

# NAG Library Routine Document

## F16DRF

**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

F16DRF computes, with respect to absolute value, the smallest component of an integer vector, along with the index of that component.

### 2 Specification

```
SUBROUTINE F16DRF (N, X, INCX, K, I)
  INTEGER N, X(1+(N-1)*ABS(INCX)), INCX, K, I
```

### 3 Description

F16DRF computes, with respect to absolute value, 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 $x$ with respect to absolute value. If $N \leq 0$ on input then $K$ is returned as 0. |               |

5: I – INTEGER

*Output*

*On exit:*  $i$ , the smallest component of  $x$  with respect to absolute value. 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

F16DRF is not threaded in any implementation.

## 9 Further Comments

None.

## 10 Example

This example computes the smallest 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

```

Program f16drfe

!      F16DRF Example Program Text

!      Mark 26 Release. NAG Copyright 2016.

!      .. Use Statements ..
!      Use nag_library, Only: f16drf
!      .. 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,*) 'F16DRF 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(abs(x)) and i = min(abs(x)).

      Call f16drf(n,x,incx,k,i)

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

99999 Format (1X,'Index of absolutely smallest component of x is',I3)
99998 Format (1X,'Absolutely smallest component of x is',I12)
      End Program f16drfe

```

## 10.2 Program Data

F16DRF Example Program Data

5	1	: n and incx
1		
10		
11		
-2		
9		: Vector x

## 10.3 Program Results

F16DRF Example Program Results

Index of absolutely smallest component of x is	1
Absolutely smallest component of x is	1

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