

GAMS Index for the NAG Parallel Library

This index classifies NAG Parallel Library routines according to Version 2 of the GAMS classification scheme described in [1]. Note that only those GAMS classes which contain Library routines, either directly or in a subclass, are included below.

C	Elementary and special functions (<i>search also class L5</i>)
C1	Integer-valued functions (e.g., factorial, binomial coefficient, permutations, combinations, floor, ceiling)
	C06GXFP Factorizes a positive integer n as $n = n1 \times n2$. This routine may be used in conjunction with C06MCFP
D	Linear Algebra
D1	Elementary vector and matrix operations
D1a	Elementary vector operations
D1a1	Set to constant
D1a11	Other vector operations
	F01XEFP Scatter real vector distributed conformally to sparse matrix, used with routines from Chapter F11
	F01XFFP Gather real vector distributed conformally to sparse matrix, used with routines from Chapter F11
	F01XGFP Scatter integer vector distributed conformally to sparse matrix, used with routines from Chapter F11
	F01XHFP Gather integer vector distributed conformally to sparse matrix, used with routines from Chapter F11
	F01XUFP Gather complex vector distributed conformally to sparse matrix, used with routines from Chapter F11
	F01YEFP In-place generation of real dense vector distributed conformally to sparse matrix
	F01YTFP In-place generation of complex dense vector distributed conformally to sparse matrix, used with routines from Chapter F11
	F01ZYFP In-place generation of complex vector in column block fashion, used with routines from Chapter F07
	F01ZZFP In-place generation of real vector in column block fashion, used with routines from Chapter F07
	F11YBFP Permutation of real vector from distribution based order to local indexing based order
	F11YCFP Permutation of real vector from local indexing based order to distribution based order
	F11YFPF Permutation of complex vector from distribution based order to local indexing based order
	F11YQFP Permutation of complex vector from local indexing based order to distribution based order
	X04YFPF Outputs complex vector, distributed conformally to sparse matrix to a sequential file
D1b	Elementary matrix operations
	F01CFP Element-wise maximum or minimum in absolute value of integer matrices
	F11YAFP Permutation of non-zero entries of real sparse matrix with repeated sparsity pattern
	F11YNFP Permutation of non-zero entries of complex sparse matrix with repeated sparsity pattern
	F11ZGFP Generates multi-colour ordering for real sparse matrix with symmetric sparsity pattern, distributed in row block form
	F11ZUFP Generates multi-colour ordering for complex sparse matrix with symmetric sparsity pattern, distributed in row block form.
	X04BZFP Outputs complex matrix stored in row block fashion
D1b1	Initialize (e.g., to zero or identity)
	F01YAFP In-place generation of real sparse matrix using cyclic row block distribution
	F01YBFP In-place generation of real sparse matrix using cyclic row block distribution (suitable for repeated sparsity pattern), used with routines from Chapter F11
	F01YFPF In-place generation of complex sparse matrix according to cyclic row block distribution, used with routines from Chapter F11
	F01YQFP In-place generation of complex sparse matrix according to cyclic row block distribution (suitable for repeated sparsity pattern)
	F01YWFP In-place generation of complex Hermitian banded matrix in column block fashion, used with routines from Chapter F07
	F01YXFP In-place generation of real symmetric banded matrix in column block fashion, used with routines from Chapter F07
	F01YYFP In-place generation of real matrix in row block fashion on a one-dimensional grid of processors, used with routines from Chapter F07
	F01YZFP In-place generation of complex matrix in row block fashion on a one-dimensional grid of processors, used with routines from Chapter F07
	F01ZHFP Generates an l by m by n three-dimensional array $A(i, j, k)$ on a grid of processors in i -block form

