



# **Disk Mirroring Operator Guide**

ND 200701 EN





# **Disk Mirroring Operator Guide**

ND-30.070.1 EN

## Preface:

### THE PRODUCT

This Operator Guide documents the

ND Disk Mirroring ND 210855

version C, as implemented under SINTRAN III version J or later.

### THE READER

This manual should be read by all system operators (supervisors) in charge of installing, loading, testing and maintaining the product listed above.

### PREREQUISITE KNOWLEDGE

Detailed knowledge of the operating procedures of SINTRAN III (version J or later) is assumed. Thorough understanding of the operational procedures of the file or database system used is also advisable.

### RELATED MANUALS

The following manuals supply additional information about products closely related to Disk Mirroring.

|  |              |
|--|--------------|
| FTX Configuration Management Guide     | ND-30.069 EN |
| Error Logger Operator/Programmer Guide | ND-20.014 EN |
| SINTRAN III Reference Manual           | ND-60.128 EN |
| SINTRAN III System Supervisor Manual   | ND-30.003 EN |
| COSMOS Operator Guide                  | ND-30.025 EN |
| SIBAS II Operator's manual             | ND-30.009 EN |





## TABLE OF CONTENTS

| Section   | Page   |
|---|--------|
| 1 INTRODUCTION . . . . .  | 1      |
| 1.1 Disk Mirroring . . . . .                                    | 3      |
| 1.2 The Fundamental Operating Principles . . . . .              | 3      |
| 1.3 The Product ND Disk Mirroring . . . . .                     | 4      |
| 1.4 Some Key Terms and Definitions . . . . .                    | 4      |
| 1.5 Functions . . . . .   | 5      |
| 1.5.1 Low level functions . . . . .                             | 5      |
| 1.6 Reviving . . . . .  | 6      |
| 1.7 The DIMIR-MANAGER Commands . . . . .                        | 6      |
| 2 OPERATING DISK MIRRORING . . . . .                            | 9      |
| 2.1 Uses of the Disk Mirroring . . . . .                        | 11     |
| 2.2 Starts/Restarts of the System . . . . .                     | 11     |
| 2.3 The LOAD- and HENT-MODE Files . . . . .                     | 12     |
| 2.4 Taking Backup while Applications are Running . . . . .      | 13     |
| 2.4.1 On-line Backup without Running Disk Mirroring Permanently | 14     |
| 2.4.2 On-line Backup while Running Disk Mirroring . . . . .     | 17     |
| 2.4.3 On-line Backup Without Turning Mirroring Off . . . . .    | 17     |
| 3 HARDWARE CONSIDERATIONS . . . . .                             | 19     |
| 3.1 Disk Drives . . . . .                                       | 21     |
| 3.2 Disk Controllers . . . . .                                  | 21     |
| <br><u>APPENDIX</u>   |        |
| A THE DIMIR-MANAGER COMMANDS . . . . .                          | 23     |
| <br>Index   | <br>61 |





## CHAPTER 1

### INTRODUCTION





## **1 INTRODUCTION**

This chapter gives an introductory overview of the Disk Mirroring (DIMIR) product. It also explains some of the fundamental operating principles of a typical (standard) Disk Mirroring implementation.

### **1.1 Disk Mirroring**

The Disk Mirroring mechanism in SINTRAN III makes it possible to duplicate data. This increases the database integrity and availability.

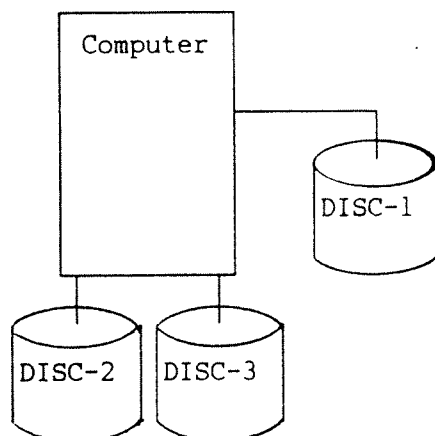
The addition of extra disks, and the duplication of data, are invisible to the application programs. The advantages thus gained are twofold:

- Security against disk failures is improved.
- Backups can be taken while applications (e.g. database systems) are running, hence increased availability.

### **1.2 The Fundamental Operating Principles**

The fundamental operating principles of Disk Mirroring are quite simple. As seen from the operating system, the complete set of discs connected to the machine may be looked upon as a contiguous storage area.

In the example below, three different discs are connected to the computer.



DISC-1 is the system disk (70MB) in this configuration, containing the directory PACK-ONE. DISC-2 is used for storage of the application data and DISC-3 is an exact copy, a mirror, of DISC-2.

When Disk Mirroring is turned on, all write operations to DISC-2 are also done on DISC-3. This is done in two separate write operations, where the second write operation may be done in parallel with the first one depending on the hardware configuration.

### **1.3 The Product ND Disk Mirroring**

The Disk Mirroring system consists of four software modules:

Mirroring Module - This module is additions/changes to the operating system disk I/O routines. The operation of this module is controlled by a Disk Mirroring (DM) Table.

MON SYSU - A monitor call used for controlling Disk Mirroring.

REVIVE - An RT-program which enables copying from one disk to another, while the disks are available for ordinary use.

DIMIR-MANAGER - This program is the operator command interface to the Disk Mirroring modules.

In addition, this version of Disk Mirroring uses the Error Logger (FTXEL and FTXWD) for error reporting. However, this is mainly hidden for the operator. For detailed description and operating procedures on the error logger, contact your local ND representative.

### **1.4 Some Key Terms and Definitions**

MEMBER - A Member is either a directory, disk area/partitioning, or all directories on a disk unit.

DISK CLUSTER - A disk cluster consists of two or three members each exact copies of one other. All members of a cluster must have the same logical size.

PRIMARY - Only Member 1 of a disk cluster is seen by the operating system and is called the primary. Only primaries can contain entered directories.

SECONDARIES - Member 2 and Member 3 are called secondaries. For backup purposes it is possible to share Member 3 between different clusters.



NO UPDATE AREAS - It may occasionally be desirable to temporarily exclude selected areas from the mirroring process. For this purpose, "no update areas" may be defined.

REVIVE - Disk Mirroring provides the facility of on-line copying between members. This process is called REVIVE and may be used in parallel with normal activity on the cluster.

CONNECTED - A CONNECTED member is logically attached to a cluster and may be operated on.

VALID - A VALID member means that the member is flagged as a fully updated and consistent member as seen from the Disk Mirroring software. Note that this does not necessarily mean that any database on this member is consistent.

## 1.5 Functions

### 1.5.1 Low level functions

Write operations - All write operations issued to the primary (Member 1) in a cluster are also automatically performed on the secondary members (invisible to the applications and to most of SINTRAN), in order to keep them equal.

Read operations - A read operation will be performed on only one of the members. If there is more than one valid member then it is possible to distribute the read operations between two of the members. This may in certain cases increase throughput by between 40% and 80%.

If read distribution is disabled, all read operations will be done on the first valid member. If read distribution is enabled and a read distribution border specified, then read operations above the border will be done on the first valid member and those below on the second valid member.

If you have a SINTRAN running with disk sorting (K version or later) it is possible to use a more efficient scheme. Read operations are then performed on the member with the shortest queue length. This is achieved by enabling read distribution and setting the read distribution border to 0. This dynamic distribution is recommended when parallel seek is possible, i.e. when the members are on different controllers or when they are on different units on a controller with parallel seek.

In addition, a new operation, concatenated read and write, is defined. This operation performs a direct copying of the contents of a disk area from a member to one or two other members. All disk transfer to the same area is suspended until the "atomic" read/write is finished. This provides a safe way of doing revive concurrently with other use of the disks in the cluster.

### 1.6 Reviving

The revive function may, in the current version of Disk Mirroring, be performed onto a member, or onto a no-update area on the member. Applications may run in parallel with reviving, the difference being only some degradation in disk I/O performance. The degradation depends on the revive time and the I/O capacity for other purposes.

