```
|------------------------------------------|
|                                          |
|            ARIX CORPORATION              |
|                                          |
|        PROPRIETARY AND CONFIDENTIAL       |
|                                          |
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```

A.cache Read Miss Processing

When the IU misses in the code/data cache (CDC) and the operand is cachable,
a cache fill sequence is begun. There are five different situations that can
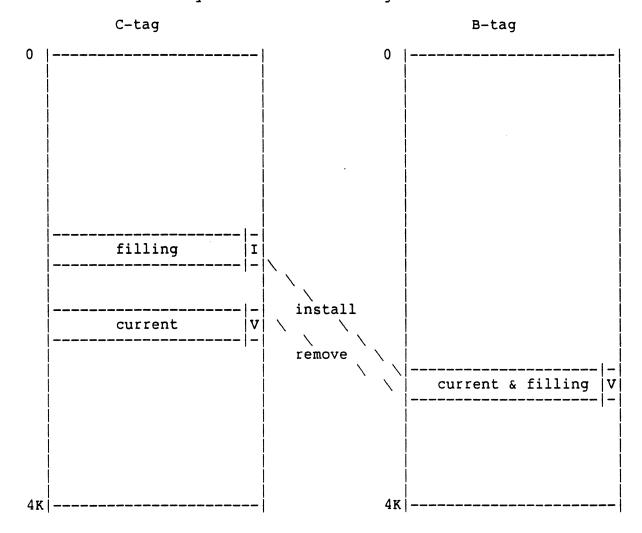exist.

In the following diagrams, the terms B-tag and C-tag refer to the CDC tag
arrays associated with the bus watcher and the cache respectively. The B-tag
is indexed with physical addresses; the C-tag is indexed with logical
addresses. The right most bit in each tag entry that is shown indicates
whether the entry is VALID (V) or INVALID (I) when the cache fill begins.
The only tag entries shown explicitly are those that are changed in some
manner during the fill operation.

The links between B-tag and C-tag entries are shown with dashed lines. The
links that will be removed during the cache fill operation are marked
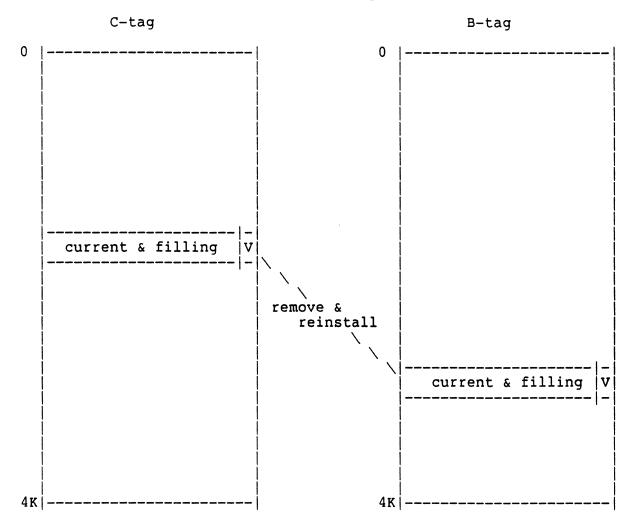"remove" and the links that will be added are marked "install".

Case 2

The C-tag entry that will identify the cache line being filled
is INVALID. The B-tag entry that will identify the cache line
being filled is VALID and points to a VALID C-tag entry.

In this case, the C-tag entry pointed to by the VALID B-tag entry
that will identify the cache line being filled must be marked INVLAID.

```
             C-tag                                    B-tag

    0 |-----------------------|           0 |-----------------------|
      |                       |             |                       |
      |                       |             |                       |
      |                       |             |                       |
      |                       |             |                       |
      |                       |             |                       |
      |-------------------|-| |             |                       |
      |      filling      |I| |             |                       |
      |-------------------|-| \             |                       |
      |                   |   \             |                       |
      |-------------------|-|   \ install   |                       |
      |      current      |V| \   \         |                       |
      |-------------------|-|  \   \        |                       |
      |                   |    \    \       |-------------------|-|
      |                   |  remove \  \    | current & filling |V|
      |                   |          \  \   |-------------------|-|
      |                   |           \  \  |                   |
      |                   |            \    |                   |
      |                   |                 |                   |
      |                   |                 |                   |
   4K |-------------------|             4K |-------------------|
```

Case 4

   The C-tag entry and the B-tag entry that will identify the cache
   line being filled are both VALID and point to each other.

```
                   C-tag                                    B-tag

  0 |------------------------|               0 |------------------------|
    |                        |                 |                        |
    |                        |                 |                        |
    |                        |                 |                        |
    |                        |                 |                        |
    |                        |                 |                        |
    |                        |                 |                        |
    |                        |                 |                        |
    |------------------|-|                     |                        |
    | current & filling|V|                     |                        |
    |------------------|-|                     |                        |
    |                   \                       |                        |
    |                    \                      |                        |
    |                     remove &              |                        |
    |                      reinstall            |                        |
    |                        \                  |                        |
    |                         \                 |------------------|-|
    |                          \               | current & filling|V|
    |                           \              |------------------|-|
    |                        |                 |                        |
    |                        |                 |                        |
    |                        |                 |                        |
    |                        |                 |                        |
 4K |------------------------|              4K |------------------------|
```

Code/Data Cache Tag Maintenance During Cache Fill

To support the maintenance of the B-tag during a cache fill operation, the
cdc ~~sequencer~~ must provide the B-tag with the following information:

     C-tag Address [16:12] (= ([ASI[1], IU_Address[15:12])) of
     the cache line being filled.

     B-tag Address [16:12] that is linked to the C-tag entry being
     filled and whether this B-tag entry should be marked INVALID.
     (The B-tag entry must be marked INVALID for cases 3 and 5.
     The B-tag entry is overwritten in cases 2 and 4.)

     Physical Address [35:5] of the cache line being filled.

To support the maintenance of the C-tag during a cache fill, the bus watcher
will issue a C-tag invalidation order to the cache sequencer for cases 2 and
5.

The bus watcher will also inform the cache fill sequencer if the line being
filled should be marked VALID or INVALID after one use by the IU.

Code/Data Cache Tag Maintenance From Write-thru Traffic

The bus watcher monitors all SBus WRITE operations. With one exception,
any SBus WRITE that hits in the B-tag, causes that B-tag entry to be marked
INVALID and an invalidation order for the corresponding C-tag entry to be
issued to the CDC cache invalidation sequencer. The one exception is SBus
WRITEs that were issued by this RPM and HIT in the CDC.

If the SBus WRITE hits on a cache line that is being filled, the B-tag entry
is not marked VALID when the fill completes and the CDC cache fill sequencer
is notified of the hit.