

## NAG Fortran Library Chapter Introduction

### X04 – Input/Output Utilities

#### Contents

<b>1</b>	<b>Scope of the Chapter</b> .....	2
<b>2</b>	<b>Background to the Problems</b> .....	2
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> .....	2
<b>4</b>	<b>Index</b> .....	3
<b>5</b>	<b>Routines Withdrawn or Scheduled for Withdrawal</b> .....	3

## 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)
```

Note that both X04AAF and X04ABF use a Fortran SAVE statement to retain the value of the unit number and so neither routine is safe to use in a multithreaded environment.

## 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
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Disconnecting an external file .....	X04ADF
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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

## 5 Routines Withdrawn or Scheduled for Withdrawal

None.

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