

# E47

## A DBA's View of IMS Online Recovery Service

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# Introduction



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### ▶ Silicon Valley Lab (remotely)

- IMS Data Propagator
- Classic Connect

### ▶ Formerly

- ITSO IMS Specialist
- IMS Systems Programmer
- IMS DBA
- Application Programmer

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# Introduction



*The world depends on it*

- 
- This presentation was developed as a result of an ITSO **Redbook** residency
  
  - The **Redbook** number is **SG24-6112**
    - ▶ Available at [WWW.REDBOOKS.IBM.COM](http://WWW.REDBOOKS.IBM.COM)

# Objectives



- **Why use IMS ORS?**
- **What the DBA needs to know**
  - ▶ **Provide DBA's a working view of IMS ORS components**
  - ▶ **Changes in recovery options**
- **Walk through the new interface to recoveries**

# Why use IMS ORS?

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- **Remove need to run change accumulation**
  - ▶ **Data sharing environment**
  - ▶ **Concurrent update log data sets**
  
- **Read logs only once**
  - ▶ **Multiple DB recoveries**
  - ▶ **Don't have to merge logs or run last CA**

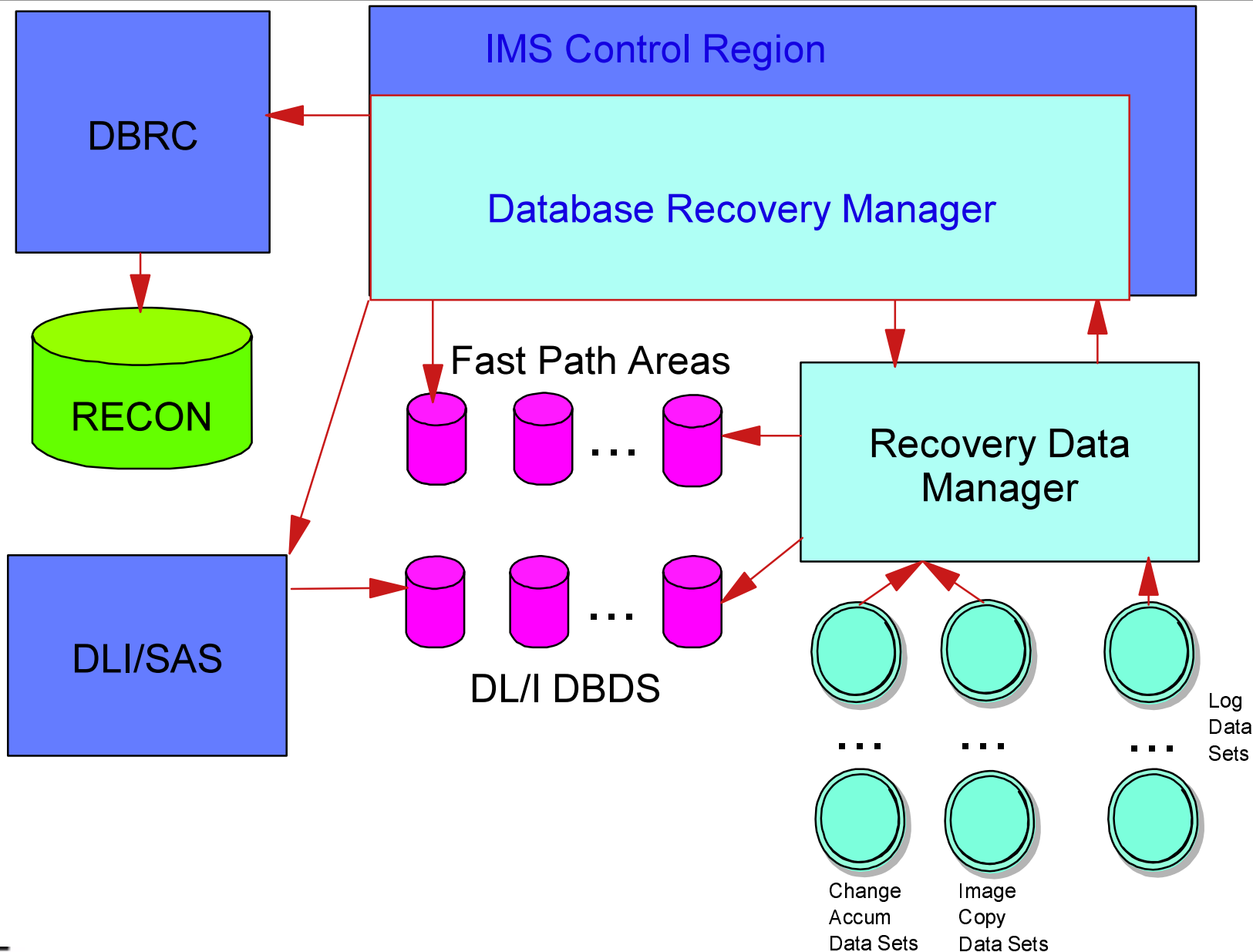
# Why use IMS ORS?

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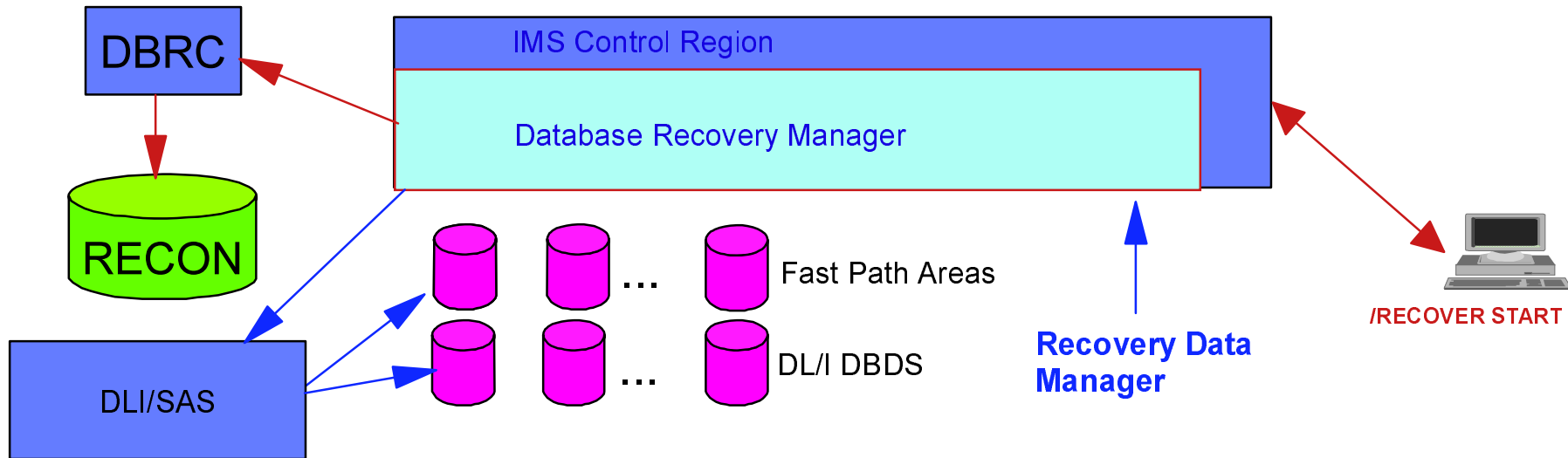


