which the agent is running should have a properly configured *tnsnames.ora*, Oracle Transparent Network Substrate configuration file. This file is in the \$ORACLE_HOME/network /admin directory.
- The backup sessions you select to restore must have been successfully completed backup jobs. Do not attempt to restore a cancelled or failed backup job.
- If a job fails, always check the following logs for possible reasons for the failure:
 - *oragentd_<job id>.log*
 - BrightStor ARCserve Activity log
 - The Oracle RMAN log (\$ORACLE_BASE/admin/SID/udump/sbtio.log)

Messages

This section explains the most common messages for the agent on the UNIX platform.

Backup or Restore Failed

Reason:

There can be a number of reasons for backup or restore to fail.

Action:

Check the agent log file, which is located in the agent/logs directory. For more information about backup operations, see your Oracle manual.

If a previous backup job has failed, it may have left the source tablespaces in backup mode. To put the tablespace in normal mode, enter the following command at the SVRMGR or SQLPLUS prompt:

```
ALTER TABLESPACE "tablespace_name" END BACKUP
```

No Oracle Server icon in BrightStor ARCserve browser

Reason:

The agent is not installed or is not configured.

Action:

Install the agent. Check instance.cfg in the agent home directory.

Oracle - (209) ORA-01219: database not open: queries allowed on fixed tables/views only.

E8606 - Failed to enumerate databases.

Reason:

A backup of a mounted, but unopened Oracle server was attempted.

Action:

Open the Oracle server.

Database not available for desired operation.

E9900 Oracle: Instance shut down failure.

Can't shut down the instance.

Reason:

Trying to perform a backup job and the agent cannot shut down the database.

Action:

Shut down the database and resubmit the backup job.

ERROR: Fail to connect to Oracle DBAgent with Browsing mode: return [24].

Database not available for desired operation.

Reason:

You are trying to perform an online backup job of an offline database.

Action:

Startup (mount and open) the database and resubmit the backup job.

!get OracleState():olog()failed. lda-rc=1033

Reason: ORA-01033:ORACLE initialization or shutdown in progress.

DSA Connect Agent(): Cannot determine state of instance hpdb.

ERROR: Fail to connect to Oracle DBAgent with Browsing mode: return[24].

E9900 Oracle: database not available for desired operation.

Reason:

You are trying to perform an online backup when the database was started with nomount or mount option.

Action:

The database must be in an open state for a successful backup job. Open the database and resubmit the backup job.

127.0.0.1 localhost.localdomain

IP address of host localhost.localdomain localhost hostname

oraclebr: fatal: relocation error: file <...>/libclntsh.so: symbol slpmprodstab: referenced symbol not found

Reason:

This is an Oracle bug.

Action:

Either get a patch from Oracle or follow these steps:

1. Logon as the oracle user.
2. Shut down the database.
3. Edit the \$ORACLE_HOME/bin/genclntsh script.
4. Comment out the following line:

```
ar d $LIBCOMMON sorapt.o
```

5. Regenerate the shared library (libclntsh.so) by running genclntsh.
6. Restart the database.

ConnecttoServer(): olog() failed.lida-return-code=1017

Reason:ORA-01017: invalid username/password; logon denied

Cannot log on with given username/password.

Reason:

You submitted an online backup job with the wrong password.

Action:

Resubmit the job with the correct username and password.

OBK-5607 Error accessing internal tables.

OBK-5629 Error while executing select thread #, seq # from V\$thread. OBK-504 SQL error ORA-01403 no data found.

OBK-5621 file not belong to target database anymore target database information is out of sync.

RMAN-6088 Data file copy not found or out of sync with catalog.

Reason:

The database instance name has the ./ character in its name.

Action:

- Check the instance name by using the following command:

```
select * from v$thread;
```

- Change the instance name to one different from the database name or recreate the control files.

If you are using the svrmgr utility, drop the tablespace and recreate it with the full path name.

ORA-12223: TNS: internal limit restriction exceeded.

ORA-12500 TNS: listener failed to start a dedicated server process

Reason:

Too many Transparent Network Substrate (TNS) connections open simultaneously.

Action:

Split the backup job into multiple jobs, with each job containing several tablespaces. The first job must include the system tablespace and the last backup job must include the archive log and the control files.

unix_user@hostname not validated in authentication server

Reason:

The BrightStor ARCserve Backup user equivalency was not created.

