

NAG Library Function Document

nag_sparse_nherm_basic_diagnostic (f11btc)

1 Purpose

nag_sparse_nherm_basic_diagnostic (f11btc) is the third in a suite of three functions for the iterative solution of a complex general (non-Hermitian) system of simultaneous linear equations (see Golub and Van Loan (1996)). nag_sparse_nherm_basic_diagnostic (f11btc) returns information about the computations during an iteration and/or after this has been completed. The first function of the suite, nag_sparse_nherm_basic_setup (f11brc), is a setup function; the second function, nag_sparse_nherm_basic_solver (f11bsc), is the iterative solver itself.

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

2 Specification

```
#include <nag.h>
#include <nagf11.h>

void nag_sparse_nherm_basic_diagnostic (Integer *itn, double *stplhs,
    double *stprhs, double *anorm, double *sigmax, Complex work[],
    Integer lwork, NagError *fail)
```

3 Description

nag_sparse_nherm_basic_diagnostic (f11btc) returns information about the solution process. It can be called either during a monitoring step of nag_sparse_nherm_basic_solver (f11bsc) or after nag_sparse_nherm_basic_solver (f11bsc) has completed its tasks. Calling nag_sparse_nherm_basic_diagnostic (f11btc) at any other time will result in an error condition being raised.

For further information you should read the documentation for nag_sparse_nherm_basic_setup (f11brc) and nag_sparse_nherm_basic_solver (f11bsc).

4 References

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

5 Arguments

- 1: **itn** – Integer * *Output*
On exit: the number of iterations carried out by nag_sparse_nherm_basic_solver (f11bsc).
- 2: **stplhs** – double * *Output*
On exit: the current value of the left-hand side of the termination criterion used by nag_sparse_nherm_basic_solver (f11bsc).
- 3: **stprhs** – double * *Output*
On exit: the current value of the right-hand side of the termination criterion used by nag_sparse_nherm_basic_solver (f11bsc).

- 4: **anorm** – double * *Output*
On exit: if **iterm** = 1 in the previous call to `nag_sparse_nherm_basic_setup` (f11brc), then **anorm** contains $\|A\|_p$, where $p = 1, 2$ or ∞ , either supplied or, in the case of 1 or ∞ , estimated by `nag_sparse_nherm_basic_solver` (f11bsc); otherwise **anorm** = 0.0.
- 5: **sigmax** – double * *Output*
On exit: if **iterm** = 2 in the previous call to `nag_sparse_nherm_basic_setup` (f11brc), 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 `nag_sparse_nherm_basic_solver` (f11bsc), either when it has been supplied to `nag_sparse_nherm_basic_setup` (f11brc) or it has been estimated by `nag_sparse_nherm_basic_solver` (f11bsc) (see also Sections 3 and 5 in `nag_sparse_nherm_basic_setup` (f11brc)); otherwise, **sigmax** = 0.0 is returned.
- 6: **work**[**lwork**] – Complex *Communication Array*
On entry: the array **work** as returned by `nag_sparse_nherm_basic_solver` (f11bsc) (see also Sections 3 and 5 in `nag_sparse_nherm_basic_solver` (f11bsc)).
- 7: **lwork** – Integer *Input*
On entry: the dimension of the array **work** (see also `nag_sparse_nherm_basic_setup` (f11brc)).
Constraint: **lwork** \geq 120.
Note: although the minimum value of **lwork** ensures the correct functioning of `nag_sparse_nherm_basic_diagnostic` (f11btc), a larger value is required by the iterative solver `nag_sparse_nherm_basic_solver` (f11bsc) (see also `nag_sparse_nherm_basic_setup` (f11brc)).
- 8: **fail** – NagError * *Input/Output*
The NAG error argument (see Section 3.6 in the Essential Introduction).

6 Error Indicators and Warnings

NE_BAD_PARAM

On entry, argument $\langle value \rangle$ had an illegal value.

NE_INT

On entry, **lwork** = $\langle value \rangle$.
Constraint: **lwork** \geq 120.

NE_INTERNAL_ERROR

An internal error has occurred in this function. Check the function call and any array sizes. If the call is correct then please contact NAG for assistance.

NE_OUT_OF_SEQUENCE

`nag_sparse_nherm_basic_diagnostic` (f11btc) has been called out of sequence.

7 Accuracy

Not applicable.

8 Parallelism and Performance

Not applicable.

9 Further Comments

None.

10 Example

See Section 10 in `nag_sparse_nherm_basic_setup` (f11brc).
