

NAG Toolbox

nag_matop_dtfttp (f01vl)

1 Purpose

nag_matop_dtfttp (f01vl) copies a real triangular matrix, stored in a Rectangular Full Packed (RFP) format array, to a standard packed format array.

2 Syntax

```
[ap, info] = nag_matop_dtfttp(transr, uplo, n, ar)
[ap, info] = f01vl(transr, uplo, n, ar)
```

3 Description

nag_matop_dtfttp (f01vl) packs a real n by n triangular matrix A , stored in RFP format, to packed format. This function is intended for possible use in conjunction with functions from Chapters F07 and F16 where some functions that use triangular matrices store them in RFP format. The RFP storage format is described in Section 3.2.3 in the F07 Chapter Introduction and the packed storage format is described in Section 3.2.2 in the F07 Chapter Introduction.

4 References

Gustavson F G, Waśniewski J, Dongarra J J and Langou J (2010) Rectangular full packed format for Cholesky's algorithm: factorization, solution, and inversion *ACM Trans. Math. Software* **37**, 2

5 Parameters

5.1 Compulsory Input Parameters

1: **transr** – CHARACTER(1)

Specifies whether the normal RFP representation of A or its transpose is stored.

transr = 'N'

The RFP representation of the matrix A is stored.

transr = 'T'

The transpose of the RFP representation of the matrix A is stored.

Constraint: **transr** = 'N' or 'T'.

2: **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'.

3: **n** – INTEGER

n , the order of the matrix A .

Constraint: **n** \geq 0.

4: **ar**($n \times (n + 1)/2$) – REAL (KIND=nag_wp) array

The upper or lower n by n triangular matrix A (as specified by **uplo**) in either normal or transposed RFP format (as specified by **transr**). The storage format is described in Section 3.2.3 in the F07 Chapter Introduction.

5.2 Optional Input Parameters

None.

5.3 Output Parameters

1: **ap**($n \times (n + 1)/2$) – 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 is stored with element A_{ij} in **ap**($i + j(j - 1)/2$) for $i \leq j$;

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

2: **info** – INTEGER

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

6 Error Indicators and Warnings

$-999 < \mathbf{info} < 0$

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

info = -999

Dynamic memory allocation failed.

7 Accuracy

Not applicable.

8 Further Comments

None.

9 Example

This example reads in a triangular matrix in RFP format and copies it to packed format.

9.1 Program Text

```
function f01vl_example

fprintf('f01vl example results\n\n');

transr = 'n';
uplo   = 'u';
n      = nag_int(4);
ar = [1.30; 2.30; 3.30; 1.10; 1.20; 1.40; 2.40; 3.40; 4.40; 2.20];
% Print the Rectangular Full Packed array
fprintf('\n');
```

```
[ifail] = x04cb('g', 'x', ar, 'f5.2', 'RFP Packed Array ar:', 'i', ...
              {''}, 'n', {''}, nag_int(80), nag_int(0));
% Convert to packed vector form
[ap, info] = f01vl(transr, uplo, n, ar);
% Print the packed vector
fprintf('\n');
[ifail] = x04cb('g', 'x', ap, 'f5.2', 'Packed Array ap:', 'i', ...
              {''}, 'n', {''}, nag_int(80), nag_int(0));
```

9.2 Program Results

f01vl example results

RFP Packed Array ar:

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

Packed Array ap:

```
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
```
