



FASTCPK

B E S T P R A C T I C E S G U I D E

JUNE 2016



Last Modified: June 29, 2016 1:26 PM

COMPAKTOR™ is a trademark of INNOVATION DATA PROCESSING and is registered with the US patent office.

FDRCPK / FASTCPK / COMPAKTOR is a proprietary program product of:

INNOVATION DATA PROCESSING
Innovation Plaza
275 Paterson Avenue
Little Falls, New Jersey 07424-1658
Tel: (973) 890-7300 FAX: (973) 890-7147

and is available for license exclusively from INNOVATION DATA PROCESSING.

© Copyright 2016

© INNOVATION DATA PROCESSING

Fast, Efficient, and Minimally Disruptive z/OS DASD Volume Reorganization

Modern disk arrays are still regarded by the z/OS operating system as a set of conventional DASD volumes. Each logical volume in the array has a fixed number of cylinders, and space is managed in the usual way – with a standard VTOC and VTOCIX.

As described in more detail in the [Case for FASTCPK White Paper](#), the issues of fragmented free space, multi-extent data sets, over-allocated data sets, and wasted space are still as important today as they have always been.

Introducing FASTCPK

FASTCPK is a DASD volume reorganization tool that provides a fast, efficient and minimally disruptive solution to a wide range of DASD related Storage Management issues, including:

- Free Space Fragmentation. FASTCPK can “defrag” or consolidate free space on a volume into as few as one or two contiguous areas, reducing the fragmentation index (fragindex).
- Multiple Extents. FASTCPK merges the extents of Sequential, PDS, PDSE, VSAM, DB2 and Extended Format VSAM data sets.
- Wasted Space. FASTCPK releases all or part of the unused space within Sequential, PDS, PDSE, VSAM, DB2 and Extended Format VSAM data sets.
- VTOC errors. FASTCPK analyzes a VTOC and detects logical errors (e.g. invalid Format 5 and Format 7 DSCBs, incorrect free space definitions, and broken Format 1/3 or Format 8/9/3 DSCB chains).

Simulation & Reporting

FASTCPK can produce a wide range of information, in both detailed and summary format.

- The MAP function allows you to map out the contents of selected volumes.
- The SIMULATE feature lets you see the effects of a COMPAKTion without actually having to run it for real.

Before and After maps can be produced for each volume processed, either on a SIMULATE or a real COMPAKTion, together with a concise summary of the effects of the COMPAKTion.

Here is an example of the summary report:

90% Reduction in Free Space Areas

Elapsed time per volume

CPK301I INNOVATION DATA PROCESSING - COMPAKTOR VER. 5.4/85P														COMBINED SUMMARY			DATE	2016.157	TIME	10.48.26	PAGE	1
VOLSER	DEVTYPE	- NUMBER OF -	>1	-- ALLOCATED	----	FREE	-----	FRAG	- EMPTY	TRACKS	IN	-	- VTOC -	TIME	COMP							
		CYLS	EXTS	TRACKS	EXTS	AREAS	LARGEST	INDEX	VSAM	PS	PO	SIZE	%US	(MIN)	CODE							
RMN020	3390-27	32760	575	30 401412	681 82 89988	181	11265	0.317	10858	8667	855	974	1									
	--AFTER-CPK-->		575	20 401412	652 82 89988	18	14250	0.246	10858	8667	855	974	1	.3	0							
RMN039	3390-27	32760	1163	37 330375	1380 67 161025	228	83100	0.223	38693	14532	8377	2939	1									
	--AFTER-CPK-->		1163	33 330375	1358 67 161025	23	85935	0.177	38693	14532	8377	2939	1	.3	0							
RMN040	3390-27	32760	1024	29 374671	1220 76 116729	203	35310	0.292	17893	17786	3856	2939	1									
	--AFTER-CPK-->		1024	24 374671	1199 76 116729	19	35535	0.226	17893	17786	3856	2939	1	.3	0							

2.1 Recommendations & Improvements

COMPAKTOR (FASTCPK) has been available for more than 35 years. We have found many of our COMPAKTOR customers have not updated their COMPAKTOR jobs to take advantage of our past recommendations and improvements which can provide you with optimum results while using very little CPU and elapsed time.