- **Point-in-time recoveries**
  - ▶ **Recovery to any valid timestamp**
  - ▶ **Only committed updates applied**
  
- **Simplified recovery procedures**
  - ▶ **IMS command interface**
  
  - ▶ **No JCL requirements**

# IMS ORS Components



# Database Recovery Manager



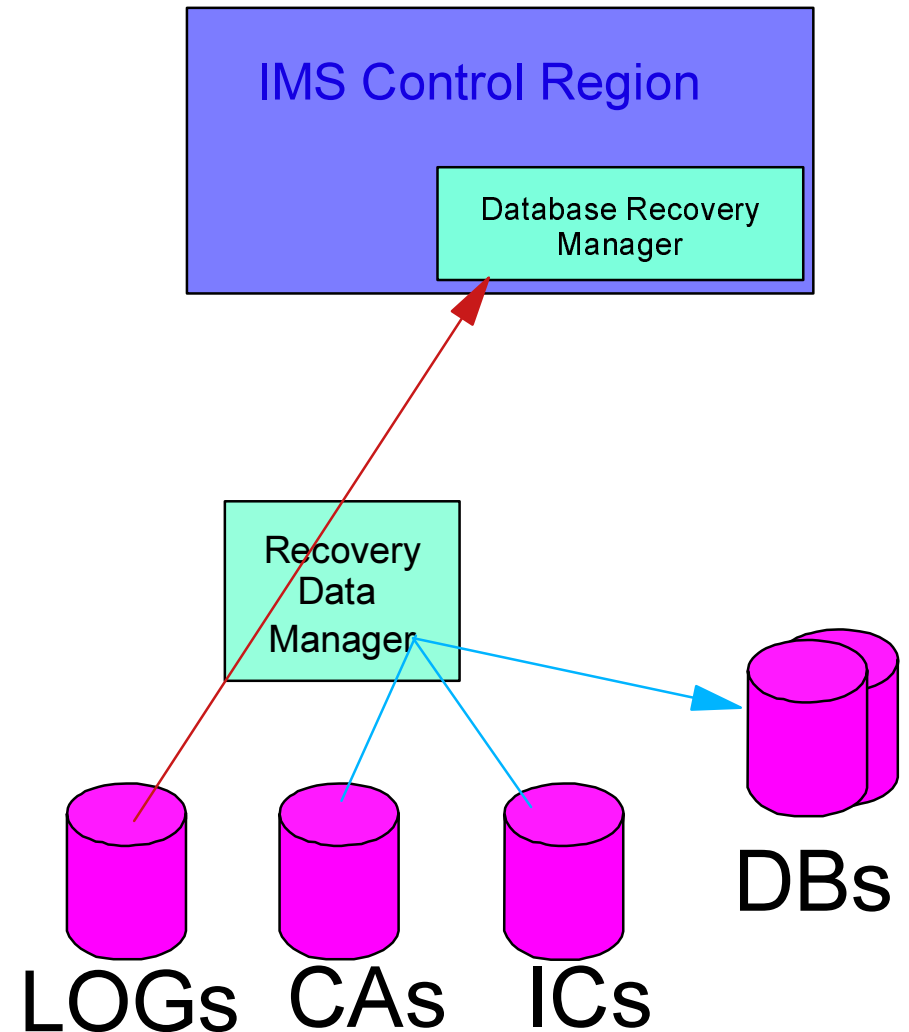
- **IMS modules running in the Control region**
- **Driven by IMS command processor**
- **Ensures operational readiness of recovery**
- **Initiates Recovery Data Manager (RDM) address space**
- **Receives streams of log data from RDM**
- **Passes log streams to DLISAS for update processing**
- **Coordinates recovery termination**



