

# NAG Library Routine Document

## F06TDF

**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

F06TDF performs the symmetric rank-1 update operation

$$A \leftarrow \alpha x x^T + A,$$

where  $A$  is an  $n$  by  $n$  complex symmetric matrix, stored in packed form,  $x$  is an  $n$ -element complex vector, and  $\alpha$  is a complex scalar.

### 2 Specification

```
SUBROUTINE F06TDF (UPLO, N, ALPHA, X, INCX, AP)
INTEGER           N, INCX
COMPLEX (KIND=nag_wp) ALPHA, X(*), AP(*)
CHARACTER(1)     UPLO
```

### 3 Description

None.

### 4 References

None.

### 5 Arguments

- |    |   |              |
|----|---|--------------|
| 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  | <i>Input</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 $n$ -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:  $\text{INCX}$  – INTEGER

*Input*

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

*Constraint:*  $\text{INCX} \neq 0$ .

6:  $\text{AP}(\ast)$  – COMPLEX (KIND=nag\_wp) array

*Input/Output*

**Note:** the dimension of the array  $\text{AP}$  must be at least  $N \times (N + 1)/2$ .

*On entry:* the  $n$  by  $n$  symmetric 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  $A$ .

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Parallelism and Performance

F06TDF is not threaded in any implementation.

## 9 Further Comments

None.

## 10 Example

None.

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