

NAG Library Function Document

nag_iamax_val (f16dq)

1 Purpose

nag_iamax_val (f16dq) computes, with respect to absolute value, the largest component of an integer vector, along with the index of that component.

2 Specification

```
#include <nag.h>
#include <nagf16.h>

void nag_iamax_val (Integer n, const Integer x[], Integer incx, Integer *k,
                   Integer *i, NagError *fail)
```

3 Description

nag_iamax_val (f16dq) computes, with respect to absolute value, the largest component, i , of an n -element integer vector x , and determines the smallest index, k , such that

$$i = |x_k| = \max_j |x_j|.$$

4 References

Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001) *Basic Linear Algebra Subprograms Technical (BLAST) Forum Standard* University of Tennessee, Knoxville, Tennessee <http://www.netlib.org/blas/blast-forum/blas-report.pdf>

5 Arguments

- 1: **n** – Integer *Input*
On entry: n , the number of elements in x .
Constraint: $n \geq 0$.
- 2: **x**[*dim*] – const Integer *Input*
Note: the dimension, *dim*, of the array **x** must be at least $\max(1, 1 + (n - 1) \times |\mathbf{incx}|)$.
On entry: the n -element vector x .
 If $\mathbf{incx} > 0$, x_i must be stored in $\mathbf{x}[(i - 1) \times |\mathbf{incx}|]$, for $i = 1, 2, \dots, n$.
 If $\mathbf{incx} < 0$, x_i must be stored in $\mathbf{x}[(n - i) \times |\mathbf{incx}|]$, for $i = 1, 2, \dots, n$.
 Intermediate elements of **x** are not referenced. If $n = 0$, **x** is not referenced and may be **NULL**.
- 3: **incx** – Integer *Input*
On entry: the increment in the subscripts of **x** between successive elements of x .
Constraint: $\mathbf{incx} \neq 0$.
- 4: **k** – Integer * *Output*
On exit: k , the index, from the set $\{0, |\mathbf{incx}|, \dots, (n - 1) \times |\mathbf{incx}|\}$, of the largest component of x with respect to absolute value. If $n = 0$ on input then **k** is returned as -1 .

- 5: **i** – Integer * *Output*
On exit: *i*, the largest component of *x* with respect to absolute value. If **n** = 0 on input then **i** is returned as 0.
- 6: **fail** – NagError * *Input/Output*
 The NAG error argument (see Section 3.6 in the Essential Introduction).

6 Error Indicators and Warnings

NE_ALLOC_FAIL

Dynamic memory allocation failed.
 See Section 3.2.1.2 in the Essential Introduction for further information.

NE_BAD_PARAM

On entry, argument $\langle value \rangle$ had an illegal value.

NE_INT

On entry, **incx** = $\langle value \rangle$.
 Constraint: **incx** \neq 0.

On entry, **n** = $\langle value \rangle$.
 Constraint: **n** \geq 0.

NE_INTERNAL_ERROR

An unexpected error has been triggered by this function. Please contact NAG.
 See Section 3.6.6 in the Essential Introduction for further information.

NE_NO_LICENCE

Your licence key may have expired or may not have been installed correctly.
 See Section 3.6.5 in the Essential Introduction for further information.

7 Accuracy

The BLAS standard requires accurate implementations which avoid unnecessary over/underflow (see Section 2.7 of Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001)).

8 Parallelism and Performance

Not applicable.

9 Further Comments

None.

10 Example

This example computes the largest component with respect to absolute value and index of that component for the vector

$$x = (1, 10, 11, -2, 9)^T.$$

10.1 Program Text

```

/* nag_iamax_val (f16dqc) Example Program.
 *
 * Copyright 2014 Numerical Algorithms Group.
 *
 * Mark 9, 2009.
 */

#include <stdio.h>
#include <nag.h>
#include <nag_stdlib.h>
#include <nagf16.h>

int main(void)
{
    /* Scalars */
    Integer exit_status, i, incx, j, k, n, xlen;
    /* Arrays */
    Integer *x = 0;
    /* Nag Types */
    NagError fail;

    exit_status = 0;
    INIT_FAIL(fail);

    printf("nag_iamax_val (f16dqc) Example Program Results\n\n");

    /* Skip heading in data file */
#ifdef _WIN32
    scanf_s("%*[\n] ");
#else
    scanf("%*[\n] ");
#endif
    /* Read the number of elements and the increment */
#ifdef _WIN32
    scanf_s("%"NAG_IFMT%"NAG_IFMT"%*[\n] ", &n, &incx);
#else
    scanf("%"NAG_IFMT%"NAG_IFMT"%*[\n] ", &n, &incx);
#endif

    xlen = MAX(1, 1 + (n - 1)*ABS(incx));

    if (n > 0)
    {
        /* Allocate memory */
        if (!(x = NAG_ALLOC(xlen, Integer)))
        {
            printf("Allocation failure\n");
            exit_status = -1;
            goto END;
        }
    }
    else
    {
        printf("Invalid n\n");
        exit_status = 1;
        goto END;
    }

    /* Input vector x */
    for (j = 0; j < xlen; j = j + incx)
#ifdef _WIN32
        scanf_s("%"NAG_IFMT"", &x[j]);
#else
        scanf("%"NAG_IFMT"", &x[j]);
#endif
#ifdef _WIN32
    scanf_s("%*[\n] ");
#else
    scanf("%*[\n] ");

```

```

#endif

/* nag_iamax_val (f16dq).
 * Get absolutely maximum value (i) and location of that value (k)
 * of Integer vector */
nag_iamax_val(n, x, incx, &k, &i, &fail);

if (fail.code != NE_NOERROR)
{
    printf("Error from nag_iamax_val (f16dq).\n%s\n", fail.message);
    exit_status = 1;
    goto END;
}

/* Print the absolutely maximum value */
printf("Absolutely maximum element of x is %12"NAG_IFMT"\n", i);
/* Print its location */
printf("Index of absolutely maximum element of x is %3"NAG_IFMT"\n", k);

END:
NAG_FREE(x);

return exit_status;
}

```

10.2 Program Data

```

nag_iamax_val (f16dq) Example Program Data
5 1 : n and incx
1 10 11 -2 9 : Array x

```

10.3 Program Results

```

nag_iamax_val (f16dq) Example Program Results
Absolutely maximum element of x is 11
Index of absolutely maximum element of x is 2

```
