## 5.4 Copia de Seguridad y Recuperación con RMAN (Recovery Manager)

Es una utilidad de Oracle que permite hacer rápidamente backup de todos los datos o de una parte de la base de datos. Facilita la realización de copias de seguridad, restauraciones y recuperaciones mediante un lenguaje de comandos.

Ejecutable RMAN

Se encuentra en el directorio bin de la carpeta de Oracle y se ejecuta desde el sistema operativo
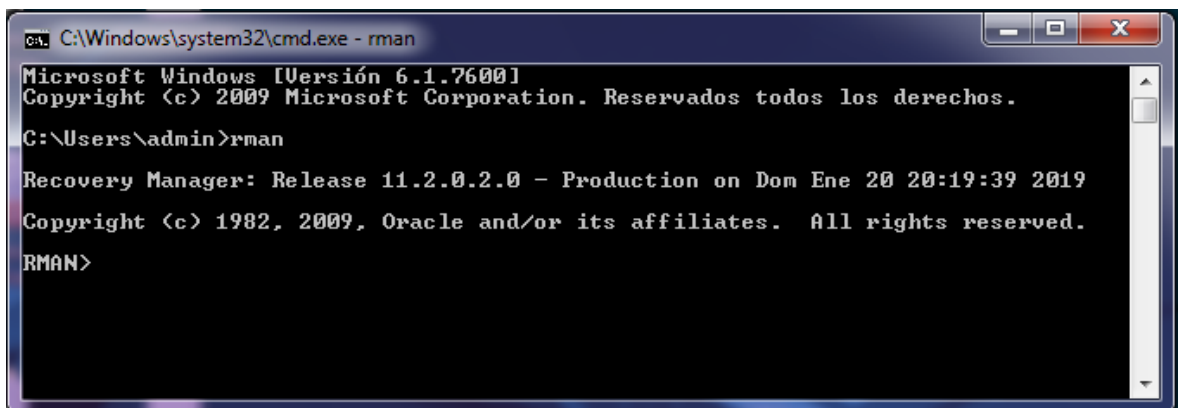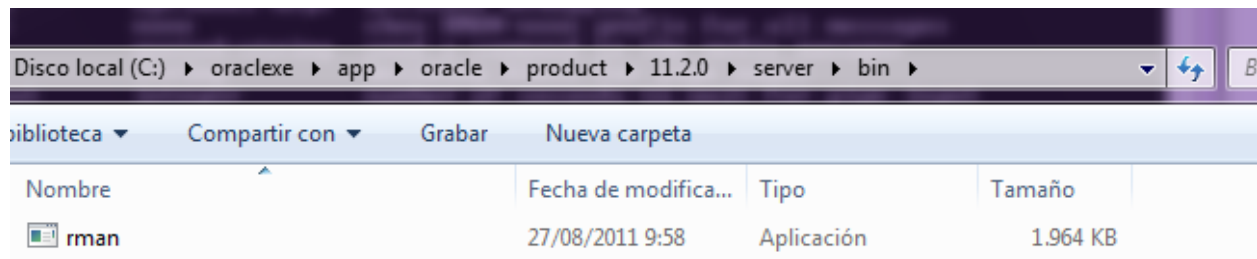
Para poder trabajar con él tenemos que estar en el cmd en modo **administrador**.
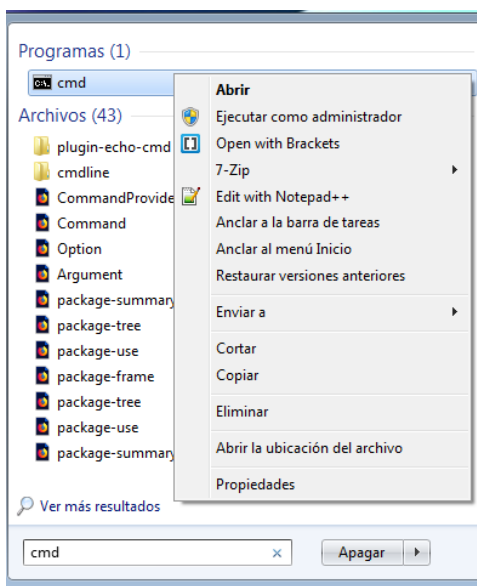
Lo primero que haremos será conectarnos a la instancia de la base de datos, en nuestro caso XE

