Some words about the MultiNEC models.

The Equations sheet.

Clear All

Set variables using constants or formulas.
Cells in column C are named as indicated.

Name	Value	Comment		
WL.5 :	825.374	½ λ	} Read-Only Variables	
WL.25 :	412.687	¼ λ		
WL.001 :	1.651	**0.001 λ**		
		Change Units		
WL or W :	1650.749	**Inches**		*Area below may be used as a scratch pad.*
Freq or F :	7.150	**Design Frequency (MHz)**		
A :	120	Total Height of radiator		Defined value
B :	0.5	Height of loading coil (fraction of total height)		Defined value
D :	3.725638	Radius of coil		Calculated value
E :	0.5	Winding pitch of coil		Defined value
G :	16	Number of turns on coil		Defined value
H :	56	Location of bottom of coil (in)		Calculated value
I :	0	True = Coil, False = Load		Set by calculation
J :				
K :	0	Simulated ground resistance		Defined value
L :	36.691714	Inductance of lumped load (uH)		Calculated value
M :	1648.367	Inductive reactance of lumped load		Calculated value
N :				
O :				
P :				
Q :	100000	Lumped coil Q		Defined value
S :				
T :				
U :				

Most of the variables on the equations sheet should be fairly self-explanatory but there are some subtleties.

The model is set up to allow the loading coil to "move up and down" the radiator. Changing the value of variable "B" does this. Because of the way the wires are assembled, there are practical limits to the positioning of the load. There are always two wires between the source and the wire containing the lumped load, or the beginning of the distributed. Segment length limits on these wires limit the lower load positioning to perhaps 10% of the total height. At the other end of the antenna, 90% seems to be a practical limit.

Variable "D" is normally adjusted using the resonating function, although of course, it can be changed manually.

Variable "E" can also be changed either way, however, to avoid having wires too close to each other, 0.5" is probably a lower limit unless the wire diameter is changed.

Variable "G" should be considered a constant and not a variable. It is only used to calculate the length of the distributed coil.

Variable "H" is a calculated value based on the overall length of the antenna, and the position and length of the loading coil.

Variable "I" is a logic value that can be set either manually or during calculations. When "False" or zero, the loading is via the NEC load model. When "True" or 1, the loading is via the distributed "wire" coil. The change is made by a logic test performed in the "A" column on the Wires sheet.

Variable "K" is the simulated ground loss resistance. The value here sets the value of a resistive load that is placed on the bottom wire.

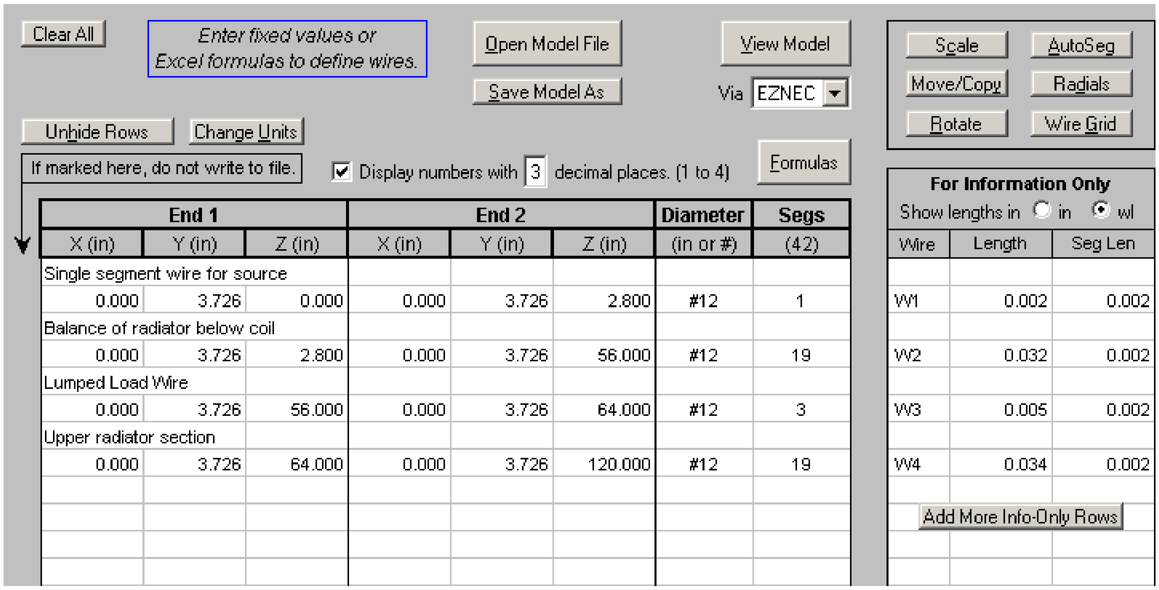
Variable "L" is calculated using the reactance value and the design frequency.