# Recovery Data Manager

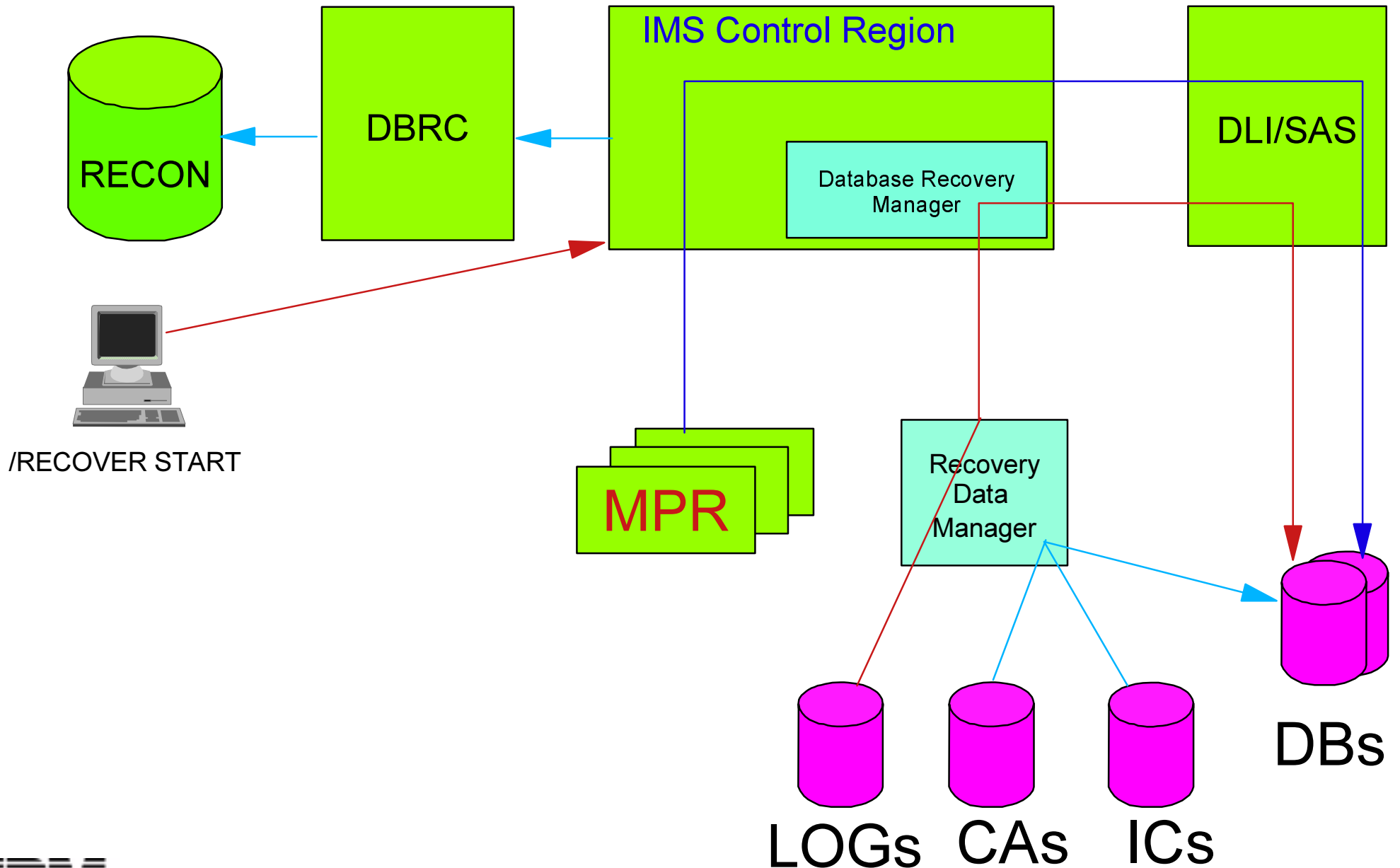


- **MVS address space**
  - ▶ Started on first /REC START command
  - ▶ Terminated by /REC TERM command
- **Function**
  - ▶ Reads IC data sets and restores database(s)
  - ▶ Reads and merges CA data sets onto database(s)
  - ▶ Merges log data into recovery stream and sends to DRM
    - RLDS if available
    - SLDS if RLDS in error
    - Can't read OLDS (can't start recovery with unarchived data)





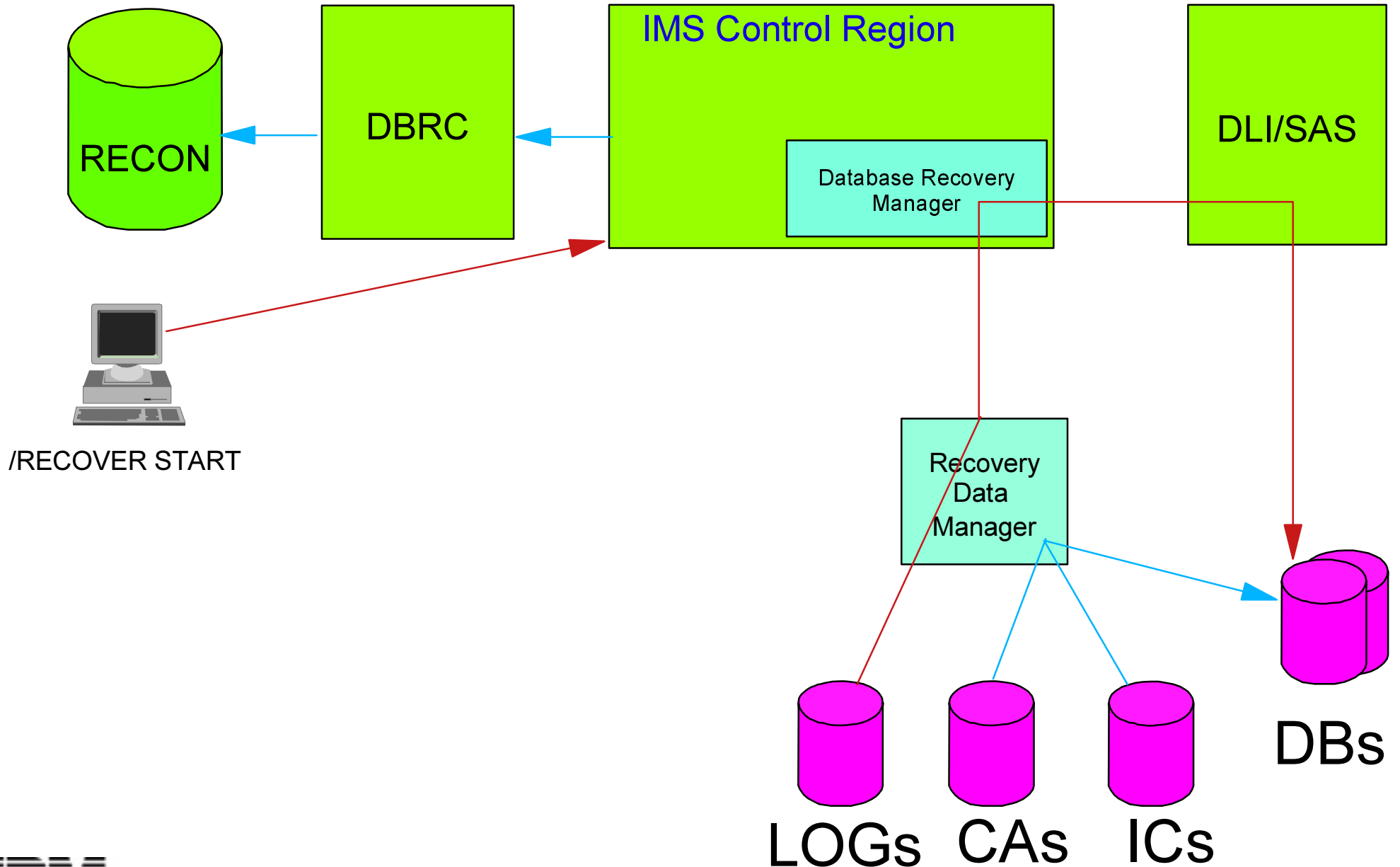
# Operational IMS system with ORS running



# ORS Only System



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# What the DBA needs to know



## ➤ Recovery Data Manager parameters

### ▶ Number of concurrent read operations available

- **READNUM**
- This number is the total number of volumes (cartridge and DASD) which can be used at one time
- Count includes IC, CA and log data sets
- IC and CA applied directly to databases
- Logs passed to Database Recovery Manager for updates

# What the DBA needs to know



- **Only one recovery can be STARTED in an IMS system**
  - ▶ **More than one recovery list can be built**
  - ▶ **Multiple IMS systems could run multiple recoveries concurrently (even in data sharing environment)**
  - ▶ **Any of the DBRC groups can be used to dynamically define databases to be recovered**
    - **Recovery groups (RECOVGRP)**
    - **Database dataset groups (DBDSGRP)**
    - **Database groups (DBGRP)**

# What the DBA needs to know



- ▶ **If using a stand alone IMS system to run IMS ORS**
  - ▶ **All databases must be defined via DATABASE macro commands in the IMS gen**
  - ▶ **RECONs should be shared with operational IMS system**
  - ▶ **Databases must be registered to DBRC**
  - ▶ **Databases must be offline from operational and stand alone IMS systems**