FASTCPK users are seeing elapsed times of between 36 and 60 seconds to reduce 90 percent of the free areas on a 3390-27 volume.

Click this [link](#) to see a typical FASTCPK user experience.

The default objective for FASTCPK is to reduce the number of free space areas by 90%. The SIZEKEEP option controls this. INNOVATION recommends that you run with the default SIZEKEEP to minimize elapsed time. For the best performance, we recommend that you run free space release (CPK TYPE=RLSE) as a separate step just prior to the FASTCPK run. For example,

- First Step:

```
COMPAKT TYPE=RLSE ,VOL=TSO* ,NOSECOND=NORLSE ,  
        PSRLSE=TRK ,PORLSE=ALL ,VSRLSE=ALL ,%POFREE=10 ,%VSFREE=10
```

- Significant amounts of space are wasted within PS, PO, and VSAM data sets including DB2. FASTCPK can release all or a portion of the wasted space during a TYPE=RLSE run. To preserve some free space within data sets, specify %FREE= or %PSFREE=, %POFREE=, %VSFREE=. It is recommended that some free space be left in VSAM and PO files.
- NOSECOND=NORLSE should be specified so data sets without secondary allocations are not eligible for space release.
- Second Step:

```
COMPAKT TYPE=FASTCPK ,VOL=TSO* ,UNABLE=IGNORE ,SIZEKEEP=(100 , 90 , 60)
```

NOTE: A given FASTCPK job processes only one volume at a time, so to run concurrently you must set up multiple jobs. For best results, put volumes on the same DASD array into the same job.

2.2 SIZEKEEP=(size,pct,mx,trks)

This is a performance option that reduces the number and size of the data sets to be moved by COMPAKTOR while still providing most of the free space consolidation benefits of COMPAKTion. Since data sets that are not moved do not have their tracks copied, this significantly reduces COMPAKTOR elapsed time. There are four subparameters:

- The first subparameter “**size**” specifies that COMPAKTOR is to search for groups of allocated tracks greater than or equal to this size; a group is a contiguous set of tracks, belonging to one or more data sets, with a free space extent on either side of it. These groups are initially made unmovable. “size” may range from 0 to 999999.
The default value is 100. The recommended value is 100.
- The second subparameter “**pct**” specifies a percentage reduction in the number of free space areas that COMPAKTOR must achieve (for example, 50 specifies that CPK must reduce the number of free space areas on the volume by at least 50 percent). If COMPAKTOR cannot achieve this goal, it makes some of the track groups selected by the first subparameter movable (the smaller groups in the list) and tries again, repeating this until the desired percentage reduction is achieved or until all groups have been made movable. “pct” may range from 1 to 100.
The default value is 90. The recommended value is 90.
- The third subparameter “**mx**” is the maximum number of extents that a multi-extent data set may have to be included in SIZEKEEP processing. Data sets with more than “mx” extents are not considered part of any SIZEKEEP track group, and COMPAKTOR tries to combine their extents. If some, but not all, of the extents of a data set with “mx” or fewer extents are part of SIZEKEEP track groups, COMPAKTOR may move the other extents but does not combine them. “mx” may range from 1 to 60.
The default value is 60. The recommended value is 60.
- The fourth subparameter “**trks**” sets a limit on the maximum number of tracks FASTCPK will attempt to move.
The default value is 15000. The recommended value is 15000 (the default) except for EAV volumes where the recommended value is 50000.

If a data set that would be made unmovable by SIZEKEEP is positioned by a SELECT statement with POS=, the SELECT is honored. Space release is honored for SIZEKEEP data sets. SIZEKEEP is honored only for COMPAKTion in-place (TYPE=FASTCPK or TYPE=COMPAKT).

2.3 What can I do to avoid a job abending if FASTCPK is moving a data set that is now needed by a dynamic allocation?

FASTCPK in version 5.4 L80 and higher supports an exit that intercepts all dynamic allocations and checks for those requesting a data set that is not available because FASTCPK is moving it. The exit delays those dynamic allocations until FASTCPK finishes moving the data set, so that the dynamic allocations can complete successfully.

