

## **NAG Toolbox Chapter Introduction**

### **X04 – Input/Output Utilities**

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## 1 Scope of the Chapter

This chapter contains utility functions concerned with input and output to or from an external file.

## 2 Background to the Problems

### 2.1 Output from NAG Toolbox Functions

Output from NAG Toolbox functions to an external file falls into two categories.

(a) **Error messages**

which are always associated with an error exit from a function, that is, with a nonzero value of **ifail** as specified in Section 6 of the function document.

(b) **Advisory messages**

which include output of final results, output of intermediate results to monitor the course of a computation, and various warning or informative messages.

Since the NAG Toolbox is written in Fortran it uses Fortran I/O features. In particular output is directed to an *output unit* identified by a unique *unit number*. To allow output to be redirected to files from within Matlab, we provide two functions for connecting and disconnecting a file to and from a Fortran unit: `nag_file_open` (x04ac) and `nag_file_close` (x04ad). Fortran unit numbers should be between 1 and 99. The numbers 5 and 6 are reserved for standard input and output respectively.

At present only formatted records are output from the Library. All formatted output to an external file from within the Library is performed by `nag_file_line_write` (x04ba). Similarly, all formatted input from an external file is performed by `nag_file_line_read` (x04bb).

### 2.2 Matrix Printing Functions

Functions are provided to allow formatted output of

- (a) general matrices stored in a two-dimensional array (real, complex and integer data types);
- (b) triangular matrices stored in a packed one-dimensional array (real and complex data types);
- (c) band matrices stored in a packed two-dimensional array (real and complex data types).

Functions in (b) and (c) allow printing of matrices stored in formats used in particular by Chapter F07 of the Library.

By appropriate choice of arguments you can specify titles, labels, maximum output record length, and the format of individual matrix elements. All output is directed to the advisory messages unit, which may be altered by a call to `nag_file_set_unit_advisory` (x04ab).

## 3 Recommendations on Choice and Use of Available Functions

Apart from the obvious utility of the matrix printing functions, users of the Library may need to call functions in Chapter X04 for the following purposes.

If the default error message unit is not satisfactory, it may be changed to a new value **nerr** by the statement

```
[nerr] = x04aa(int32(1),nerr)
```

Similarly the advisory message unit may be changed to a new value **nadv** by the statement

```
[nadv] = x04ab(int32(1),nadv)
```

Note that both `nag_file_set_unit_error` (x04aa) and `nag_file_set_unit_advisory` (x04ab) use a Fortran SAVE statement to retain the value of the unit number and so neither function is safe to use in a multithreaded environment.

## 4 Functionality Index

Accessing external formatted file,	
reading a record.....	x04bb
writing a record .....	x04ba
Accessing unit number,	
of advisory message unit .....	x04ab
of error message unit.....	x04aa
Connecting an external file .....	x04ac
Disconnecting an external file.....	x04ad
Printing matrices,	
comprehensive functions,	
general complex matrix.....	x04db
general integer matrix .....	x04eb
general real matrix .....	x04cb
packed complex band matrix .....	x04df
packed complex triangular matrix .....	x04dd
packed real band matrix.....	x04cf
packed real triangular matrix .....	x04cd
easy-to-use functions,	
general complex matrix.....	x04da
general integer matrix .....	x04ea
general real matrix .....	x04ca
packed complex band matrix .....	x04de
packed complex triangular matrix .....	x04dc
packed real band matrix.....	x04ce
packed real triangular matrix .....	x04cc

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