



Oracle Database Complete (Full) Recovery: Zero Data Loss

Step By Step Plan and Explanation

<https://digitalksystems.com>

https://www.youtube.com/channel/UCCGTnI9vvF_ETMhGUXGdFWw

SCENARIO

- Last Full (Level 0) backup: **Sunday, 16 Nov @ 4:00 PM**
- Last Incremental Level 1 backup: **Today, 18 Nov @ 4:30 PM**
- Database crashed: **Today, 18 Nov @ 4:45 PM**

Goal

Perform **full complete recovery**: restore DB exactly to crash time (**4:45 PM**).

1. What Backups RMAN Will Use

RMAN uses these layers of recovery:

Level 0 backup

- Base image of database (full copy).

Level 1 incremental backup

- Contains all changed blocks from last L0/L1 until 4:30 PM today.

Archived redo logs

- Contain changes generated after the 4:30 PM L1 backup until the last log switch.

Online redo logs

- Contain the most recent changes from: (Last Archived log Till crash moment (4:45 PM))

This combination makes full, complete recovery possible.

2. How Recovery Will Bring the DB from 4:00 PM → 4:45 PM

Phase 1 — Restore Level 0 (16 Nov, 4 PM)

- This restores datafiles exactly as they were on Sunday.

Phase 2 — Apply Level 1 (18 Nov, 4:30 PM)

- This rollforwards all changes up to the incremental backup.

Phase 3 — Apply archived logs

- From **4:30 PM → last archived log today** (just before crash).
- These logs contain changes such as DML, commits, etc.

Phase 4 — Apply online redo (current redo)

- Online redo log contains changes **from the last archived log → crash time (4:45 PM)**.

Using this, Oracle rolls forward exactly to the moment of failure.



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3. COMPLETE ACTION PLAN (RMAN commands)

Step-1: Start RMAN and mount the database

```
rman target /  
SHUTDOWN IMMEDIATE;  
STARTUP MOUNT;
```

Step-2: Restore database (datafiles)

```
RMAN> RESTORE DATABASE;  
RMAN selects:
```

- Level 0 backup (base)
- Most recent control file (if needed)

Step-3: Recover the database (roll forward)

```
RMAN> RECOVER DATABASE;  
Internally RMAN applies:
```

- **Level 1 backup** (4:30 PM)
- **Archived logs** (4:30 → crash)
- **Online redo logs** (last few minutes → crash at 4:45 PM)

Step-4: Open database

```
SQL> ALTER DATABASE OPEN;
```

- **No RESETLOGS with OPEN**, because this is full recovery to the last SCN.

4. Internals: How Oracle Uses Redo to Recover to Crash Time

Archived Redo Logs

Example timeline:

- Seq 520 -> archived at 4:31 PM
- Seq 521 -> archived at 4:35 PM
- Seq 522 -> archived at 4:40 PM

RMAN applies them in order.

Online Redo Logs

Current redo log (NOT archived) contains:

- Changes from ~4:40 PM → 4:45 PM (crash)

This is critical because the L1 backup ended at 4:30.

Oracle reads these redo entries and applies them to bring DB up to the latest SCN.

This is how we recover *beyond* the last backup.



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5. Visual Timeline Diagram

Date / Time	Backup / Log Type	Contents / Purpose	Applied During Recovery Step
16 Nov 4:00 PM	Level 0 (Full Backup)	Full database image (base)	RESTORE DATABASE
18 Nov 4:30 PM	Level 1 Incremental Backup	Only changed blocks since last L0/L1	RECOVER DATABASE (rollforward)
18 Nov 4:30 PM → 4:40 PM	Archived Redo Logs	All transactions after L1 until last archived log	RECOVER DATABASE (apply archived logs)
18 Nov 4:40 PM → 4:45 PM	Online Redo Logs (Current)	Transactions between last archived log and crash	RECOVER DATABASE (apply online redo)
18 Nov 4:45 PM	Crash / Recovery Target SCN	Database state at crash	Database is opened to this exact moment

6. What If Something Is Missing? (Important)

Missing Component	Result	Explanation
Level 0	No recovery possible	Base image gone
Level 1	Recovery possible, but more redo required	RMAN uses L0 + lots of redo
Some archived logs	Complete recovery impossible → Only PITR	Oracle cannot reapply transactions
Online redo logs	Full recovery may still work if crash was earlier	If missing latest changes, PITR needed
Control file	Can recover if autobackup ON	RMAN restores control file

7. Pre-Recovery Checks (Essential)

Check archive logs:

RMAN> LIST ARCHIVELOG ALL;

Check incremental backups:

RMAN> LIST BACKUP OF DATABASE;

RMAN> LIST BACKUP OF ARCHIVELOG ALL;

Check restore points:

RMAN> REPORT NEED BACKUP;

8. Summary (Copy-Paste Professional Summary)

To perform full complete recovery after a crash at 4:45 PM:

RMAN will use:

- L0 backup from 16 Nov 4 PM
- L1 incremental backup from 18 Nov 4:30 PM
- Archived logs (4:30 PM → last archived before crash)
- Online redo logs (last few mins → 4:45 PM crash)

Recovery process:

- Restore database (L0)
- Apply L1 incremental
- Apply archived redo
- Apply online redo
- Open DB normally

Result:

Exact state of database at 4:45 PM (crash moment), no data loss.