INPUT DATA DOCUMENTATION FOR TWOFNR (J.A.T. JULY 1997)

Input data documentation for Surrey version of Code TWOFNR

This version (Tostevin) is a shortened version exclusively for
use with one step Zero Range calculations.
It will also perform Local Energy Approximation calculations.

The input data is of four types
  A) Control information
  B) Potential data for the two channels
  C) Formfactor data
  D) Amplitude mixing information

A data set comprises one or a number of the following elements

CONTROL CARD FOR AMPLITUDE CALCULATION, KTOUT(1).NE.9
REACTION / OPTICAL POTENTIAL DEFINING CARDS

A blank card indicates termination of these cards.

FORMFACTOR DEFINITION CARDS

A blank card indicates termination of these cards.

The above sequence is repeated as many times as there are
amplitudes to be calculated. Then the following

CONTROL CARD FOR MIXING THE AMPLITUDES, KTOUT(1)=9
AMPLITUDE MIXING CARDS

Input of these cards is terminated by a blank card.

The above amplitude mixing cards alone, or the entire data set
can be repeated as many times as required, the end of each input
signified by the blank line.

The input format of this data and the amount required to be input
depends to some extent on the input control information and type
of calculation undertaken (Zero or Finite range). In all cases each
calculation, or sub-calculation if many possible amplitudes are
necessary, starts with the following control information.

CONTROL CARD

The first card inputs a title, the control array KTOUT to define
the I/O required, and controls amount of printed output.

FORMAT(10I1,3I2,I4,15A4)	
KTOUT(1)	Controls printout of the reduced amplitudes BETA, and type of calculation to follow =5 Output to disk
KTOUT(2)	Controls output of the radial overlaps =0 (default) No output of integrals =1 Output to the lineprinter
KTOUT(3)	Output of INCIDENT channel distorted wave =0 Calculate functions/no printout =1 Read functions /no printout =2 Read functions /printout =3 Calculate functions/printout
KTOUT(4)	Output of FINAL channel distorted wave =0 Calculate functions/no printout =1 Read functions /no printout =2 Read functions /printout =3 Calculate functions/printout
KTOUT(5)	Not used. Set a null value
KTOUT(6)	Not used. Set a null value

KTOUT(7)	Make a lineprinter plot of the X-section =0 No plot is made =1 (default) X-section is plotted
KTOUT(8)	Not used. Set a null value.
KTOUT(9)	Total parity change in the reaction =0 (default) Total parity change is +ve =1 Total parity change is -ve
KTOUT(10)	Not used. Set a null value
INS	If KTOUT(1) equals 4 or 5, INS labels the amplitude to be calculated on the disk file which is written out to channel FT08
NUMRUN(1)	Run identifier, Date usually
NUMRUN(2)	Run identifier, Month usually
NUMRUN(3)	Run identifier, Year.
ITITOL(I)	Title (I=1,15), Maximum 60 Characters

In the following the character $ refers to channel 1 or channel 2. Two sets of cards must be input whenever $ appears, one for the entrance and one for the exit channel.

Nb: Only those cards used need be input. If no Ispin dependent potentials are used cards 8.$ need not be supplied. The end of the input from the N.$ prefixed cards is signified by a blank card.

FORMAT(8F10.0)

CARD 1

1.0	Unity. Identifier for CARD 1
0.0	Zero
RMAX	Maximum radius of integration (fermis)
NRMIN	Lower cutoff radius = NRMIN*STEP
NRMAX	STEP = RMAX/NRMAX, Number of radial steps Maximum value is 500
ELABI	Lab. energy of incident projectile (MeV)
KTZF(1)	Type of calculation to be performed =0 Zero Range Calculation

CARD 2

2.2	two point two, identifies CARD 2
TRS(1,2)	Spin transfer for the reaction
LTR(1,2)	Orbital angular momentum transfer
TRJ(1,2)	Total angular momentum transfer

