

NAG Toolbox

nag_blast_zaxpby (f16gc)

1 Purpose

nag_blast_zaxpby (f16gc) computes the sum of two scaled vectors, for complex scalars and vectors.

2 Syntax

```
[y] = nag_blast_zaxpby(n, alpha, x, incx, beta, y, incy)
[y] = f16gc(n, alpha, x, incx, beta, y, incy)
```

3 Description

nag_blast_zaxpby (f16gc) performs the operation

$$y \leftarrow \alpha x + \beta y,$$

where x and y are n -element complex vectors, and α and β are complex scalars. If n is less than or equal to zero, or if α is equal to zero and β is equal to 1, this function returns immediately.

4 References

Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001) *Basic Linear Algebra Subprograms Technical (BLAST) Forum Standard* University of Tennessee, Knoxville, Tennessee
<http://www.netlib.orgblas/blast-forum/blas-report.pdf>

5 Parameters

5.1 Compulsory Input Parameters

1: **n** – INTEGER

n , the number of elements in x and y .

2: **alpha** – COMPLEX (KIND=nag_wp)

The scalar α .

3: **x(1 + (n - 1) × |incx|)** – COMPLEX (KIND=nag_wp) array

The n -element vector x .

If **incx** > 0, x_i must be stored in $x((i - 1) \times |incx| + 1)$, for $i = 1, 2, \dots, n$.

If **incx** < 0, x_i must be stored in $x((n - i) \times |incx| + 1)$, for $i = 1, 2, \dots, n$.

Intermediate elements of **x** are not referenced.

4: **incx** – INTEGER

The increment in the subscripts of **x** between successive elements of x .

Constraint: **incx** ≠ 0.

5: **beta** – COMPLEX (KIND=nag_wp)

The scalar β .

6: $y(1 + (\mathbf{n} - 1) \times |\text{incy}|)$ – COMPLEX (KIND=nag_wp) array

The n -element vector y .

If $\text{incy} > 0$, y_i must be stored in $y((i - 1) \times \text{incy} + 1)$, for $i = 1, 2, \dots, \mathbf{n}$.

If $\text{incy} < 0$, y_i must be stored in $y((\mathbf{n} - i) \times |\text{incy}| + 1)$, for $i = 1, 2, \dots, \mathbf{n}$.

Intermediate elements of y are not referenced.

7: incy – INTEGER

The increment in the subscripts of y between successive elements of y .

Constraint: $\text{incy} \neq 0$.

5.2 Optional Input Parameters

None.

5.3 Output Parameters

1: $y(1 + (\mathbf{n} - 1) \times |\text{incy}|)$ – COMPLEX (KIND=nag_wp) array

The updated vector y stored in the array elements used to supply the original vector y .

Intermediate elements of y are unchanged.

6 Error Indicators and Warnings

If $\text{incx} = 0$ or $\text{incy} = 0$, an error message is printed and program execution is terminated.

7 Accuracy

The BLAS standard requires accurate implementations which avoid unnecessary over/underflow (see Section 2.7 of Basic Linear Algebra Subprograms Technical (BLAST) Forum (2001)).

8 Further Comments

None.

9 Example

This example computes the result of a scaled vector accumulation for

$$\begin{aligned}\alpha &= 3 + 2i, & x &= (-6 + 1.2i, 3.7 + 4.5i, -4 + 2.1i)^T, \\ \beta &= -i, & y &= (-5.1, 6.4 - 5i, -3 - 2.4i)^T.\end{aligned}$$

x and y are stored in reverse order.

9.1 Program Text

```
function f16gc_example

fprintf('f16gc example results\n\n');

n = nag_int(3);
x = [ -4 + 2.1i    3.7 + 4.5i    -6    + 1.2i];
y = [ -3 - 2.4i    6.4 - 5.0i    -5.1 + 0.0i];

% z = alpha*x +beta*y;
alpha = 3 + 2i;
beta = 0 - 1i;

incx = nag_int(-1);
```

```

incy = nag_int(-1);
[z] = f16gc( ...
    n, alpha, x, incx, beta, y, incy);

disp('x, y:');
fprintf(' x = ');
for j = 1:n
    fprintf('%11.4f %+ 8.4fi',real(x(j)),imag(x(j)));
end
fprintf('\n y = ');
for j = 1:n
    fprintf('%11.4f %+ 8.4fi',real(y(j)),imag(y(j)));
end

fprintf('\n\nalpha = %5.1f%+5.1fi      beta = %5.1f%+5.1fi\n', ...
    real(alpha), imag(alpha), real(beta), imag(beta));
fprintf('\nalpha*x + beta*y = \n      ');
for j = 1:n
    fprintf('%11.4f %+ 8.4fi',real(z(j)),imag(z(j)));
end
fprintf('\n');

```

9.2 Program Results

f16gc example results

```

x, y:
 x =      -4.0000   +2.1000i      3.7000   +4.5000i     -6.0000   +1.2000i
 y =      -3.0000   -2.4000i      6.4000   -5.0000i     -5.1000   +0.0000i

alpha =    3.0 +2.0i      beta =     0.0 -1.0i

alpha*x + beta*y =
 -18.6000   +1.3000i     -2.9000   +14.5000i     -20.4000   -3.3000i

```