RMAN TARGET XE

Se necesitan privilegios de DBA por lo que nos pedirá la contraseña del SYS

Para salir **EXIT**

También podemos acceder de la siguiente manera:

RMAN TARGET SYS/manager@XE

Una vez dentro podemos ejecutar diversos comandos:

- RMAN> REPORT SCHEMA, visualiza la estructura de la base de datos

- RMAN> REPORT NEED BACKUP, muestra los archivos que necesitan hacer copias de seguridad

```
RMAN> REPORT NEED BACKUP;
RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
Report of files with less than 1 redundant backups
File #bkps Name
---- ----- --------------------------------------------------------------------
1    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\SYSTEM.DBF
2    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\UNDOTBS1.DBF
3    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\SYSAUX.DBF
4    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\USERS.DBF
5    0     C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERVER\DATABASE\TRABAJO.DBF
6    0     C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERVER\DATABASE\OTRO.DBF
```

- RMAN> REPORT OBSOLETE, indica las copias de seguridad que se puede eliminar.

```
RMAN> REPORT OBSOLETE;

RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
no obsolete backups found

RMAN>
```

Comando BACKUP

Permite realizar una copia de seguridad de una base de datos, un tablespace, un archivo de datos o de los Redo Logs archivados.

- BACKUP TABLESPACE nombre;   copia el tablespace indicado

(Puede darnos un error si la BD no está en modo ARCHIVELOG, en ese caso la ponemos en dicho modo.

```
RMAN> BACKUP TABLESPACE TRABAJO;

Starting backup at 29/01/21
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=16 device type=DISK
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
RMAN-00571: ===========================================================
RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============
RMAN-00571: ===========================================================
RMAN-03009: failure of backup command on ORA_DISK_1 channel at 01/29/2021 00:18:
36
ORA-19602: cannot backup or copy active file in NOARCHIVELOG mode

RMAN>
```

Recordamos: ARCHIVE LOG LIST para ver el modo

SHUTDOWN IMMEDIATE

STARTUP MOUNT

ALTER DATABASE ARCHIVELOG

ALTER DATABASE OPEN)

```
RMAN> BACKUP TABLESPACE TRABAJO;

Starting backup at 28/01/21
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=105 device type=DISK
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00005 name=C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERV
ER\DATABASE\TRABAJO.DBF
input datafile file number=00006 name=C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERV
ER\DATABASE\OTRO.DBF
channel ORA_DISK_1: starting piece 1 at 28/01/21
channel ORA_DISK_1: finished piece 1 at 28/01/21
piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BACKUPSET\2021_01_28\O
1_MF_NNNDF_TAG20210128T234847_J168SJ92_.BKP tag=TAG20210128T234847 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:02
Finished backup at 28/01/21

RMAN> REPORT NEED BACKUP;

RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
Report of files with less than 1 redundant backups
File #bkps Name
---- ----- ---------------------------------------------------
1    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\SYSTEM.DBF
2    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\UNDOTBS1.DBF
3    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\SYSAUX.DBF
4    0     C:\ORACLEXE\APP\ORACLE\ORADATA\XE\USERS.DBF
```

  o BACKUP ARCHIVELOG ALL; copia los Redo Logs archivados

```
RMAN> BACKUP ARCHIVELOG ALL;

Starting backup at 29/01/21
current log archived
using channel ORA_DISK_1
channel ORA_DISK_1: starting archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=7 RECID=1 STAMP=1061641531
input archived log thread=1 sequence=8 RECID=2 STAMP=1061674474
input archived log thread=1 sequence=9 RECID=3 STAMP=1061675855
input archived log thread=1 sequence=10 RECID=4 STAMP=1061896849
input archived log thread=1 sequence=11 RECID=5 STAMP=1062376031
input archived log thread=1 sequence=12 RECID=6 STAMP=1063064286
input archived log thread=1 sequence=13 RECID=7 STAMP=1063065810
channel ORA_DISK_1: starting piece 1 at 29/01/21
channel ORA_DISK_1: finished piece 1 at 29/01/21
piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BACKUPSET\2021_01_29\O
1_MF_ANNNN_TAG20210129T000330_J169O31Q_.BKP tag=TAG20210129T000330 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:07
Finished backup at 29/01/21

RMAN>
```