See [3.1 Dynamic Exit Installation](#) for documentation and installation instruction on the exit.

2.4 We have the need to run FASTCPK while the volumes are in use. What impact does this have on my users?

FASTCPK automatically detects active data sets. Linklist data sets on the system that FASTCPK is run on are automatically made unmovable by FASTCPK. Other active data sets not enqueued by the operating system should be put in the COMPAKTOR Unmovable Table (a list of such data sets appears in Section 40.21 "COMPAKTING Active Volumes" of the manual). FASTCPK issues an ENQUEUE/RESERVE on the VTOC for the duration of the COMPAKTion. This prevents users on the system where COMPAKTOR is running from allocating, scratching, or obtaining secondary extents. Data sets that are in use at the time FASTCPK is started are still available to the end user. On other systems with shared DASD, the entire volume may be unavailable while it is being COMPAKTeD.¹ Shortly after FASTCPK starts, FASTCPK DEQUEUEs data sets that are not going to be moved and those data sets are available again to end users on the system where COMPAKTOR is running.

HINT: FASTCPK does not enqueue data sets in the COMPAKTOR Unmovable Table. So, if you want certain data sets always accessible on a volume that you are COMPAKTING, put those data sets in the COMPAKTOR Unmovable Table. For VSAM data sets, the component name is specified in the COMPAKTOR Unmovable Table.

2.5 How do I avoid a U0888 ABEND if COMPAKTOR gets a CPK554E message with a reason indicating that the Algorithms Failed?

```
CPK554E UNABLE TO COMPAKT THIS VOLUME REASON=ALOGRITHMS FAILED-VOLUME NOT CHANGED
```

In some unusual circumstances, FASTCPK might not be able to COMPAKT a volume (all of the data set placement algorithms have failed). This type of error results in the general ABEND code U0888 at the end of the job. Since the volume was not changed, you can code UNABLE=IGNORE on the COMPAKT statement to suppress the U0888 ABEND for this type of error.

NOTE: UNABLE=IGNORE also suppresses the U0888 ABEND for conditions where FASTCPK is unable to allocate a recovery log (no free DSCBs or free tracks) or where there are insufficient free tracks on the volume to perform a COMPAKTion.

¹ This depends on whether the installation converts RESERVEs on SYSVTOC to global ENQs. If so, the considerations on other systems are the same as on the system where COMPAKTOR is running.

2.6 How accurate is the Elapsed Time Estimate in the SIMULATION COMBINED SUMMARY report?

We have adjusted the simulation function to account for the faster disks and channels that are available now. This change is in V54L85 SPIN=1 which went GA on 23 June 2016.

NOTE: If you are going to run FASTCPK on a volume with active data sets right after a SIMULATION, add DSNENQ=USE to the SIM TYPE=FASTCPK run to get a more accurate report on what FASTCPK will do.

2.7 What does CPK554E message with Recovery Log Full mean?

CPK554E UNABLE TO COMPAKT THIS VOLUME REASON=RECOVERY LOG FULL

If a significant number of tracks need to be moved, it is possible that the CPK recovery log fills up and COMPAKTOR goes into recovery and backs out the changes. If you have encountered this situation, contact INNOVATION Technical Support for assistance on changing the SIZEKEEP and CPKFREEEX values.

2.8 My VVDS is in multiple extents. Can COMPAKTOR merge a VVDS into one extent?

As a default, COMPAKTOR considers a VVDS as unmovable. Many times, a VVDS goes into extents and this can affect overall DASD performance.

If you specify OVERRIDE=YES and SELECT DSN=SYS1.VVDS.Vvolser,POS=VTOC, COMPAKTOR merges all the extents of the VVDS into one extent and positions the VVDS next to the VTOC.

