

NAG Library Routine Document

F16EHF (BLAS_DWAXPBY)

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

F16EHF (BLAS_DWAXPBY) computes the sum of two scaled vectors, preserving input, for real scalars and vectors.

2 Specification

```
SUBROUTINE F16EHF (N, ALPHA, X, INCX, BETA, Y, INCY, W, INCW)
```

```
INTEGER N, INCX, INCY, INCW
```

```
REAL (KIND=nag_wp) ALPHA, X(1+(N-1)*ABS(INCX)), BETA, &  
Y(1+(N-1)*ABS(INCY)), W(1+(N-1)*ABS(INCW))
```

The routine may be called by its BLAST name *blas_dwaxpby*.

3 Description

F16EHF (BLAS_DWAXPBY) performs the operation

$$w \leftarrow \alpha x + \beta y,$$

where x and y are n -element real vectors, and α and β are real scalars.

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 Parameters

- | | | |
|----|--------------------------------------------------------------------------------------------|--------------|
| 1: | N – INTEGER | <i>Input</i> |
| | <i>On entry:</i> n , the number of elements in x , y and w . | |
| 2: | ALPHA – REAL (KIND=nag_wp) | <i>Input</i> |
| | <i>On entry:</i> the scalar α . | |
| 3: | X(1 + (N – 1) × INCX) – REAL (KIND=nag_wp) array | <i>Input</i> |
| | <i>On entry:</i> the n -element vector x . | |
| | If INCX > 0, x_i must be stored in X(1 + (i – 1) × INCX), for $i = 1, 2, \dots, N$. | |
| | If INCX < 0, x_i must be stored in X(1 – (N – i) × INCX), for $i = 1, 2, \dots, N$. | |
| | Intermediate elements of X are not referenced. | |
| 4: | 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 ≠ 0. | |

- 5: BETA – REAL (KIND=nag_wp) Input
On entry: the scalar β .
- 6: $Y(1 + (N - 1) \times |\text{INCY}|)$ – REAL (KIND=nag_wp) array Input
On entry: the n -element vector y .
 If $\text{INCY} > 0$, y_i must be stored in $Y(1 + (i - 1) \times \text{INCY})$, for $i = 1, 2, \dots, N$.
 If $\text{INCY} < 0$, y_i must be stored in $Y(1 - (N - i) \times \text{INCY})$, for $i = 1, 2, \dots, N$.
 Intermediate elements of Y are not referenced.
- 7: INCY – INTEGER Input
On entry: the increment in the subscripts of Y between successive elements of y .
Constraint: $\text{INCY} \neq 0$.
- 8: $W(1 + (N - 1) \times |\text{INCW}|)$ – REAL (KIND=nag_wp) array Output
On exit: the n -element vector w .
 If $\text{INCW} > 0$, w_i is in $W(1 + (i - 1) \times \text{INCW})$, for $i = 1, 2, \dots, N$.
 If $\text{INCW} < 0$, w_i is in $W(1 + (N - i) \times \text{INCW})$, for $i = 1, 2, \dots, N$.
 Intermediate elements of W are not referenced.
- 9: INCW – INTEGER Input
On entry: the increment in the subscripts of W between successive elements of w .
Constraint: $\text{INCW} \neq 0$.

6 Error Indicators and Warnings

If $\text{INCX} = 0$ or $\text{INCY} = 0$ or $\text{INCW} = 0$, 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 Further Comments

None.

9 Example

This example computes the result of a scaled vector accumulation for

$$\alpha = 3, \quad x = (-4, 2.1, 3.7, 4.5, -6)^T,$$

$$\beta = -1, \quad y = (-3, -2.4, 6.4, -5, -5.1)^T.$$

9.1 Program Text

```

Program f16ehfe
!      F16EHF Example Program Text
!
!      Mark 24 Release. NAG Copyright 2012.
!
!      .. Use Statements ..

```

```

      Use nag_library, Only: blas_dwaxpby, nag_wp
!      .. Implicit None Statement ..
      Implicit None
!      .. Parameters ..
      Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
      Real (Kind=nag_wp)         :: alpha, beta
      Integer                    :: incw, incx, incy, n, nw, nx, ny
!      .. Local Arrays ..
      Real (Kind=nag_wp), Allocatable :: w(:), x(:), y(:)
!      .. Intrinsic Procedures ..
      Intrinsic                  :: abs
!      .. Executable Statements ..
      Write (nout,*) 'F16EHF Example Program Results'

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

      Read (nin,*) n
      Read (nin,*) incx, incy, incw

      nw = 1 + (n-1)*abs(incw)
      nx = 1 + (n-1)*abs(incx)
      ny = 1 + (n-1)*abs(incy)
      Allocate (w(nw),x(nx),y(ny))

      Read (nin,*) alpha, beta
      Read (nin,*) x(1:nx:abs(incx))
      Read (nin,*) y(1:ny:abs(incy))

!      Compute W = alpha*X + beta*Y

      Call blas_dwaxpby(n,alpha,x,incx,beta,y,incy,w,incw)

      Write (nout,*)
      Write (nout,99999)
      Write (nout,99998) w(1:nw:abs(incw))

99999 Format (1X,'Result of scaled vector addition is')
99998 Format (1X,'W =',5F9.4)
      End Program f16ehfe

```

9.2 Program Data

F16EHF Example Program Data

```

5           : n
-1         -1         -1           : incx, incy and incw
3.0        -1.0       : alpha and beta
-4.0        2.1        3.7         4.5        -6.0       : x
-3.0        -2.4        6.4        -5.0        -5.1       : y

```

9.3 Program Results

F16EHF Example Program Results

```

Result of scaled vector addition is
W = -9.0000  8.7000  4.7000  18.5000 -12.9000

```