		F01ZMFP	In-place generation of real matrix in row block fashion, used with routines from Chapters C06 and F04
		F01ZNFP	In-place generation of complex matrix in row block fashion, used with routines from Chapter F04
		F11ZAFP	General set-up routine for real sparse matrix distributed in cyclic row block form
		F11ZBFP	General set-up routine for real sparse matrix distributed in cyclic row block form (suitable for repeated sparsity pattern)
		F11ZPFP	General set-up routine for complex sparse matrix, distributed in cyclic row block form (suitable for repeated sparsity pattern)
		X04BXFP	Outputs real matrix stored in row block fashion
D1b4	Multiplication by vector		
		F11XBFP	Matrix-vector multiplication for real sparse matrix
		F11XPFP	Matrix-vector multiplication for complex sparse matrix
D1b9	Storage mode conversion		
		F01WAFP	Gather real matrix, regarded as submatrix of matrix distributed in cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WBFP	Gather real matrix distributed in cyclic two-dimensional block format, used with routines from Chapter F04
		F01WGFP	Gather complex matrix distributed in cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WHFP	Gather complex matrix distributed in cyclic two-dimensional block format, used with routines from Chapter F04
		F01WNFP	Scatter real matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WPFP	Scatter real matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapter F04
		F01WUFP	Scatter complex matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WVFP	Scatter complex matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapter F04
		F01XAFP	Scatter real sparse matrix, stored in coordinate storage format, using cyclic row block distribution
		F01XPFP	Scatter complex sparse matrix, stored in coordinate storage format, using cyclic row block distribution, used with routines from Chapter F11
		F01XTFP	Scatter complex vector distributed conformally to sparse matrix, used with routines from Chapter F11
		F01YWFP	In-place generation of complex Hermitian banded matrix in column block fashion, used with routines from Chapter F07
		F01YXFP	In-place generation of real symmetric banded matrix in column block fashion, used with routines from Chapter F07
		F01YYFP	In-place generation of real matrix in row block fashion on a one-dimensional grid of processors, used with routines from Chapter F07
		F01YZFP	In-place generation of complex matrix in row block fashion on a one-dimensional grid of processors, used with routines from Chapter F07
		F01ZHFP	Generates an l by m by n three-dimensional array $A(i, j, k)$ on a grid of processors in i -block form
		F01ZMFP	In-place generation of real matrix in row block fashion, used with routines from Chapters C06 and F04
		F01ZNFP	In-place generation of complex matrix in row block fashion, used with routines from Chapter F04
		F01ZPFP	Gather real vector distributed conformally to matrix, used with routines from Chapters F07 and F08
		F01ZQFP	In-place generation of real matrix in cyclic two-dimensional block fashion, used with routines from Chapters F07 and F08
		F01ZRFP	In-place generation of real matrix in column block fashion, used with routines from Chapters F02 and F04
		F01ZSFP	In-place generation of real matrix in cyclic two-dimensional block fashion, used with routines from Chapter F04 (Black Box)
		F01ZVFP	In-place generation of complex matrix in cyclic two-dimensional block fashion, used with routines from Chapters F07 and F08
		F01ZWFP	In-place generation of complex matrix in column block fashion, used with routines from Chapters F02 and F04
		F01ZXFP	In-place generation of complex matrix in cyclic two-dimensional block fashion, used with routines from Chapters F04 (Black Box)
D2	Solution of systems of linear equations (including inversion, LU and related decompositions)		
D2a	Real nonsymmetric matrices		
D2a1	General		
		F04EBFP	Solution of real linear system (Black Box)
		F07ADFP	(PDGETRF) LU factorization of real general matrix
		F07AEPF	(PDGETRS) Solution of real linear system, matrix already factorized by F07ADFP (PDGETRF)