The I/O capacity taken by the REVIVE program is determined by setting the <Revive Cycle Delay> parameter and the <Revive Priority> parameter in the commands Set-Revive-Priority and Set-Revive-Cycle-Delay (see appendix A).

The revive time is also dependent upon the number of buffer pages set in the command Set-Revive-Buffer-Size (see appendix A).

### 1.7 The DIMIR-MANAGER Commands

The DIMIR-MANAGER command syntax in Disk Mirroring is as in SINTRAN III, that is, all commands may be abbreviated and parameters are separated by a space or comma.

In this version of the command program the commands may be divided into the following command levels:

NORMAL            The commands most frequently used.

EXTENDED        Less frequently used commands.



Below, all the normal and extended commands of the DIMIR-MANAGER program are listed. You should note that the commands in the extended set are only for special purposes and requires special precautions. For a complete description of each command, see Appendix A.

|                              |                                 |
|------------------------------|---------------------------------|
| Normal commands:             |                                 |
| Define-Cluster               | Set-Read-Distribution           |
| Enable-Mirroring             | Define-Read-Distribution-Border |
| Disable-Mirroring            | Define-No-Update-Area           |
| Revive-Member                | Enable-No-Update-Area           |
| Connect-Member               | Disable-No-Update-Area          |
| Disconnect-Member            | Revive-Area                     |
| Cluster-Status               | Set-Revive-Buffer-Size          |
| Set-Command-Level            | Set-Revive-Priority             |
| List-Disk-Devices            | Set-Revive-Cycle-Delay          |
| Decode-Disk-Hardware-Status  | Program-Status                  |
| Print-Disk-Error-Information | Exit                            |
| Priority-Select              | Help                            |
| Release                      | CC                              |
| Delete-Cluster               |                                 |
| Extended commands:           |                                 |
| Set-Valid                    | Stop-Revive                     |
| Inhibit-Member               | Parity-Check                    |
| Set-Error-Warning-Limit      | Print-Disk-Layout-Table         |



CHAPTER 2

OPERATING DISK MIRRORING





## **2 OPERATING DISK MIRRORING**

### **2.1 Uses of the Disk Mirroring**

There are two reasons for using the Disk Mirroring:

- Security against disk failure, possibly also disk controller failure. This is achieved by constant running Disk Mirroring with two or more valid copies of the data on line. This use of mirroring should be avoided on system disks.
- Taking backup copies while applications are running. This requires use of the Disk Mirroring only during the actual backup process.

These two ways of using the Disk Mirroring may of course be combined.

- One member may be removable and then used as backup.
- One member may be disconnected and the backup-system used to take a copy to either disk or tape.
- A third way is to share a removable disk as secondary-2 between multiple cluster and use this for backup purposes. Each cluster can then always have two valid copies online.

In all cases, however, be sure to disconnect all members residing on a disk pack before it is dismounted. Conversely, always connect the member involved when mounting a new disk pack.

### **2.2 Starts/Restarts of the System**

If Disk Mirroring is used as a security against disk failure, the normal procedure would be to define a cluster after each cold start (i.e. in the HENT-MODE file). If you are running a standard SINTRAN version, all device names must be defined in advance.

If not previously defined, you must define the device names:

```
@DEFINE-MASS-STORAGE-UNIT DISC-70MB-1,1,, ~  
@DEFINE-MASS-STORAGE-UNIT DISC-70MB-2,0,, ~
```

Then you define these devices as members in a cluster.

```
@DIMIR-MANAGER ~  
DEFINE-CLUSTER 1,DISC-70MB-1,1,DISC-70MB-2,0,,, ~  
EXIT ~
```

To verify that the cluster definition is OK, use the CLUSTER-STATUS command. As you can see, the disk DISC-70MB-1 unit 1 has become the primary (Member 1), the DISC-70MB-2 unit 0 has become a secondary (Member 2). You should note that although the disk cluster has been defined, it is not yet active.

The procedure above will store cluster information both on the members of the cluster and on the image area of SINTRAN. This means that cluster definitions and status will be available after a warm-start of the system (warm-start).

Note that it is not advisable to run Disk Mirroring on the system disk (PACK-ONE). The reason for this is that the image-area information will probably be incorrect after a change of system disks.

### 2.3 The LOAD- and HENT-MODE Files

The following should be done after each restart (warm-start) of the system (i.e. in the LOAD-MODE or LOAD-SYSTEM file).

```
@CC Define all device names when standard SINTRAN
@DEFINE-MASS-STORAGE-UNIT DISC-70MB-1,1,,
@DEFINE-MASS-STORAGE-UNIT DISC-70-MB-2,0,,
@CC
@DIMIR-MANAGER
CC Mirroring is first disabled to avoid destruction of last
CC written cluster information on members.
DISABLE-MIRRORING 1
CC
CC Then all members in the cluster is connected to allow fetching
CC of cluster status information.
CONNECT-MEMBER 1 1 NO
CONNECT-MEMBER 1 2 NO
CC
CC And then mirroring is enabled with last recorded status.
CC Revive will be performed when necessary
ENABLE-MIRRORING 1 YES YES
EXIT
@CC
@CC Now enter the directory(s)
@ENTER-DIRECTORY ,DISC-70MB-1,1
```

#### **2.4 Taking Backup while Applications are Running**

If you are running SIBAS and want to take backup while the database system is running, you need the SIBAS II version E10. This is because "on-the-fly" backup requires the possibility of check-pointing and then locking the database.

With older versions of SIBAS or with any other database system, the database must be stopped, in the same way as when a backup is taken without the Disk Mirroring. In general, the steps to follow should be:

- Make certain that your disk is mirrored/revived (i.e., the backup is an exact copy of the original).
- Take a check-point of the database and 'freeze' it
- Disconnect the backup member.
- Release the database from its 'freeze'.
- Remove the backup disk pack.

In the following examples the database system SIBAS II version E10 is used. If you are running any other database, the normal database backup steps, except the copying, must be taken when the SIBAS FTX commands are given. In all the examples it is assumed that the database is initialized and in running state using SIBAS process number 0. If you aren't using any database system, skip the commands concerning SIBAS.

#### **2.4.1 On-line Backup without Running Disk Mirroring Permanently**

If you just want to use the Disk Mirroring for backup purposes, a cluster must be defined before the on-line backup is done. You must turn mirroring on and do a revive before each backup. Place the commands in a mode file which is started each time you want to take a backup.



Define the cluster:

```
@DIMIR
DIM:DELETE-CLUSTER,1
DIM:DEFINE-CLUSTER,1,DISC-70-1,1,DISC-70-2,0,,,
```

Turn mirroring on, and do a revive:

```
DIM:ENABLE-MIRRORING,1,NO,YES
DIM:EXIT
```

Take a check-point of the database:

```
@SIBAS-SERVICE
Explanation ?NO
Status for all SIBAS-processes ?NO
SYSTEM NUMBER :0
>>DATABASE-STATUS
>>OPEN-DATABASE,YES,<password>
>>BACKUP-FTX
>>EXIT
```

Disconnect Member 2:

```
@DIMIR
DIM:DISCONNECT-MEMBER 1,2      (see WARNING below).
DIM:EXIT
```

Release SIBAS:

```
@SIBAS-SERVICE
Explanation ?NO
Status for all SIBAS-processes ?NO
SYSTEM NUMBER :0
>>CONTINUE-FTX
>>CLOSE-DATABASE
>>DATABASE-STATUS
>>EXIT
```

Member 2 may now be removed for backup purposes.

WARNING: When releasing a member for backup purposes, you should use the command Disconnect-Member. If you use Disable-Mirroring essential status information on the disk will be lost.

