NAG Toolbox

nag_matop_ztrttf (f01vf)

1 Purpose

nag_matop_ztrttf (f01vf) copies a complex triangular matrix, stored in a full format array, to a Rectangular Full Packed (RFP) format array.

2 Syntax

```
[ar, info] = nag_matop_ztrttf(transr, uplo, a, 'n', n)
[ar, info] = f01vf(transr, uplo, a, 'n', n)
```

3 Description

nag_matop_ztrttf (f01vf) packs a complex n by n triangular matrix A, stored conventionally in a full format array, into RFP 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.

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 conjugate transpose is stored.

transr = 'N'
The RFP representation of the matrix A is stored.

transr = 'C'
The conjugate transpose of the RFP representation of the matrix A is stored.

Constraint: **transr** = 'N' or 'C'.

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

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

The second dimension of the array **a** must be at least **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.

5.2 Optional Input Parameters

1: **n** – INTEGER

Default: the first dimension of the array **a**.

n, the order of the matrix A.

Constraint: $\mathbf{n} \geq 0$.

5.3 Output Parameters

1: **ar**$(\mathbf{n} \times (\mathbf{n}+\mathbf{1})/\mathbf{2})$ – COMPLEX (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.

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 and copies it to RFP format.

9.1 Program Text

```
function f01vf_example

fprintf('f01vf example results\n\n');

uplo   = 'u';
transr = 'n';
a = [1.1000 + 1.1000i,  1.2000 + 1.2000i,  1.3000 + 1.3000i,  1.4000 + 1.4000i;
        0,              2.2000 + 2.2000i,  2.3000 + 2.3000i,  2.4000 + 2.4000i;
        0,                  0,             3.3000 + 3.3000i,  3.4000 + 3.4000i;
        0,                  0,                  0,            4.4000 + 4.4000i];
% Print the unpacked matrix
fprintf('\n');
```

```
[ifail] = x04db(uplo, 'n', a, 'b', 'f5.2', 'Unpacked matrix a:', 'i', ...
                'i', nag_int(80), nag_int(0));
% Convert to Rectangular Full Packed form
[ar, info] = f01vf(transr, uplo, a);
% Print the packed vector
fprintf('\n');
[ifail] = x04db('g', 'x', ar, 'b', 'f5.2', 'RFP Packed Array ar:', 'i', ...
                'n', nag_int(80), nag_int(0));

n = nag_int(size(a,1));
k = nag_int(n/2);
q = n - k;
if transr=='N' || transr=='n'
  lar1 = 2*k + 1;
  lar2 = q;
else
  lar1 = q;
  lar2 = 2*k + 1;
end

ar = reshape(ar,lar1,lar2);

fprintf('\n');
[ifail] = x04db('g', 'x', ar, 'b', 'f5.2', ...
                'RFP Packed Array ar (graphical representation):', 'i', ...
                'i', nag_int(80), nag_int(0), 'm', lar1, 'n', lar2);
```

9.2 Program Results

```
     f01vf example results

 Unpacked matrix a:
                  1             2             3             4
 1  ( 1.10, 1.10) ( 1.20, 1.20) ( 1.30, 1.30) ( 1.40, 1.40)
 2                ( 2.20, 2.20) ( 2.30, 2.30) ( 2.40, 2.40)
 3                              ( 3.30, 3.30) ( 3.40, 3.40)
 4                                            ( 4.40, 4.40)

 RFP Packed Array ar:
  1  ( 1.30, 1.30)
  2  ( 2.30, 2.30)
  3  ( 3.30, 3.30)
  4  ( 1.10,-1.10)
  5  ( 1.20,-1.20)
  6  ( 1.40, 1.40)
  7  ( 2.40, 2.40)
  8  ( 3.40, 3.40)
  9  ( 4.40, 4.40)
 10  ( 2.20,-2.20)

 RFP Packed Array ar (graphical representation):
                  1             2
 1  ( 1.30, 1.30) ( 1.40, 1.40)
 2  ( 2.30, 2.30) ( 2.40, 2.40)
 3  ( 3.30, 3.30) ( 3.40, 3.40)
 4  ( 1.10,-1.10) ( 4.40, 4.40)
 5  ( 1.20,-1.20) ( 2.20,-2.20)
```