D2a3	Triangular		

		F07TGFP	(PDTRCON) Estimates condition number of real triangular matrix
D2a4	Sparse	F11BAFP	Real sparse nonsymmetric linear system, reverse-communication, set-up for F11BBFP
		F11BBFP	Real sparse nonsymmetric linear system, reverse-communication, solver using preconditioned RGMRES, CGS or Bi-CGSTAB
		F11BCFP	Real sparse nonsymmetric linear system, reverse-communication, diagnostic for F11BBFP
		F11DCFP	Black Box routine for sparse system of linear equations
		F11DDFP	Apply iterations of SOR method to real sparse linear system, used mostly as SOR preconditioner for real sparse matrix
		F11DEFP	Solution of real sparse nonsymmetric linear system using Jacobi, SOR or no preconditioned RGMRES, CGS or Bi-CGSTAB (Black Box)
		F11DFFP	Real sparse nonsymmetric linear system, reverse-communication, incomplete <i>LU</i> factorization of local or overlapping diagonal blocks, used mostly as incomplete <i>LU</i> preconditioner for real sparse matrix
		F11DGFP	Real sparse nonsymmetric linear system, reverse-communication, preconditioner for real sparse matrix
		F11DHFP	Solution of real sparse nonsymmetric linear system using block-Jacobi preconditioned RGMRES, CGS or Bi-CGSTAB (Black Box)
		F11DKFP	Apply iterations of relaxed Jacobi iterative method to a real sparse linear system, used mostly as Jacobi preconditioner for real sparse matrix
D2b	Real symmetric matrices		
D2b1	General		
D2b1b	Positive-definite	F04FBFP	Solution of real symmetric positive-definite linear system (Black Box)
		F07FDFP	(PDPOTRF) Cholesky factorization of real symmetric positive-definite matrix
		F07FEFP	(PDPOTRS) Solution of real symmetric positive-definite linear system, matrix already factorized by F07FDFP (PDPOTRF)
D2b2	Positive-definite banded	F04HEFP	Solution of real symmetric banded linear system (Black Box)
		F07HDFP	(PDPBTRF) Cholesky factorization of real symmetric banded matrix with no pivoting
		F07HEFP	(PDPBTRS) Solution of real symmetric banded linear system, matrix already factorized by F07HDFP (PDPBTRF)
D2b2a	Tridiagonal	F04JBFP	Solution of real symmetric tridiagonal linear system (Black Box)
		F07JDFP	(PDPTRF) Cholesky factorization of real symmetric tridiagonal matrix with no pivoting
		F07JEFP	(PDPTRS) Solution of real symmetric tridiagonal linear system, matrix already factorized by F07JDFP (PDPTRF)
D2b4	Sparse	F11GAFP	Real sparse symmetric linear system, reverse-communication, set-up for F11GBFP
		F11GBFP	Real sparse symmetric linear system, reverse-communication, solver using preconditioned CG or SYMMLQ
		F11GCFP	Real sparse symmetric linear system, reverse-communication, diagnostic for F11GBFP
		F11JEFP	Solution of real sparse symmetric linear system using Jacobi, SSOR or no preconditioned CG or SYMMLQ (Black Box)
		F11JHFP	Solution of sparse symmetric linear system using block-Jacobi preconditioned CG or SYMMLQ (Black Box)
D2c	Complex non-Hermitian matrices		
D2c1	General	F04ECFP	Solution of complex linear equations (Black Box)
		F07ARFP	(PZGETRF) <i>LU</i> factorization of complex general matrix
		F07ASFP	(PZGETRS) Solution of complex linear system, matrix already factorized by F07ARFP (PZGETRF)
D2c4	Sparse	F11BRFP	Complex sparse non-Hermitian linear system, reverse-communication, set-up for F11BSFP
		F11BSFP	Complex sparse non-Hermitian linear system, reverse-communication, solver using preconditioned GMRES, CGS or Bi-CGSTAB
		F11BTFP	Complex sparse non-Hermitian linear system, reverse-communication, diagnostic for F11BSFP
		F11DRFP	Apply iterations of SOR method to the complex sparse linear system, used mostly as SOR preconditioner for complex sparse matrix
		F11DSFP	Solution of complex sparse non-Hermitian linear system using Jacobi, SOR or no preconditioned RGMRES, CGS or Bi-CGSTAB (Black Box)
		F11DTFP	Computes incomplete <i>LU</i> factorization of local diagonal blocks of complex sparse matrix
		F11DUFP	Complex sparse non-Hermitian linear system, reverse-communication, block-Jacobi preconditioner generated by F11DTFP

