

# NAG Fortran Library Routine Document

## F06PHF (DTPMV)

**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

F06PHF (DTPMV) performs one of the matrix-vector operations

$$x \leftarrow Ax \quad \text{or} \quad x \leftarrow A^T x,$$

where  $A$  is an  $n$  by  $n$  real triangular matrix, stored in packed form, and  $x$  is an  $n$  element real vector.

### 2 Specification

```
SUBROUTINE F06PHF (UPLO, TRANS, DIAG, N, AP, X, INCX)
  INTEGER          N, INCX
  double precision AP(*), X(*)
  CHARACTER*1     UPLO, TRANS, DIAG
```

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

### 3 Description

None.

### 4 References

None.

### 5 Parameters

- 1: UPLO – CHARACTER\*1 *Input*  
*On entry:* specifies whether  $A$  is upper or lower triangular as follows:  
 if UPLO = 'U',  $A$  is upper triangular;  
 if UPLO = 'L',  $A$  is lower triangular.  
*Constraint:* UPLO = 'U' or 'L'.
- 2: TRANS – CHARACTER\*1 *Input*  
*On entry:* specifies the operation to be performed as follows:  
 if TRANS = 'N',  $x \leftarrow Ax$ ;  
 if TRANS = 'T' or 'C',  $x \leftarrow A^T x$ .  
*Constraint:* TRANS = 'N', 'T' or 'C'.
- 3: DIAG – CHARACTER\*1 *Input*  
*On entry:* specifies whether  $A$  has non-unit or unit diagonal elements, as follows:  
 if DIAG = 'N', the diagonal elements are stored explicitly;  
 if DIAG = 'U', the diagonal elements are assumed to be 1, and are not referenced.  
*Constraint:* DIAG = 'N' or 'U'.

- 4: N – INTEGER *Input*  
*On entry:*  $n$ , the order of the matrix  $A$ .  
*Constraint:*  $N \geq 0$ .
- 5: AP(\*) – **double precision** array *Input*  
**Note:** the dimension of the array AP must be at least  $\max(1, N \times (N + 1)/2)$ .  
*On entry:* the  $n$  by  $n$  triangular matrix  $A$ , packed by columns. More precisely, if UPLO = 'U', the upper triangle of  $A$  must be stored with element  $a_{ij}$  in  $AP(i + j(j - 1)/2)$  for  $i \leq j$ ; if UPLO = 'L', the lower triangle of  $A$  must be stored with element  $a_{ij}$  in  $AP(i + (2n - j)(j - 1)/2)$  for  $i \geq j$ . If DIAG = 'U', the diagonal elements of  $A$  are assumed to be 1, and are not referenced; the same storage scheme is used whether DIAG = 'N' or 'U'.
- 6: X(\*) – **double precision** array *Input/Output*  
*On entry:* the vector  $x$ .  
*On exit:* the updated vector  $x$ .
- 7: INCX – INTEGER *Input*  
*On entry:* the increment in the subscripts of X between successive elements of  $x$ .  
*Constraint:*  $INCX \neq 0$ .

## 6 Error Indicators and Warnings

None.

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