

# NAG Library Routine Document

## F06PCF (DSYMV)

**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

F06PCF (DSYMV) the matrix-vector product for a real symmetric matrix.

### 2 Specification

```
SUBROUTINE F06PCF (UPLO, N, ALPHA, A, LDA, X, INCX, BETA, Y, INCY)
  INTEGER          N, LDA, INCX, INCY
  REAL (KIND=nag_wp) ALPHA, A(LDA,*), X(*), BETA, Y(*)
  CHARACTER(1)    UPLO
```

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

### 3 Description

F06PCF (DSYMV) performs the matrix-vector operation

$$y \leftarrow \alpha Ax + \beta y,$$

where  $A$  is an  $n$  by  $n$  real symmetric matrix,  $x$  and  $y$  are  $n$ -element real vectors, and  $\alpha$  and  $\beta$  are real scalars.

### 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 – REAL (KIND=nag_wp)  | <i>Input</i> |
|    | <i>On entry:</i> the scalar $\alpha$ .  |              |
| 4: | A(LDA,*) – REAL (KIND=nag_wp) array   | <i>Input</i> |
|    | <b>Note:</b> the second dimension of the array $A$ must be at least $\max(1, N)$ .      |              |
|    | <i>On entry:</i> the $n$ by $n$ symmetric matrix $A$ .                                  |              |

If UPLO = 'U', the upper triangular part of  $A$  must be stored and the elements of the array below the diagonal are not referenced.

If UPLO = 'L', the lower triangular part of  $A$  must be stored and the elements of the array above the diagonal are not referenced.

- 5: LDA – INTEGER *Input*  
*On entry:* the first dimension of the array  $A$  as declared in the (sub)program from which F06PCF (DSYMV) is called.  
*Constraint:*  $LDA \geq \max(1, N)$ .
- 6: X(\*) – REAL (KIND=nag\_wp) array *Input*  
**Note:** the dimension of the array  $X$  must be at least  $\max(1, 1 + (N - 1) \times |INCX|)$ .  
*On entry:* the  $n$ -element vector  $x$ .  
 If  $INCX > 0$ ,  $x_i$  must be stored in  $X(1 + (i - 1) \times INCX)$ , for  $i = 1, 2, \dots, N$ .  
 If  $INCX < 0$ ,  $x_i$  must be stored in  $X(1 - (N - i) \times INCX)$ , for  $i = 1, 2, \dots, N$ .  
 Intermediate elements of  $X$  are not referenced.
- 7: INCX – INTEGER *Input*  
*On entry:* the increment in the subscripts of  $X$  between successive elements of  $x$ .  
*Constraint:*  $INCX \neq 0$ .
- 8: BETA – REAL (KIND=nag\_wp) *Input*  
*On entry:* the scalar  $\beta$ .
- 9: Y(\*) – REAL (KIND=nag\_wp) array *Input/Output*  
**Note:** the dimension of the array  $Y$  must be at least  $\max(1, 1 + (N - 1) \times |INCY|)$ .  
*On entry:* the  $n$ -element vector  $y$ , if BETA = 0.0  $Y$  need not be set.  
 If  $INCY > 0$ ,  $y_i$  must be stored in  $Y(1 + (i - 1) \times INCY)$ , for  $i = 1, 2, \dots, N$ .  
 If  $INCY < 0$ ,  $y_i$  must be stored in  $Y(1 - (N - i) \times INCY)$ , for  $i = 1, 2, \dots, N$ .  
*On exit:* the updated vector  $y$  stored in the array elements used to supply the original vector  $y$ .
- 10: INCY – INTEGER *Input*  
*On entry:* the increment in the subscripts of  $Y$  between successive elements of  $y$ .  
*Constraint:*  $INCY \neq 0$ .

## 6 Error Indicators and Warnings

None.

## 7 Accuracy

Not applicable.

## 8 Parallelism and Performance

F06PCF (DSYMV) is not threaded in any implementation.

## **9 Further Comments**

None.

## **10 Example**

None.

---