		F11DVFP	Solution of complex sparse non-Hermitian linear system using block-Jacobi preconditioned RGMRES, CGS or Bi-CGSTAB (Black Box)
		F11DXFP	Apply iterations of relaxed Jacobi iterative method to complex sparse linear system, used mostly as Jacobi preconditioner for complex sparse matrix
D2d	Complex Hermitian matrices		
D2d1	General		
D2d1b	Positive-definite		
		F04FCFP	Solution of complex Hermitian positive-definite linear system (Black Box)
		F07FRFP	(PZPOTRF) Cholesky factorization of complex Hermitian positive-definite matrix
		F07FSFP	(PZPOTRS) Solution of complex Hermitian positive-definite linear system, matrix already factorized by F07FRFP (PZPOTRF)
D2d2	Positive-definite banded		
		F04HZFP	Solution of complex Hermitian banded linear system (Black Box)
		F07HRFP	(PZPBTRF) Cholesky factorization of complex Hermitian banded matrix with no-pivoting
		F07HSFP	(PZPBTRS) Solution of complex Hermitian banded linear system, matrix already factorized by F07HRFP (PZPBTRF)
D2d2a	Tridiagonal		
		F04JZFP	Solution of complex Hermitian tridiagonal linear system (Black Box)
		F07JRFP	(PZPTTRF) Factorization of complex Hermitian tridiagonal matrix with no-pivoting
		F07JSFP	(PZPTTRS) Solution of real symmetric tridiagonal linear system, matrix already factorized by F07JRFP (PZPTTRF)
D2e	Associated operations (e.g., matrix reorderings)		
		F11DAFP	Incomplete <i>LU</i> factorization of the local diagonal blocks of a real sparse matrix, represented in coordinate storage format, distributed on a logical grid of processors in cyclic row block form
		F11DBFP	Solution of real system of linear equations, involving a real block diagonal sparse matrix, represented in coordinate storage format, distributed on a logical grid of processors in cyclic row block form
		F11DFFP	Real sparse nonsymmetric linear system, reverse-communication, incomplete <i>LU</i> factorization of local or overlapping diagonal blocks, used mostly as incomplete <i>LU</i> preconditioner for real sparse matrix
		F11DGFP	Real sparse nonsymmetric linear system, reverse-communication, preconditioner for real sparse matrix
D4	Eigenvalues, eigenvectors		
D4a	Ordinary eigenvalue problems ($Ax = \lambda x$)		
D4a1	Real symmetric		
		F02FQFP	Eigenvalues and eigenvectors of real symmetric matrix, one-sided Jacobi method
D4a3	Complex Hermitian		
		F02FRFP	Eigenvalues and eigenvectors of complex Hermitian matrix, one-sided Jacobi method
D4a5	Tridiagonal		
		F08JJFP	(PDSTEBZ) All or selected eigenvalues of real symmetric tridiagonal matrix by bisection
D4c	Associated operations		
D4c1	Transform problem		
D4c1b	Reduce to compact form		
D4c1b1	Tridiagonal		
		F08FEFP	(PDSYTRD) Orthogonal reduction of real symmetric matrix to tridiagonal form
		F08FSFP	(PZHETRD) Unitary reduction of complex Hermitian matrix to real symmetric tridiagonal form
D4c2	Compute eigenvalues of matrix in compact form		
D4c2a	Tridiagonal		
		F08JJFP	(PDSTEBZ) All or selected eigenvalues of real symmetric tridiagonal matrix by bisection
D4c3	Form eigenvectors from eigenvalues		
		F08JKFP	(PDSTEIN) Selected eigenvectors of real symmetric tridiagonal matrix by inverse iteration, storing eigenvectors in real array
		F08JKFP	(PDSTEIN) Selected eigenvectors of real symmetric tridiagonal matrix by inverse iteration, storing eigenvectors in real array
		F08JXFP	(PZSTEIN) Selected eigenvectors of real symmetric tridiagonal matrix by inverse iteration, storing eigenvectors in complex array
D4c4	Back transform eigenvectors		
		F08FGFP	(PDORMTR) Apply orthogonal transformation determined by F08FEFP (PDSYTRD)
		F08FUFFP	(PZUNMTR) Apply unitary transformation matrix determined by F08FSFP (PZHETRD)
D5	<i>QR</i> decomposition, Gram–Schmidt orthogonalization		
		F04GBFP	Solution of real linear least-squares problem (Black Box)
		F08AEFP	(PDGEQRF) <i>QR</i> factorization of real general rectangular matrix
		F08AFFP	(PDORGQR) Form all or part of an orthogonal <i>Q</i> from <i>QR</i> factorization determined by F08AEFP (PDGEQRF)

- F08AGFP (PDORMQR) Apply the orthogonal transformation determined by F08AEFP (PDORMQR)
