

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 Arguments

- | | | |
|----|--|---------------|
| 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

A02ACF is not threaded in any implementation.

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 26 Release. NAG Copyright 2016.

!      .. 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
