

## NAG Toolbox

### nag\_matop\_ztrttp (f01vb)

#### 1 Purpose

nag\_matop\_ztrttp (f01vb) copies a complex triangular matrix, stored in a full format array, to a packed format array.

#### 2 Syntax

```
[ap, info] = nag_matop_ztrttp(uplo, a, 'n', n)
[ap, info] = f01vb(uplo, a, 'n', n)
```

#### 3 Description

nag\_matop\_ztrttp (f01vb) packs a complex  $n$  by  $n$  triangular matrix  $A$ , stored conventionally in a full format array, into an array of length  $n(n+1)/2$ . The matrix is packed by columns. 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: **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 second dimension of the array **a**.

*n*, the order of the matrix *A*.

*Constraint:*  $n \geq 0$ .

## 5.3 Output Parameters

1: **ap**( $n \times (n + 1)/2$ ) – COMPLEX (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

**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 packed format.

### 9.1 Program Text

```
function f01vb_example

fprintf('f01vb example results\n\n');

uplo = 'u';
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 packed vector form
```

```
[ap, info] = f01vb(uplo, a);  
% Print the packed vector  
fprintf('\n');  
[ifail] = x04db('g', 'x', ap, 'b', 'f5.2', 'Packed matrix ap:', 'i', ...  
              'n', nag_int(80), nag_int(0));
```

## 9.2 Program Results

f01vb 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)
```

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

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