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) *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 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
```