# What the DBA needs to know



- ▶ **IMS ORS uses the RECON definitions to dynamically allocate devices**
  - ▶ **TAPEUNIT/DASDUNIT on RECON header record**
  - ▶ **Must be set to valid unit devices for this MVS system**
  - ▶ **INIT/CHANGE.RECON**

# What the DBA needs to know



- **The data set allocation/attributes are outside the scope of IMS ORS**
  - ▶ **Data sets must already be allocated**
  - ▶ **IMS Version 7 support the VSAM REUSE option**
    - No longer do you have to delete/define VSAM clusters
  - ▶ **OSAM allows IMS to overwrite data set**
    - Multi-volume data set support
  - ▶ **To change any data set attributes**
    - Use traditional delete/define methods
    - Use ALTER



# Walk Through the Interface



- **IMS ORS is a JCL free recovery zone**
  - ▶ Recoveries are run in an **IMS online region**
  - ▶ **No Utility JCL to code**
  - ▶ **No skelatal JCL to modify**
- **IMS ORS is a Utility free zone**
  - ▶ **No decisions on which utilities to use**
  - ▶ **No multiple job recoveries to control**
- **IMS ORS is a single IMS command interface**
  - ▶ **One command fits all**
  - ▶ **/RECOVER**

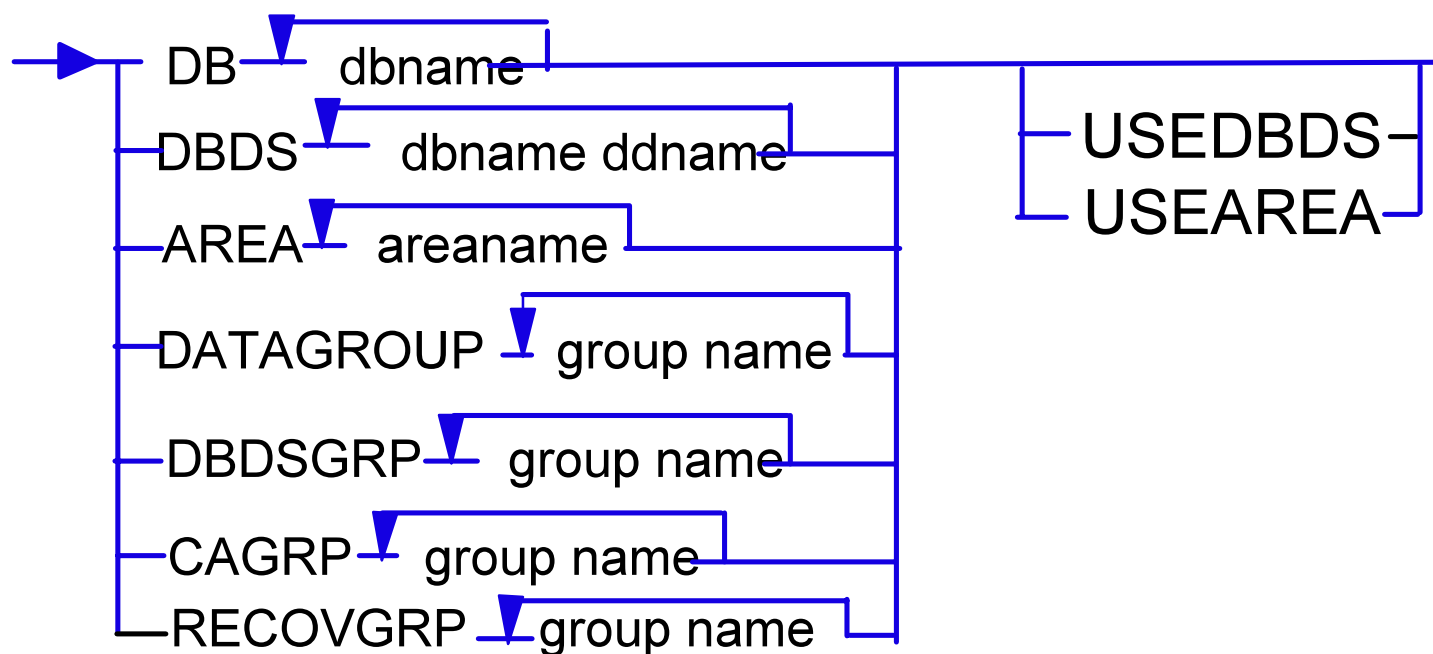
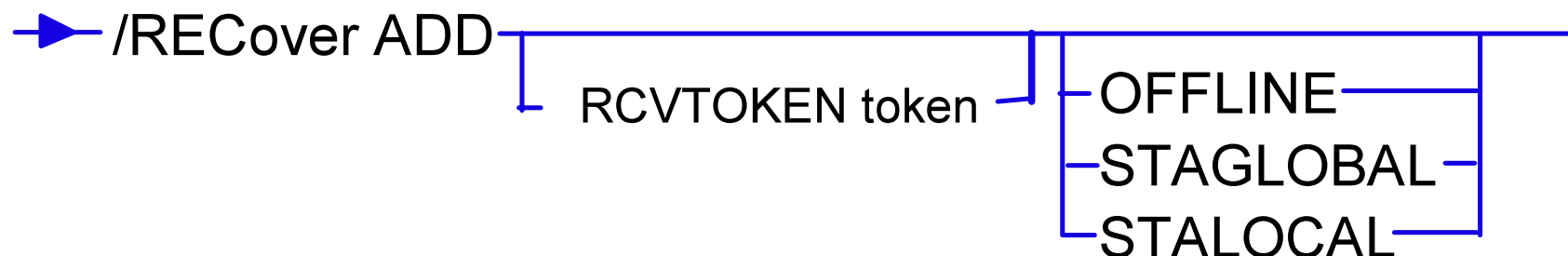
# Recovery Process



- **Build a recovery list**
  - ▶ **Define which databases are to be recovered**
- **Display a recovery list (optional)**
  - ▶ **Check to ensure correct databases included**
- **Modify a recovery list (if required)**
  - ▶ **Add/remove databases as required**
- **Start a recovery**
  - ▶ **Begin the execution of the recovery**
  - ▶ **Modify a recovery in progress**
- **Check completed recovery**

