F11BTF – NAG Fortran Library Routine Document

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

F11BTF is the third in a suite of three routines for the iterative solution of a complex general (non-Hermitian) system of simultaneous linear equations (Golub and Van Loan [1]). F11BTF returns information about the computations during an iteration and/or after this has been completed. The first routine of the suite, F11BRF, is a set-up routine; the second routine, F11BSF is the iterative solver itself.

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

2 Specification

```
 SUBROUTINE F11BTF(ITN, STPLHS, STPRHS, ANORM, SIGMAX, WORK,
1                  LWORK, IFAIL)
 INTEGER           ITN, IFAIL, LWORK
 real              STPLHS, STPRHS, ANORM, SIGMAX
 complex           WORK(LWORK)
```

3 Description

F11BTF returns information about the solution process. It can be called either during a monitoring step of F11BSF or after F11BSF has completed its tasks. Calling F11BTF at any other time will result in an error condition being raised.

For further information you should read the documentation for F11BRF and F11BSF.

4 References

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

5 Parameters

1: ITN — INTEGER *Output*

On exit: the number of iterations carried out by F11BSF.

2: STPLHS — ***real*** *Output*

On exit: the current value of the left-hand side of the termination criterion used by F11BSF.

3: STPRHS — ***real*** *Output*

On exit: the current value of the right-hand side of the termination criterion used by F11BSF.

4: ANORM — ***real*** *Output*

On exit: the norm $\|A\|_1$ or $\|A\|_\infty$ when it is used by the termination criterion in F11BSF, either when it has been supplied to F11BRF or it has been estimated by F11BSF (see also Sections 3 and 5 of the document for F11BRF); 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 F11BSF, either when it has been supplied to F11BRF or it has been estimated by F11BSF (see also Sections 3 and 5 of the document for F11BRF); otherwise, SIGMAX = 0.0 is returned.

6: WORK (LWORK) — ***complex*** array *Input*

On entry: the workspace WORK as returned by F11BSF (see also Sections 3 and 5 of the document for F11BSF).

7: LWORK — INTEGER *Input*

On entry: the dimension of the array WORK as declared in the (sub)program from which F11BTF was called (see also Section 5 of the document for F11BRF).

Constraint: LWORK ≥ 120.

Note: although the minimum value of LWORK ensures the correct functioning of F11BTF, a larger value is required by the iterative solver F11BSF (see also Section 5 of the document for F11BRF).

8: IFAIL — INTEGER *Input/Output*

On entry: IFAIL must be set to 0, −1 or 1. For users not familiar with this parameter (described in Chapter P01) the recommended value is 0.

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

6 Errors 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 detected by the routine:

IFAIL = $-i$

On entry, the ith argument had an illegal value.

IFAIL = 1

F11BTF has been called out of sequence. For example, the last call to F11BSF did not return IREVCM = 3 or 4.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

See the example for F11BRF.