This type of operation can be done only when the VVDS is not in use and requires COMPAKTOR to take a backup (TYPE=CPK, DUMP=YES). The safest procedure is:

1. VARY the volume OFFLINE to all other systems with shared DASD before COMPAKTOR starts.
2. Do not specify ACTMESS=NO, and do not reply IGNORE if message FDRW81 appears informing you that there are open data sets on the volume.
3. VARY the volume back ONLINE to sharing systems after COMPAKTOR completes.

2.9 What Happens if the System Crashes During a FASTCPK?

You can resubmit the COMPAKTOR job that was running and FASTCPK automatically recovers the volume. If you do not know which volume was being processed submit a MAP job with the command MAP VOL=*,MAPS=SUMMARY.

COMPAKTOR prints a CPK586W message for each volume on which you must resubmit FASTCPK to recover the volume.

2.10 Occasionally, we see free space errors in the VTOC. Can COMPAKTOR correct free space errors?

COMPAKTOR automatically corrects VTOC free space errors during any COMPAKTion or RELEASE run.

A simple RELEASE run of one data set runs in seconds and automatically rebuilds the VTOC including the free space descriptors. For example:

```
CPK TYPE=RLSE ,VOL=xxxxxx  
SELECT DSN=MY.DATA.SET ,RLSE=ALL
```

2.11 TSO users receive the following messages during logon for the ISPF profile data set if FASTCPK is COMPAKTING that volume and has the ISPF profile data set enqueued.

```
IKJ56225I DATA SET dsn ALREADY IN USE, TRY LATER+  
IKJ56225I DATA SET IS ALLOCATED TO ANOTHER JOB OR USER
```

Without the ISPPROF data set, they cannot access ISPF. This can be circumvented by adding a generic filter mask to the COMPAKTOR Unmovable Table for the ISPF profile data sets. Use FDRZAPOP or the ISPF panel A.I.5 to update the COMPAKTOR Unmovable Table with:

```
CPKUNMOV DSN=**ISPPROF**
```

COMPAKTOR does not enqueue on data sets that are in the COMPAKTOR Unmovable Table.

2.12 What happens if the operator cancels COMPAKTOR before it is completed?

Since the majority of interrupted COMPAKTOR jobs result from operators issuing CANCEL commands, COMPAKTOR includes a CANCEL protection function. If a CANCEL is issued against a COMPAKTOR job at any time during the restore phase (while the VTOC, VVDS, or data tracks are actually being updated or moved), COMPAKTOR intercepts that CANCEL and issues an FDRW99 message to the operator indicating that the CANCEL will result in volume corruption, and giving the operator the option of ignoring the CANCEL, canceling the job, or bringing COMPAKTOR to a graceful termination when it finishes processing the current volume.

The operator should always reply "S" (STOP) so that COMPAKTOR just completes the volume currently in progress before terminating, or "I" (IGNORE) if the CANCEL was a mistake.

HINT: You may want to automate the response to the FDRW99 messages to always be "S".

2.13 How Long Does it Take FASTCPK to Recover a Volume?

FASTCPK recovery takes about two times as much elapsed time as COMPAKTOR spent COMPAKting the volume before the failure. For example, if the FASTCPK was processing the volume for one minute, recovery is completed in two more minutes.

2.14 Simple Conversion From DEFRAG

Just minutes to convert JCL and Control Cards

IBM DEFRAG

```
//ADRDUSSU EXEC PGM=ADRDUSSU
//SYSPPRINT DD SYSOUT=*
//DASD1 DD VOL=TSO001,DISP=SHR,
        UNIT=SYSALLDA
//SYSIN DD *
DEFRAG DDNAME(DASD1)
/*
```

Fast COMPAKTOR

```
//FASTCPK EXEC PGM=FDRCPK,REGION=0M
//SYSPPRINT DD SYSOUT=*
//SYSMAP DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//SYSIN DD *
COMPACT TYPE=FASTCPK,VOL=TSO001
/*
```

2.15 SIMULATION Examples

SIMULATE Fast COMPAKTion on all volumes within an SMS storage group.

```
//SIM EXEC PGM=FDRCPK,REGION=0M
//SYSPPRINT DD SYSOUT=*
//SYSMAP DD SYSOUT=*
//SYSSUMM DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//SYSIN DD *
SIMULATE TYPE=FASTCPK,STORGRP=DATADB
/*
```