- BACKUP DATAFILE nombre; copia un archivo de datos

```
RMAN> BACKUP DATAFILE 'OTRO.DBF';

Starting backup at 29/01/21
using channel ORA_DISK_1
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00006 name=C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERV
ER\DATABASE\OTRO.DBF
channel ORA_DISK_1: starting piece 1 at 29/01/21
channel ORA_DISK_1: finished piece 1 at 29/01/21
piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BACKUPSET\2021_01_29\O
1_MF_NNNDF_TAG20210129T001147_J16B4N1R_.BKP tag=TAG20210129T001147 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 29/01/21

RMAN>
```

- LIST BACKUP; muestra información sobre los archivos de copias de seguridad disponibles.

Los archivos de backup que hemos ido generando se encuentran en:

- BACKUP DATABASE; copia la base de datos

```
RMAN> BACKUP DATABASE;
starting backup at 29/01/21
using channel ORA_DISK_1
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00002 name=C:\ORACLEXE\APP\ORACLE\ORADATA\XE\UNDOTBS1
.DBF
input datafile file number=00001 name=C:\ORACLEXE\APP\ORACLE\ORADATA\XE\SYSTEM.D
BF
input datafile file number=00004 name=C:\ORACLEXE\APP\ORACLE\ORADATA\XE\USERS.DB
F
input datafile file number=00003 name=C:\ORACLEXE\APP\ORACLE\ORADATA\XE\SYSAUX.D
BF
input datafile file number=00005 name=C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERV
ER\DATABASE\TRABAJO.DBF
input datafile file number=00006 name=C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERV
ER\DATABASE\OTRO.DBF
channel ORA_DISK_1: starting piece 1 at 29/01/21
channel ORA_DISK_1: finished piece 1 at 29/01/21
piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BACKUPSET\2021_01_29\O
1_MF_NNNDF_TAG20210129T002338_J16BTTFZ_.BKP tag=TAG20210129T002338 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:01:25
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
including current control file in backup set
including current SPFILE in backup set
channel ORA_DISK_1: starting piece 1 at 29/01/21
channel ORA_DISK_1: finished piece 1 at 29/01/21
piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BACKUPSET\2021_01_29\O
1_MF_NCSNF_TAG20210129T002338_J16BXJOS_.BKP tag=TAG20210129T002338 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:03
Finished backup at 29/01/21

RMAN>
```

Si hacemos ahora REPORT NEED BACKUP no saldrá nada porque acabamos de hacer una copia de toda la base de datos.

```
RMAN> REPORT NEED BACKUP;

RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
Report of files with less than 1 redundant backups
File #bkps Name
---- ----- ----------------------------------------------------------

RMAN>
```

Si creo un nuevo tablespace y vuelvo a ejecutar entonces si aparecerá este nuevo archivo.

```
SQL> CONNECT SYSTEM/manager;
Connected.
SQL> CREATE TABLESPACE NUEVO DATAFILE 'NUEVO.DBF' SIZE 1M;

Tablespace created.

SQL> _
```

```
RMAN> REPORT NEED BACKUP;

RMAN retention policy will be applied to the command
RMAN retention policy is set to redundancy 1
Report of files with less than 1 redundant backups
File #bkps Name
---- ----- ----------------------------------------------------------
7    0     C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERVER\DATABASE\NUEVO.DBF

RMAN>
```

Restauración y recuperación con RMAN

Se pueden hacer restauraciones de:

- base de datos
- tablespaces
- archivos de datos.

Si las copias de seguridad han sido realizadas con RMAN sólo pueden ser restauradas con RMAN.

