

# 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) *Input*  
*On entry:* specifies whether the upper or lower triangular part of  $A$  is stored.  
UPLO = 'U'  
The upper triangular part of  $A$  is stored.  
UPLO = 'L'  
The lower triangular part of  $A$  is stored.  
*Constraint:* UPLO = 'U' or 'L'.
- 2: N – INTEGER *Input*  
*On entry:*  $n$ , the order of the matrix  $A$ .  
*Constraint:*  $N \geq 0$ .
- 3: ALPHA – COMPLEX (KIND=nag\_wp) *Input*  
*On entry:* 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:  $\text{INCX}$  – 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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