

Fortran 90 MP Library 4.0 Online User's Guide

Visual Numerics, Inc. has now merged the products F90MP version 3.0 and Distributed Network Fortran Library (DNFL) into one standard Fortran library called F90MP version 4.0. This new product enables users to take advantage of parallel computing if their environment supports it. Fortran programmers can write their applications in either Fortran 90 or FORTRAN 77. The Fortran 90 MP Library Online User's Guide describes over 900 high-performance numerical analysis routines written in Fortran that can take advantage of multi-processor environments.

By combining these products this allows the programmer to leverage available CPUs, regardless of type in order to maximize hardware investment and optimize Fortran application performance. In addition, parallel and non-parallel applications can be run using Fortran 90 MP version 4.0.

Features	Benefits
<i>Operators and function modules</i>	Provide easier and more natural programming through an object-oriented approach
<i>Interface modules for all user-callable Fortran 90 and FORTRAN 77 subroutines</i>	Reduce development effort by checking data-type matches and array sizing at compile time
<i>Source code document examples</i>	Quick start to Fortran programming via full Fortran 90 compliant code
<i>Computational Control of the Server Node</i>	Optimize the performance of your application based on your network configuration.
<i>Scalability</i>	F90 MP Library application performance will scale with computing resources in your network. As a network grows, F90 MP Library applications should not require changes to leverage your new processors.
<i>Automatic Processor Prioritization</i>	F90 MP Library provides the option to automatically prioritize the available processors based on computational performance so more work is allocated to the fastest nodes.
<i>Self-Scheduling Algorithm</i>	Leverage the performance of your distributed system by keeping processors active and allocating as much of the computational load as possible to the fastest processors.
<i>Box Data Type Application</i>	Efficient use of the distributed system through parallelization at a higher level than most algorithms. Provides an excellent strategy for utilizing distributed systems.
<i>Computational Integrity</i>	F90 MP Library does not sacrifice algorithm robustness in lieu of performance. The IMSL algorithms are based on 25 years of quality improvements, enhancements and upgrades.
<i>Dynamic Error Processing</i>	A newly designed error processing system insures proper error handling during parallel execution.
<i>Over 60 Fortran 90 coded, not translated, subroutines</i>	Algorithms redesigned to take full advantage of Fortran 90 features for efficient program execution

What's in this Manual:

Introduction - explains IMSL Fortran 90 MP Library, User Background, Using Library Subprograms, Using Operators and Generic Functions, Getting Started, Error Processing and the Testing Suite, Optional Subprogram Arguments, Optional Data, and Combining Fortran 90 and FORTRAN 77 Routines.

Chapter 1: Linear Solvers - describes routines for solving systems of linear algebraic equations by direct matrix factorization methods, for computing just the matrix factorizations, and for computing linear least-squares solutions.

Chapter 2: Singular Value and Eigenvalue Decomposition - describes routines for computing the singular value decomposition for rectangular matrices, and the eigenvalue-eigenvector decomposition for square matrices.

Chapter 3: Fourier Transforms - includes routines for computing Fourier Transforms of rank-1, rank-2, and rank-3 complex arrays.

Chapter 4: Curve Fitting and Surface Fitting with Splines - describes each of the system variables for fitting data by splines in one and two dimensions. Constraints may be added.

Chapter 5: Utilities - describes each of the library utilities: `error_post`, `rand_gen`, `sort_real`, and `show`.

Chapter 6: Operators and Generic Functions - describes numerical algebra software packaged as operations that are executed with a function notation similar to standard mathematics and thus describes the important aspects of "object-oriented" programming.

Chapter 7: ScalAPACK Utilities and Large-Scale Solvers - describes the use of *ScalAPACK*, a suite of dense linear algebra solvers, applicable when a single problem size is large. We have integrated usage of Fortran 90 MP Library with this library. However, the *ScalAPACK* library, including libraries for *BLACS* and *PBLAS*, are not part of Fortran 90 MP Library.

Chapter 8: Partial Differential Equations - describes an algorithm and a corresponding integrator subroutine `PDE_1D_MG` for solving a system of partial differential equations.

Chapter 9: Error Handling and Messages - The Parallel Option - describes the error-handling system used from within the IMSL Fortran 90 MP Library.

Appendix A: List of Subprograms and GAMS Classification - an alphabetical listing of routines (with links to the information contained in the User's Guide) in their generic names that are typically called by users in their codes.

Appendix B: List of Examples - an alphabetical listing of examples with links to information contained in the User's Guide.

Appendix C: References - an alphabetical listing of literature references.

Appendix D: Benchmarking or Timing Programs - describes the performance of Fortran 90 subprograms compared to equivalent subprograms from the FORTRAN 77 IMSL MATH/LIBRARY.

Index: - A subject index to information contained in the User's Guide.

NOTE: Please refer to the "Quick Tips" section in the online documentation for instructions on using Online Documentation.