AIR CORE INDUCTION COIL BUILDERS GUIDE

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1. Decide frequency. Considerations are: (economy of size)
    a. Use radio frequency upward (above 20,000 Hz's).
    b. Use natural frequency (coils have both capacitance and inductance), that is match the wire length of the wire in the coil to the desired frequency.
    c. Wire length is either one quarter, one half or full wave length.
    d. obtain wire length (in feet) use the following: If using one quarter wave length divide 247 by the desired frequency (megahertz range is desirable). If using one half wave length divide 494 by the desired frequency. If using full wave length divide 998 by the desired frequency.

2. Decide number of turns, ratio of increase in number of turns sets the function. In the case of L-1 coil each turn divides the input voltage by the number of turns. In the case of L-2 the resulting voltage by division from L-1 is induced into each turn of L-2, resulting in an additive process. For example if the input into L-1 from a high voltage, low amperage module is 2,400 volts. L-1, for example has 10 turns. Then each turn of L-1 will have 240 volts of magnetic induction which transfers 240 volts of electricity to each turn of L-2. L-2 may be one turn or many, such as 100 to 500 plus turns. At 100 turns, 24,000 volts is produced. At 500 turns, 120,000 volts is produced.

3. Decide the height and diameter of the coil system. The larger the diameter of the coil, the fewer number of turns required, and shorter (lowering of) in height. In the case of L-2 this results in lowering the amplification of the induced voltage from L-1.

4. For example, 24.7 MHz is the desired frequency output from L-2. One quarter wave length would be 247 divided by 24.7 equals 10 feet of wire. The number of turns will be the amplification factor. The coil may be wound on standard size P.V.C. or purchased from a supplier. The supplier is normally a ham radio supply source. Once the length is determined and the number of turns decided, move the next step. For example let each turn of L-1 have 24 volts and desired output of L-2 being 640 volts. Therefore L-2 needs 26.67 turns. It has been determined that the wire length for one quarter wave length is 10 feet. The number of inches in 10 feet is 120. Using Chart "A" supplied look for next higher number of turns showing (being between 20 and 30 turns with a 2" diameter coil). This tells us

to use a 2" coil. If ready made as in the case of Barker and Williamson, 10 Canal Street, Bristol, Penna., 215-788-5581, they come in standard sizes of 4, 6 and 10 turns per inch. For higher "Q" use wider spacing of the turns. These coils come in a ready made length of 10 inches. Select from the coil 30 turns and put input clamps on the base of the coil and at 30 turns. For exact determination of the correct position of the output clamp, use an externally grounded voltage probe. The node of maximum intensity, being the natural resonate point. Off the shelf multimeters are not radio frequency responsive. The easiest way to accomplish the above is to get from the hardware store or Radio Shack a voltage detector having a neon bulb system (Radio Shack Cat. No. 272-1100b, NE2-Neon Lamps) will work. With your hand as a ground, move the wire extension of the neon lamp along the coil surface until bulb is brightest.
This is the desired point of resonance and connection.

5. The input power now needs consideration. A 2,400 H.V. module has been previously selected. This module can be made from a diode bridge or any combination of voltage amplifiers. The one used here is an off-the-shelf type, similar to those used for laser technology.

6. Construction of the input L-1 coil. For purposes already determined there will be 10 turns. Length of the wire here is not critical. Since L-2 is 2" in diameter, the next off-the-shelf larger may be used for L-1. Use a 3" diameter off the shelf coil having 10 turns to the inch. Remove (cut) a 10 turn portion from the larger coil. Use a L.C.R. meter and get the natural farads and henry's reading from L-2. Now do the same for L-1. It will be necessary to put a capacitor for matching L-1 to L-2 across the voltage input of L-1. Also a spark gap in parallel is required on the return voltage from L-1. A tunable capacitor of the pad type for L-1 is desirable.

7. L-2 can be further enhance by having an Earth grounding from the base of the coil. The maximum voltage output will be between the base and top of L-2. Lesser voltage can be obtained at intermediate points from L-2.

SUPPLY SOURCES

1. HAM RADIO SUPPLY STORES

2. COILS, AIR INDUCTOR IN HOUSTON

   BAKER AND WILLIAMSON (READY MADE), BRISTOL, PENNA.
   ALSO R.F. DUMMY LOADS AND WATTMETERS.