- F08ASFP (PZGEQRF) QR factorization of complex general rectangular matrix
- F08ATFP (PZUNGQR) Form all or part of a unitary Q from QR factorization determined by F08ASFP (PZGEQRF)
- F08AUFPP (PZUNMQR) Apply the unitary transformation determined by F08ASFP (PZUNMQR)
- D6 Singular value decomposition
 - F02WQFP Singular Value Decomposition (SVD) of real matrix, one-sided Jacobi method
 - F02WRFP Singular Value Decomposition (SVD) of complex matrix, one-sided Jacobi method
- H Differentiation, integration
- H2 Quadrature (numerical evaluation of definite integrals)
- H2a One-dimensional integrals
 - H2a1 Finite interval (general integrand)
 - H2a1a Integrand available via user-defined procedure
 - H2a1a1 Automatic (user need only specify required accuracy)
 - D01ATFP One-dimensional quadrature, adaptive, finite interval, allowing for badly behaved integrands
 - D01AUFPP One-dimensional quadrature, adaptive, finite interval, suitable for oscillating functions
 - H2a2 Finite interval (specific or special type integrand including weight functions, oscillating and singular integrands, principal value integrals, splines, etc.)
 - H2a2a Integrand available via user-defined procedure
 - H2a2a1 Automatic (user need only specify required accuracy)
 - D01AXFP One-dimensional quadrature, adaptive, finite interval, weight functions $\cos(\omega x)$ or $\sin(\omega x)$
 - H2b Multidimensional integrals
 - H2b1 One or more hyper-rectangular regions (includes iterated integrals)
 - H2b1a Integrand available via user-defined procedure
 - H2b1a1 Automatic (user need only specify required accuracy)
 - D01DAFP Two-dimensional quadrature, finite region
 - D01FAFP Multi-dimensional quadrature, hyper-rectangle, adaptive
 - H2b1a2 Nonautomatic
 - D01GCFP Multi-dimensional quadrature, general product region, number-theoretic method
 - J Integral transforms
 - J1 Trigonometric transforms including fast Fourier transforms
 - J1a One-dimensional
 - J1a2 Complex
 - C06MCFP Direct or inverse one-dimensional discrete Fourier transform of a complex sequence
 - J1b Multidimensional
 - C06FUFPP Direct or inverse two-dimensional Fourier transform of a complex sequence
 - C06MXFP Direct or inverse three-dimensional discrete Fourier transform of a complex sequence
 - K Approximation (*search also class L8*)
 - K1 Least squares (L_2) approximation
 - K1b Nonlinear least squares
 - K1b1 Unconstrained
 - K1b1a Smooth functions
 - K1b1a1 User provides no derivatives
 - E04FDFP Unconstrained minimum of a sum of squares, Gauss–Newton algorithm using function values only (easy-to-use)
 - E04JBFP Minimum of a general nonlinear function with unconstrained, Gauss–Newton algorithm using function values only (easy-to-use)
 - L Statistics, probability
 - L6 Random number generation
 - L6a Univariate
 - L6a14 Negative binomial, normal, normal order statistics
 - G05ADFP Function returning pseudo-random real number from the interval $[a,b)$, Normal distribution
 - G05BDFP Pseudo-random real numbers from the interval (a,b) , Normal distribution
 - L6a2 Beta, binomial, Boolean
 - L6a21 Uniform (continuous, discrete), uniform order statistics
 - G05AAFP Function returning pseudo-random real number from the interval $(0,1)$
 - G05ABFP Selects random number generator and initialises seeds to give repeatable sequence
 - G05ACFP Function returning pseudo-random real number from the interval $[a,b)$, uniform distribution
 - G05AZFP Function returning pseudo-random integer from the interval $[ia,ib)$, uniform distribution
 - G05BAFP Pseudo-random real numbers from the interval $(0,0)$, uniform distribution
 - G05BCFP Pseudo-random real numbers from the interval (a,b) , uniform distribution
 - G05BZFP Pseudo-random integers from the interval (ia,ib) , uniform distribution
 - L6a5 Exponential, extreme value

		G05AEFP	Function returning pseudo-random real number from the interval $[a,b)$, exponential distribution
		G05BEFP	Pseudo-random real numbers from the interval (a,b) , exponential distribution
L6c	Service routines (e.g., seed)		
