

# NAG Library Routine Document

## A02ACF

**Note:** before using this routine, please read the Users' Note for your implementation to check the interpretation of *bold italicised* terms and other implementation-dependent details.

### 1 Purpose

A02ACF divides one complex number,  $x = (x_r, x_i)$ , by a second complex number,  $y = (y_r, y_i)$ , returning the result in  $z = (z_r, z_i)$ .

### 2 Specification

```
SUBROUTINE A02ACF (XR, XI, YR, YI, ZR, ZI)
REAL (KIND=nag_wp) XR, XI, YR, YI, ZR, ZI
```

### 3 Description

The result  $z$  is calculated using Smith's algorithm with scaling, from Li *et al.* (2002), which ensures that no unnecessary overflow or underflow occurs at intermediate stages of the computation.

### 4 References

Li X S, Demmel J W, Bailey D H, Henry G, Hida Y, Iskandar J, Kahan W, Kapur A, Martin M C, Tung T and Yoo D J (2002) Design, implementation and testing of extended and mixed precision BLAS *ACM Trans. Math. Soft.* **28(2)** 152–205

### 5 Parameters

- |    |  |               |
|----|--|---------------|
| 1: | XR – REAL (KIND=nag_wp)  | <i>Input</i>  |
| 2: | XI – REAL (KIND=nag_wp)  | <i>Input</i>  |
|    | <i>On entry:</i> $x_r$ and $x_i$ , the real and imaginary parts of $x$ , respectively. |               |
| 3: | YR – REAL (KIND=nag_wp)  | <i>Input</i>  |
| 4: | YI – REAL (KIND=nag_wp)  | <i>Input</i>  |
|    | <i>On entry:</i> $y_r$ and $y_i$ , the real and imaginary parts of $y$ , respectively. |               |
| 5: | ZR – REAL (KIND=nag_wp)  | <i>Output</i> |
| 6: | ZI – REAL (KIND=nag_wp)  | <i>Output</i> |
|    | <i>On exit:</i> $z_r$ and $z_i$ , the real and imaginary parts of $z$ , respectively.  |               |

### 6 Error Indicators and Warnings

None.

### 7 Accuracy

The result should be correct to *machine precision*.

### 8 Parallelism and Performance

Not applicable.

## 9 Further Comments

The time taken by A02ACF is negligible.

This routine **must** not be called with  $YR = 0.0$  and  $YI = 0.0$ .

## 10 Example

This example finds the value of  $(-1.7 + 2.6i)/(-3.1 - 0.9i)$ .

### 10.1 Program Text

```

Program a02acfe

!      A02ACF Example Program Text

!      Mark 25 Release. NAG Copyright 2014.

!      .. Use Statements ..
Use nag_library, Only: a02acf, nag_wp
!      .. Implicit None Statement ..
Implicit None
!      .. Parameters ..
Integer, Parameter          :: nin = 5, nout = 6
!      .. Local Scalars ..
Real (Kind=nag_wp)         :: xi, xr, yi, yr, zi, zr
!      .. Executable Statements ..
Write (nout,*) 'A02ACF Example Program Results'

!      Skip heading in data file
Read (nin,*)

      Read (nin,*) xr, xi, yr, yi

!      Compute (XR,XI)/(YR,YI) = (ZR,ZI)

      Call a02acf(xr,xi,yr,yi,zr,zi)

      Write (nout,*)
      Write (nout,*) '   XR   XI   YR   YI   ZR   ZI'
      Write (nout,99999) xr, xi, yr, yi, zr, zi

99999 Format (1X,4F6.1,2F9.4)
End Program a02acfe

```

### 10.2 Program Data

```

A02ACF Example Program Data
-1.7  2.6 -3.1 -0.9

```

### 10.3 Program Results

```

A02ACF Example Program Results

   XR   XI   YR   YI   ZR   ZI
-1.7   2.6  -3.1  -0.9   0.2812  -0.9203

```

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