

LINKED LIST MIS

Imported Modules

None

Interfaces

```
PROCEDURE AddBefore( n: INTEGER)
PROCEDURE AddAfter( n: INTEGER)
PROCEDURE Del()
PROCEDURE SetVal( n: INTEGER)
PROCEDURE GetVal() : INTEGER
PROCEDURE First()
PROCEDURE Next()
PROCEDURE Prev()
PROCEDURE Last()
```

Exceptions

list_full : **BOOLEAN**
list_empty : **BOOLEAN**
list_at_end : **BOOLEAN**
list_at_start: **BOOLEAN**

State Constants

MAXSIZE: **INTEGER** ($0 \leq \text{MAXSIZE}$)

State Variables

s : **lists[INTEGER]**
(**initially** $\forall x$: **INTEGER**. $0 \leq x < \text{MAXSIZE} \supset s[x] = 0$)
pos : **INTEGER** (**initially** $\text{pos} = 0$)

Behavior Rules (see next page)

AddBefore

Input	Output	Transition	Exception
N: Integer	--	If $ s = 0$ then $s' = [n]$ Elseif $\text{pos} = 0$ then $s' = n \parallel s$ Else $s' = s[0.. \text{pos}-1] \parallel n \parallel s[\text{pos}.. s -1]$ $\text{Pos}' = \text{pos} + 1$	$ s = \text{MAXSIZE} \Rightarrow \text{list_full}$

AddAfter

Input	Output	Transition	Exception
N: Integer	--	If $ s = 0$ then $s' = [n]$ $\text{Pos}' = \text{pos} + 1$ Elseif $\text{pos} = \text{size} - 1$ then $s' = s \parallel n$ Else $s' = s[0.. \text{pos}] \parallel n \parallel s[\text{pos} + 1.. s -1]$	$ s = \text{MAXSIZE} \Rightarrow \text{list_full}$

Del

Input	Output	Transition	Exception
--	--	If $\text{pos} = \text{size} - 1$ then $s' = s[0.. \text{pos}-1]$ $\text{Pos}' = \text{pos} - 1$ Elseif $\text{pos} = 0$ then $s' = s[1.. s -1]$ Else $s' = s[0.. \text{pos}-1] \parallel s[\text{pos} + 1.. s -1]$	$ s = 0 \Rightarrow \text{list_empty}$

SetVal

Input	Output	Transition	Exception
N: Integer	--	$s[pos] = n$	$ s = 0 \Rightarrow \text{list_empty}$

GetVal

Input	Output	Transition	Exception
	N: Integer	$s[pos]$	$ s = 0 \Rightarrow \text{list_empty}$

First

Input	Output	Transition	Exception
		$Pos' = 0$	$ s = 0 \Rightarrow \text{list_empty}$

Last

Input	Output	Transition	Exception
		$Pos' = s - 1$	$ s = 0 \Rightarrow \text{list_empty}$

Next

Input	Output	Transition	Exception
		$\text{Pos}' = \text{pos} + 1$	$ \text{s} = 0 \Rightarrow \text{list_empty}$ $\text{Pos} = \text{MAXSIZE} - 1 \Rightarrow \text{list_at_end}$

Prev

Input	Output	Transition	Exception
		$\text{Pos}' = \text{pos} - 1$	$ \text{s} = 0 \Rightarrow \text{list_empty}$ $\text{Pos} = 0 \Rightarrow \text{list_at_start}$