

## Helper Internals

Note this is not quite complete:  
see Helper listing for 1 or 2 passes  
not covered here.

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## Real & Pseudo Close: Processing of Pointer Blocks in DDS

### I. Close and Pseudo Close:

Attached to each pointer block are 3 flags

1. Needed-on-disk: At least one descendant data block exists, hence the block must appear in the final disk copy
2. Needed-in-DDS: at least one descendant data block is attached, hence the block must appear in DDS. (Note: sometimes set on a block with no attached descendants; see pseudo-close)
3. Dirty relative to Disk Copy: At least one disk address in the DDS version differs from the version on the Disk.

The processing of non-root pointer blocks proceeds in two phases:

a) Phase 1 ("PBLKIN") performs functions detailed below

b) Phase 2 ("PBFLUSH") deletes the DDS copy if Needed-in-DDS is not set, and deletes the disk copy as per instructions left by phase I. The disk block is added to a "free-list" and is not actually released until the FHB has been written.

### Phase I processing by Cases:

II Close: During real-close, Needed-in-DOS is never set, so PBFUSH always deletes all pointer blocks (except the root, of course)

Thus, action on each pointer block is determined by:

- 1) Needed / Not needed on Disk
- 2) Dirty / Clean rel to Disk copy

Moreover, the case "not-needed and clean" is not possible, so only 3 cases occur:

A. Needed and Clean: simply forgets having brought the block in; i.e. sets status to OUT and marks father block Needed-on-Disk.

B. Needed and Dirty: Old copy is put on free-list and fresh copy is written on disk. New disk addr is placed in pointer, but pointer is not made busy during I/O since father block is about to be written too. Father block is marked Needed-on-Disk and Dirty.

C. Not-needed and Dirty: Old copy is put on free-list. Pointer is set to non-existent and father block is marked Dirty.

III Pseudo-Close: Pseudo-close must keep track of which pointer blocks are needed-in-DDS and delete only the unneeded ones. Thus, action for each block is determined by:

- ① Needed / Not-needed on Disk
- ② Needed / Not needed in DDS
- ③ Clean / Dirty rel to Disk Copy

As in close, the case "Clean and Not-needed-on-disk" is not possible. Also, a block cannot be needed-in-DDS without being needed-on-Disk, so only 5 cases actually occur

A. Needed-on-Disk, Needed-in-DDS, Clean:

In this case, nothing is done except to mark the father block Needed-on-Disk and Needed-in-DDS.

B. Needed-on-Disk, Needed-in-DDS, Dirty:

The old disk copy is put on the free-list and a fresh copy is written on the disk. The block remains in DDS and the father block is marked Needed-on-Disk and Needed-in-DDS, and Dirty

C. Needed-on-Disk, Not-needed-in-DDS, Clean

Status set to out and block is deleted from DDS. Father block is marked Needed-on-Disk

D. Needed-on-Disk, Not-Needed-in-DDS, Dirty: Old disk copy is put on free list and fresh copy written to Disk. Block is deleted from DDS. Status is set to GOING during I/O. Father block is marked Needed-on-Disk and also Needed-in-DDS (for later update by Terminator).

E. Not-needed-on-Disk, not-needed-in-EC  
Dirty: Old disk copy is put on free list, pointer is set to "nonexistent" and father block is marked Dirty.