This program is an interactive one (a front-end) to help you to
automatically generate a data set (called tran.dp12C below) for
input to the transfer reaction program twofnr. The data set name
will be requested when twofnr is run. A typical interaction for
a zero-range (d,p) reaction calculation on a 12C target, here
12C(d,p)13C(g.s), is as follows:

```
<78 dill:~ >front6
 ================================================
  Front end for generating TWOFNR transfer data set
 ================================================
  Data set identifier (xx in tran.xx: max 12 chars)
dp12C
  >>>> dp12C
  Output is to file: tran.dp12C
  Input saved to file: in.dp12C
 ------------------------------------------------
  Enter title information (for info only< 46 chars)
(d,p) on 12C to 13C(gs) Johnson Soper
  >>>> (d,p) on 12C to 13C(gs) Johnson Soper
  Reaction type: [1] (p,d)
                 [2] (d,p)
                 [3] (n,d)
                 [4] (d,n)
                 [5] (d,t)
                 [6] (d,3He)
                 [7] (3He,d)
                 [8] ....
2
  >>>>            2
  Laboratory energy per nucleon (MeV)
12.5
  >>>>    12.50000
  Target mass (a1) and charge (z1)
12  6
  >>>>    12.00000       6.000000
 ------------------------------------------------
  Integration ranges: [1] use defaults
  (defaults: 0-30 fm in 0.10 fm steps)
                      [2] specify values
1
  >>>>            1
  integrations from 0 to   30.00000      fm
  in steps of  0.1000000      fm
  step in outgoing channel =  9.2307694E-02

  number of partial waves [1] default (70)
                          [2] specify
1
  >>>>            1
  Input the required centre of mass angles info:
  number of angles: step (degrees): starting value
181  1  0
  >>>>    101.0000       1.000000      0.0000000E+00
 ------------------------------------------------
  sp quantum numbers l and j of transferred nucleon
1  0.5
  >>>>            1  0.5000000
  number of nodes in nucleon sp radial wave function
  (convention here: the lowest state has zero nodes)
0
  >>>>            0

  specify : [1] neutron separation energy (>0 MeV)
  or        [2] reaction Q-value (MeV)
1
  >>>>            1
  nucleon separation energy (MeV: >0)
4.946
  >>>>    4.946000
   Q-value is   2.721427      MeV
 ================================================
  entrance channel cm energy    21.42857
  exit     channel cm energy    24.15000
  wavenumbers and grazing angular momenta
  kin  =    1.330599       L(in ) =    3.655573
  kout =    1.039621       L(out) =    2.856166
  so L mismatch of   0.7994069      hbar
  for an estimated radius of    2.747314      fm
  and an L transfer of            1  hbar
```

```
 ================================================
  incident (deuteron) channel information
  nonlocality in incident channel [1] no
                                  [2] yes
1
  >>>>            1
  target spin in incident channel
0
  >>>>   0.0000000E+00
  incident channel potential
             [1] from those built in
             [2] specify potential parameters
1
  >>>>            1
 ------------------------------------------------
  initial state potential at Elab=   25.00000      MeV
  Optical potentials for DWBA
  [1] Lohr-Haeberli (A>40 8<E<13 MeV)
              see: ADNTD 17 (1976) p6
  [2] Perey-Perey (12<E<25 MeV) no spin-orbit
              see: ADNTD 17 (1976) p6
  [3] Daehnick Global (A>27 12<E<90 MeV)
      Phys. Rev. C 21, 2253 (1980)
 ------------------------------------------------
  Adiabatic potential for breakup
  [4] Johnson-Soper adiabatic potential
             PRC 1 (1970) 976
 ------------------------------------------------
4
  >>>>            4
  Adiabatic deuteron potential for a =  12.0
  z =  6.0 at  25.0 MeV deuteron energy
  from one of the nucleon potentials:
  Coulomb radius parameter =    1.300000
 ================================================
  outgoing (proton) channel information
  nonlocality in outgoing channel [1] no
                                  [2] yes
1
  >>>>            1
  target spin in outgoing channel
0.5
  >>>>   0.5000000
  outgoing channel potential
             [1] from those built in
             [2] specify potential parameters
1
  >>>>            1
 ------------------------------------------------
  final state potential at Elab=   26.00769      MeV
  [1] Bechetti-Greenlees (A>40 20<E<50 MeV)
             Phys Rev 182 (1969) 1190
  [2] Chapel-Hill 89 Global set (A>40 E>10 MeV)
             Phys Rep 201 (1991) 57
  [3] Menet (30<E<60) see: ADNTD 17 (1976) p6
  [4] Perey (E<20MeV) see: ADNTD 17 (1976) p6
  [5] JLM microscopic optical potential
 ------------------------------------------------
2
  >>>>            2
  Chapel Hill 89 potentials for a =  13.0
  z =  6.0 at  26.0 MeV proton energy
  Coulomb radius parameter =    1.291035
     vr     ro     ao     ws     ri     ai     wv
  47.154  1.154  0.690  6.713  1.151  0.690  2.459
     vso    rso    aso
   5.900  0.830  0.630
 ------------------------------------------------
  Now construct the adiabatic potential:
  [1] Bechetti-Greenlees (A>40 20<E<50 MeV)
             Phys Rev 182 (1969) 1190
  [2] Chapel-Hill 89 Global set (A>40 E>10 MeV)
             Phys Rep 201 (1991) 57
  [3] JLM microscopic optical potentials
 ------------------------------------------------
2
  >>>>            2
  Chapel Hill 89 potentials for a =  12.0
  z =  6.0 at  12.5 MeV nucleon energy
    proton
```

```
     vr      ro      ao      ws      ri      ai      wv
  50.211  1.152  0.690  6.748  1.147  0.690  1.283
    neutron
     vr      ro      ao      ws      ri      ai      wv
  49.163  1.152  0.690  6.537  1.147  0.690  1.535
     vso     rso     aso
   5.900  0.816  0.630
  printout is in          303  steps of  0.1000000
 -------------------------------------------------
  <p|d>  vertex constant D0 = -122.5 MeV fm^3/2
  (Reid SC)  e.g. Nucl. Phys. A241 (1975)  36
  this gives D0^2 =    15006.25      MeV^2 fm^3
  use this default [1] yes
                   [2] no
1
  >>>>            1
 -------------------------------------------------
  Treatment of range (fnrng) of <d|p> vertex
             [1] zero-range (fnrng = 0)
             [2] local-energy (default value)
             [3] local-energy (specify value)
1
  >>>>            1
  Zero-range calculation (fnrng = 0)
 -------------------------------------------------
  neutron binding potential
  radius and diffuseness (e.g. 1.25  0.65 fm)
1.25  0.65
  >>>>    1.250000      0.6500000
  Spin-orbit: strength of l.sigma (~6.0 MeV)
6
  >>>>    6.000000
  Bound state non-locality parameter (~0.85 fm)
0
  >>>>   0.0000000E+00
  Bound state spin-orbit radius parameter
1.25
  >>>>    1.250000
  Bound state spin-orbit diffuseness parameter
0.65
  >>>>   0.6500000
 -------------------------------------------------
```