

NAG Library Routine Document

X02AJF

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

X02AJF returns ϵ , the value *machine precision*.

2 Specification

double precision FUNCTION X02AJF()

3 Description

X02AJF returns *machine precision*, computed as $\epsilon = \frac{1}{2} \times b^{1-p}$, where b is the arithmetic base (see X02BHF) and p is the number of significant base- b digits (see X02BJF).

It is important to note that the definition of ϵ here differs from that in ISO (1997).

4 References

ISO (1997) ISO Fortran 95 programming language (ISO/IEC 1539–1:1997)

5 Parameters

None.

6 Error Indicators and Warnings

None.

7 Accuracy

None.

8 Further Comments

None.

9 Example

This example prints the values of all the functions in Chapter X02. The results will vary from one implementation of the Library to another.

9.1 Program Text

```
*      X02AJF Example Program Text
*      Mark 17 Revised. NAG Copyright 1995.
*      .. Parameters ..
      INTEGER          NOUT
      PARAMETER        (NOUT=6)
*      .. External Functions ..
      DOUBLE PRECISION X02AHF, X02AJF, X02AKF, X02ALF, X02AMF, X02ANF
      INTEGER          X02BBF, X02BEF, X02BHF, X02BJF, X02BKF, X02BLF
```

```

      LOGICAL          X02DAF, X02DJF
      EXTERNAL         X02AHF, X02AJF, X02AKF, X02ALF, X02AMF, X02ANF,
+                     X02BBF, X02BEF, X02BHF, X02BJF, X02BKF, X02BLF,
+                     X02DAF, X02DJF
*      .. Executable Statements ..
      WRITE (NOUT,*) 'X02AJF Example Program Results'
      WRITE (NOUT,*)
      WRITE (NOUT,*) '(results are machine-dependent)'
      WRITE (NOUT,*)
      WRITE (NOUT,*) 'The basic parameters of the model'
      WRITE (NOUT,*)
      WRITE (NOUT,99999) ' X02BHF = ', X02BHF(),
+ ' (the model parameter B)'
      WRITE (NOUT,99999) ' X02BJF = ', X02BJF(),
+ ' (the model parameter P)'
      WRITE (NOUT,99999) ' X02BKF = ', X02BKF(),
+ ' (the model parameter EMIN)'
      WRITE (NOUT,99999) ' X02BLF = ', X02BLF(),
+ ' (the model parameter EMAX)'
      WRITE (NOUT,99998) ' X02DJF = ', X02DJF(),
+ ' (the model parameter ROUNDS)'
      WRITE (NOUT,*)
      WRITE (NOUT,*) 'Derived parameters of floating-point arithmetic'
      WRITE (NOUT,*)
      WRITE (NOUT,99997) ' X02AJF = ', X02AJF(),
+ ' (the machine precision)'
      WRITE (NOUT,99997) ' X02AKF = ', X02AKF(),
+ ' (the smallest positive model number)'
      WRITE (NOUT,99997) ' X02ALF = ', X02ALF(),
+ ' (the largest positive model number)'
      WRITE (NOUT,99997) ' X02AMF = ', X02AMF(),
+ ' (the real safe range parameter)'
      WRITE (NOUT,99997) ' X02ANF = ', X02ANF(),
+ ' (the complex safe range parameter)'
      WRITE (NOUT,*)
      WRITE (NOUT,*)
      WRITE (NOUT,*) 'Parameters of other aspects of the computing environment'
      WRITE (NOUT,*)
      WRITE (NOUT,99994) ' X02AHF = ', X02AHF(0.0D0),
+ ' (largest argument for SIN and COS)'
      WRITE (NOUT,99996) ' X02BBF = ', X02BBF(0.0D0),
+ ' (largest positive integer)'
      WRITE (NOUT,99996) ' X02BEF = ', X02BEF(0.0D0),
+ ' (precision in decimal digits)'
      WRITE (NOUT,99995) ' X02DAF = ', X02DAF(0.0D0),
+ ' (indicates how underflow is handled)'
*
99999 FORMAT (1X,A,I7,1X,A)
99998 FORMAT (1X,A,L7,1X,A)
99997 FORMAT (1X,A,1P,E26.18E3,1X,A)
99996 FORMAT (1X,A,I20,1X,A)
99995 FORMAT (1X,A,L20,1X,A)
99994 FORMAT (1X,A,1P,E20.8E3,1X,A)
      END

```

9.2 Program Data

None.

9.3 Program Results

X02AJF Example Program Results

(results are machine-dependent)

The basic parameters of the model

```

X02BHF =      2   (the model parameter B)
X02BJF =     53   (the model parameter P)
X02BKF =   -1021  (the model parameter EMIN)

```

X02BLF = 1024 (the model parameter EMAX)
X02DJF = T (the model parameter ROUNDS)

Derived parameters of floating-point arithmetic

X02AJF = 1.110223024625156540E-016 (the machine precision)
X02AKF = 2.225073858507201383E-308 (the smallest positive model number)
X02ALF = 1.797693134862315708E+308 (the largest positive model number)
X02AMF = 2.225073858507201877E-308 (the real safe range parameter)
X02ANF = 2.225073858507201877E-308 (the complex safe range parameter)

Parameters of other aspects of the computing environment

X02AHF = 1.42724769E+045 (largest argument for SIN and COS)
X02BBF = 2147483647 (largest positive integer)
X02BEF = 15 (precision in decimal digits)
X02DAF = T (indicates how underflow is handled)