Para restaurar una base de datos o un tablespace utilizaremos:

- **RESTORE**: este comando restaura archivos de copias de seguridad en la ubicación predeterminada o en otra ubicación si se indica.
    - **RESTORE DATABASE;** restaura la base de datos completa.
    - **RESTORE TABLESPACE nombre;** restaura un tablespace

- **RECOVER**: aplica registros de Redo Logs o copias de seguridad incrementales si las hubiera a un conjunto de copias restaurado o a una copia normal, con el fin de actualizar la base de datos a un instante específico y sincronizar todos los archivos de datos.
    - **RECOVER DATABASE;** recupera y sincroniza la base de datos completa.
    - **RECOVER TABLESPACE nombre;** recupera y sincroniza un tablespace:

Para restaurar una base de datos tenemos que tener la base de datos en estado MOUNT y sin abrir. Para restaurar un tablespace podemos hacerlo también en esta situación (BD en estado MOUNT) o con la base de datos abierta ponerlo en modo offline, restaurar y después volverlo a poner en modo online

```
RMAN> SQL "ALTER TABLESPACE TRABAJO OFFLINE IMMEDIATE";
RMAN> RESTORE TABLESPACE TRABAJO;
RMAN> RECOVER TABLESPACE TRABAJO;
RMAN> SQL "ALTER TABLESPACE TRABAJO ONLINE";
```

Además de lo visto, RMAN tiene una gran cantidad de comandos para realizar las copias de seguridad, restaurar y recuperar una base de datos.

https://orasite.com/tutoriales/backup-base-datos/rman-comandos-guia

Ejemplo de BACKUP y restauración de un tablespace

```
RMAN> BACKUP TABLESPACE NUEVO;

Starting backup at 29/01/21
using channel ORA_DISK_1
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00007 name=C:\ORACLEXE\APP\ORACLE\PRODUCT\11.2.0\SERV
ER\DATABASE\NUEVO.DBF
channel ORA_DISK_1: starting piece 1 at 29/01/21
channel ORA_DISK_1: finished piece 1 at 29/01/21
piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BACKUPSET\2021_01_29\0
1_MF_NNNDF_TAG20210129T005058_J16DG2W4_.BKP tag=TAG20210129T005058 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 29/01/21

RMAN>
```

Para restaurar el tablespace paramos la BD, montamos la BD, hacemos restore, recover y abrimos la base de datos

```
RMAN> SHUTDOWN IMMEDIATE

database closed
database dismounted
Oracle instance shut down
RMAN> STARTUP MOUNT

connected to target database (not started)
Oracle instance started
database mounted

Total System Global Area    535662592 bytes

Fixed Size                    1384760 bytes
Variable Size               390074056 bytes
Database Buffers            138412032 bytes
Redo Buffers                  5791744 bytes
RMAN> RESTORE TABLESPACE NUEVO;

Starting restore at 29/01/21
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=10 device type=DISK

channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00007 to C:\ORACLEXE\APP\ORACLE\PRODUCT\1
1.2.0\SERVER\DATABASE\NUEVO.DBF
channel ORA_DISK_1: reading from backup piece C:\ORACLEXE\APP\ORACLE\FAST_RECOVE
RY_AREA\XE\BACKUPSET\2021_01_29\01_MF_NNNDF_TAG20210129T005058_J16DG2W4_.BKP
channel ORA_DISK_1: piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BA
CKUPSET\2021_01_29\01_MF_NNNDF_TAG20210129T005058_J16DG2W4_.BKP tag=TAG20210129T
005058
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01
Finished restore at 29/01/21
RMAN> RECOVER TABLESPACE NUEVO;

Starting recover at 29/01/21
using channel ORA_DISK_1

starting media recovery
media recovery complete, elapsed time: 00:00:01

Finished recover at 29/01/21

RMAN> SQL "ALTER DATABASE OPEN";

sql statement: ALTER DATABASE OPEN

RMAN>
```

