

# NAG Library Routine Document

## F06SSF (ZHPR2)

**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

F06SSF (ZHPR2) computes the rank-2 update of a complex Hermitian matrix stored in packed form.

### 2 Specification

```
SUBROUTINE F06SSF (UPLO, N, ALPHA, X, INCX, Y, INCY, AP)
```

```
INTEGER                N, INCX, INCY
COMPLEX (KIND=nag_wp) ALPHA, X(*), Y(*), AP(*)
CHARACTER(1)          UPLO
```

The routine may be called by its BLAS name *zhpr2*.

### 3 Description

F06SSF (ZHPR2) performs the Hermitian rank-2 update operation

$$A \leftarrow \alpha xy^H + \bar{\alpha} yx^H + A,$$

where  $A$  is an  $n$  by  $n$  complex Hermitian matrix, stored in packed form,  $x$  and  $y$  are  $n$ -element complex vectors, and  $\alpha$  is a complex scalar.

### 4 References

None.

### 5 Parameters

- |    |   |              |
|----|---|--------------|
| 1: | UPLO – CHARACTER(1)   | <i>Input</i> |
|    | <i>On entry:</i> specifies whether the upper or lower triangular part of $A$ is stored. |              |
|    | UPLO = 'U'<br>The upper triangular part of $A$ is stored.                               |              |
|    | UPLO = 'L'<br>The lower triangular part of $A$ is stored.                               |              |
|    | <i>Constraint:</i> UPLO = 'U' or 'L'.   |              |
| 2: | N – INTEGER   | <i>Input</i> |
|    | <i>On entry:</i> $n$ , the order of the matrix $A$ .                                    |              |
|    | <i>Constraint:</i> $N \geq 0$ .   |              |
| 3: | ALPHA – COMPLEX (KIND=nag_wp)   | <i>Input</i> |
|    | <i>On entry:</i> the scalar $\alpha$ .  |              |

- 4: X(\*) – COMPLEX (KIND=nag\_wp) array *Input*  
**Note:** the dimension of the array X must be at least  $\max(1, 1 + (N - 1) \times |\text{INCX}|)$ .  
*On entry:* 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  $i = 1, 2, \dots, N$ .  
 Intermediate elements of X are not referenced.
- 5: INCX – INTEGER *Input*  
*On entry:* the increment in the subscripts of X between successive elements of  $x$ .  
*Constraint:*  $\text{INCX} \neq 0$ .
- 6: Y(\*) – COMPLEX (KIND=nag\_wp) array *Input*  
**Note:** the dimension of the array Y must be at least  $\max(1, 1 + (N - 1) \times |\text{INCY}|)$ .  
*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: AP(\*) – COMPLEX (KIND=nag\_wp) array *Input/Output*  
**Note:** the dimension of the array AP must be at least  $N \times (N + 1)/2$ .  
*On entry:* the  $n$  by  $n$  Hermitian matrix  $A$ , packed by columns.  
 More precisely,  
     if  $\text{UPLO} = 'U'$ , the upper triangle of  $A$  must be stored with element  $A_{ij}$  in  
      $\text{AP}(i + j(j - 1)/2)$  for  $i \leq j$ ;  
     if  $\text{UPLO} = 'L'$ , the lower triangle of  $A$  must be stored with element  $A_{ij}$  in  
      $\text{AP}(i + (2n - j)(j - 1)/2)$  for  $i \geq j$ .  
*On exit:* the updated matrix  $A$ . The imaginary parts of the diagonal elements are set to zero.

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Further Comments

None.

## 9 Example

None.