Z02EAFP

NAG Parallel Library Routine Document

Note: before using this routine, please read the Users' Note for your implementation to check for implementation-dependent details. You are advised to enclose any calls to NAG Parallel Library routines between calls to Z01AAFP and Z01ABFP.

1 Description

Z02EAFP enables users to reduce the amount of error checking carried out in subsequent calls to NAG Parallel Library routines, by setting the input parameter LEVEL $= \pm 1$. The performance improvement attained depends on the specific Library routine called, on the characteristics of the computing environment and on the numerical problem being solved. It can be significant for routines which are computationally inexpensive but are repeatedly called, and/or when a large number of processors is used.

After a call to Z02EAFP with LEVEL $= \pm 1$, the detection of errors and inconsistencies in input arguments is disabled in all subsequent NAG Parallel Library routines, until a further call to Z02EAFP is made or until the Library Grid termination routine Z01ABFP is called, in which case the error detection system is re-enabled (default).

The user must be fully familiar with the information in Section 1.1 before using Z02EAFP.

It should also be noted that calling routine Z02EAFP to reduce the amount of error checking does not disable all the argument checking in F07 and F08 routines. Some global argument checks will be omitted, but for compatibility with ScaLAPACK, the checks performed by ScaLAPACK are retained (see Blackford *et al.* [1] for details).

1.1 Warning

Particular caution must be exercised when a call to Z02EAFP with LEVEL $= \pm 1$ is inserted in any application program. Specifically, the correctness, reliability and robustness of the program must have been rigorously established, as the possible consequences of non-validated input may include:

>   incorrect or inaccurate program results,

>   program deadlock,

>   program crash.

Unpredictable behaviour may also occur when the user's program does not reinitialise the error parameter IFAIL between calls to NAG Parallel Library routines but relies instead on a value of IFAIL $= 0$ being returned on successful completion from a NAG Parallel Library routine. If Z02EAFP was called with LEVEL $= -1$, any subsequent NAG Parallel Library routine will return the value IFAIL $= -9999$ on succesful completion. If IFAIL is not reinitialised between calls, the program may perform incorrectly.

Z02EAFP will return an error code according to the error checking level used before it is called: in other words, enabling or disabling the error checking will not effect the current call to Z02EAFP.

2 Specification

```
SUBROUTINE Z02EAFP(ICNTXT, LEVEL, IFAIL)
INTEGER          ICNTXT, LEVEL, IFAIL
```

3 Usage

3.1 Definitions

None.

3.2 Global and Local Arguments

The following global **input** arguments must have the same value on entry to the routine on each processor and the global **output** arguments will have the same value on exit from the routine on each processor:

Global input arguments: LEVEL, IFAIL

Global output arguments: IFAIL

The remaining arguments are local.

4   Arguments

1:   ICNTXT — INTEGER   *Local Input*

On entry: the Library context, usually returned by a call to the Library Grid initialisation routine Z01AAFP.

Note: the value of ICNTXT **must not** be changed.

2:   LEVEL — INTEGER   *Global Input*

On entry: specifies the level of error checking performed in subsequent calls to NAG Parallel Library routines:

if LEVEL $= 0$, rigorous error checking is performed; this is the default error checking mode;

if LEVEL $= 1$, error checking is only operational for algorithmic error conditions, such as lack of convergence, singularity of matrices, etc., but not for illegal user-specified input arguments, such as invalid arguments or inconsistent global arguments. Note that algorithmic error conditions reported in subsequent calls of NAG Parallel Library routines may be caused by undetected errors or inconsistencies in input arguments;

if LEVEL $= -1$, error checking is performed as for LEVEL $= 1$; additionally, NAG Parallel Library routines will return IFAIL $= -9999$ instead of IFAIL $= 0$ on successful completion, thereby signalling the possibility of wrong or inaccurate results.

Note: Z02EAFP will return an error code according to the error checking level used before it is called: in other words, enabling or disabling the error checking will not effect the current call to Z02EAFP.

Constraint: LEVEL $= 0$, -1 or 1.

3:   IFAIL — INTEGER   *Global Input/Global Output*

The NAG Parallel Library provides a mechanism, via the routine Z02EAFP, to reduce the amount of parameter validation performed by this routine. For a full description refer to the Z02 Chapter Introduction.

On entry: IFAIL must be set to 0, -1 or 1. For users not familiar with this argument (described in the Essential Introduction) the recommended values are:

IFAIL $= 0$, if multigridding is **not** employed;

IFAIL $= -1$, if multigridding is employed.

On exit: IFAIL $= 0$ (or -9999 if reduced error checking is enabled) unless the routine detects an error (see Section 5).

5   Errors and Warnings

If on entry IFAIL $= 0$ or -1, explanatory error messages are output from the root processor (or processor $\{0,0\}$ when the root processor is not available) on the current error message unit (as defined by X04AAF).

5.1 Full Error Checking Mode Only

IFAIL $= -2000$

> The routine has been called with an invalid value of ICNTXT on one or more processors.

IFAIL $= -1000$

> The logical processor grid and library mechanism (Library Grid) have not been correctly defined, see Z01AAFP.

IFAIL $= -i$

> On entry, the ith argument was invalid. This error occured either because a global argument did not have the same value on all logical processors, or because its value on one or more processors was incorrect. An explanatory message distinguishes between these two cases.

5.2 Any Error Checking Mode

All error conditions are detected properly by Z02EAFP even when the error checking mode was reduced by a prior call to Z02EAFP with LEVEL $= \pm 1$.

6 Further Comments

6.1 Default Error Checking Mode

The error checking mode is (re)set to rigorous error checking after every call to the Library Grid termination routine Z01ABFP. Therefore, Z02EAFP must be called with LEVEL $= \pm 1$ after each call to Z01AAFP if reduced error checking is to be performed in subsequent calls of NAG Parallel Library routines.

6.2 Scoping of Z02EAFP Calls

The error checking mode set by a call to Z02EAFP is effective until a subsequent call is made to either Z01ABFP or Z02EAFP. In particular, it is unnecessary to make consecutive calls to Z02EAFP with the same value of LEVEL. In fact, for performance reasons, such redundant calls to Z02EAFP should be avoided.

7 References

[**1**] Blackford L S, Choi J, Cleary A, D'Azevedo E, Demmel J, Dhillon I, Dongarra J, Hammarling S, Henry G, Petitet A, Stanley K, Walker D and Whaley R C (1997) ScaLAPACK Users' Guide *SIAM* 3600 University City Science Center, Philadelpia, PA 19104-2688, USA. URL: http://www.netlib.org/scalapack/slug/scalapack_slug.html

8 Example

See Section 8 of the document for F11BAFP.