# Build a Recovery List

## ➤ /RECOVER ADD command



# Build a Recovery List



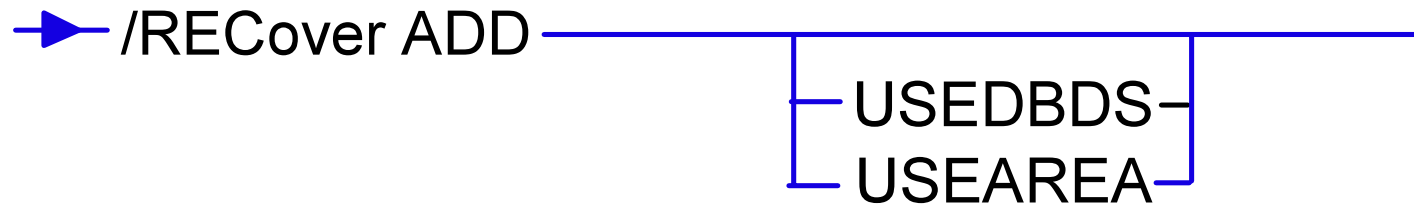
- If no token entered a default of DFSxxxxx is used, where xxxx is the next available number starting at 00001.
- If supplied and the list is already defined, then DB records will be added to the list.
- The list will be kept while this IMS system is active
- Many lists can be built but only one can be **STARTED**

# Build a Recovery List



- ▶ **Start option to be used upon successful completion of the recovery**
  - ▶ **Leave offline - default**
  - ▶ **Start databases on local IMS system**
  - ▶ **Start databases on all sharing IMS systems**

# Build a Recovery List



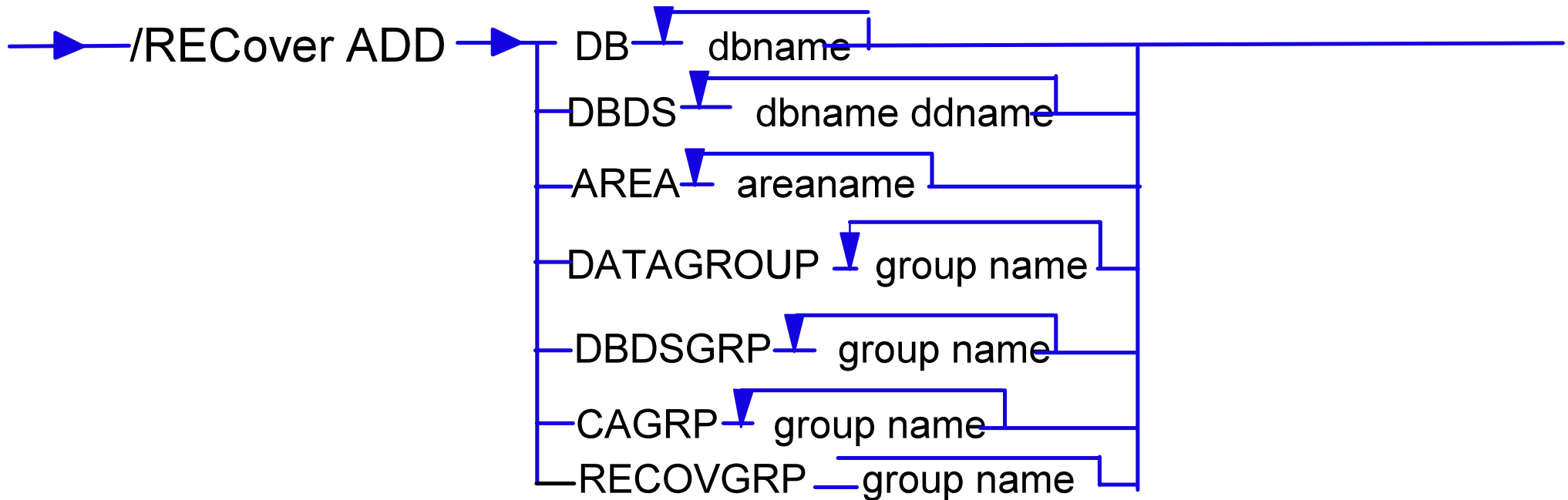
## ➤ Bypass the Image copy restore

▶ **USEDDBDS/USEAREA**

▶ **Only CA and Log data sets used**

▶ **Applied to already existing database data sets**

# Build a Recovery List



## ➤ Database data sets added

### ▶ By name

- DB
- DBDS
- AREA

## ➤ By RECON Group

- ▶ **DBDSGRP**
- ▶ **DBGGRP**
- ▶ **CAGRP**
- ▶ **RECOVGRP (new)**

# Build a Recovery List

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- **Recovery Group (RECOVGRP)**
  - ▶ **Group of data base which IMS ORS is to enforce recovery rules**
    - **All data base**