The procedure from the reservation of SIBAS until its release should only take a few seconds if all users are outside critical sequences. Some users may be inside long critical sequences. If SIBAS "hangs" for more than a desirable amount of time in the >>BACKUP-FTX command, you may want to stop the backup process. The following steps should be taken:

First check (from any available terminal) to see if some users are inside long critical sequences with the commands:

```
@SIBAS-SERVICE
Explanation ?NO
Status for all SIBAS-processes ?NO
SYSTEM NUMBER :0
>>DATABASE-STATUS
```

This will give an output similar to this:

```
BEFORE IMAGE LOG ACTIVE, SIZE: 800 C-P TRIGGER: 731 CURRENT: 306
INTERFACE * LOG ADDRESS * TIME
STATISTICS * BLOCK WORD * BASIC-UNIT HOUR/MIN./SEC. DAY/MONTH/YEAR
-----
CURRENT * 469 512 * 41 13:13:11 07.03. 1985
INITIATION * 1 004 * 7 12:58:53 07.03. 1985
LAST OPEN * 1 004 * 37 12:59:02 07.03. 1985
LAST CLOSE * 1 070 * 14 12:59:04 07.03. 1985
LAST CHECK * 1 100 * 17 12:59:04 07.03. 1985
FILE SIZE * 1000 LOGGED CALLS = 9876 LOG-TYPE: CIRCULAR
DATABASE (SI-TEST )FORDB IS OPENED BY 6 USERS
TOTAL NUMBER OF SIBAS CALLS EXECUTED SINCE START: 10104
RUNFLAG 002775B,OFLOG NOT ALLOWED,SGET ANSWERS NOT LOGGED
```

```
: USER-ID :
OCTAL APM DEV UPDATE LOG TIME LAST UNCOMPLETED SEQUENCE
-----
004073 1 59 BG NO OFF
004063 1 51 BG YES ON 10 13:12:59 07.03. 1985
004054 1 44 BG YES ON
004072 1 58 BG YES ON 9 13:11:49 07.03. 1985
004001 1 1 BG YES ON
```

```
LAST SYNCHRONIZED CP REQUESTED 13:13:08(42) 07.03. 1985
SYNCHRONIZED CP IS STILL WAITING FOR UNCOMPLETED SEQUENCE(S)
LAST SYNCPC OWNER: 004001B
```

The example shows that there are still users inside critical sequences (user 004063 and 004072). If you want to stop the backup process, do a FORCE-CLOSE of the database:

```
>>FORCE-CLOSE,<last syncpc owner>
>>DATABASE-STATUS
>>EXIT
```

#### 2.4.2 On-line Backup while Running Disk Mirroring

The following steps should be taken if you are constantly running with the Disk Mirroring and want to take an on-line backup.

'Freeze' the database (all users will be hanging):

```
@SIBAS-SERVICE ~
Explanation ?NO ~
Status for all SIBAS-processes ?NO ~
SYSTEM NUMBER :0 ~
>>DATABASE-STATUS ~
>>OPEN-DATABASE,YES,<password> ~
>>BACKUP-FTX ~
>>EXIT ~
```

Disconnect Member 2:

```
@DIMIR-MANAGER ~
DIM:DISCONNECT-MEMBER,1,2 ~
DIM:EXIT ~
```

Release SIBAS from the freeze:

```
@SIBAS-SERVICE ~
Explanation ?NO ~
Status for all SIBAS-processes ?NO ~
SYSTEM NUMBER :0 ~
>>CONTINUE-FTX ~
>>CLOSE-DATABASE ~
>>DATABASE-STATUS ~
>>EXIT ~
```

Member 2 can now be removed and kept as a backup copy, or you may copy it using the Backup System to a removable disk or magtape. Mount a new disk pack on the Member 2 disk drive.

Connect Member 2 and revive the disk:

```
@DIMIR ~
DIM:CONNECT-MEMBER,1,2,YES ~
DIM:EXIT ~
```

The time from the reservation of SIBAS to the release of it should be only a few seconds if all users are outside critical sequences. If some users remain in critical sequences longer than the desired time, thus "hanging" SIBAS, you can stop the backup process as explained in the previous example.

#### 2.4.3 On-line Backup Without Turning Mirroring Off

If you also want the Disk Mirroring to run during the release of SIBAS and the mounting of a new disk pack, you should define a Member 3 when Disk Mirroring is started, and then connect, revive and disconnect Member 3.

In the example below we assume that Member 1 = controller 1 unit 1, Member 2 = controller 2 unit 0 and Member 3 = controller 2 unit 1.

Define the cluster

```
@DIMIR ~
DIM:DEFINE-CLUSTER,1,DISC-75-1,1,DISC-75-2,0,DISC-75-2,1 ~
DIM:ENABLE-MIRRORING,1,YES,YES ~
DIM:EXIT ~
```

Connect and revive Member 3:

```
@DIMIR
DIM:CONNECT-MEMBER,1,3,YES
DIM:EXIT
```

Take a check-point of the database:

```
@SIBAS-SERVICE
Explanation ?NO
Status for all SIBAS-processes ?NO
SYSTEM NUMBER :0
>>DATABASE-STATUS
>>OPEN-DATABASE,YES,<password>
>>BACKUP-FTX
>>EXIT
```

Disconnect Member 3

```
@DIMIR
DIM:DISCONNECT-MEMBER,1,3
DIM:EXIT
```

Release SIBAS:

```
Explanation ?NO
Status for all SIBAS-processes ?NO
SYSTEM NUMBER :0
@SIBAS-SERVICE
>>CONTINUE-FTX
>>CLOSE-DATABASE
>>DATABASE-STATUS
>>EXIT
```

Member 3 may now be removed.

If there are users within critical sequences longer than desirable, you can stop the backup process.

If you want the system to be constantly running with two secondaries, you should do a REVIVE on both secondaries when the Disk Mirroring is started. Wait until backup before you disconnect any member. Then, after releasing SIBAS, mount a new disk pack, connect the disconnected member, and revive it after the backup is taken.

## CHAPTER 3

### HARDWARE CONSIDERATIONS





### **3 HARDWARE CONSIDERATIONS**

#### **3.1 Disk Drives**

Most new disk drives may be used when running Disk Mirroring. However some older disk types, i.e. the 30, 60 and 90 MB combined fixed/removable disks (PHOENIX), are not supported by Disk Mirroring.

All disk drives used in mirroring should be configured so that each member belonging to the same cluster is of equal size. Apart from this, they should preferably have the same speed.

#### **3.2 Disk Controllers**

If all members in a cluster are connected to the same controller, resistance against fatal errors is reduced and in the worst case all write operations are done sequentially. To avoid this, we recommend that all units in a cluster should be connected to separate controllers. This also increases the resilience.

The following figures show some typical cluster configurations.

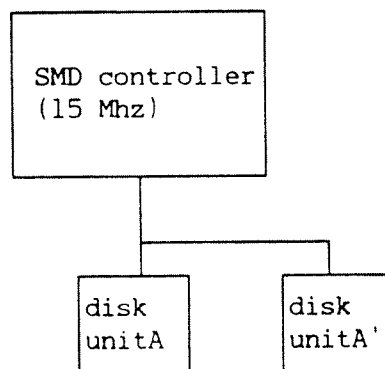


Fig. 1. Minimum cluster configuration

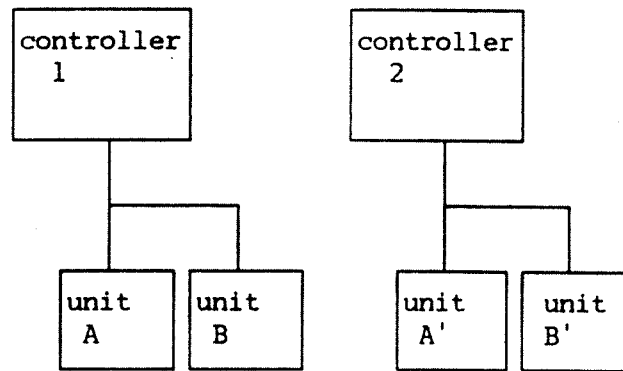


Fig. 2. Typical disk cluster configuration

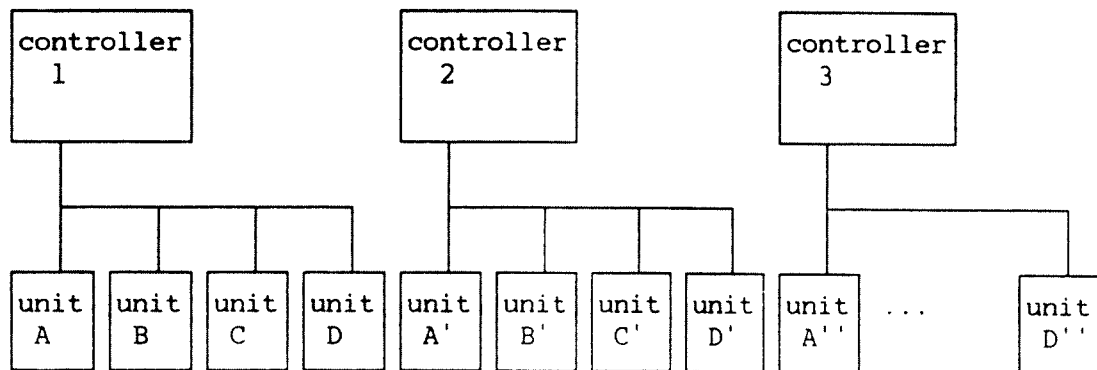


Fig. 3. Maximum cluster configuration

Four disk drives (units) are triplicated for maximum security.