Variable "M" is the reactance of the lumped load. It is normally set via the resonating function.

Variable "Q" is—well—the Q of the lumped load.

The Wires sheet

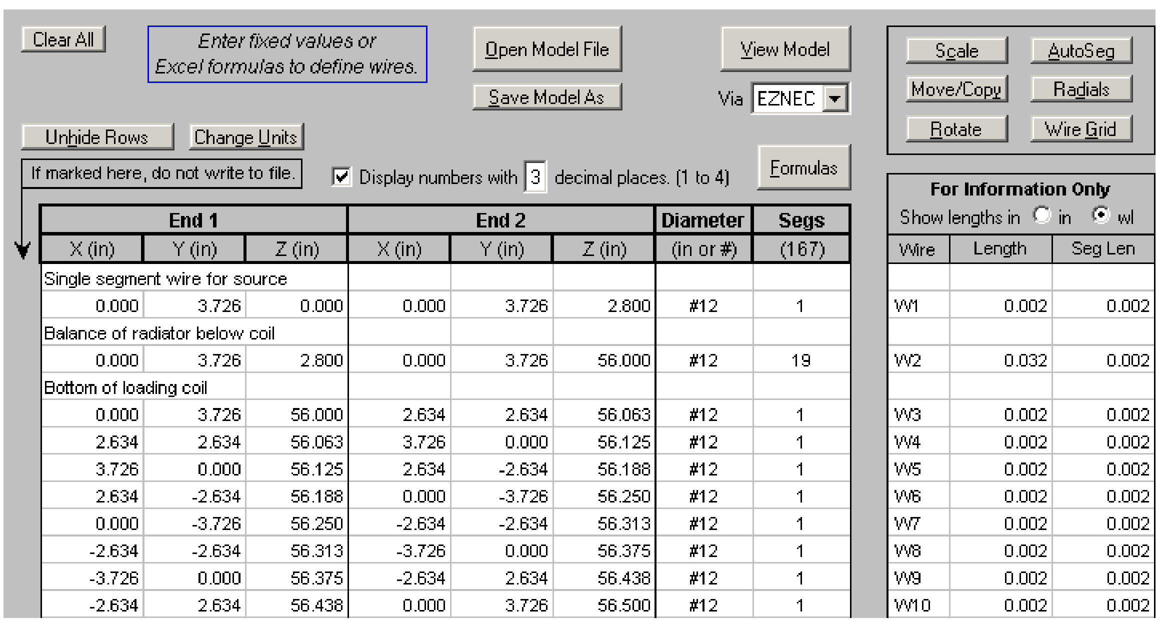
The screen shot below shows the wires when the logical variable "I" is false and "marked" rows (those with something in the "A" column) are hidden.) This is the lumped load case.



End 1 X (in)	End 1 Y (in)	End 1 Z (in)	End 2 X (in)	End 2 Y (in)	End 2 Z (in)	Diameter (in or #)	Segs (42)
Single segment wire for source							
0.000	3.726	0.000	0.000	3.726	2.800	#12	1
Balance of radiator below coil							
0.000	3.726	2.800	0.000	3.726	56.000	#12	19
Lumped Load Wire							
0.000	3.726	56.000	0.000	3.726	64.000	#12	3
Upper radiator section							
0.000	3.726	64.000	0.000	3.726	120.000	#12	19

Wire	Length	Seg Len
W1	0.002	0.002
W2	0.032	0.002
W3	0.005	0.002
W4	0.034	0.002

Below is a screen shot that shows some of the wires that make up the distributed loading coil. Changing from one case to the other is as simple as changing the value of one variable. This demonstrates some of the power of the MultiNEC program. Clicking on the "Formulas" button will reveal the underlying equations that set the coordinates of the wires that comprise the model.



End 1 X (in)	End 1 Y (in)	End 1 Z (in)	End 2 X (in)	End 2 Y (in)	End 2 Z (in)	Diameter (in or #)	Segs (167)
Single segment wire for source							
0.000	3.726	0.000	0.000	3.726	2.800	#12	1
Balance of radiator below coil							
0.000	3.726	2.800	0.000	3.726	56.000	#12	19
Bottom of loading coil							
0.000	3.726	56.000	2.634	2.634	56.063	#12	1
2.634	2.634	56.063	3.726	0.000	56.125	#12	1
3.726	0.000	56.125	2.634	-2.634	56.188	#12	1
2.634	-2.634	56.188	0.000	-3.726	56.250	#12	1
0.000	-3.726	56.250	-2.634	-2.634	56.313	#12	1
-2.634	-2.634	56.313	-3.726	0.000	56.375	#12	1
-3.726	0.000	56.375	-2.634	2.634	56.438	#12	1
-2.634	2.634	56.438	0.000	3.726	56.500	#12	1

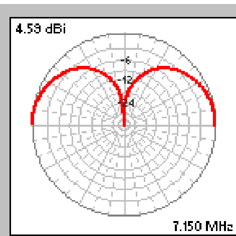
Wire	Length	Seg Len
W1	0.002	0.002
W2	0.032	0.002
W3	0.002	0.002
W4	0.002	0.002
W5	0.002	0.002
W6	0.002	0.002
W7	0.002	0.002
W8	0.002	0.002
W9	0.002	0.002
W10	0.002	0.002

The Source, Load, Transmission line sheet

Like the wires sheet, this sheet has a different look depending on which model is being calculated and whether ground loss is included.