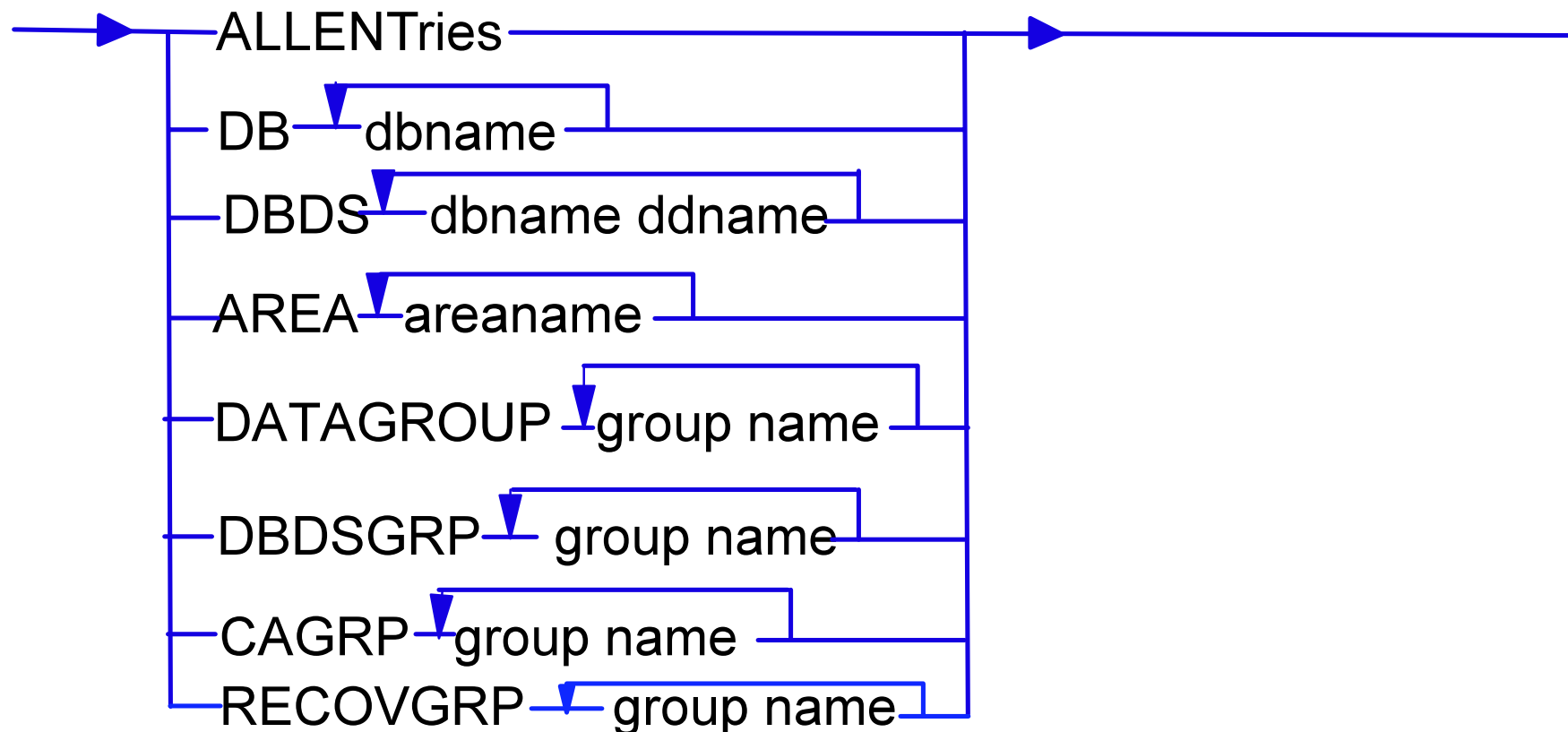
# Display a Recovery List



- 
- ▶ **/DISPLAY RECOVERY RCVTOKEN token**
  
  - ▶ **DBDS in recovery list (alphabetically)**
  
  - ▶ **START option for each DBDS**
  
  - ▶ **STATUS**
  
  - ▶ **Authorization**
    - **If DB is currently authorized to subsystem**
    - **IMSID or Jobname**

# Modify a Recovery List

➔ /RECOVER REMOVE \_\_\_\_\_ RCVTOKEN— token ➔



# Modify a Recovery List



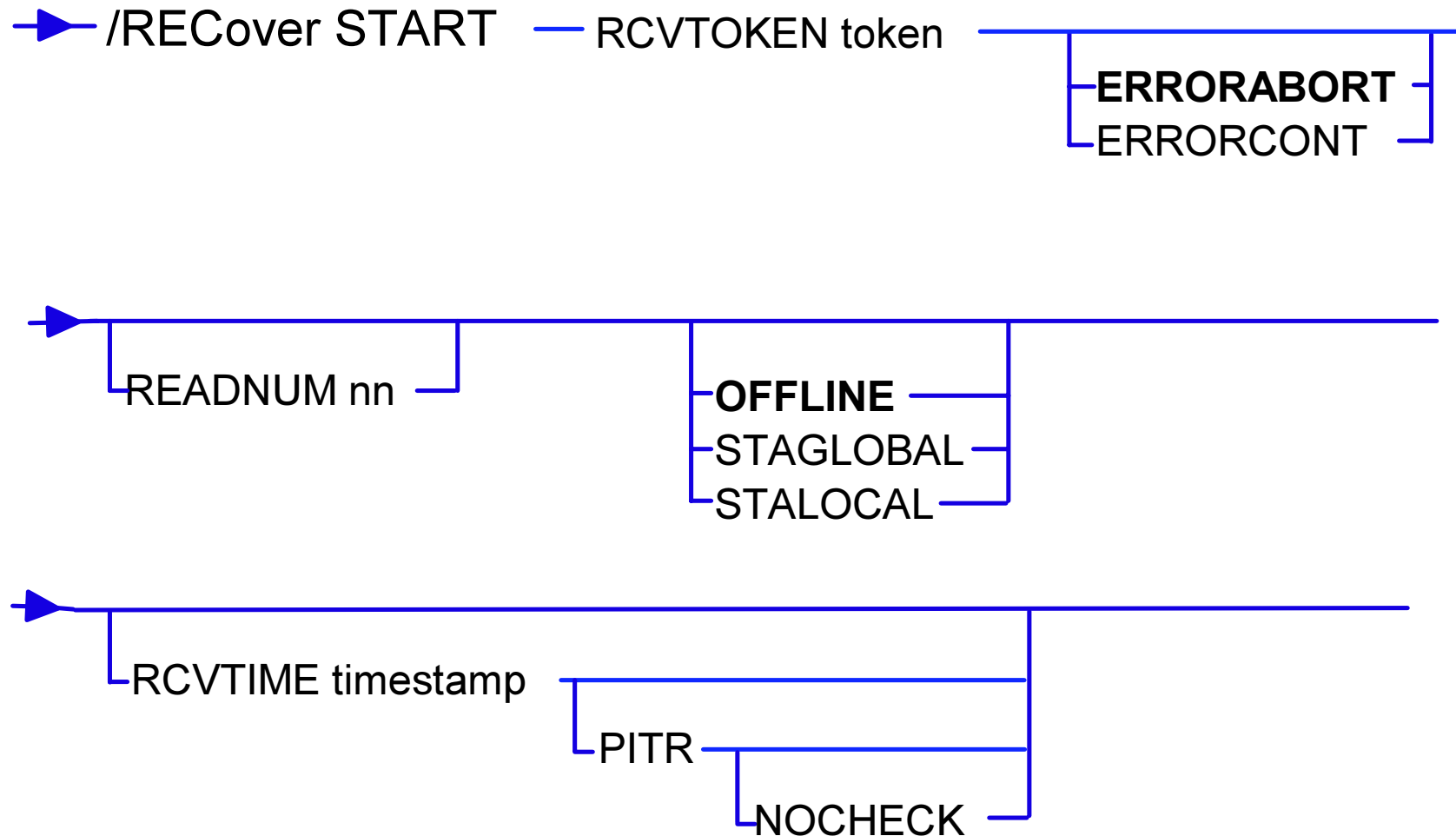
- **Can't modify a STARTED list**
- **Remove DBDS just like adding them**
  - ▶ **Individual**
  - ▶ **group**
- **ALLEN** removes entire list and list is deleted
- **Why use it?**
  - ▶ **Avoid creating one off groups**
  - ▶ **Add a group of databases**
  - ▶ **Remove one or two individual databases**
  - ▶ **Saves typing**

