NAG Toolbox

nag_matop_dtpttr (f01vc)

1 Purpose

nag_matop_dtpttr (f01vc) unpacks a real triangular matrix, stored in a standard packed format array, to a full format array.

2 Syntax

```
[a, info] = nag_matop_dtpttr(uplo, n, ap)

[a, info] = f01vc(uplo, n, ap)
```

3 Description

nag_matop_dtpttr (f01vc) unpacks a real n by n triangular matrix A, stored in an array of length $n(n+1)/2$, to conventional storage in a full format array. This function is intended for possible use in conjunction with functions from Chapters F07, F08 and F16 where some functions use triangular matrices stored in the packed form. Packed storage format is described in Section 3.2.2 in the F07 Chapter Introduction.

4 References

None.

5 Parameters

5.1 Compulsory Input Parameters

1: **uplo** – CHARACTER(1)

Specifies whether A is upper or lower triangular.

uplo = 'U'
    A is upper triangular.

uplo = 'L'
    A is lower triangular.

Constraint: **uplo** = 'U' or 'L'.

2: **n** – INTEGER

n, the order of the matrix A.

Constraint: **n** ≥ 0.

3: **ap**($\mathbf{n} \times (\mathbf{n} + \mathbf{1})/\mathbf{2}$) – REAL (KIND=nag_wp) array

The n by n triangular matrix A, packed by columns.

More precisely,

if **uplo** = 'U', the upper triangle of A must be stored with element A_{ij} in **ap**$(i + j(j - 1)/2)$ for $i \leq j$;

if **uplo** = 'L', the lower triangle of A must be stored with element A_{ij} in **ap**$(i + (2n - j)(j - 1)/2)$ for $i \geq j$.

5.2   Optional Input Parameters

None.

5.3   Output Parameters

1:      **a**($lda, :$) – REAL (KIND=nag_wp) array

The first dimension of the array **a** will be $\max(1, \mathbf{n})$.

The second dimension of the array **a** will be **n**.

The triangular matrix A.

> If **uplo** = 'U', a is upper triangular and the elements of the array below the diagonal are not referenced.

> If **uplo** = 'L', a is lower triangular and the elements of the array above the diagonal are not referenced.

2:      **info** – INTEGER

info $= 0$ unless the function detects an error (see Section 6).

6   Error Indicators and Warnings

info < 0

> If **info** $= -i$, argument i had an illegal value. An explanatory message is output, and execution of the program is terminated.

7   Accuracy

Not applicable.

8   Further Comments

None.

9   Example

This example reads in a triangular matrix packed by columns and unpacks it to full format.

9.1   Program Text

```
function f01vc_example

fprintf('f01vc example results\n\n');

uplo = 'u';
n = nag_int(4);
ap = [1.1; 1.2; 2.2; 1.3; 2.3; 3.3; 1.4; 2.4; 3.4; 4.4];
% Print the unpacked matrix
fprintf('\n');
[ifail] = x04cb('g', 'x', ap, 'f5.2', 'Packed matrix a:', 'i', ...
                {''}, 'i', {''}, nag_int(80), nag_int(0));
% Convert to unpacked form
[a, info] = f01vc(uplo, n, ap);
% Print the packed vector
fprintf('\n');
[ifail] = x04cb(uplo, 'n', a, 'f5.2', 'Unpacked matrix ap:', 'i', ...
                {''}, 'n', {''}, nag_int(80), nag_int(0));
```

9.2 Program Results

```
    f01vc example results

Packed matrix a:
        1
 1  1.10
 2  1.20
 3  2.20
 4  1.30
 5  2.30
 6  3.30
 7  1.40
 8  2.40
 9  3.40
10  4.40

Unpacked matrix ap:
1   1.10 1.20 1.30 1.40
2        2.20 2.30 2.40
3             3.30 3.40
4                  4.40
```