REACTION CHANNEL DEFINITION CARDS

FORMAT(8F10.0)

CARD 3

3.$	Identifier for CARD 3, Channel $

LMIND($)	Minimum partial wave in channel $
LMAXD($)	Maximum partial wave in channel $ (.LE.90)
BETA	Enter Unity if $=2, Zero if $=1
PNLOC($)	Nonlocality Range for Channel $

CARD 4

4.$	Identifier for CARD 4, Channel $
PMAS($)	Projectile Mass (in amu) in channel $
TMAS($)	Target Mass (in amu) in channel $
PZ($)	Projectile Charge in Channel $
TZ($)	Target Charge in Channel $
PSPN($)	Projectile spin in Channel $
TSPN($)	Target spin in Channel $
QVLUE	Q Value if $=2, else set Zero if $=1

CARD 5

5.$	Identifier for CARD 5, Channel $
VD($)	Real Potential depth, Channel $
WD($)	Imag.Potential depth in Channel $
VSOD($)	Real Spin-Orbit depth in Channel $
WSOD($)	Imag.Spin-Orbit depth in Channel $
RRD($)	Real Potential radius parameter
ARD($)	Real Potential diffuseness parameter
RCD($)	Coulomb potential radius parameter

CARD 6

6.$	Identifier for CARD 6, Channel $
RSORD($)	Real Spin-Orbit radius parameter channel $
ASORD($)	Real Spin-Orbit diffuseness parameter ch.$
RSOID($)	Imag.Spin-Orbit radius parameter channel $
ASOID($)	Imag.Spin-Orbit diffuseness parameter ch.$

Note: If any Radius parameter is given a negative value, the interaction radius is calculated using the form
R = (TMAS($)**1/3 + PMAS($)**1/3) * MOD(radius)

CARD 7

7.$	Identifier for CARD 7, Channel $
CSDGD($)	Imaginary Potential volume-surface ratio Volume depth = (1-CSDGD($)) * WD($) Surface depth = CSDGD($) * WD($)
RID($)	Imaginary Potential radius parameter ch.$ (Non zero if Fermi form potentials used)

AID($)	Imaginary potential diffuseness parameter (Non zero if Fermi form potentials used)
RGD($)	Imaginary Potential radius parameter ch.$ (Non zero if Gauss form potentials used)
AGD($)	Imaginary potential diffuseness parameter (Non zero if Gauss form potentials used)

CARD 8

8.$	Identifier for CARD 8, Channel $
KTISP($)	Control parameter for ispin dependent pot. Code the value 10*KTR + KTI, where for both KTR and KTI we can have the values =1 Volume form of ispin potential =2 Surface form for ispin potential
VISD($)	Real isospin dependent Potential depth
RISRD($)	Real isospin dependent pot. radius
AISRD($)	Real isospin dependent pot.diffuseness
WISD($)	Imag.isospin dependent Potential depth
RISID($)	Imag.isospin dependent pot. radius
AISID($)	Imag.isospin dependent pot.diffuseness

CARDS 9

9.0	Identifier for CARD 9, Angle input
JMAX	Number of angles at which calculation done (Maximum allowed is 180 angles)
DTHETA	Angle step in degrees
THETAD(1)	first or starting angle in degrees C.M.
THETAD(J) J=1,JMAX	If DTHETA was set to Zero, the JMAX angles are read in now from cards with the format FORMAT(8F10.5)

CARD 10

A BLANK CARD IS NEEDED TO TERMINATE THE INPUT

ZERO RANGE FORMFACTOR CARDS

Only those cards required to define the formfactor needed must be input. That is, either those for a Wood Saxon Formfactor or those indicating that formfactor is to be read from cards.

