

# Chapter X04

## Input/Output Utilities

### Contents

<b>1</b>	<b>Scope of the Chapter</b>	<b>2</b>
<b>2</b>	<b>Background to the Problems</b>	<b>2</b>
2.1	Output from NAG Library Routines . . . . .	2
2.2	Matrix Printing Routines . . . . .	2
<b>3</b>	<b>Recommendations on Choice and Use of Available Routines</b>	<b>2</b>
<b>4</b>	<b>Index</b>	<b>3</b>

## 1 Scope of the Chapter

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

## 2 Background to the Problems

### 2.1 Output from NAG Library Routines

Output from NAG library routines to an external file falls into two categories.

- (a) **Error messages**  
which are always associated with an error exit from a routine, that is, with a non-zero value of IFAIL as specified in Section 6 of the routine 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.

Each category of output is written to its own Fortran output unit – the **error message unit** or the **advisory message unit**. In practice these may be the same unit number. Default unit numbers are provided for each implementation of the Library (see the Users' Note for your implementation); they may be changed by users. Output of error messages may be controlled by the setting of IFAIL (see the Essential Introduction or Chapter P01). Output of advisory messages may usually be controlled by the setting of some other parameter (e.g. MSGLVL) (or in some routines also by IFAIL). An alternative mechanism for completely suppressing output is to set the relevant unit number  $< 0$ .

At present only formatted records are output from the Library. All formatted output to an external file from within the Library is performed by X04BAF. Similarly, all formatted input from an external file is performed by X04BBF.

For further information about error and advisory messages, see Chapter P01.

When the library is being called from another language, such as C or Visual Basic, the routines X04ACF and X04ADF may be especially useful. X04ACF connects a file to a FORTRAN unit and X04ADF disconnects a file from a FORTRAN unit.

### 2.2 Matrix Printing Routines

Routines 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).

Routines in (b) and (c) allow printing of matrices stored in formats used in particular by Chapter F06 and Chapter F07 of the Library.

By appropriate choice of arguments the user can specify titles, labels, maximum output record length, and the format of individual matrix elements. All output is directed to the unit number for output of advisory messages, which may be altered by a call to X04ABF.

## 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.

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

If the default unit number for error messages (given in the Users' Note for your implementation) is not satisfactory, it may be changed to a new value NERR by the statement

```
CALL X04AAF(1,NERR)
```

Similarly the unit number for advisory messages may be changed to a new value NADV by the statement

```
CALL X04ABF(1,NADV)
```

## 4 Index

Accessing external formatted file:	
reading a record	X04BBF
writing a record	X04BAF
Accessing unit number:	
of advisory message unit	X04ABF
of error message unit	X04AAF
Connecting an external file	X04ACF
Disconnecting an external file	X04ADF
Printing matrices:	
Comprehensive routines:	
general complex matrix	X04DBF
general integer matrix	X04EBF
general real matrix	X04CBF
packed complex band matrix	X04DFB
packed real band matrix	X04CFB
packed complex triangular matrix	X04DDF
packed real triangular matrix	X04CDF
Easy-to-use routines:	
general complex matrix	X04DAF
general integer matrix	X04EAF
general real matrix	X04CAF
packed complex band matrix	X04DEF
packed real band matrix	X04CEF
packed complex triangular matrix	X04DCF
packed real triangular matrix	X04CCF

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