

# NAG Library Routine Document

## F06CHF

**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

F06CHF applies a complex similarity rotation having real cosine and complex sine to a 2 by 2 complex Hermitian matrix.

### 2 Specification

```
SUBROUTINE F06CHF (X, Y, Z, C, S)
```

```
REAL (KIND=nag_wp) C
```

```
COMPLEX (KIND=nag_wp) X, Y, Z, S
```

### 3 Description

F06CHF applies a complex similarity rotation, with parameters  $c$  (real) and  $s$  (complex), to a given 2 by 2 complex Hermitian matrix; that is, it performs the operation:

$$\begin{pmatrix} x & y \\ \bar{y} & z \end{pmatrix} \leftarrow \begin{pmatrix} c & \bar{s} \\ -s & c \end{pmatrix} \begin{pmatrix} x & y \\ \bar{y} & z \end{pmatrix} \begin{pmatrix} c & -\bar{s} \\ s & c \end{pmatrix},$$

where  $x$  and  $z$  are real.

The parameter X and Z which hold  $x$  and  $z$  are declared complex for convenience when using the routine to operate on submatrices of larger Hermitian matrices.

Note that:

$$\begin{pmatrix} z & \bar{y} \\ y & x \end{pmatrix} \leftarrow \begin{pmatrix} c & \bar{w} \\ -w & c \end{pmatrix} \begin{pmatrix} z & \bar{y} \\ y & x \end{pmatrix} \begin{pmatrix} c & -\bar{w} \\ w & c \end{pmatrix},$$

where  $w = -\bar{s}$ , so to use F06CHF when  $y$  is the (2,1) element of the matrix, you can make the call

```
CALL F06CHF(Z, Y, X, C, -CONJG(S))
```

### 4 References

None.

### 5 Parameters

1: X – COMPLEX (KIND=nag\_wp) *Input/Output*

*On entry:* the value  $x$ , the (1,1) element of the input matrix. The imaginary part of X need not be set; it is assumed to be zero.

*On exit:* the transformed value  $x$ . The imaginary part of X is set to zero.

2: Y – COMPLEX (KIND=nag\_wp) *Input/Output*

*On entry:* the value  $y$ , the (1,2) element of the input matrix.

*On exit:* the transformed value  $y$ .

- 3: Z – COMPLEX (KIND=nag\_wp) *Input/Output*  
*On entry:* the value  $z$ , the (2,2) element of the input matrix. The imaginary part of Z need not be set; it is assumed to be zero.  
*On exit:* the transformed value  $z$ . The imaginary part of Z is set to zero.
- 4: C – REAL (KIND=nag\_wp) *Input*  
*On entry:* the value  $c$ , the cosine of the rotation.
- 5: S – COMPLEX (KIND=nag\_wp) *Input*  
*On entry:* the value  $s$ , the sine of the rotation.

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Further Comments

None.

## 9 Example

None.

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