

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) *Input*
 2: XI – REAL (KIND=nag_wp) *Input*

On entry: x_r and x_i , the real and imaginary parts of x , respectively.

3: YR – REAL (KIND=nag_wp) *Input*
 4: YI – REAL (KIND=nag_wp) *Input*

On entry: y_r and y_i , the real and imaginary parts of y , respectively.

5: ZR – REAL (KIND=nag_wp) *Output*
 6: ZI – REAL (KIND=nag_wp) *Output*

On exit: 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 Further Comments

The time taken by A02ACF is negligible.

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

9 Example

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

9.1 Program Text

```

Program a02acfe

!      A02ACF Example Program Text

!      Mark 24 Release. NAG Copyright 2012.

!      .. 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

```

9.2 Program Data

```

A02ACF Example Program Data
-1.7  2.6 -3.1 -0.9

```

9.3 Program Results

```

A02ACF Example Program Results

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

```
