



Linux Ubuntu 26.04 Manual Pages on command 'CIRCLEQ_INSERT_AFTER.3'

\$ man CIRCLEQ_INSERT_AFTER.3

CIRCLEQ(3) Library Functions Manual CIRCLEQ(3)

NAME

CIRCLEQ_EMPTY, CIRCLEQ_ENTRY, CIRCLEQ_FIRST, CIRCLEQ_FOREACH, CIRCLEQ_FOREACH_REVERSE, CIR?

CLEQ_HEAD, CIRCLEQ_HEAD_INITIALIZER, CIRCLEQ_INIT, CIRCLEQ_INSERT_AFTER, CIRCLEQ_INSERT_BE?

FORE, CIRCLEQ_INSERT_HEAD, CIRCLEQ_INSERT_TAIL, CIRCLEQ_LAST, CIRCLEQ_LOOP_NEXT, CIR?

CLEQ_LOOP_PREV, CIRCLEQ_NEXT, CIRCLEQ_PREV, CIRCLEQ_REMOVE - implementation of a doubly linked circular queue

LIBRARY

Standard C library (libc, -lc)

SYNOPSIS

```
#include <sys/queue.h>

CIRCLEQ_ENTRY(TYPE);

CIRCLEQ_HEAD(HEADNAME, TYPE);

CIRCLEQ_HEAD CIRCLEQ_HEAD_INITIALIZER(CIRCLEQ_HEAD head);

void CIRCLEQ_INIT(CIRCLEQ_HEAD *head);

int CIRCLEQ_EMPTY(CIRCLEQ_HEAD *head);

void CIRCLEQ_INSERT_HEAD(CIRCLEQ_HEAD *head,
                        struct TYPE *elm, CIRCLEQ_ENTRY NAME);

void CIRCLEQ_INSERT_TAIL(CIRCLEQ_HEAD *head,
                        struct TYPE *elm, CIRCLEQ_ENTRY NAME);

void CIRCLEQ_INSERT_BEFORE(CIRCLEQ_HEAD *head, struct TYPE *listelm,
```

```

        struct TYPE *elm, CIRCLEQ_ENTRY NAME);

void CIRCLEQ_INSERT_AFTER(CIRCLEQ_HEAD *head, struct TYPE *listelm,

        struct TYPE *elm, CIRCLEQ_ENTRY NAME);

struct TYPE *CIRCLEQ_FIRST(CIRCLEQ_HEAD *head);

struct TYPE *CIRCLEQ_LAST(CIRCLEQ_HEAD *head);

struct TYPE *CIRCLEQ_PREV(struct TYPE *elm, CIRCLEQ_ENTRY NAME);

struct TYPE *CIRCLEQ_NEXT(struct TYPE *elm, CIRCLEQ_ENTRY NAME);

struct TYPE *CIRCLEQ_LOOP_PREV(CIRCLEQ_HEAD *head,

        struct TYPE *elm, CIRCLEQ_ENTRY NAME);

struct TYPE *CIRCLEQ_LOOP_NEXT(CIRCLEQ_HEAD *head,

        struct TYPE *elm, CIRCLEQ_ENTRY NAME);

CIRCLEQ_FOREACH(struct TYPE *var, CIRCLEQ_HEAD *head,

        CIRCLEQ_ENTRY NAME);

CIRCLEQ_FOREACH_REVERSE(struct TYPE *var, CIRCLEQ_HEAD *head,

        CIRCLEQ_ENTRY NAME);

void CIRCLEQ_REMOVE(CIRCLEQ_HEAD *head, struct TYPE *elm,

        CIRCLEQ_ENTRY NAME);

```

DESCRIPTION

These macros define and operate on doubly linked circular queues.

In the macro definitions, TYPE is the name of a user-defined structure, that must contain a field of type CIRCLEQ_ENTRY, named NAME. The argument HEADNAME is the name of a user-defined structure that must be declared using the macro CIRCLEQ_HEAD().

Creation

A circular queue is headed by a structure defined by the CIRCLEQ_HEAD() macro. This structure contains a pair of pointers, one to the first element in the queue and the other to the last element in the queue. The elements are doubly linked so that an arbitrary element can be removed without traversing the queue. New elements can be added to the queue after an existing element, before an existing element, at the head of the queue, or at the end of the queue. A CIRCLEQ_HEAD structure is declared as follows:

```
CIRCLEQ_HEAD(HEADNAME, TYPE) head;
```

where struct HEADNAME is the structure to be defined, and struct TYPE is the type of the elements to be linked into the queue. A pointer to the head of the queue can later be declared as:

```
struct HEADNAME *headp;
```

(The names head and headp are user selectable.)