SIMULATE Fast COMPAKTion on selected online DASD volumes.

```
//SIM EXEC PGM=FDRCPK,REGION=0M
//SYSPPRINT DD SYSOUT=*
//SYSMAP DD SYSOUT=*
//SYSSUMM DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//SYSIN DD *
SIMULATE TYPE=FASTCPK,VOL=(TSO*,PROD*),MAPS=SUMMARY,DSNENQ=USE
/*
```

The following section describes the procedure for the dynamic installation of the exit.

During the COMPACTion process, FASTCPK holds an exclusive SYSDSN enqueue on each data set while it is actively being moved, so the data set would not be available to other applications or jobs. There can be a small number of data sets that an online system or job would attempt to access while the COMPACTion is in progress. The Dynamic Allocation exit addresses the applications that attempt to access these data sets during the COMPACTion process. With the exit installed, dynamic allocations are monitored and checked to see if the data set being allocated is being moved by COMPACTOR. If it is, this dynamic allocation is intercepted and delayed. This delay is comparable to a recall of an archived data set for a task that requires it.

The exit, FDR0009I, intercepts all dynamic allocations (SVC 99), checking the return codes and looking for requests for data sets that are being moved by FDRCPK. Successful dynamic allocations return to the caller normally. Failed dynamic allocations are checked for the return code indicating “data set in use”. If FDRCPK is holding the enqueue, the dynamic allocation is delayed for a time value (default is two seconds) and then is retried. This process is repeated up to a maximum number of times (default is 255 times). The maximum wait time using these defaults would be 8½ minutes, but we recommend setting a shorter time limit, as shown below. If the maximum wait time is reached, the dynamic allocation returns to the caller as a failure. It should be extremely rare that FASTCPK would not complete before the maximum wait time.

To install the Dynamic Allocation exit for the first time, you run a job that executes program FDRMVDAX, as shown below. The exit then remains active in the system until the next IPL, unless you deactivate it by running a job with program FDRMVDAD.

Subsequently, if you want the exit to be active any time you run FASTCPK, you can arrange to have the exit installed automatically at every IPL. You can do this by placing a cataloged procedure executing FDRMVDAX with the desired PARM field in a PROCLIB that is eligible for Start commands, and putting a Start command for this procedure in member COMMNDxx in PARMLIB.

FDR0009I is also used for FDRCPK, FDRMOVE, and FDRPAS. If the exit is already running for one of these programs, you do not have to reinstall it or install a separate copy for the others.

3.1 Dynamic Exit Installation

The exit, FDR0009I, is dynamically installed by program FDRMVDAX. The JCL to install FDR0009I for production (to intercept all dynamic allocations for all FDRCPK related jobs) while accepting the coded defaults is as follows.

```
//FDRMVDAX JOB `INSTALL THE DYNAMIC ALLOCATION EXIT`
//FDRMVDAX EXEC PGM=FDRMVDAX
//STEPLIB DD DISP=SHR,DSN=fdrcpk.loadlib
//SYSLIB DD DISP=SHR,DSN=fdrcpk.loadlib
//SYSUDUMP DD SYSOUT=*
```

This JCL is supplied in member FDRMVDAX in the FDR Installation Control Library (ICL).

Program FDRMVDAX supports several options that are specified in the PARM field; see "[3.2 PARM Field Operands](#)" below.

If desired, the Dynamic Allocation exit can be removed or deactivated by using program FDRMVDAD.

To deactivate a production install of the Dynamic Allocation exit, use the following JCL.

```
//FDRMVDAD JOB `DEACTIVATE THE DYNAMIC ALLOCATION EXIT`
//FDRMVDAD EXEC PGM=FDRMVDAD
//STEPLIB DD DISP=SHR,DSN=fdrpcpk.loadlib
//SYSLIB DD DISP=SHR,DSN=fdrpcpk.loadlib
//SYSUDUMP DD SYSOUT=*
```

This JCL is supplied in member FDRMVDAD in the FDR Installation Control Library (ICL).

