

NAG Library Routine Document

F16DPF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of *bold italicised* terms and other implementation-dependent details.

1 Purpose

F16DPF computes the smallest component of an integer vector, along with the index of that component.

2 Specification

```
SUBROUTINE F16DPF (N, X, INCX, K, I)
  INTEGER N, X(1+(N-1)*ABS(INCX)), INCX, K, I
```

3 Description

F16DPF computes the smallest component, i , of an n -element integer vector x , and determines the smallest index, k , such that

$$i = x_k = \min_j x_j.$$

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 | <i>Input</i> |
| | <i>On entry:</i> n , the number of elements in x . | |
| 2: | $X(1 + (N - 1) \times INCX)$ – INTEGER array | <i>Input</i> |
| | <i>On entry:</i> the n -element vector x . | |
| | If $INCX > 0$, x_i must be stored in $X((i - 1) \times INCX + 1)$, for $i = 1, 2, \dots, N$. | |
| | If $INCX < 0$, x_i must be stored in $X((N - i) \times INCX + 1)$, for $i = 1, 2, \dots, N$. | |
| | Intermediate elements of X are not referenced. If $N = 0$, X is not referenced. | |
| 3: | INCX – INTEGER | <i>Input</i> |
| | <i>On entry:</i> the increment in the subscripts of X between successive elements of x . | |
| | <i>Constraint:</i> $INCX \neq 0$. | |
| 4: | K – INTEGER | <i>Output</i> |
| | <i>On exit:</i> k , the index, from the set $\{1, 2, \dots, N\}$, of the smallest component of x . If $N \leq 0$ on input then K is returned as 0. | |
| 5: | I – INTEGER | <i>Output</i> |
| | <i>On exit:</i> i , the smallest component of x . If $N \leq 0$ on input then I is returned as 0. | |

6 Error Indicators and Warnings

If $INCX = 0$, an error message is printed and program execution is terminated.

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

F16DPF is not threaded in any implementation.

9 Further Comments

None.

10 Example

This example computes the smallest component and index of that component for the vector

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

10.1 Program Text

```

Program f16dpfe
!      F16DPF Example Program Text
!      Mark 26 Release. NAG Copyright 2016.
!
!      .. Use Statements ..
Use nag_library, Only: f16dpf
!      .. Implicit None Statement ..
Implicit None
!      .. Parameters ..
Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
Integer                    :: i, incx, j, jx, k, n
!      .. Local Arrays ..
Integer, Allocatable       :: x(:)
!      .. Intrinsic Procedures ..
Intrinsic                  :: abs
!      .. Executable Statements ..
Write (nout,*) 'F16DPF Example Program Results'

!      Skip heading in data file
Read (nin,*)

      Read (nin,*) n, incx
      Allocate (x(1+(n-1)*abs(incx)))

!      Read the vector x and store forwards or backwards
!      as determined by incx.
      If (incx>0) Then
         jx = 1
      Else
         jx = 1 - (n-1)*incx
      End If

      Do j = 1, n
         Read (nin,*) x(jx)
         jx = jx + incx
      End Do

```

```

!      Find k = argmin(x) and i = min(x).

      Call f16dpf(n,x,incx,k,i)

      Write (nout,*)
      Write (nout,99999) k
      Write (nout,99998) i

99999 Format (1X,'Index of smallest component of x is',I3)
99998 Format (1X,'Smallest component of x is',I12)
      End Program f16dpfe

```

10.2 Program Data

```

F16DPF Example Program Data
  5   1                                : n and incx
  1
 10
 11
 -2
  9                                    : Vector x

```

10.3 Program Results

F16DPF Example Program Results

```

Index of smallest component of x is  4
Smallest component of x is          -2

```