		G05BBFP	Selects random number generator and initialises seeds to give repeatable sequence
L8	Regression (search also classes D5, D6, D9, G, K)		
L8e	Nonlinear (i.e., $y = F(X,b)$) (search also class L8h)		
L8e1	Ordinary least squares		
L8e1b	Parameter estimation (search also class L8e1a)		
L8e1b1	Unweighted data, user provides no derivatives		
		E04FDFP	Unconstrained minimum of a sum of squares, Gauss–Newton algorithm using function values only (easy-to-use)
		E04JBFP	Minimum of a general nonlinear function with unconstrained, Gauss–Newton algorithm using function values only (easy-to-use)
N	Data handling (search also class L2)		
N1	Input, output		
		X04AAF	Returns or sets unit number for error message
		X04ABF	Returns or sets unit number for advisory messages
		X04BCFP	Reads real general matrix, from external file, into array distributed in cyclic two-dimensional form, used with routines from Chapters F07 and F08
		X04BDFP	Outputs real general matrix, stored in cyclic two-dimensional block fashion, to an external file, used with routines from Chapters F07 and F08
		X04BFFP	Outputs set of real general matrices distributed on a two-dimensional logical processor grid, used with routines from Chapter F02
		X04BGFP	Reads general real matrix from external file into array distributed in cyclic two-dimensional block form, used with routines from Chapter F04 (Black Box)
		X04BHFP	Outputs general real matrix, stored in cyclic two-dimensional block fashion, to external file, used with routines from Chapter F04 (Black Box)
		X04BMFP	Outputs set of general integer matrices distributed on a two-dimensional logical processor grid
		X04BRFP	Reads complex general matrix from an external file into array distributed in cyclic two-dimensional block form, used with routines from Chapters F07 and F08
		X04BSFP	Outputs complex general matrix, stored in cyclic two-dimensional block fashion to an external file, used with routines from Chapters F07 and F08
		X04BUFP	Outputs set of complex general matrices distributed on a two-dimensional logical processor grid, used with routines from Chapter F02
		X04BVFP	Reads general complex matrix from an external file into an array distributed in cyclic two-dimensional block form, used with routines from Chapter F04 (Black Box)
		X04BWFP	Outputs general complex matrix, stored in cyclic two-dimensional block fashion, used with routines from Chapter F04 (Black Box)
		X04BZFP	Outputs complex matrix stored in row block fashion
		X04YAFP	Outputs real dense vector, distributed conformally to a sparse matrix on a logical grid of processors, to an external file
		X04YFPF	Outputs complex vector, distributed conformally to sparse matrix to a sequential file
N4	Storage management (e.g., stacks, heaps, trees)		
		F01WAFP	Gather real matrix, regarded as submatrix of matrix distributed in cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WBFP	Gather real matrix distributed in cyclic two-dimensional block format, used with routines from Chapter F04
		F01WGFP	Gather complex matrix distributed in cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WHFP	Gather complex matrix distributed in cyclic two-dimensional block format, used with routines from Chapter F04
		F01WNFP	Scatter real matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WPFP	Scatter real matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapter F04
		F01WUFP	Scatter complex matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapters F07 and F08
		F01WVFP	Scatter complex matrix from the root processor to the Library Grid using cyclic two-dimensional block format, used with routines from Chapter F04
		F01XAFP	Scatter real sparse matrix, stored in coordinate storage format, using cyclic row block distribution
		F01XEFP	Scatter real vector distributed conformally to sparse matrix, used with routines from Chapter F11
		F01XFFP	Gather real vector distributed conformally to sparse matrix, used with routines from Chapter F11
		F01XGFP	Scatter integer vector distributed conformally to sparse matrix, used with routines from Chapter F11