NOTE: If a version of the exit is currently installed and an FDRCPK job is actively compacting data sets that may cause jobs to be intercepted by the exit, you should not replace or deactivate the exit until the FDRCPK job(s) have completed.

3.2 PARM Field Operands

```
//FDRMVDAX EXEC PGM=FDRMVDAX,PARM='option[,option]...'
```

PROD / TEST

Specifies how the exit is to be used.

PROD – Is used to intercept ALL dynamic allocations.

TEST – Is used to only intercept dynamic allocations from selected jobs, as specified by JOBNAME=.

Default: PROD.

RECOMMENDATION: During initial testing, specify TEST, with JOBNAME= specifying the FASTCPK tests that you will run. When testing is complete, default to PROD.

DEBUG

Display startup values as well as trace data for the dynamic allocations that are intercepted.

Default: DEBUG is not in effect.

RECOMMENDATION: Do not specify DEBUG unless requested by INNOVATION.

JOBNAME=

jobname – Specifies the job(s) that are to be processed by the TEST version of the exit. JOBNAME= may be abbreviated as JOB=. TSO user ids and started task names are also checked for a match and are eligible for processing by the TEST version of the exit. This keyword can only be specified with the TEST keyword. The value specified may be:

- A single job name, for example, JOBNAME=XYZ
- A job name prefix followed by an asterisk, for example, JOBNAME=XYZ*
- Up to five job names or prefixes enclosed in parenthesis, for example, JOB=(ABC,XYZ*,SYS*).
- If JOBNAME=* or JOB=* is specified, then all jobs are processed by the TEST version of the exit; this gives the same effect as the PROD operand.

Any job that does not match is not processed by the exit.

Default: None. If TEST is specified, JOBNAME= is required. If PROD is specified or defaulted, JOBNAME= is not valid.

LOOPS=

nnn – Maximum retry loop count. Valid values are from 1 to 800.

Default: 255.

RECOMMENDATION: 60.

WAITIME=

n – Wait time in seconds between loops. Valid values are from 1 to 9.

Default: 2.

RECOMMENDATION: No need to specify; accept the default of 2.

3.3 Example

To install the Dynamic Allocation exit and allow FDR0009I to delay dynamic allocations for a maximum of 2 minutes for data sets that are being moved by FDRCPK:

```
//FDRMVDAX JOB `INSTALL THE DYNAMIC ALLOCATION EXIT'
//FDRMVDAX EXEC PGM=FDRMVDAX, PARM=' WAITIME=2, LOOPS=60'
//STEPLIB DD DISP=SHR, DSN=fdrckp.loadlib
//SYSLIB DD DISP=SHR, DSN=fdrckp.loadlib
//SYSUDUMP DD SYSOUT=*
```



Corporate Headquarters

Innovation Plaza
275 Paterson Avenue, Little Falls, New Jersey 07424-1658
Tel: (973) 890-7300 Fax: (973) 890-7147

support@fdrinnovation.com sales@fdrinnovation.com

www.fdr.com

European Offices

FRANCE

191, avenue Aristide Briand
94230 Cachan

Tel: (33) 1 49 69 94 02
Fax: (33) 1 49 69 90 98
frsales@fdrinnovation.com
frsupport@fdrinnovation.com

GERMANY

Orleansstraße 4a
81669 München

Tel: (49) 089-489 0210
Fax: (49) 089-489 1355
desales@fdrinnovation.com
desupport@fdrinnovation.com

NETHERLANDS (& Nordic Countries)

Brouwerstraat 8
1315 BP Almere

Tel: (31) 036-534 1660
Fax: (31) 036-533 7308
nlsales@fdrinnovation.com
nlsupport@fdrinnovation.com

UNITED KINGDOM

Clarendon House
125 Shenley Road
Borehamwood, Herts
WD6 1AG

Tel: (44) 0208-905 1266
Fax: (44) 0208-905 1428
uksales@fdrinnovation.com
uksupport@fdrinnovation.com

FASTCPK BEST PRACTICES GUIDE