Chapter F01

Matrix Operations and Distribution

Contents

1 Scope of the Chapter

This chapter is concerned with the generation and the distribution of dense matrices and vectors in column block fashion and in cyclic 2-d block fashion, as required by routines in Chapters F02, F04, F07 and F08. It also deals with the distribution of sparse matrices, represented in coordinate storage format, in row block fashion, and the distribution of dense vectors conformally to sparse matrices, as required by routines in Chapter F11. A routine to gather a vector distributed across each processor row is also provided.

2 Background to the Problems

The symmetric eigenvalue and the singular value routines in Chapter F02 require their matrices to be distributed on the Library Grid in a column block distribution, while the routines in Chapters F04, F07 and F08 require their matrices to be distributed on the Library Grid in a cyclic 2-d block distribution. The sparse linear algebra routines in Chapter F11 require their matrices, represented in coordinate storage format, to be distributed on the Library Grid in a row block distribution and the vectors to be distributed conformally to the associated sparse matrices. See the Essential Introduction or the respective Chapter Introductions for further information on these distributions.

The routines in this chapter are designed to help the users to generate and distribute matrices or vectors in the required formats, given a user-supplied procedure for generating blocks of a matrix, the non-zero elements in blocks of a sparse matrix in coordinate storage format, or parts of a vector associated with a sparse matrix.

3 Recommendations on Choice and Use of Available Routines

Note: Refer to the Users' Note for your implementation to check that a routine is available.

3.1 Column Block Distribution Routines

F01ZRFP can be called prior to either of the routines F02FQFP and F02WQFP in order to generate a real matrix in the required column block distribution.

F01ZWFP can be called prior to either of the routines F02FRFP and F02WRFP in order to generate a complex matrix in the required column block distribution.

3.2 Cyclic 2-d Block Distribution Routines

F01ZSFP can be called prior to either of the F04 Black Box routines F04EBFP, F04FBFP and F04GBFP in order to generate a real matrix in the required cyclic 2-d block distribution.

F01ZQFP can be called prior to any of the ScaLAPACK routines in Chapter F07 F08 in order to generate a real matrix in the required cyclic 2-d block distribution.

F01ZXFP can be called prior to either of the F04 Black Box routines F04ECFP and F04FCFP in order to generate a complex matrix in the required cyclic 2-d block distribution.

F01ZVFP can be called prior to any of the ScaLAPACK routines in Chapter F07 F08 in order to generate a complex matrix in the required cyclic 2-d block distribution.

3.3 Row Block Distribution Routines

Routine F01YAFP can be called prior to F11ZAFP in order to generate a real matrix in the required cyclic row block distribution.

3.4 Conformal Distribution Routines

Routine F01YEFP can be called prior to the routines F11XBFP, F11DBFP, and F11DCFP in order to generate a real vector in the required conformal distribution. Note that the routine F11ZAFP must be called prior to F01YEFP to set up auxiliary information about the associated sparse matrix.

3.5 Gathering Routines

Routine F01ZPFP gathers a distributed vector to each logical processor on a 2-d logical processor grid. It is assumed that an identical copy of the vector is distributed in cyclic 1-d block form across logical processors on each row of the grid. This routine is primarily designed to be used following a call to F08FEFP.
