1 SUMMARY

Given \( x \geq 0 \) computes the values of the Spherical Bessel functions

\[
j_n(x) = \left( \frac{\pi}{2x} \right)^{\frac{1}{2}} J_n(x)
\]

for \( n = 0 \) up to \( N, N \leq 29 \).

The method used is based upon the recurrence relation

\[
j_{n+1}(x) = \left( \frac{2n+1}{x} \right) j_n(x) - j_{n-1}(x)
\]

given by F.J. Corbalo and J.L. Uretsky, J.A.C.M., Vol. 6, No. 3.


2 HOW TO USE THE PACKAGE

The single precision version

\[
\text{CALL FF05A(N,X,ARRAY)}
\]

The double precision version

\[
\text{CALL FF05AD(N,X,ARRAY)}
\]

\( N \) is an INTEGER variable which must be set by the user to the upper limit of the range of functions to be computed, i.e. the subroutine will return the values of \( j_n(x), n = 0,1,..,N \). Restriction: \( 1 \leq N \leq 29 \).

\( X \) is a REAL (DOUBLE PRECISION in the D version) variable which must be set by the user to the value of the argument \( x \). Restriction: \( x \geq 0 \).

\( ARRAY \) is a REAL (DOUBLE PRECISION in the D version) array of length at least \( N+1 \) which is set by the subroutine to the function values. The computed values of \( j_n(x), n = 0,1,..,N \) will be stored in \( ARRAY(I) \) \( I = 1,N+1 \).

3 GENERAL INFORMATION

Use of common: none.

Workspace: none.

Other subroutines: none.

Input/Output: prints a diagnostic message when any of the restrictions are violated.

Restrictions:

\( x \geq 0 \),

\( 1 \leq N \leq 29 \).

Accuracies: The 8-byte version has been checked and found to give at least ten decimal digits accuracy in the range \( 0 \leq x \leq 20 \). There is no reason why it should not give at least 13 figure accuracy over the whole range of positive \( x \) values. The 4-byte version is accurate to 6 figures.
4 METHOD

The method used is based upon the recurrence relation

$$J_{n+1}(x) = \left( \frac{2n+1}{x} \right) J_n(x) - J_{n-1}(x)$$

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