A P P E N D I X   A

THE DIMIR-MANAGER COMMANDS





### THE DIMIR-MANAGER PROGRAM

SYSTEM and RT are the only users allowed to enter the DIMIR-MANAGER program.

The DIMIR-MANAGER or command program uses the same command syntax as the SINTRAN operating system.

When revive is started by a command, a series of "-" signs are printed to report progress. It is, however possible to use the ESCape key to leave the command program. Revive will continue and it is always possible to check on its progress by giving the CLUSTER-STATUS command later.

| Command : CC     |                   | Type: Normal     |
|------------------|-------------------|------------------|
|                  |                   |                  |
| Param.<br>number | Parameter<br>name | Default<br>value |
|                  | No Parameters     |                  |

**FUNCTION** : This command is included to allow comment strings within mode/batch files. It is similar to the SINTRAN command @CC.

|                          |                   | Type: Normal     |
|--------------------------|-------------------|------------------|
| Command : CLUSTER-STATUS |                   |                  |
| Param.<br>number         | Parameter<br>name | Default<br>value |
| 1                        | <Cluster number>  | All              |

**FUNCTION** : Prints the definition and status of a defined cluster.

**SEE ALSO** : Program-Status on page 49.

**EXPLANATION:** Since Disk Mirroring is invisible to most parts of the operating system, this is the only command that indicates the true status of a cluster. In all other contexts than Disk Mirroring, only Member 1 is visible.

The SINTRAN command List-Directories-Entered will always list the directory that is entered on the Member 1 device, even though Member 1 disk may be dismounted.

**EXAMPLE** :

DIM:CLUSTER-STATUS ~  
Cluster number /all/: ~

```
CLUSTER 1 -----> Enabled
  Member 1 : DISC-6-70MB-1-F UNIT 0 SUBUNIT 0 ... Valid
  Member 2 : DISC-6-70MB-2-F UNIT 0 SUBUNIT 0 ... Connected
  Member 3 : .....
  Revive buffer size unspecified.
  No update area 1:          100-          199 Disabled
  No update area 2:
  Read distribution enabled.
```

DIM:

| Command : <b>CONNECT-MEMBER</b> |                   | Type: Normal     |
|---------------------------------|-------------------|------------------|
|                                 |                   |                  |
| Param.<br>number                | Parameter<br>name | Default<br>value |
| 1                               | <Cluster number>  |                  |
| 2                               | <Member (1-3)>    |                  |
| 3                               | <Revive (yes/no)> |                  |

**FUNCTION** : Connects a member in a cluster. This allows mirroring to distribute all updates to the member. After a successful revive the member is given valid status.

**RULES** : The member must not be inhibited. A member can only be connected to one cluster at a time.

Used when a new disk is to be included in the cluster, i.e. after backup.

**SEE ALSO** : Disconnect-Member on page 37.

**EXPLANATION:** Mirroring is only able to read from valid members. To ensure this, always do a revive when connecting a member. When changing a disk pack, always disconnect the member before removing and a connect after mounting the new disk pack.

**EXAMPLE** :

```
DIM:CONNECT-MEMBER ~
Cluster number: 1 ~
Member (1-3) /2/: 2 ~
Revive (yes/no) /yes/: ~
```

REVIVE FROM MEMBER 1 TO 2 STARTED. TOTAL AREA IS 34765 PAGES.

```
>----->
>----->
```

DIM:

|                                       |                   | Type: Normal     |
|---------------------------------------|-------------------|------------------|
| Command : DECODE-DISK-HARDWARE-STATUS |                   |                  |
| Param.<br>number                      | Parameter<br>name | Default<br>value |
| 1                                     | <Device name>     |                  |
| 2                                     | <Hardware status> |                  |

**FUNCTION** : Prints the meaning of the individual bits set in a hardware status word from disk.

Used to find out more about the reasons for a particular disk transfer error.

**SEE ALSO** : Print-Disk-Error-Information on page 46.

**EXAMPLE** :

DIM: DECODE-DISK-HARDWARE-STATUS DISC-6-75MB-3,20230B ~

BIT 3 : CONTROLLER FINISHED WITH A DEVICE OPERATION  
BIT 4 : ERROR IN OPERATION  
BIT 7 : HARDWARE ERROR  
BIT 13 : DISK UNIT NOT READY

DIM:

|                          |                        | Type: Normal     |
|--------------------------|------------------------|------------------|
| Command : DEFINE-CLUSTER |                        |                  |
| Param.<br>number         | Parameter<br>name      | Default<br>value |
| 1                        | <Cluster number>       |                  |
| 2                        | <Member 1 device name> |                  |
| 3                        | <Member 1 unit>        |                  |
| 4                        | [<Member 1 subunit>]   |                  |
| 5                        | <Member 2 device name> |                  |
| 6                        | <Member 2 unit>        |                  |
| 7                        | [<Member 2 subunit>]   |                  |
| 8                        | <Member 3 device name> |                  |
| 9                        | <Member 3 unit>        |                  |
| 10                       | [<Member 3 subunit>]   |                  |

**FUNCTION** : Defines a cluster by specifying the location of the members in a cluster.

**SEE ALSO** : Cluster-Status on page 27.  
Delete-Cluster on page 34.  
Enable-Mirroring on page 38.

**RULES** : A member can be a directory or physical disk (i.e. all directories on that disk drive). All members must be of the same size. Member 1 and at least one of the other members (secondaries) must be defined. Member 1 and the Member 2 must not be members of other clusters. More than one cluster may however share a member as Member 3.

**EXPLANATION:** In versions of SINTRAN where devices are not predefined in a standard configuration, all disk units must be defined using the SINTRAN command Define-Mass-Storage-Unit in the filesystem before the cluster is defined.

Subunits will not be prompted when they are implicit from the configuration (e.g. when there is only one subunit).

The cluster will be created with mirroring disabled, Member 1 valid, Member 2 connected and Member 3 disconnected.



EXAMPLE :

```
DIM: DEFINE-CLUSTER ~  
Cluster number: 1 ~  
Member 1 device name: DISC-6-70MB-2 ~  
Member 1 unit: 0 ~  
Member 1 subunit: 0 ~  
Member 2 device name: DISC-6-70MB-3 ~  
Member 2 unit: 0 ~  
Member 2 subunit: 0 ~  
Member 3 device name: DISC-70MB-1 ~  
Member 3 unit: 1 ~  
Member 3 subunit: 0 ~
```

DIM:

|                                 |                     | Type: Normal     |
|---------------------------------|---------------------|------------------|
| Command : DEFINE-NO-UPDATE-AREA |                     |                  |
| Param.<br>number                | Parameter<br>name   | Default<br>value |
| 1                               | <Cluster number>    |                  |
| 2                               | <Area number>       |                  |
| 3                               | <File name>         |                  |
| 4                               | [<Start page>]      |                  |
| 5                               | [<Number of pages>] |                  |

**FUNCTION** : No update areas provides a way to protect an area on a secondary, Member 2 or member 3, from being updated (mirrored). Disk Mirroring will never write to a "no-update area".