		F01XHFP	Gather integer vector distributed conformally to sparse matrix, used with routines from Chapter F11
		F01XPFP	Scatter complex sparse matrix, stored in coordinate storage format, using cyclic row block distribution, used with routines from Chapter F11
		F01XTFP	Scatter complex vector distributed conformally to sparse matrix, used with routines from Chapter F11
		F01XUFP	Gather complex vector distributed conformally to sparse matrix, used with routines from Chapter F11
		F01YAFP	In-place generation of real sparse matrix using cyclic row block distribution
		F01YBFP	In-place generation of real sparse matrix using cyclic row block distribution (suitable for repeated sparsity pattern), used with routines from Chapter F11
		F01YEFP	In-place generation of real dense vector distributed conformally to sparse matrix
		F01YFPF	In-place generation of complex sparse matrix according to cyclic row block distribution, used with routines from Chapter F11
		F01YQFP	In-place generation of complex sparse matrix according to cyclic row block distribution (suitable for repeated sparsity pattern)
		F01YTFP	In-place generation of complex dense vector distributed conformally to sparse matrix, used with routines from Chapter F11
		F01YWFP	In-place generation of complex Hermitian banded matrix in column block fashion, used with routines from Chapter F07
		F01YXFP	In-place generation of real symmetric banded matrix in column block fashion, used with routines from Chapter F07
		F01YYFP	In-place generation of real matrix in row block fashion on a one-dimensional grid of processors, used with routines from Chapter F07
		F01YZFP	In-place generation of complex matrix in row block fashion on a one-dimensional grid of processors, used with routines from Chapter F07
		F01ZHFP	Generates an l by m by n three-dimensional array $A(i, j, k)$ on a grid of processors in i -block form
		F01ZMFP	In-place generation of real matrix in row block fashion, used with routines from Chapters C06 and F04
		F01ZNF	In-place generation of complex matrix in row block fashion, used with routines from Chapter F04
		F01ZPFP	Gather real vector distributed conformally to matrix, used with routines from Chapters F07 and F08
		F01ZQFP	In-place generation of real matrix in cyclic two-dimensional block fashion, used with routines from Chapters F07 and F08
		F01ZRFP	In-place generation of real matrix in column block fashion, used with routines from Chapters F02 and F04
		F01ZSFP	In-place generation of real matrix in cyclic two-dimensional block fashion, used with routines from Chapter F04 (Black Box)
		F01ZVFP	In-place generation of complex matrix in cyclic two-dimensional block fashion, used with routines from Chapters F07 and F08
		F01ZWFP	In-place generation of complex matrix in column block fashion, used with routines from Chapters F02 and F04
		F01ZXFP	In-place generation of complex matrix in cyclic two-dimensional block fashion, used with routines from Chapters F04 (Black Box)
		F01ZYFP	In-place generation of complex vector in column block fashion, used with routines from Chapter F07
		F01ZZFP	In-place generation of real vector in column block fashion, used with routines from Chapter F07
		F11ZAFP	General set-up routine for real sparse matrix distributed in cyclic row block form
		F11ZBFP	General set-up routine for real sparse matrix distributed in cyclic row block form (suitable for repeated sparsity pattern)
		F11ZPFP	General set-up routine for complex sparse matrix, distributed in cyclic row block form (suitable for repeated sparsity pattern)
N5	Searching		
N5a	Extreme value	F01CPFP	Element-wise maximum or minimum in absolute value of integer matrices
N6	Sorting		
N6a	Internal		
N6a1	Passive (i.e., construct pointer array, rank)	F11ZGFP	Generates multi-colour ordering for real sparse matrix with symmetric sparsity pattern, distributed in row block form
		F11ZUFP	Generates multi-colour ordering for complex sparse matrix with symmetric sparsity pattern, distributed in row block form.