Action:

Check if you have properly created your BrightStor ARCserve Backup user equivalency.

ORA-19565: BACKUP_TAPE_IO_SLAVES not enabled when duplexing to sequential devices

Reason:

You are attempting to generate more than one copy for your backup.

Action:

Enable the BACKUP_TAPE_IO_SLAVES option in either your init<sid>.ora or SPFILE file when generating more than once copy of your backup.

RMAN Messages

This section contains common Recovery Manager (RMAN) messages.

Note: For more information about RMAN messages, see the *Oracle Backup and Recovery Guide*.

Allocate Command Error

```
RMAN-00571:=====
RMAN-00569: ===== ERROR MESSAGE STACK FOLLOWS=====
RMAN-00571:=====
RMAN-03007: retryable error occurred during execution of command:
allocate

RMAN-07004: unhandled exception during command execution on channel
dev1

RMAN-10035: exception raised in RPC: ORA-19554: error allocating
device, device type: SBT_TAPE, device name:

ORA-19557: device error, device type: SBT_TAPE, device name:

ORA-27000: skgfqsbi: failed to initialize storage subsystem (SBT) layer

Additional information: 4110

ORA-19511: SBT error = 4110, errno = 0, BACKUP_DIR environment variable
is not set

RMAN-10031: ORA-19624 occurred during call to DBMS_BACKUP_RESTORE.
DEVICEALLOCATE
```

Reason:

Oracle link to libobk library does not exist or failed.

Action:

Either relink Oracle to your libobk library or create a softlink by entering:

```
ln -s $CAORA_HOME/libobk.so.1.32 $ORACLE_HOME/lib/libobk.so.
```


Appendix D: Understanding the agent.cfg File and the sbt.cfg Parameter File

This appendix contains information about the agent.cfg (agent configuration) and the sbt.cfg parameter files.

The agent.cfg Configuration File

The agent configuration file, agent.cfg, is located in the Common Agent home directory, and supplies the default information used when running orasetup for each sub-agent (Backup and Client Agent) installed on your system. It also contains the Oracle home directory, the user name and password of the Oracle Recovery Manager, and NLS_LANG and NLS_DATE_FORMAT information.

Note: You must reload the agent using the *caagent update* command after changing the agent.cfg file.

The following is a sample of the contents of the *agent.cfg* file:

```
[46]
# Oracle Agent
NAME Oracle Agent
VERSION 11.5.0
HOME <Oracle Agent home directory>
ENV CAS_ENV_ORACLE_AGENT_HOME=<Oracle Agent home directory>
#ENV_BAB_HOME=<BrightStorAB home directory>
#ENV CA_ENV_NUM_OF_REST_BUFF=
ENV DAYS_ORAGENTD_LOGS_RETAINED=30
ENV BAB_INITIATED=1
ENV ORACLE_SHUTDOWN_TYPE=immediate
#ENV NLS_LANG=american
ENV NLS_DATE_FORMAT=MM/DD/YYYY/HH24:MI:SS
ENV LD_LIBRARY_PATH=/usr/lib:<Oracle Agent home directory>:<Oracle Agent
home directory>/lib:/opt/CA/BABcmagt:/usr/local/Calib:$LD_LIBRARY_PATH
BROWSER oraclebr
AGENT oragentd
```

The CA_ENV_NUM_OF_REST_BUFF parameter lets you modify performance for restore operations. Since optimal values may vary depending on environments and host loads, modify this parameter with care.

If you want to modify the number of days that the agent keeps the agent logs before it automatically deletes them, update the DAYS_ORAGENTD_LOGS _RETAINED variable. If you do not want to have the log files deleted automatically, enter 0.

You should not manually change the settings for any of the Recovery Manager home directories listed in the agent.cfg file. Instead, to change these settings, rerun the orasetup program, enter the new information, and re-register it.

You can also use the configuration file to select the type of shutdown Oracle will perform when an offline operation is required on an Oracle database. The supported values are normal, immediate, and abort. You should not enable the Debug option unless instructed to do so by a Computer Associates Customer Support representative.

If you call Computer Associates Customer Support line for help, you may be asked by the Customer Support representative to enable the Debug option manually in the agent.cfg file.

Enable Debug Option

To enable the Debug option, follow these steps:

1. Open the agent.cfg file (located in /opt/CA/BABcmagt) in an editor and add the following line:
`ENV CA_ENV_DEBUG_LEVEL=4`
2. Reload the agent using the *caagent update* command.