**SEE ALSO** : Enable-No-Update-Area on page 40.  
Disable-No-Update-Area on page 36.

**EXPLANATION:** If the parameter <File name> is specified, the two last parameters are not asked for. If the parameter <File name> is not specified the last two parameters are asked for.

**EXAMPLE** :

```
DIM:DEFINE-NO-UPDATE-AREA ^
Cluster number:1 ^
Area number: 1 ^
File name: DATABASE:DATA ^
```

DIM:

```
DIM:DEFINE-NO-UPDATE-AREA ^
Cluster number:1 ^
Area number: 2 ^
File name: ^
Start page: 100 ^
Number of pages: 99 ^
```

DIM:

|   |                  | Type: Normal  |
|---|------------------|---------------|
| Command : DEFINE-READ-DISTRIBUTION-BORDER |                  |               |
| Param. number                             | Parameter name   | Default value |
| 1   | <Cluster-number> |               |
| 2   | <Page address>   | 0             |

**FUNCTION** : It is possible to have Disk Mirroring distribute read accesses between two valid members.

One way of doing this is to define a read distribution boundary. Read operations with disk address above this boundary is performed on the first valid member and those below on the second valid member.

**SEE ALSO** : Set-Read-Distribution on page 55.  
Cluster-Status on page 27.

**EXPLANATION:** The default value 0 of the parameter <Page address> means that all read operations will take place on the first valid member, unless you run SINTRAN with disk sorting (version K or later).

**EXAMPLE** :

```
DIM:DEFINE-READ-DISTRIBUTION-BORDER ~
Cluster number: 1 ~
Page address /0/: 22536 ~
```

DIM:

| Command : DELETE-CLUSTER |                   | Type: Normal     |
|--------------------------|-------------------|------------------|
|                          |                   |                  |
| Param.<br>number         | Parameter<br>name | Default<br>value |
| 1                        | <Cluster number>  |                  |

**FUNCTION** : Removes all information about a cluster.

**SEE ALSO** : Disable-Mirroring on page 35.

**RULES** : Disk Mirroring must be disabled before the cluster is deleted.

Note that, before a cluster can be changed or redefined, it must be deleted.

**EXAMPLE** :

DIM:DELETE-CLUSTER 1 ~

DIM:

| Command : DISABLE-MIRRORING |                   | Type: Normal     |
|-----------------------------|-------------------|------------------|
|                             |                   |                  |
| Param.<br>number            | Parameter<br>name | Default<br>value |
| 1                           | <Cluster number>  |                  |

**FUNCTION** : Disables mirroring on a cluster. With mirroring disabled all disk accesses will go to Member 1 regardless of what the cluster status may have been.

Used when mirroring of a disk is not wanted or the secondaries are wanted for other purposes.

**SEE ALSO** : Enable-Mirroring on page 38.  
Cluster-Status on page 27.  
Disconnect-Member on page 37.

**EXPLANATION:** For Disk Mirroring to function properly it has to know which members are valid. Since Disk Mirroing cannot keep track of changes made when mirroring is disabled. The operator must update this information before mirroring is enabled again.

With mirroring disabled, the members behaves and can be used as if mirroring was not installed.

**WARNING:** When releasing a member for backup purposes, you should use the command Disconnect-Member. If you use Disable-Mirroring essential status information on the disk will be lost.

**EXAMPLE** :

DIM:DISABLE-MIRRORING 1 ~

DIM:

|                                  |                   | Type: Normal  |
|----------------------------------|-------------------|---------------|
| Command : DISABLE-NO-UPDATE-AREA |                   |               |
| Param. number                    | Parameter name    | Default value |
| 1                                | <Cluster number>  |               |
| 2                                | <Area number>     |               |
| 3                                | <On Member (2-3)> |               |
| 4                                | <Revive (yes/no)> |               |

**FUNCTION** : This command disables a no-update area on a member. When an area is disabled, update will take place as normal.

**SEE ALSO** : Define-No-Update-Area on page 32.  
Cluster-Status on page 27.

**EXPLANATION:** Disk Mirroring will keep track of which parts of a member are valid. If an area was the only invalid part, then the whole member will appear valid after reviving the area.

**EXAMPLE** :

```
DIM:DISABLE-NO-UPDATE-AREA ^
Cluster number: 1 ^
Area number: 1 ^
On member (2-3): 2 ^
Revive (yes/no) /yes/: ^
```

REVIVE FROM MEMBER 1 TO 2 STARTED. TOTAL AREA IS 100 PAGES.

```
>----->
>----->
```

DIM:

| Command : DISCONNECT-MEMBER |                   | Type: Normal     |
|-----------------------------|-------------------|------------------|
|                             |                   |                  |
| Param.<br>number            | Parameter<br>name | Default<br>value |
| 1                           | <Cluster number>  |                  |
| 2                           | <Member (1-3)>    |                  |

**FUNCTION** : The member is removed from the cluster. No read or write will take place on disconnected member.

Used when one wants to change a disk pack etc.

**SEE ALSO** : Connect-Member on page 28.  
Cluster-Status on page 27.

**RULES** : If mirroring is enabled, the member is set invalid. It is illegal to disconnect the last valid member (if you really want this, use the SET-VALID command first).

**EXPLANATION:** Always disconnect a member before removing the corresponding disk pack.

**EXAMPLE** :

```
DIM:DISCONNECT-MEMBER ~  
Cluster number: 1 ~  
Member (1-3): 2 ~
```

DIM:

| Command : <b>ENABLE-MIRRORING</b> |                               | Type: Normal     |
|-----------------------------------|-------------------------------|------------------|
|                                   |                               |                  |
| Param.<br>number                  | Parameter<br>name             | Default<br>value |
| 1                                 | <Cluster number>              |                  |
| 2                                 | <Read member status (yes/no)> | No               |
| 3                                 | <Revive (yes/no)>             | Yes              |

**FUNCTION** : This command enables mirroring on a cluster. If wanted, information about member status (disconnected valid) is read from disk. It is also possible to start revive of any members that are not valid.

Normally used after the Define-Cluster command to start mirroring and to update the cluster with status information from disk.

**SEE ALSO** : Disable-Mirroring on page 35.  
Cluster-Status on page 27.

**RULES** : None of the connected secondaries may have an entered directory. Member 3 must not be active in another cluster. Inaccessible members will be disconnected. Member-status information will only be read from connected members.

**EXPLANATION:** Inaccessible members will be disconnected. This is reported to the error logger.

Secondaries will be reserved. This means that an attempt to enter an directory will give a "DEVICE UNIT RESERVED FOR SPECIAL USE" error message from the filesystem.

The member-status information is written to a special area outside the directory on the disk. Some older disk types may not have this area. To use this option, all members must have this area. Also it must be possible to read from either Member 1 or Member 2 to read status information successfully from disk.



EXAMPLE :

DIM: ENABLE-MIRRORING ↵  
Cluster number: 1 ↵  
Read member status (yes/no) /no/: ↵  
Revive (yes/no) /yes/: NO ↵

DIM:

|                                 |                   | Type: Normal     |
|---------------------------------|-------------------|------------------|
| Command : ENABLE-NO-UPDATE-AREA |                   |                  |
| Param.<br>number                | Parameter<br>name | Default<br>value |
| 1                               | <Cluster number>  |                  |
| 2                               | <Area number>     |                  |
| 3                               | <On member (2-3)> |                  |

**FUNCTION** : This command enables a no-update area on a member. No update will take place on a **enabled** no-update area.

**RULES** : The area must be defined. It is illegal to enable an area on the last valid member in a cluster. The reason for this is that this area will be excluded for read operations as well as write operations, meaning that this area will not be accessible at all.