# Start a Recovery



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## ➤ /RECOVER START command





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# Start a Recovery

→ /RECOVER START — RCVTOKEN token

ERRORABORT
ERRORCONT

➤ Only one **STARTED** recovery per IMS system

➤ **ERRORABORT**

▶ Abort recovery on first error

▶ All databases left with **RECOVERY NEEDED**

▶ List is kept

# Start a Recovery



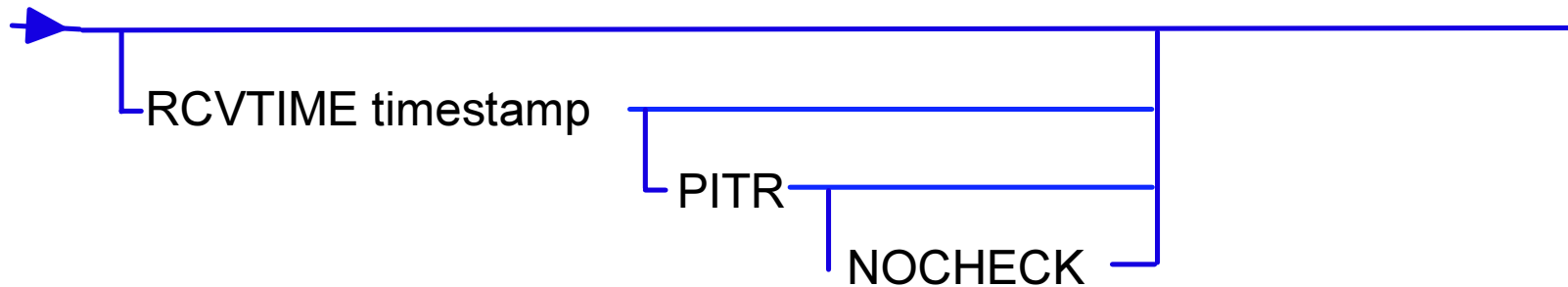
→ /RECOVER START — RCVTOKEN token

ERRORABORT
ERRORCONT

## ➤ ERRORCONT

- ▶ Abort recovery for a database on first error
- ▶ Only databases not recovered left with RECOVERY NEEDED
- ▶ List is not kept

# Start a Recovery



## ➤ Timestamp

- ▶ Any valid timestamp
- ▶ Any valid format

## ➤ PITR (Point In Time Recovery)

- ▶ if not present then timestamp must be valid DBRC timestamp
- ▶ IMAGE COPY NEEDED flag set

## ➤ NOCHECK

- ▶ Do check for consistence across a RECOVERY group

# IMS ORS Example



- 
- **Recovery 2 HALDB databases and 2 partitioned Secondary index databases**
  - **Commands issued from IMS terminal**



# Display Before Recovery



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/DISPLAY DB DFXCSTP DFXBALY DFXZIPY DFXPRDP

DATABASE	TYPE	TOTAL	UNUSED	TOTAL	UNUSED	ACC	CONDITIONS
DFXCSTP	PHIDAM					UP	
CUST1	PART					UP	ALLOCS
CUST2	PART					UP	ALLOCS
CUST3	PART					UP	ALLOCS
CUST4	PART					UP	ALLOCS
CUST5	PART					UP	ALLOCS
CUST6	PART					UP	ALLOCS
DFXBALY	PSINDEX					UP	
BAL1	PART					UP	ALLOCS
DFXZIPY	PSINDEX					UP	
ZIP1	PART					UP	ALLOCS
DFXPRDP	PHDAM					UP	
PROD1	PART					UP	ALLOCS
PROD2	PART					UP	ALLOCS
*00153/122652*							

# Build Recovery List



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```
/RECOVER ADD RCVTOKEN APL1RECV DB DFXCSTP DFXBALY DFXZIPY DFXPRDP
```

```
DFS058I 17:20:13 RECOVER COMMAND IN PROGRESS
```

```
DFS4263I THE FOLLOWING ENTRIES ARE ADDED TO THE APL1RECV RECOVERY LIST:
```

```
DFS4265I BAL1 BAL1A
```

```
DFS4265I CUST1 CUST1A
```

```
DFS4265I CUST2 CUST2A
```

```
DFS4265I CUST3 CUST3A
```

```
DFS4265I CUST4 CUST4A
```

```
DFS4265I CUST5 CUST5A
```

```
DFS4265I CUST6 CUST6A
```

```
DFS4265I PROD1 PROD1A
```

```
DFS4265I PROD2 PROD2A
```

```
DFS4265I ZIP1 ZIP1A
```

# Display Recovery List



/DISPLAY RECOVERY RCVTOKEN APL1RECV

\*\*\*\* RECOVERY LIST INFORMATION \*\*\*\*

TOKEN	STATUS	ERROR	OPTION	RECOVERY	TYPE
APL1RECV	BEING BUILT	N/A		N/A	

\*\*\*\* RECOVERY LIST ENTRY INFORMATION \*\*\*\*

DATABASE	DATA SET	START	OPTION	STATUS	AUTH	SSID
BAL1	BAL1A	OFFLINE		NORMAL	IMSR	
CUST1	CUST1A	OFFLINE		NORMAL	IMSR	
CUST2	CUST2A	OFFLINE		NORMAL	IMSR	
CUST3	CUST3A	OFFLINE		NORMAL	IMSR	
CUST4	CUST4A	OFFLINE		NORMAL	IMSR	
CUST5	CUST5A	OFFLINE		NORMAL	IMSR	
CUST6	CUST6A	OFFLINE		NORMAL	IMSR	
PROD1	PROD1A	OFFLINE		NORMAL	IMSR	
PROD2	PROD2A	OFFLINE		NORMAL	IMSR	
ZIP1	ZIP1A	OFFLINE		NORMAL	IMSR	

\*00153/183333\*

# DBR Databases



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---

/DBR DB CUST1 CUST2 CUST3 CUST4 CUST5 CUST6 BAL1 ZIP1 PROD1 PROD2

DFS058I 12:10:14 DBRECOVERY COMMAND IN PROGRESS

DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	CUST1	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	CUST2	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	CUST3	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	CUST3	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	CUST4	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	CUST5	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	CUST6	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	BAL1	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	ZIP1	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	PROD1	RC=	0
DFS0488I	DBR	COMMAND	COMPLETED.	DBN=	PROD2	RC=	0

# Display After DBR



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/DIS DB DFXCSTP DFXBALY DFXZIPY DFXPRDP

DATABASE	TYPE	TOTAL	UNUSED	TOTAL	UNUSED	ACC	CONDITIONS
DFXCSTP	PHIDAM					UP	
CUST1	PART					UP	STOPPED, NOTOPEN
CUST2	PART					UP	STOPPED, NOTOPEN
CUST3	PART					UP	STOPPED, NOTOPEN
CUST4	PART					UP	STOPPED, NOTOPEN
CUST5	PART					UP	STOPPED, NOTOPEN
CUST6	PART					UP	STOPPED, NOTOPEN
DFXBALY	PSINDEX					UP	
BAL1	PART					UP	STOPPED, NOTOPEN
DFXZIPY	PSINDEX					UP	
ZIP1	PART					UP	STOPPED, NOTOPEN
DFXPRDP	PHDAM					UP	
PROD1	PART					UP	STOPPED, NOTOPEN
PROD2	PART					UP	STOPPED, NOTOPEN
*00153/171142*							

# Start Recovery



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---

/RECOVERY START RCVTOKEN APL1RECV

DFS058I 13:21:42 RECOVER COMMAND IN PROGRESS

DFS4264I RECOVERY STARTED FOR (APL1RECV,ERRORABORT) :

DFS4265I BAL1 BAL1A

DFS4265I CUST1 CUST1A

DFS4265I CUST2 CUST2A

DFS4265I CUST3 CUST3A

DFS4265I CUST4 CUST4A

DFS4265I CUST5 CUST5A

DFS4265I CUST6 CUST6A

DFS4265I PROD1 PROD1A

DFS4265I PROD2 PROD2A

DFS4265I ZIP1 ZIP1A

# Display of DBs During Recovery



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```
/DIS DB CUST1 CUST2 CUST3 CUST4 CUST5 CUST6
```