Note: You should not enable the Debug option unless instructed to do so by a Computer Associates Customer Support representative.

The sbt.cfg Parameter File

After you create the initial sbt.cfg file, it is placed in the agent home directory. This file includes the following parameters:

- SBT_HOST <host name>-Name of the host where the desired BrightStor ARCserve Backup server runs.
- SBT_ORIGINAL_CLIENT_HOST <host name>-When restoring data from one host to another, this parameter specifies the name of the original client host.

- SBT_USERNAME <user name>-Name of a UNIX or Linux user who can connect to the host where the Agent for Oracle runs.
- SBT_PASSWORD <password>-Password for the UNIX or Linux user who can connect to the host where the agent runs. This value is encrypted using the cas_encr program.
- SBT_TIMEOUT <number of minutes>-Number of minutes that the Oracle Recovery Manager waits for the agent to be started before timing out.
- SBT_DESTGROUP <device group name>-Name of the BrightStor ARCserve Backup destination device group to use for a backup operation. When this is not specified, any available device group is used.

Note: This is a backup parameter only.

- SBT_DESTTAPE <tape name>-Name of the BrightStor ARCserve Backup destination media name to use for a backup operation. When not specified, any available media is used.

Note: This is a backup parameter only.

- SBT_MEDIAPOL <media pool name>-Name of the BrightStor ARCserve Backup destination media pool to use for a backup operation. By default, none is specified and no media pool is used.

Note: This is a backup parameter only.

- SBT_LOGFILE <log file path>-Records activities during the backup job to the specified filename.

- SBT_LOGDETAIL <summary | all>-Specifies whether a summary or all activity of the job should be logged in the file specified by the SBT_LOGFILE parameter.

- SBT_SNMP <true | false>-Indicates whether to use the SNMP alert option by the BrightStor ARCserve Backup logger. The default value is 'false'.

- SBT_TNG <true | false>-Indicates whether to use the CA-Unicenter alert option. The default value is 'false'.

- SBT_EMAIL <email address>-Sends a copy of the Activity Log to the specified email address. The default is none.

- SBT_PRINTER <printer name>-Sends a copy of the Activity Log to the specified printer. The printer must be set up in the \$BAB_HOME/config/caloggerd.cfg configuration file. The default is no printer.

- SBT_EJECT <true | false>-Indicates whether the tape should be ejected at the end of the backup operation. The default is 'false'.
Note: This is a backup parameter only.
- SBT_TAPEMETHOD <append | owritesameblank | owritesameblankany | owritesameanyblank>-Method that determines how the job should handle the media:
 - append-Adds the session after the last one on the media. This is the default value.
 - owritesameblank-Tries to use the media specified as the SBT_DESTTAPES parameter. If it cannot be used, tries to use a blank media.
 - owritesameblankany-Tries to use the media specified as the SBT_DESTTAPES parameter. If it cannot be used, tries to use a blank media. If none is available, uses any tape.
 - owritesameanyblank-Tries to use the media specified as the SBT_DESTTAPES parameter. If it cannot be used, tries to use any other tape. If none is available, tries to use a blank media.
- SBT_NOTE: This parameter requires the SBT_DESTTAPES or SBT_DESTTAPESUN...SBT_DESTTAPESAT parameters to be set. This is a backup parameter only.
- SBT_SPANTAPEMETHOD <owritesameblank | owritesameblankany | owritesameanyblank>-Method that determines how the job should handle the media in case of tape spanning:
 - owritesameblank-Tries to use the media specified as the SBT_DESTTAPES parameter. If it cannot be used, tries to use a blank media. This is the default value.
 - owritesameblankany-Tries to use the media specified as the SBT_DESTTAPES parameter. If it cannot be used, tries to use a blank media. If none is available, uses any tape.
 - owritesameanyblank-Tries to use the media specified as the SBT_DESTTAPES parameter. If it cannot be used, tries to use any other tape. If none is available, tries to use a blank media.
- SBT_NOTE: This is a backup parameter only.
- SBT_TAPETIMEOUT <number of minutes>-Number of minutes allowed for mounting a media before the job times out. The default value is 5 minutes.
- SBT_SPANTAPETIMEOUT <number of minutes>-Number of minutes allowed for mounting a media in case of a tape spanning situation before the job times out. The default value is infinite.