**SEE ALSO** : Define-No-Update-Area on page 32.  
Disable-No-Update-Area on page 36.

**EXAMPLE** :

DIM:ENABLE-NO-UPDATE-AREA ↵

Cluster number: 1 ↵

Area number: 1 ↵

On member (2-3): 2 ↵

DIM:

| Command : EXIT   |                   | Type: Normal     |
|------------------|-------------------|------------------|
|                  |                   |                  |
| Param.<br>number | Parameter<br>name | Default<br>value |
|                  | No Parameters     |                  |

**FUNCTION** : Terminates the Disk Mirroring command program and returns to SINTRAN.

| Command : HELP   |                   | Type: Normal     |
|------------------|-------------------|------------------|
|                  |                   |                  |
| Param.<br>number | Parameter<br>name | Default<br>value |
| 1                | <Command name>    | All commands     |

**FUNCTION** : Prints out the commands available on the current command level. The command level is defined by the command SET-COMMAND-LEVEL.

|                          |                    | Type: Extended   |
|--------------------------|--------------------|------------------|
| Command : INHIBIT-MEMBER |                    |                  |
| Param.<br>number         | Parameter<br>name  | Default<br>value |
| 1                        | <Cluster number>   |                  |
| 2                        | <Member (1-3)>     |                  |
| 3                        | <Inhibit (yes/no)> | No               |

**FUNCTION** : Changes the inhibit status of a member. If the member is inhibited, no operations are allowed on the unit.

**SEE ALSO** : Cluster-Status on page 27.

**RULES** : The member must be disconnected before it can be inhibited.

The inhibit status is primarily intended for future use. However, it can be used for blocking any connection of a member.

**EXAMPLE** :

DIM:SET-COMMAND-LEVEL EXTENDED ~

DIM:INHIBIT-MEMBER ~

Cluster number: 1 ~

Member (1-3): 1 ~

Inhibit (yes/no) /no: YES ~

DIM:

| Command : LIST-DISK-DEVICES |                   | Type: Normal     |
|-----------------------------|-------------------|------------------|
|                             |                   |                  |
| Param.<br>number            | Parameter<br>name | Default<br>value |
|                             | No Parameters     |                  |

**FUNCTION** : Prints all disk devices defined. In addition, device size, logical and hardware device numbers are printed.

This command may also be used to identify the LDN, Logical Device Number, corresponding to a hardware device number.

**SEE ALSO** : Cluster-Status on page 27.

**EXAMPLE** :

DIM: LIST-DISK-DEVICES ↵

```

                                DISK DEVICE UNITS
LDN   Hdev  Name                Unit Size
-----
1224   500  DISC-45MB-1          0  22032 PAGES.
1224   500  DISC-45MB-1          1  22032 PAGES.
1207  1550  DISC-2-70MB-2-F      1  69530 PAGES ON 2 SUBUNITS WITH 34765 EACH.
1207  1550  DISC-2-70MB-2-F      2  69530 PAGES ON 2 SUBUNITS WITH 34765 EACH.
 565   540  DISC-6-70MB-3-F      0  208590 PAGES ON 6 SUBUNITS WITH 34765 EACH.
 565   540  DISC-6-70MB-3-F      1  208590 PAGES ON 6 SUBUNITS WITH 34765 EACH.
 566   550  DISC-6-70MB-4-F      0  208590 PAGES ON 6 SUBUNITS WITH 34765 EACH.
-----

```

LDN is logical device number (octal). Hdev is hardware device number (octal).  
The rightmost numeral in a device name indicates the controller number.

DIM:

| Command : PARITY-CHECK |                   | Type: Extended   |
|------------------------|-------------------|------------------|
|                        |                   |                  |
| Param.<br>number       | Parameter<br>name | Default<br>value |
| 1                      | <Device name>     |                  |
| 2                      | <Unit>            |                  |
| 3                      | [<Subunit>]       |                  |

**FUNCTION** : This command provides a way to run a parity check on a disk while SINTRAN is running and the disk is in use.

**EXAMPLE** :

DIM:SET-COMMAND-LEVEL EXTENDED ↵

DIM:PARITY-CHECK ↵

Device name: DISC-6-70-2 ↵

Device unit /0:/0 ↵

Device subunit /0:/ 0 ↵

PARITY CHECK STARTED. TOTAL 34765 PAGES.

CHECKING PAGE 34765

DIM:

|  |                   | Type: Normal     |
|--|-------------------|------------------|
| Command : PRINT-DISK-ERROR-INFORMATION |                   |                  |
| Param.<br>number                       | Parameter<br>name | Default<br>value |
| 1                                      | <Device name>     |                  |
| 2                                      | <Unit>            |                  |

**FUNCTION** : Prints error statistics of a disk drive.

The command will give an indication of the performance of disk hardware and storage medium. It will also print the last error that occurred on the unit and a short explanation.

**SEE ALSO** : Decode-Disk-Hardware-Status on page 29.

**EXAMPLE** :

DIM:PRINT-DISK-ERROR-INFORMATION ↵

Device name: DISC-6-70MB-3 ↵

Logical unit /0/: 0 ↵

```

----- ERROR INFORMATION FOR DISC-6-70MB-3-F UNIT 0 -----
NUMBER OF ERRORS ON READ ..... 8
NUMBER OF ERRORS ON WRITE ..... 0
ACCUMULATED READ-ERROR BITS ..... 20230B
ACCUMULATED WRITE-ERROR BITS ..... 0B
NUMBER OF TIMEOUTS ON READ ..... 0
NUMBER OF TIMEOUTS ON WRITE ..... 0
NUMBER OF RETRIES ON READ ..... 0
NUMBER OF RETRIES ON WRITE ..... 0
NUMBER OF ERROR CORRECTIONS USED ..... 0
NUMBER OF TIMES REALLOCATED TRACKS USED . 0
LAST ERROR STATUS (X-REGISTER) ..... 20230B HARDWARE OR
                                         DISK SWITCH
LAST ERROR STATUS (T-REGISTER) ..... 1042B SEEK ERROR

```

DIM:



|                                   |                   | Type: Extended   |
|-----------------------------------|-------------------|------------------|
| Command : PRINT-DISK-LAYOUT-TABLE |                   |                  |
| Param.<br>number                  | Parameter<br>name | Default<br>value |
| 1                                 | <Device name>     |                  |
| 2                                 | <Unit>            |                  |

**FUNCTION** : Prints the physical layout table of disk drive.

**EXAMPLE** :

DIM:SET-COMMAND-LEVEL EXTENDED ~

DIM:PRINT-DISK-LAYOUT-TABLE ~

Device name: DISC-6-70MB-3 ~

Logical unit /0/: 0 ~

```

----- LAYOUT TABLE FOR DISC-6-70MB-3-F UNIT 0-----
WORD/SECTOR ..... 1000B    512D
SECTORS/TRAC ..... 32B      26D
SECTORS/CYLINDER ..... 1160B   624D
MAX CYLINDER ..... 1306B    710D
FIRST CYLINDER IN POOL ..... 1303B   707D
FIRST RESERVED CYLINDER ..... 1305B   709D
FORMAT TYPE ..... TRACK AND SECTOR REALLOCATION
FORMAT INDEX OF ENTRY ..... 32B     26D

```

DIM:

| Command : PRIORITY-SELECT |                   | Type: Normal     |
|---------------------------|-------------------|------------------|
|                           |                   |                  |
| Param.<br>number          | Parameter<br>name | Default<br>value |
| 1                         | <Device name>     |                  |
| 2                         | <Unit>            |                  |

**FUNCTION** : This command will send a priority select to the disk switch. This facility will override a select from another computer, thus disconnecting the disks from the other machine and connecting the devices to own machine

Used by the FTX system modules during reconfiguration to ensure that the disks common to both system are available to this CPU.

**SEE ALSO** : Release on page 50.

**RULES** : If the device unit is Member 1 of an enabled cluster, the Priority-Select command will be sent to all connected members. If Priority-Select is sent from the other CPU first, or the disk switch is manually selected, the command will have no effect.

