NAG Fortran Library Routine Document

F11BCF

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

F11BCF is the third in a suite of three routines for the iterative solution of a general (nonsymmetric) system of simultaneous linear equations (Golub and van Loan (1996)). F11BCF returns information about the computations during an iteration and/or after this has been completed. The first routine of the suite, F11BAF, is a setup routine; the second routine, F11BBF, is the iterative solver itself.

These three routines are suitable for the solution of large sparse general (nonsymmetric) systems of equations.

2 Specification

```
SUBROUTINE F11BCF(ITN, STPLHS, STPRHS, ANORM, SIGMAX, IFAIL)
INTEGER         ITN, IFAIL
real            STPLHS, STPRHS, ANORM, SIGMAX
```

3 Description

F11BCF returns information about the solution process. It can be called either during a monitoring step of F11BBF or after F11BBF has completed its tasks. Calling F11BCF at any other time will result in an error condition being raised.

For further information you should read the documentation for F11BAF and F11BBF.

4 References

Golub G H and van Loan C F (1996) *Matrix Computations* (3rd Edition) Johns Hopkins University Press, Baltimore

5 Parameters

1: ITN – INTEGER *Output*

    On exit: the number of iterations carried out by F11BBF.

2: STPLHS – **real** *Output*

    On exit: the current value of the left-hand side of the termination criterion used by F11BBF.

3: STPRHS – **real** *Output*

    On exit: the current value of the right-hand side of the termination criterion used by F11BBF.

4: ANORM – **real** *Output*

    On exit: the norm $\|A\|_1$ or $\|A\|_\infty$ when it is used by the termination criterion in F11BBF, either when it has been supplied to F11BAF or it has been estimated by F11BBF (see also Sections 3 and 5 of the document for F11BAF); otherwise, ANORM = 0.0 is returned.

5: SIGMAX – **real** *Output*

    On exit: the current estimate of the largest singular value $\sigma_1(\bar{A})$ of the preconditioned iteration matrix when it is used by the termination criterion in F11BBF, either when it has been supplied to

F11BAF or it has been estimated by F11BBF (see also Sections 3 and 5 of the document for F11BAF); otherwise, SIGMAX = 0.0 is returned.

6: IFAIL – INTEGER   *Input/Output*

On entry: IFAIL must be set to 0, −1 or 1. Users who are unfamiliar with this parameter should refer to Chapter P01 for details.

On exit: IFAIL = 0 unless the routine detects an error (see Section 6).

For environments where it might be inappropriate to halt program execution when an error is detected, the value −1 or 1 is recommended. If the output of error messages is undesirable, then the value 1 is recommended. Otherwise, for users not familiar with this parameter the recommended value is 0. **When the value −1 or 1 is used it is essential to test the value of IFAIL on exit.**

6   Error Indicators and Warnings

If on entry IFAIL = 0 or −1, explanatory error messages are output on the current error message unit (as defined by X04AAF).

Errors or warnings detected by the routine:

IFAIL = 1

F11BCF has been called out of sequence. For example, the last call to F11BBF did not return IREVCM = 3 or 4.

7   Accuracy

Not applicable.

8   Further Comments

None.

9   Example

See Section 9 of the document for F11BAF.