The Calculation Sheet.

Clear All | Generate Test Cases | Setup and Options
Calculate Selected Row | **Calculate All Rows** | Resonate on Selected Cell
Engine: NEC-2 via GoNec.bat | Use StepRad Correction



3D Plot for Selected Row | Via: EZNEC | 3D Step: 5°
Ground Type, Characteristics: Perfect
Wire Loss: Copper
E-fld | Feedline | SWR Zo
Plot/Slice Type: Elevation | Azimuth Angle: 0 ° | Step Size: 1°

7.150 Design Frequency (Equations sheet)

	Variable Names and Values									
Freq (MHz)	D	M	I	R at Src1	X at Src1	SWR(50)	Max Gain	@ El °	Fr / Back	Fr / Rear
7.150	3.725638	1648.367	0	5.07	0.00	9.870	4.59	0		0.00
7.000	3.725638	1648.367	1	4.89	-62.54	26.301	3.72	0		0.00
7.050	3.725638	1648.367	1	5.04	-42.17	17.015	3.72	0		0.00
7.100	3.725638	1648.367	1	5.20	-21.34	11.373	3.72	0		0.00
7.150	3.725638	1648.367	1	5.37	0.00	9.303	3.72	0		0.00
7.200	3.725638	1648.367	1	5.55	21.86	10.742	3.72	0		0.00
7.250	3.725638	1648.367	1	5.74	44.31	15.595	3.72	0		0.00
7.300	3.725638	1648.367	1	5.94	67.36	23.771	3.72	0		0.00
7.000	3.725638	1648.367	0	4.59	-77.12	36.896	4.58	0		0.00
7.050	3.725638	1648.367	0	4.74	-51.95	21.989	4.59	0		0.00
7.100	3.725638	1648.367	0	4.90	-26.26	13.043	4.59	0		0.00
7.150	3.725638	1648.367	0	5.07	0.00	9.870	4.59	0		0.00
7.200	3.725638	1648.367	0	5.24	26.86	12.318	4.60	0		0.00
7.250	3.725638	1648.367	0	5.42	54.37	20.174	4.60	0		0.00
7.300	3.725638	1648.367	0	5.62	82.56	33.251	4.60	0		0.00
7.000	3.725638	0	0	2.14	-881.13	999.000	4.57	0		0.00
7.050	3.725638	0	0	2.17	-873.90	999.000	4.57	0		0.00
7.100	3.725638	0	0	2.20	-866.75	999.000	4.57	0		0.00
7.150	3.725638	0	0	2.23	-859.70	999.000	4.58	0		0.00
7.200	3.725638	0	0	2.26	-852.74	999.000	4.58	0		0.00
7.250	3.725638	0	0	2.29	-845.87	999.000	4.58	0		0.00
7.300	3.725638	0	0	2.32	-839.08	999.000	4.59	0		0.00

There are basically three sets of calculations performed if **Calculate All Rows** is selected. Ignoring the first line for the moment, seven calculations are made with **"I"** set to logic 1 (true). This is the distributed coil case so the frequency is swept from 7.000 to 7.300 MHz with the radius of the coil set to the value in column **"D"**.

For the next seven calculations, **"I"** is set to 0 (false) and the lumped load case is calculated with the load inductance equal to the value in column **"M"**.

The last seven calculations have the load inductance set to zero. This is the unloaded antenna case.

The first calculation row is used to resonate the antenna. If **"I"** is set to false, then cell **"M"** is selected and the **"Resonate on Selected Cell"** button is "pushed." The program will then adjust the inductance value until the "X at Src1" is zero or very near to zero. This value is then automatically copied to the following cells in the same column.

If **"I"** is set to true, then cell **"D"** is selected and the **"Resonate on Selected Cell"** button is "pushed." The program will then adjust the distributed coil radius value until the "X at Src1" is zero or very near to zero. This value is then automatically copied to the following cells in the same column.

In the latter case, double-precision NEC is much more robust in finding a solution. EZNEC will work but sometimes requires manual intervention because the inductance with respect to coil radius is a very sensitive variable and the solver can easily overshoot and "hunt" for a long time.