DATABASE	TYPE	TOTAL	UNUSED	TOTAL	UNUSED	ACC	CONDITIONS
DFXCSTP	PHIDAM					UP	
CUST1	PART					UP	NOTOPEN, RECOVERY
DFXCSTP	PHIDAM					UP	
CUST2	PART					UP	NOTOPEN, RECOVERY
DFXCSTP	PHIDAM					UP	
CUST3	PART					UP	NOTOPEN, RECOVERY
DFXCSTP	PHIDAM					UP	
CUST4	PART					UP	NOTOPEN, RECOVERY
DFXCSTP	PHIDAM					UP	
CUST5	PART					UP	NOTOPEN, RECOVERY
DFXCSTP	PHIDAM					UP	
CUST6	PART					UP	NOTOPEN, RECOVERY

# Display of Rec List During Recovery

---



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\*\*\*\* RECOVERY LIST INFORMATION \*\*\*\*

TOKEN	STATUS	ERROR OPTION	RECOVERY TYPE
APL1RECV	STARTED	ERRORABORT	FULL

\*\*\*\* RECOVERY PROGRESS INFORMATION \*\*\*\*

TOKEN	LAST PROCESSED	RCVTIME
APL1RECV	0000.000	00:00:00.0
		N/A



# Recovery Completed



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```
DFS4277I RECOVERY COMPLETE FOR: BAL1 BAL1A
DFS4277I RECOVERY COMPLETE FOR: CUST1 CUST1A
DFS4277I RECOVERY COMPLETE FOR: CUST2 CUST2A
DFS4277I RECOVERY COMPLETE FOR: CUST3 CUST3A
DFS4277I RECOVERY COMPLETE FOR: CUST4 CUST4A
DFS4277I RECOVERY COMPLETE FOR: CUST5 CUST5A
DFS4277I RECOVERY COMPLETE FOR: CUST6 CUST6A
DFS4277I RECOVERY COMPLETE FOR: PROD1 PROD1A
DFS4277I RECOVERY COMPLETE FOR: PROD2 PROD2A
DFS4277I RECOVERY COMPLETE FOR: ZIP1 ZIP1A
```

```
DFS4285I END OF RECOVERY FOR: APL1RECV
```

# Messages from RDM



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```
DFS4222I IMAGE COPY RESTORE COMPLETE: BAL1 BAL1A
DFS4222I IMAGE COPY RESTORE COMPLETE: CUST4 CUST4A
DFS4222I IMAGE COPY RESTORE COMPLETE: CUST1 CUST1A
DFS4222I IMAGE COPY RESTORE COMPLETE: CUST5 CUST5A
DFS4222I IMAGE COPY RESTORE COMPLETE: CUST2 CUST2A
DFS4222I IMAGE COPY RESTORE COMPLETE: CUST6 CUST6A
DFS4222I IMAGE COPY RESTORE COMPLETE: CUST3 CUST3A
DFS4222I IMAGE COPY RESTORE COMPLETE: ZIP1 ZIP1A
DFS4222I IMAGE COPY RESTORE COMPLETE: PROD2 PROD2A
DFS4222I IMAGE COPY RESTORE COMPLETE: PROD1 PROD1A

DFS4219I 00000000 RECORDS PROCESSED
```

# Start Recovery while databases online

---



/RECOVERY START RCVTOKEN APL1RECV

DFS058I 13:44:18 RECOVER COMMAND IN PROGRESS

DFS4266I UNABLE TO RECOVER: BAL1 BAL1A , **NOT OFFLINE**

DFS4267I RECOVERY NOT STARTED, ERRORABORT SPECIFIED

# Partially completed Recovery List



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```
DFS4278I UNABLE TO COMPLETE RECOVERY FOR:  BAL1      BAL1A IMSR
DFS4278I UNABLE TO COMPLETE RECOVERY FOR:  CUST1      CUST1A IMSR
DFS4277I RECOVERY COMPLETE FOR:  CUST2      CUST2A IMSR
DFS4278I UNABLE TO COMPLETE RECOVERY FOR:  CUST3      CUST3A IMSR
DFS4277I RECOVERY COMPLETE FOR:  CUST4      CUST4A IMSR
DFS4278I UNABLE TO COMPLETE RECOVERY FOR:  CUST5      CUST5A IMSR
DFS4277I RECOVERY COMPLETE FOR:  CUST6      CUST6A IMSR
DFS4277I RECOVERY COMPLETE FOR:  PROD1      PROD1A IMSR
DFS4277I RECOVERY COMPLETE FOR:  PROD2      PROD2A IMSR
DFS4277I RECOVERY COMPLETE FOR:  ZIP1       ZIP1A IMSR
DFS4285I END OF RECOVERY FOR:  APL1RECV IMSR
```

# Adding Non-Register Database

---



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```
/RECOVER ADD RCVTOKEN APL2RECV DB DFXCLAP DFXSTUP
```

```
DFS4261I UNABLE TO ADD TO APL2RECV DATABASE DFXCLAP:NOT DEFINED IN RECON
```



# RMLIST command example

```
/RMLIST DBRC='DB DBD (DFXSTUP) '
```

```
LIST.DB DBD (DFXSTUP)
```

-----  
DB

```
DBD=DFXSTUP                                DMB#=35          TYPE=IMS
SHARE LEVEL=1                               GSGNAME=**NULL**  USID=0000000001
AUTHORIZED USID=0000000000 RECEIVE USID=0000000000 HARD USID=00000000
RECEIVE NEEDED USID=0000000000
DBRCVGRP=APL2RECG
```

FLAGS:

```
BACKOUT NEEDED          =OFF
READ ONLY                =OFF
PROHIBIT AUTHORIZATION=OFF
RECOVERABLE              =YES

TRACKING SUSPENDED      =NO
OFR REQUIRED              =NO
```

COUNTERS:

```
RECOVERY NEEDED COUNT    =0
IMAGE COPY NEEDED COUNT  =0
AUTHORIZED SUBSYSTEMS    =0
HELD AUTHORIZATION STATE=0
EEQE COUNT                =0
RECEIVE REQUIRED COUNT    =0
```