**EXAMPLE** :

DIM:PRIORITY-SELECT DISC-2-7-MB-1,0.

| Command : PROGRAM-STATUS |                   | Type: Normal     |
|--------------------------|-------------------|------------------|
|                          |                   |                  |
| Param.<br>number         | Parameter<br>name | Default<br>value |
|                          | No Parameters     |                  |

**FUNCTION** : Prints out an overview of all clusters and the values of some important program variables.

**EXAMPLE** :

DIM:PROGRAM-STATUS ~

| CLUSTER OVERVIEW |                          |                  |
|------------------|--------------------------|------------------|
| Cluster          | Member 1                 | Mirroring Status |
| 1.               | DISC-45MB-1 UNIT 0 ..... | Enabled          |
| 2.               | Undefined.               |                  |
| 3.               | Undefined.               |                  |
| 4.               | Undefined.               |                  |

WARNING LIMIT FOR NONFATAL DISK ERRORS ..... DISABLED.  
 REVIVE PRIORITY ..... 20D.  
 REVIVE CYCLIC DELAY ..... NONE.  
 SINGLE REVIVE PROCESS.

DIM:

| Command : RELEASE |                   | Type: Normal     |
|-------------------|-------------------|------------------|
|                   |                   |                  |
| Param.<br>number  | Parameter<br>name | Default<br>value |
| 1                 | <Device name>     |                  |
| 2                 | <Unit>            |                  |

**FUNCTION** : Send a release to a disk switch. Used to free a disk unit after a priority select.

**RULES** : If the device unit is Member 1 of an enabled cluster, the release will be sent to all connected members.

|                       |                     | Type: Normal     |
|-----------------------|---------------------|------------------|
| Command : REVIVE-AREA |                     |                  |
| Param.<br>number      | Parameter<br>name   | Default<br>value |
| 1                     | <Cluster number>    |                  |
| 2                     | <Area number>       |                  |
| 3                     | <From member (1-3)> |                  |
| 4                     | <On member (2-3)>   |                  |
| 5                     | <On member (2-3)>   |                  |

**FUNCTION** : Performs revive of a no update area, from specified valid member.

**SEE ALSO** : Enable-No-Update-Area on page 40.  
Disable-No-Update-Area on page 36.

**RULES** : Revive is only possible from a valid member. The no-update area must be disabled on all members that are to be revived.

**EXPLANATION:** After revive the area will be set valid. If this is the only nonvalid area on the member, the member is set valid.

**EXAMPLE** :

```
DIM:REVIVE-AREA ~
Cluster number: 1 ~
Area number: 1 ~
From member (1-3) /1/: 1 ~
On member (2-3): 2 ~
On member (2-3) /none/: 3 ~
```

REVIVE FROM MEMBER 1 TO 2 AND 3 STARTED. TOTAL AREA IS 100 PAGES.

```
>----->
>----->
```

DIM:

| Command : <b>REVIVE-MEMBER</b> |                     | Type: Normal     |
|--------------------------------|---------------------|------------------|
|                                |                     |                  |
| Param.<br>number               | Parameter<br>name   | Default<br>value |
| 1                              | <Cluster number>    |                  |
| 2                              | <From member (1-3)> |                  |
| 3                              | <To member (1-3)>   |                  |
| 4                              | <To member (1-3)>   |                  |

**FUNCTION** : Starts a revive of specified member onto specified member(s).

**SEE ALSO** : Connect-Member on page 28.  
Cluster-Status on page 27.

**RULES** : Members must not be inhibited or disconnected. It is only permitted to revive from a valid member.

**EXAMPLE** :

```
DIM:REVIVE-MEMBER ↵
Cluster number: 1 ↵
Area number: 1 ↵
From member (1-3) /1/: 1 ↵
To member (1-3): 3 ↵
To member (1-3) /none/: ↵
```

REVIVE FROM MEMBER 1 TO 3 STARTED. TOTAL AREA IS 34765 PAGES.

```
>----->
>----->
```

DIM:

| Command : SET-COMMAND-LEVEL |                   | Type: Normal     |
|-----------------------------|-------------------|------------------|
|                             |                   |                  |
| Param.<br>number            | Parameter<br>name | Default<br>value |
| 1                           | <Command level>   | NORMAL           |

**FUNCTION** : This command switches the command level between NORMAL and EXTENDED.

**RULES** : Care should be exercised when using commands at the extended level.

|                                   |                   | Type: Extended   |
|-----------------------------------|-------------------|------------------|
| Command : SET-ERROR-WARNING-LIMIT |                   |                  |
| Param.<br>number                  | Parameter<br>name | Default<br>value |
| 1                                 | <Warning limit>   | 25               |

**FUNCTION** : It is possible to have Disk Mirroring to check the level of nonfatal errors (i.e. retries etc.) and give a warning when a threshold is exceeded. This command defines a limit to the number of nonfatal errors that are tolerated before the warning message is issued by the Error Logger. You may specify 0 as <Warning limit> if you want a warning each time a nonfatal error condition occurs.

A high level of nonfatal errors will normally indicate that something is wrong with hardware or the disk pack itself. High numbers of retries will also affect the overall performance of the system.

**SEE ALSO** : Program-status on page 49.

**EXAMPLE** :

DIM: SET-COMMAND-LEVEL EXTENDED ~

DIM: SET-ERROR-WARNING-LIMIT ~

Warning limit /25/: 100 ~

DIM:



|                                 |                              | Type: Normal  |
|---------------------------------|------------------------------|---------------|
| Command : SET-READ-DISTRIBUTION |                              |               |
| Param. number                   | Parameter name               | Default value |
| 1                               | <Cluster number>             |               |
| 2                               | <Read distribution (yes/no)> | Yes           |

**FUNCTION** : It is possible to have Disk Mirroring distribute read accesses between Member 1 and Member 2 when both are valid. This will minimize search times and increase throughput on the disk. Two strategies are used, dependent on whether SINTRAN has the disk sorting utility installed or not.

Without disk sorting, Disk Mirroring uses a fixed address on disk, termed read distribution boundary, to distribute the load. Read operations with disk addresses above the boundary go to Member 1 and those below to Member 2.

When disk sorting is present, a more effective strategy, based on actual load, is possible. This strategy will be used when no read distribution border is defined.

Read distribution is initially disabled. When disabled, all accesses go to the first valid member.

**SEE ALSO** : Define-Read-Distribution-Border on page 33.  
Cluster-Status on page 27.

**EXPLANATION:** The strategy used with disk sorting will only be efficient when parallel seek is possible (e.g. Member 1 and Member 2 on different disk controllers). If parallel seek is impossible, it is better to use a read distribution boundary or to disable read distribution.

**EXAMPLE** :

```
DIM:SET-READ-DISTRIBUTION ^
Cluster number: 1 ^
Read distribution allowed? (Yes/No) /yes/: YES ^
```

DIM:

|                                  |                           | Type: Normal     |
|----------------------------------|---------------------------|------------------|
| Command : SET-REVIVE-BUFFER-SIZE |                           |                  |
| Param.<br>number                 | Parameter<br>name         | Default<br>value |
| 1                                | <Cluster number>          |                  |
| 2                                | <Number of pages (1-256)> |                  |

**FUNCTION** : Specifies the length of the memory buffer used during revive.

Usually the revive process selects a suitable buffersize. In some cases, however, there may be reasons for using some other size. This can happen for example when there is shortage of memory.

**SEE ALSO** : Program-Status on page 49.

**EXPLANATION:** Memory for buffers is taken from the swapping area. When using the dual revive process option, two buffers are needed.

**EXAMPLE** :

DIM: SET-REVIVE-BUFFER-SIZE ~

Cluster number: 1 ~

Number of pages (1-256): 5 ~

DIM:

|                                  |                                  | Type: Normal     |
|----------------------------------|----------------------------------|------------------|
| Command : SET-REVIVE-CYCLE-DELAY |                                  |                  |
| Param.<br>number                 | Parameter<br>name                | Default<br>value |
| 1                                | <Revive cycle delay (0-500 BTU)> | 0                |

**FUNCTION** : Changing the cycle-delay time of the REVIVE RT-program is the recommended way of controlling the amount of resources REVIVE will use.

**SEE ALSO** : Set-Revive-Priority on page 58.  
Program-Status on page 49.

**EXPLANATION:** If cycle delay is used then revive will be a single process. A cyclic delay different from zero means that revive will be passive for the indicated number of basic time units (20 milli-seconds) between each buffer it transfers.