- SBT_DAYOFWEEK <true | false>-Indicates if the destination tape or media pool defined as values for SBT_DESTTAPESUN...SBT_DESTTAPESAT and SBT_MEDIAPOOLSUN...SBT_MEDIAPOOLSAT should be used instead of the default values specified for SBT_DESTTAPESUN and SBT_MEDIAPOOLSAT.
Note: This is a backup parameter only.
- SBT_DESTTAPESUN <tape name>-Name of the media to use if the job runs on a Sunday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_DESTTAPESUN value applies.
Note: This is a backup parameter only.
- SBT_DESTTAPEMON <tape name>-Name of the media to use if the job runs on a Monday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_DESTTAPEMON value applies.
Note: This is a backup parameter only.
- SBT_DESTTAPETUE <tape name>-Name of the media to use if the job runs on a Tuesday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_DESTTAPETUE value applies.
Note: This is a backup parameter only.
- SBT_DESTTAPEWED <tape name>-Name of the media to use if the job runs on a Wednesday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_DESTTAPEWED value applies.
Note: This is a backup parameter only.
- SBT_DESTTAPETHU <tape name>-Name of the media to use if the job runs on a Thursday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_DESTTAPETHU value applies.
Note: This is a backup parameter only.
- SBT_DESTTAPEFRI <tape name>-Name of the media to use if the job runs on a Friday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_DESTTAPEFRI value applies.
Note: This is a backup parameter only.
- SBT_DESTTAPESAT <tape name>-Name of the media to use if the job runs on a Saturday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_DESTTAPESAT value applies.
Note: This is a backup parameter only.

- SBT_MEDIAPOLLSUN <media pool name>-Name of the media pool to use if the job runs on a Sunday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_MEDIAPOL value applies.
Note: This is a backup parameter only.
- SBT_MEDIAPOLLMON <media pool name>-Name of the media pool to use if the job runs on a Monday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_MEDIAPOL value applies.
Note: This is a backup parameter only.
- SBT_MEDIAPOLLTUE <media pool name>-Name of the media pool to use if the job runs on a Tuesday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_MEDIAPOL value applies.
Note: This is a backup parameter only.
- SBT_MEDIAPOLLWED <media pool name>-Name of the media pool to use if the job runs on a Wednesday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_MEDIAPOL value applies.
Note: This is a backup parameter only.
- SBT_MEDIAPOLLTHU <media pool name>-Name of the media pool to use if the job runs on a Thursday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_MEDIAPOL value applies.
Note: This is a backup parameter only.
- SBT_MEDIAPOLLFRI <media pool name>-Name of the media pool to use if the job runs on a Friday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_MEDIAPOL value applies.
Note: This is a backup parameter only.
- SBT_MEDIAPOLLSAT <media pool name>-Name of the media pool to use if the job runs on a Saturday and the SBT_DAYOFWEEK parameter is TRUE. If this is not specified, the SBT_MEDIAPOL value applies.
Note: This is a backup parameter only.
- SBT_NB_BLOCKS <number of memory blocks>-Number of blocks of shared memory the SBT interface uses to exchange data with the agent. This is a tuning parameter and should normally not be modified. The default value provided is 50 blocks.
- SBT_APPEND_BACKUP_CMDLINE <command line arguments>-Arguments and values to append to the ca_backup command line generated by the SBT interface to submit a backup job. This is a generic way of providing parameters that are not supported by the SBT interface.

- SBT_APPEND_RESTORE_CMDLINE <command line arguments>- Arguments and values to append to the ca_restore command line generated by the SBT interface to submit a restore job. This is a generic way of providing parameters that are not supported by the SBT interface.

Note: You can also define a parameter as an environment variable and as a parameter set by the send command in a RMAN script (for Oracle 8i, 9i, and 10g). To set a parameter in a RMAN script, enter the following:

```
run {  
  allocate channel dev1 type 'sbt_tape';  
  send "SBT_HOST=myhost";  
  send "SBT_USERNAME=oracle";  
  send "SBT_PASSWORD=nobodyknows";  
  ...  
}
```

If you set a value through a send command in RMAN, this value overrides any value specified in the sbt.cfg file or the equivalent environment variable. If you set a value as an environment variable, it overrides the equivalent value specified in the sbt.cfg file.

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