N8	Permuting		
		F11YAFP	Permutation of non-zero entries of real sparse matrix with repeated sparsity pattern
		F11YBFP	Permutation of real vector from distribution based order to local indexing based order
		F11YCFP	Permutation of real vector from local indexing based order to distribution based order
		F11YNFP	Permutation of non-zero entries of complex sparse matrix with repeated sparsity pattern

		F11YFPF	Permutation of complex vector from distribution based order to local indexing based order
		F11YQFP	Permutation of complex vector from local indexing based order to distribution based order
R	Service routines	A00AAFP	Prints details of the NAG Parallel Library implementation
		F11ZZFP	Release of internally allocated memory
		Z01AAFP	Defines two-dimensional logical processor grid (Library Grid) and returns the BLACS context
		Z01ABFP	Undefines logical processor grid and invalidates the BLACS context initialised by Z01AAFP
		Z01ACFP	Root processor identifier
		Z01AEFP	Used in creating processes outside the default library mechanism, allows multigridding, used in more advanced applications
		Z01BAFP	Row and column indices of the root processor within the logical grid
		Z01BBFP	Identifies logical processors in context in the two-dimensional grid declared by Z01AAFP
		Z01BEFP	Topology to be used by BLACS for broadcasting and global operations
		Z01BGFP	Information about MPI tasks
		Z01CAFP	Number of rows or columns of matrix held locally on a given processor when the matrix is distributed in the cyclic two-dimensional block fashion (NUMROC)
		Z01CBFP	Length of the workspace for F08AEFP (PDGEQRF) and F08AFP (PDORGQR)
		Z01CCFP	Length of the workspace for F08AGFP (PDORMQR)
		Z01CDFP	Process coordinate which possesses the entry of a distributed matrix specified by a global index (INDXG2P)
		Z01CEFP	Length of the workspace for F08FEFP (PDSYTRD)
		Z01CFFP	Computes number of rows of a row block distributed matrix owned by a processor
		Z01ZAFP	Returns information on coordinates in Library Grid set up by Z01AAFP
		Z01ZBFP	Creates an MPI communicator from a Library context
R1	Machine-dependent constants	X01AAF	π
		X01ABF	Euler's constant, γ
		X02AHF	Largest permissible argument for sin and cos
		X02AJF	Machine precision
		X02AKF	Smallest positive model number
		X02ALF	Largest positive model number
		X02AMF	Safe range of real floating-point arithmetic
		X02ANF	Safe range of complex floating-point arithmetic
		X02BBF	Largest representable integer
		X02BEF	Maximum number of decimal digits that can be represented
		X02BHF	Parameter of floating-point arithmetic model, b
		X02BJF	Parameter of floating-point arithmetic model, p
		X02BKF	Parameter of floating-point arithmetic model, e_{\min}
		X02BLF	Parameter of floating-point arithmetic model, e_{\max}
		X02DJF	Parameter of floating-point arithmetic model, ROUNDS
R3	Error handling		
R3a	Set criteria for fatal errors	Z02EAFP	Specification of error checking level, can reduce the amount of checking carried out in subsequent calls to other Library routines
R3b	Set unit number for error messages	X04AAF	Returns or sets unit number for error message
		X04ABF	Returns or sets unit number for advisory messages

References

- [1] Boisvert R F, Howe S E and Kahaner D K (1990) The guide to available mathematical software problem classification scheme. *Report NISTIR 4475* Applied and Computational Mathematics Division, National Institute of Standards and Technology.