CIRCLEQ_ENTRY() declares a structure that connects the elements in the queue.

CIRCLEQ_HEAD_INITIALIZER() evaluates to an initializer for the queue head.

CIRCLEQ_INIT() initializes the queue referenced by head.

CIRCLEQ_EMPTY() evaluates to true if there are no items on the queue.

Insertion

CIRCLEQ_INSERT_HEAD() inserts the new element elm at the head of the queue.

CIRCLEQ_INSERT_TAIL() inserts the new element elm at the end of the queue.

CIRCLEQ_INSERT_BEFORE() inserts the new element elm before the element listelm.

CIRCLEQ_INSERT_AFTER() inserts the new element elm after the element listelm.

Traversal

CIRCLEQ_FIRST() returns the first item on the queue.

CIRCLEQ_LAST() returns the last item on the queue.

CIRCLEQ_PREV() returns the previous item on the queue, or &head if this item is the first one.

CIRCLEQ_NEXT() returns the next item on the queue, or &head if this item is the last one.

CIRCLEQ_LOOP_PREV() returns the previous item on the queue. If elm is the first element on the queue, the last element is returned.

CIRCLEQ_LOOP_NEXT() returns the next item on the queue. If elm is the last element on the queue, the first element is returned.

CIRCLEQ_FOREACH() traverses the queue referenced by head in the forward direction, assigning each element in turn to var. var is set to &head if the loop completes normally, or if there were no elements.

CIRCLEQ_FOREACH_REVERSE() traverses the queue referenced by head in the reverse direction, assigning each element in turn to var.

Removal

CIRCLEQ_REMOVE() removes the element elm from the queue.

RETURN VALUE

CIRCLEQ_EMPTY() returns nonzero if the queue is empty, and zero if the queue contains at least one entry.

CIRCLEQ_FIRST(), CIRCLEQ_LAST(), CIRCLEQ_LOOP_PREV(), and CIRCLEQ_LOOP_NEXT() return a pointer to the first, last, previous, or next TYPE structure, respectively.

CIRCLEQ_PREV(), and CIRCLEQ_NEXT() are similar to their CIRCLEQ_LOOP_*() counterparts, except that if the argument is the first or last element, respectively, they return &head.

CIRCLEQ_HEAD_INITIALIZER() returns an initializer that can be assigned to the queue head.

STANDARDS

BSD.

BUGS

CIRCLEQ_FOREACH() and CIRCLEQ_FOREACH_REVERSE() don't allow var to be removed or freed within the loop, as it would interfere with the traversal. CIRCLEQ_FOREACH_SAFE() and CIR?

CLEQ_FOREACH_REVERSE_SAFE(), which are present on the BSDs but are not present in glibc, fix this limitation by allowing var to safely be removed from the list and freed from within the loop without interfering with the traversal.

EXAMPLES

```
#include <stddef.h>

#include <stdio.h>

#include <stdlib.h>

#include <sys/queue.h>

struct entry {
    int data;

    CIRCLEQ_ENTRY(entry) entries;    /* Queue */
};

CIRCLEQ_HEAD(circlehead, entry);

int
main(void)
{
    struct entry *n1, *n2, *n3, *np;

    struct circlehead head;    /* Queue head */

    int i;

    CIRCLEQ_INIT(&head);    /* Initialize the queue */

    n1 = malloc(sizeof(struct entry));    /* Insert at the head */

    CIRCLEQ_INSERT_HEAD(&head, n1, entries);

    n1 = malloc(sizeof(struct entry));    /* Insert at the tail */

    CIRCLEQ_INSERT_TAIL(&head, n1, entries);

    n2 = malloc(sizeof(struct entry));    /* Insert after */
```

```

CIRCLEQ_INSERT_AFTER(&head, n1, n2, entries);
n3 = malloc(sizeof(struct entry));    /* Insert before */
CIRCLEQ_INSERT_BEFORE(&head, n2, n3, entries);
CIRCLEQ_REMOVE(&head, n2, entries);    /* Deletion */
free(n2);

                /* Forward traversal */

i = 0;
CIRCLEQ_FOREACH(np, &head, entries)
    np->data = i++;

                /* Reverse traversal */
CIRCLEQ_FOREACH_REVERSE(np, &head, entries)
    printf("%i\n", np->data);

                /* Queue deletion */

n1 = CIRCLEQ_FIRST(&head);
while (n1 != (void *)&head) {
    n2 = CIRCLEQ_NEXT(n1, entries);
    free(n1);
    n1 = n2;
}

CIRCLEQ_INIT(&head);
exit(EXIT_SUCCESS);
}

```

SEE ALSO

insque(3), queue(7)

Linux man-pages 6.17

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CIRCLEQ(3)