También podemos SOLO poner el tablespace offline, hacemos restore, recover y volvemos a ponerlo online

```
RMAN> SQL "ALTER TABLESPACE NUEVO OFFLINE IMMEDIATE";

sql statement: ALTER TABLESPACE NUEVO OFFLINE IMMEDIATE

RMAN> RESTORE TABLESPACE NUEVO;

Starting restore at 29/01/21
using channel ORA_DISK_1

channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00007 to C:\ORACLEXE\APP\ORACLE\PRODUCT\1
1.2.0\SERVER\DATABASE\NUEVO.DBF
channel ORA_DISK_1: reading from backup piece C:\ORACLEXE\APP\ORACLE\FAST_RECOVE
RY_AREA\XE\BACKUPSET\2021_01_29\O1_MF_NNNDF_TAG20210129T010658_J16FD2Q8_.BKP
channel ORA_DISK_1: piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BA
CKUPSET\2021_01_29\O1_MF_NNNDF_TAG20210129T010658_J16FD2Q8_.BKP tag=TAG20210129T
010658
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01
Finished restore at 29/01/21

RMAN> RECOVER TABLESPACE NUEVO;

Starting recover at 29/01/21
using channel ORA_DISK_1

starting media recovery
media recovery complete, elapsed time: 00:00:01

Finished recover at 29/01/21

RMAN> SQL "ALTER TABLESPACE NUEVO ONLINE";

sql statement: ALTER TABLESPACE NUEVO ONLINE

RMAN>
```

Si en lugar de un tablespace queremos restaurar la base de datos completa teniendo un backup de ella lo haremos del mismo modo pero con RESTORE DATABASE y RECOVER DATABASE

```
RMAN> SHUTDOWN IMMEDIATE

database closed
database dismounted
Oracle instance shut down
RMAN> STARTUP MOUNT

connected to target database (not started)
Oracle instance started
database mounted

Total System Global Area      535662592 bytes

Fixed Size                      1384760 bytes
Variable Size                 390074056 bytes
Database Buffers              138412032 bytes
Redo Buffers                    5791744 bytes
RMAN> RESTORE DATABASE
2> ;

Starting restore at 29/01/21
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=10 device type=DISK

channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00001 to C:\ORACLEXE\APP\ORACLE\ORADATA\X
E\SYSTEM.DBF
channel ORA_DISK_1: restoring datafile 00002 to C:\ORACLEXE\APP\ORACLE\ORADATA\X
E\UNDOTBS1.DBF
channel ORA_DISK_1: restoring datafile 00003 to C:\ORACLEXE\APP\ORACLE\ORADATA\X
E\SYSAUX.DBF
channel ORA_DISK_1: restoring datafile 00004 to C:\ORACLEXE\APP\ORACLE\ORADATA\X
E\USERS.DBF
channel ORA_DISK_1: restoring datafile 00005 to C:\ORACLEXE\APP\ORACLE\PRODUCT\1
1.2.0\SERVER\DATABASE\TRABAJO.DBF
channel ORA_DISK_1: restoring datafile 00006 to C:\ORACLEXE\APP\ORACLE\PRODUCT\1
1.2.0\SERVER\DATABASE\OTRO.DBF
channel ORA_DISK_1: reading from backup piece C:\ORACLEXE\APP\ORACLE\FAST_RECOVE
RY_AREA\XE\BACKUPSET\2021_01_29\O1_MF_NNNDF_TAG20210129T002338_J16BTTFZ_.BKP
channel ORA_DISK_1: piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BA
CKUPSET\2021_01_29\O1_MF_NNNDF_TAG20210129T002338_J16BTTFZ_.BKP tag=TAG20210129T
002338
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:55
channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00007 to C:\ORACLEXE\APP\ORACLE\PRODUCT\1
1.2.0\SERVER\DATABASE\NUEVO.DBF
channel ORA_DISK_1: reading from backup piece C:\ORACLEXE\APP\ORACLE\FAST_RECOVE
RY_AREA\XE\BACKUPSET\2021_01_29\O1_MF_NNNDF_TAG20210129T010658_J16FD2Q8_.BKP
channel ORA_DISK_1: piece handle=C:\ORACLEXE\APP\ORACLE\FAST_RECOVERY_AREA\XE\BA
CKUPSET\2021_01_29\O1_MF_NNNDF_TAG20210129T010658_J16FD2Q8_.BKP tag=TAG20210129T
010658
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01
Finished restore at 29/01/21
RMAN> RECOVER DATABASE;

Starting recover at 29/01/21
using channel ORA_DISK_1

starting media recovery
media recovery complete, elapsed time: 00:00:01

Finished recover at 29/01/21
RMAN> SQL "ALTER DATABASE OPEN";

sql statement: ALTER DATABASE OPEN
```