

NAG Fortran Library Routine Document

D02NYF

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

D02NYF is a diagnostic routine which you may call either after any user-specified exit or after a mid-integration error exit from any of the integrators in sub-chapter D02M/N.

2 Specification

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SUBROUTINE D02NYF (NEQ, NEQMAX, HU, H, TCUR, TOLSF, RWORK, NST, NRE,
1 NJE, NQU, NQ, NITER, IMXER, ALGEQU, INFORM, IFAIL)
    INTEGER          NEQ, NEQMAX, NST, NRE, NJE, NQU, NQ, NITER, IMXER,
1 INFORM(23), IFAIL
    double precision HU, H, TCUR, TOLSF, RWORK(50+4*NEQMAX)
    LOGICAL          ALGEQU(NEQ)

```

3 Description

D02NYF permits you to inspect statistics produced by any integrator in this sub-chapter. These statistics concern the integration only.

4 References

See the D02M/N Sub-chapter Introduction.

5 Parameters

- | | | |
|----|--|---------------|
| 1: | NEQ – INTEGER | <i>Input</i> |
| | <i>On entry:</i> the value used for the parameter NEQ when calling the integrator. | |
| | <i>Constraint:</i> $NEQ \geq 1$. | |
| 2: | NEQMAX – INTEGER | <i>Input</i> |
| | <i>On entry:</i> the value used for the parameter NEQMAX when calling the integrator. | |
| | <i>Constraint:</i> $NEQMAX \geq NEQ$. | |
| 3: | HU – double precision | <i>Output</i> |
| | <i>On exit:</i> the last successful step size. | |
| 4: | H – double precision | <i>Output</i> |
| | <i>On exit:</i> the proposed next step size for continuing the integration. | |
| 5: | TCUR – double precision | <i>Output</i> |
| | <i>On exit:</i> the value of the independent variable, t , which the integrator has actually reached. TCUR will always be at least as far as the output value of the argument t in the direction of integration, but may be further (if overshooting and interpolation at TOUT was specified, e.g., see D02NBF). | |

- 6: TOLSF – *double precision* *Output*
On exit: a tolerance scale factor, $TOLSF \geq 1.0$, which is computed when a request for too much accuracy is detected by the integrator (indicated by a return with IFAIL = 3 or 14). If ITOL is left unaltered but RTOL and ATOL are uniformly scaled up by a factor of TOLSF the next call to the integrator is deemed likely to succeed.
- 7: RWORK(50 + 4 × NEQMAX) – *double precision* array *Communication Array*
On entry: contains information supplied by the integrator.
- 8: NST – INTEGER *Output*
On exit: the number of steps taken in the integration so far.
- 9: NRE – INTEGER *Output*
On exit: the number of function or residual evaluations (FCN (e.g., see D02NBF) or RESID (e.g., see D02NGF) calls) used in the integration so far.
- 10: NJE – INTEGER *Output*
On exit: the number of Jacobian evaluations used in the integration so far. This equals the number of matrix *LU* decompositions.
- 11: NQU – INTEGER *Output*
On exit: the order of the method last used (successfully) in the integration.
- 12: NQ – INTEGER *Output*
On exit: the proposed order of the method for continuing the integration.
- 13: NITER – INTEGER *Output*
On exit: the number of iterations performed in the integration so far by the nonlinear equation solver.
- 14: IMXER – INTEGER *Output*
On exit: the index of the component of largest magnitude in the weighted local error vector (e_i/w_i), for $i = 1, 2, \dots, NEQ$.
- 15: ALGEQU(NEQ) – LOGICAL array *Output*
On exit: ALGEQU(i) = .TRUE. if the i th equation integrated was detected to be algebraic, otherwise ALGEQU(i) = .FALSE.. Note that when the integrators for explicit equations are being used, then ALGEQU(i) = .FALSE., for $i = 1, 2, \dots, NEQ$.
- 16: INFORM(23) – INTEGER array *Communication Array*
On entry: contains information supplied by the integrator.
- 17: IFAIL – INTEGER *Input/Output*
On entry: IFAIL must be set to 0, -1 or 1. If you are unfamiliar with this parameter you 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, if you are 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:

$IFAIL = 1$

On entry, $NEQ < 1$,
or $NEQMAX < 1$,
or $NEQ > NEQMAX$.

7 Accuracy

Not applicable.

8 Further Comments

Statistics for sparse matrix linear algebra calls (if appropriate) may be determined by a call to D02NXF.

9 Example

See Section 9 of the document for D02NBF.
