Help For The Program Gap

Gap is a program for calculating the pairing gap in masses by using binding energies.

The input file is in the form:

Line		
1	02	[This number indicates how many sets of energies you are giving the program to run. If doing one mass at a time this number will be 02, indicating there is a proton and a neutron set of energies. This must be two characters long.]
2	Dy 160 p	[This is a header for the program. It indicates what set of energies is following. The n or p has to be in the line but the order, using p first or n first does not effect the program, it is for the users reference when looking at the data. This is especially helpful when using the program for multiple masses. The only thing that matters is the form. It must be mass, mass number, p or n and 8 characters long. For example: Dy 160 p or Hf 176 n.]
		[For the proton, the binding energies are found by taken the mass, in our case 160 Dy, and adding or subtracting the number of protons in the following way. These new masses will be the binding energy used.]
3	E(1)	Z-5
4	E(2)	Z-3
5	E(3)	Z-2
6	E(4)	Z-1
7	E(5)	Z
8	E(6)	Z+1
9	E(7)	Z+3
10	E(8)	Z+5
11	Dy 160 n	[Start over using the neutron.]
		[This time neutrons will be added and subtracted in the following way and these new masses will be the binding energy.]
12	E(1)	N-5
13	E(2)	N-3
14	E(3)	N-2
15	E(4)	N-1
16	E(5)	N
17	E(6)	N+1
18	E(7)	N+3
19	E(8)	N+5

The following is an example of an input file for gap with the file name Dy160

---INPUT---
02
Dy 160 p
1270.440
1287.390
1295.898
1302.039
1309.458
1314.282
1324.390
1332.610
Dy 160 n
1268.294
1284.995
1294.060
1300.882
1309.458
1315.912
1330.380
1343.754

The binding energies in this input file correspond to

p	n
155 Pm	155 Dy
157 Eu	157 Dy
158 Gd	158 Dy
159 Tb	159 Dy
160 Dy	160 Dy
161 Ho	161 Dy
163 Tm	163 Dy
165 Lu	165 Dy

Gap is run with the following command:

gap <Dy160> out.Dy160

Gap will read the file Dy160 and the output will be placed in the file out.Dy160 which will look like this.

---OUTPUT---

0 Dy 160 p

0 1270.440

0 1287.390

0 1295.898

0 1302.039

0 1309.458

0 1314.282

0 1324.390

0 1332.610

0 D11= 0.129750D+01

0 D12= 0.103063D+01

0 D13= 0.996750D+00

0 D14= 0.990188D+00

0 D15= 0.101369D+01

0 D16= 0.101519D+01

0 DNP= 0.968250D+00

0 Dy 160 n

0 1268.294

0 1284.995

0 1294.060

0 1300.882

0 1309.458

0 1315.912

0 1330.380

0 1343.754

0 D11= 0.106100D+01

0 D12= 0.990750D+00

0 D13= 0.953875D+00

0 D14= 0.951187D+00

0 D15= 0.972312D+00

0 D16= 0.102400D+01

0 DNP= 0.969000D+00

D15 is where we get the numbers for the pairing gap calculations. So, $\Delta p \cong 1014$ KeV and $\Delta n \cong 972$ KeV. Taking twice of these numbers will give you the pairing gap: $2\Delta p \cong 2028$ KeV $2\Delta n \cong 1944$ KeV.