**EXAMPLE** :

DIM:SET-REVIVE-CYCLE-DELAY ~  
Revive cycle delay (0-500 BTU) /0/: 20 ~

DIM:

| Command : SET-REVIVE-PRIORITY |                           | Type: Normal     |
|-------------------------------|---------------------------|------------------|
|                               |                           |                  |
| Param.<br>number              | Parameter<br>name         | Default<br>value |
| 1                             | <Revive priority (1-255)> |                  |

**FUNCTION** : Sets the priority of the REVIVE RT-program.

**SEE ALSO** : Set-Revive-Cycle-Delay on page 57.  
Program-Status on page 49.

**EXPLANATION:** Changing the priority of the revive process is one way of controlling the amount of resources the REVIVE RT-program will use.

Low priority means longer revive times on a loaded system, but better response times for the users.

**EXAMPLE** :

DIM: SET-REVIVE-PRIORITY ~  
Revive priority (1-255) /76/: 87 ~

DIM:

| Command : SET-VALID |                   | Type: Normal     |
|---------------------|-------------------|------------------|
|                     |                   |                  |
| Param.<br>number    | Parameter<br>name | Default<br>value |
| 1                   | <Cluster number>  |                  |
| 2                   | <Member (1-3)>    |                  |
| 3                   | <Valid (yes/no)>  | No               |

**FUNCTION** : Changes the valid status of a member.

**SEE ALSO** : Connect-Member on page 28.  
Cluster-Status on page 27.

**RULES** : Member must be connected and valid members will still be 'connected' if "No" is given as input to the parameter <Valid>.

Note that this command bypasses the normal protection mechanisms of Disk Mirroring. It is impossible for Disk Mirroring to function at all if the valid indicators are wrong. Therefore, be absolutely sure before you set a member valid with this command. If you are in doubt, use revive.;

**EXAMPLE** :

```
DIM:SET-VALID ~
Cluster number: 1 ~
Member (1-3): 2 ~
Valid (yes/no) /no/: YES ~
```

DIM:

| Command : STOP-REVIVE |                   | Type: Extended   |
|-----------------------|-------------------|------------------|
|                       |                   |                  |
| Param.<br>number      | Parameter<br>name | Default<br>value |
| 1                     | <Cluster number>  |                  |

**FUNCTION** : This command will clear a revive condition on a cluster. If the revive process is active, it will terminate with an error message.

This command is normally used only when you want to stop a revive currently in progress, or when you want to clear the revive condition not reset by the REVIVE program if, for some reason, the REVIVE program has terminated abnormally.

**RULES** : It should never be necessary to use the SINTRAN command "@ABORT" on the REVIVE process. This should be avoided altogether.

**EXAMPLE** :

DIM: SET-COMMAND-LEVEL EXTENDED ~

DIM: STOP-REVIVE ~

Cluster number: 1 ~

DIM:

Index

|   |   |
|---|---|
| Area number . . . . .                     | 32, 36, 40, 51.   |
| areas no . . . . .                        | 5.  |
| CC . . . . .                              | 26.   |
| Cluster . . . . .                         | 4.  |
| number . . . . .                          | 27, 28, 30, 32,<br>34-38, 40, 43,<br>51, 52, 55, 56,<br>59, 60. |
| Status . . . . .                          | 12.   |
| Cluster-number . . . . .                  | 33.   |
| Cluster-Status . . . . .                  | 27.   |
| Command . . . . .                         |   |
| level . . . . .                           | 53.   |
| name . . . . .                            | 42.   |
| commands . . . . .                        | 6.  |
| concatenated read/write . . . . .         | 6.  |
| Connect-Member . . . . .                  | 28.   |
| CONNECTED . . . . .                       | 5.  |
| cycle delay . . . . .                     | 6.  |
| database . . . . .                        | 13.   |
| Decode-Disk-Hardware-Status . . . . .     | 29.   |
| Define-Cluster . . . . .                  | 30.   |
| Define-Mass-Storage-Unit . . . . .        | 12.   |
| Define-No-Update-Area . . . . .           | 32.   |
| Define-Read-Distribution-Border . . . . . | 33.   |
| Delete-Cluster . . . . .                  | 34.   |
| Device name . . . . .                     | 29, 45-48, 50.  |
| DIMIR-MANAGER . . . . .                   | 6.  |
| Disable-Mirroring . . . . .               | 35.   |
| Disable-No-Update-Area . . . . .          | 36.   |
| Disconnect-Member . . . . .               | 37.   |
| Disk . . . . .                            |   |
| cluster . . . . .                         | 4.  |
| controllers . . . . .                     | 21.   |
| drives . . . . .                          | 21.   |
| Mirroring . . . . .                       | 3, 4.   |
| size . . . . .                            | 21.   |
| speed . . . . .                           | 21.   |
| distribution read . . . . .               | 5.  |
| duplication . . . . .                     | 3.  |
| Enable-Mirroring . . . . .                | 38.   |
| Enable-No-Update-Area . . . . .           | 40.   |
| error logger . . . . .                    | 4.  |
| Exit . . . . .                            | 41.   |
| File name . . . . .                       | 32.   |
| From member . . . . .                     | 51, 52.   |
| Hardware status . . . . .                 | 29.   |
| Help . . . . .                            | 42.   |
| Inhibit yes/no . . . . .                  | 43.   |
| Inhibit-Member . . . . .                  | 43.   |
| List-Disk-Devices . . . . .               | 44.   |
| load-mode considerations . . . . .        | 12.   |

|  |                 |
|--|-----------------|
| member . . . . .                       | 4.              |
| 1 . . . . .                            | 4, 30.          |
| 1-3 . . . . .                          | 28, 37, 43, 59. |
| 2 . . . . .                            | 4, 30.          |
| 3 . . . . .                            | 4, 30.          |
| MON SYSU . . . . .                     | 4.              |
| no update . . . . .                    | 5.              |
| Number of . . . . .                    | 32, 56.         |
| On Member . . . . .                    | 36, 40, 51.     |
| On-line Backup . . . . .               | 14, 17.         |
| On-the-fly backup . . . . .            | 13.             |
| operating principles . . . . .         | 3.              |
| Page address . . . . .                 | 33.             |
| Parity-Check . . . . .                 | 45.             |
| primary . . . . .                      | 4.              |
| Print-Disk-Error-Information . . . . . | 46.             |
| Print-Disk-Layout-Table . . . . .      | 47.             |
| priority . . . . .                     | 6.              |
| Priority-Select . . . . .              | 48.             |
| Program-Status . . . . .               | 49.             |
| read                                   |                 |
| distribution . . . . .                 | 5, 55.          |
| member . . . . .                       | 38.             |
| operations . . . . .                   | 5.              |
| Release . . . . .                      | 50.             |
| REVIVE . . . . .                       | 4, 5.           |
| cycle . . . . .                        | 6, 57.          |
| priority . . . . .                     | 6, 58.          |
| yes/no . . . . .                       | 28, 36, 38.     |
| Revive-Area . . . . .                  | 51.             |
| Revive-Member . . . . .                | 52.             |
| secondary . . . . .                    | 4.              |
| security . . . . .                     | 3.              |
| Set-Command-Level . . . . .            | 53.             |
| Set-Error-Warning-Limit . . . . .      | 54.             |
| Set-Read-Distribution . . . . .        | 55.             |
| Set-Revive-Buffer-Size . . . . .       | 56.             |
| Set-Revive-Cycle-Delay . . . . .       | 57.             |
| Set-Revive-Priority . . . . .          | 58.             |
| Set-Valid . . . . .                    | 59.             |
| SIBAS II . . . . .                     | 13.             |
| Start page . . . . .                   | 32.             |
| Stop-Revive . . . . .                  | 60.             |
| Subunit . . . . .                      | 45.             |
| To member . . . . .                    | 52.             |
| Unit . . . . .                         | 45-48, 50.      |
| VALID . . . . .                        | 5.              |
| yes/no . . . . .                       | 59.             |
| warm start . . . . .                   | 12.             |
| Warning limit . . . . .                | 54.             |
| write operations . . . . .             | 5.              |



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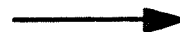
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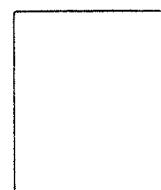
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