

NAG Library Routine Document

F06FRF

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

F06FRF generates a real elementary reflection in the NAG (as opposed to LINPACK) style.

2 Specification

```
SUBROUTINE F06FRF (N, ALPHA, X, INCX, TOL, ZETA)
```

```
INTEGER          N, INCX
```

```
REAL (KIND=nag_wp) ALPHA, X(*), TOL, ZETA
```

3 Description

F06FRF generates details of a real elementary reflection (Householder matrix), P , such that

$$P \begin{pmatrix} \alpha \\ x \end{pmatrix} = \begin{pmatrix} \beta \\ \mathbf{0} \end{pmatrix}$$

where P is orthogonal, α and β are real scalars, and x is an n -element real vector.

P is given in the form

$$P = I - \begin{pmatrix} \zeta \\ z \end{pmatrix} (\zeta \ z^T),$$

where z is an n -element real vector and ζ is a real scalar.

If x is such that

$$\max|x_i| \leq \max(tol, \epsilon|\alpha|)$$

where ϵ is the *machine precision* and tol is a user-supplied tolerance, then ζ is set to 0, and P can be taken to be the unit matrix. Otherwise $1 \leq \zeta \leq \sqrt{2}$.

4 References

None.

5 Parameters

- | | | |
|----|---|---------------------|
| 1: | N – INTEGER | <i>Input</i> |
| | <i>On entry:</i> n , the number of elements in x and z . | |
| 2: | ALPHA – REAL (KIND=nag_wp) | <i>Input/Output</i> |
| | <i>On entry:</i> the scalar α . | |
| | <i>On exit:</i> the scalar β . | |
| 3: | X(*) – REAL (KIND=nag_wp) array | <i>Input/Output</i> |
| | Note: 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 . x_i must be stored in $X(1 + (i - 1) \times \text{INCX})$, for $i = 1, 2, \dots, N$. | |

Intermediate elements of X are not referenced.

On exit: the referenced elements are overwritten by details of the real elementary reflection.

4: INCX – INTEGER *Input*

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

Constraint: INCX > 0.

5: TOL – REAL (KIND=nag_wp) *Input*

On entry: the value tol .

6: ZETA – REAL (KIND=nag_wp) *Output*

On exit: the scalar ζ .

6 Error Indicators and Warnings

None.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

None.
