

# NAG Library Routine Document

## F06HCF

**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

F06HCF multiplies a complex vector by a complex diagonal matrix.

### 2 Specification

```
SUBROUTINE F06HCF (N, D, INCD, X, INCX)
  INTEGER          N, INCD, INCX
  COMPLEX (KIND=nag_wp) D(*), X(*)
```

### 3 Description

F06HCF performs the operation

$$x \leftarrow Dx$$

where  $x$  is an  $n$ -element complex vector and  $D = \text{diag}(d)$  is a complex diagonal matrix.

Equivalently, the routine performs the element-by-element product of the vectors  $x$  and  $d$

$$x_i = d_i x_i, \quad i = 1, 2, \dots, n.$$

### 4 References

None.

### 5 Arguments

- |    |   |                     |
|----|---|---------------------|
| 1: | N – INTEGER   | <i>Input</i>        |
|    | <i>On entry:</i> $n$ , the number of elements in $d$ and $x$ .  |                     |
| 2: | D(*) – COMPLEX (KIND=nag_wp) array  | <i>Input</i>        |
|    | <b>Note:</b> the dimension of the array D must be at least $\max(1, 1 + (N - 1) \times  \text{INCD} )$ .        |                     |
|    | <i>On entry:</i> the vector $d$ .   |                     |
|    | If $\text{INCD} > 0$ , $d_i$ must be stored in $D((i - 1) \times \text{INCD} + 1)$ , for $i = 1, 2, \dots, N$ . |                     |
|    | If $\text{INCD} < 0$ , $d_i$ must be stored in $D(1 - (N - i) \times \text{INCD})$ , for $i = 1, 2, \dots, N$ . |                     |
| 3: | INCD – INTEGER  | <i>Input</i>        |
|    | <i>On entry:</i> the increment in the subscripts of D between successive elements of $d$ .                      |                     |
| 4: | X(*) – COMPLEX (KIND=nag_wp) array  | <i>Input/Output</i> |
|    | <b>Note:</b> the dimension of the array X must be at least $\max(1, 1 + (N - 1) \times  \text{INCX} )$ .        |                     |
|    | <i>On entry:</i> the array X must contain the $n$ -element vector $x$ .   |                     |
|    | If $\text{INCX} > 0$ , $x_i$ must be stored in $X(1 + (i - 1) \times \text{INCX})$ , for $i = 1, 2, \dots, N$ . |                     |
|    | If $\text{INCX} < 0$ , $x_i$ must be stored in $X(1 - (N - i) \times \text{INCX})$ , for $i = 1, 2, \dots, N$ . |                     |

*On exit:* the updated vector  $x$  stored in the array elements used to supply the original vector  $x$ . Intermediate elements of  $X$  are unchanged.

5: INCX – INTEGER

*Input*

*On entry:* the increment in the subscripts of  $X$  between successive elements of  $x$ .

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Parallelism and Performance

F06HCF makes calls to BLAS and/or LAPACK routines, which may be threaded within the vendor library used by this implementation. Consult the documentation for the vendor library for further information.

Please consult the X06 Chapter Introduction for information on how to control and interrogate the OpenMP environment used within this routine. Please also consult the Users' Note for your implementation for any additional implementation-specific information.

## 9 Further Comments

None.

## 10 Example

None.

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