FORMAT(8F10.0) unless stated otherwise

CARD ZRFF1

10.0	Ten point zero, CARD ZRFF1 identifier
AMP	Spectroscopic Amplitude Enter SQRT(Spectroscopic factor), if zero is input program sets AMP=1.0

KTFF(4)	If zero, then formactor is a simple one term form to be calculated in potential well or to be read in. If >0 (=n say) then formfactor is a sum of n+1 terms and n+1 sets of formfactor cards are needed.
D02	(Zero Range Coupling strength, D0)**2
KTFF(5)	Controls printout of formfactor =0 No printout =1 Line printer output =2 Card punch output =3 Line printer and card punch output

CARD ZRFF2

10.01	Identifier for CARD ZRFF2.
FNRNG	Finite range correction parameter (See notes following this card)

The meaning of FNRNG depends upon its sign and the type of reaction which is being undertaken.
(See DelVecchio and Daehnick, Phys.Rev.C6(1972),page 2095)

If FNRNG is positive, Finite Range correction is that of an assumed Hulthen Interaction of the transferred particle in the projectile. (FNRNG equals R of above reference)
That is R is the range of the interaction in configuration space and is 1/BETA as used in DWCODE.

If FNRNG is negative, the correction is that of an assumed Gaussian wavefunction for the transferred particle.
(FNRNG equals 1.0/(2.0*epsilon) of the above reference)

CARD ZRFF3

10.41	Identifier for CARD ZRFF3, Calculate reaction formfactor as the bound state of a Woods-Saxon potential well.
IREAD(1)	Number of nodes in Radial Function.
IREAD(2)	z*Z, product of core and bound part charges.
FREAD(1)	Binding Energy (MeV) of bound particle.
FREAD(2)	m, Mass of bound particle (a.m.u.)
FREAD(3)	M, Mass of Core (a.m.u.)
FREAD(4)	dmat (Matching moved dmat steps)

CARD ZRFF4

10.42	Identifier for CARD ZRFF4, continuation of input for Wood Saxon bound state formfactor
FREAD(6)	Radius parameter for Wood Saxon well.
FREAD(7)	Coulomb radius parameter for bound part.
FREAD(8)	Diffuseness parameter for bound state well
FREAD(9)	Spin-Orbit potential strength.
FREAD(23)	Non-locality range for part.bound state.

CARD ZRFF4A

10.43	Identifier for CARD ZRFF4A, continuation of input for Wood Saxon bound state formfactor (optional: if missing uses real geometry
FREAD(6)	Radius parameter for spin-orbit well.
FREAD(7)	Diffuseness parameter for spin-orbit well

CARDS ZRFF5

10.51	Identifier for CARDS ZRFF5, REAL PART of the formfactor is to be read from cards in the assumed FORMAT(8F10.0).
FF(I) I=1,NRMAX	Real formfactor data in the above FORMAT. Input on subsequent cards as required.

CARDS ZRFF6

10.52	Identifier for CARDS ZRFF6, IMAG.PART of the formfactor is to be read from cards in the assumed FORMAT(8F10.0).
FFI(I) I=1,NRMAX	Imag.formfactor data in the above FORMAT. Input on subsequent cards as required.

CARDS ZRFF7

10.53	Identifier for CARDS ZRFF7, REAL PART of the formfactor is to be read from cards in user supplied FORMAT to be input now.
(5E15.8)	For example, i.e. user required format to be input on a seperate card, Max. 60 Chars.
FF(I) I=1,NRMAX	Real formfactor data in the above FORMAT. Input on subsequent cards as required.

CARDS ZRFF8

10.54	Identifier for CARDS ZRFF8, IMAG.PART of the formfactor is to be read from cards in user supplied FORMAT to be input now.
(5E15.8)	For example, i.e. user required format to be input on a seperate card, Max. 60 Chars.
FFI(I) I=1,NRMAX	Imag.formfactor data in the above FORMAT. Input on subsequent cards as required.

CARD ZRFFQUIT

A BLANK CARD IS NEEDED TO TERMINATE FORMFACTOR INPUT