The BITX Tune Tutorial

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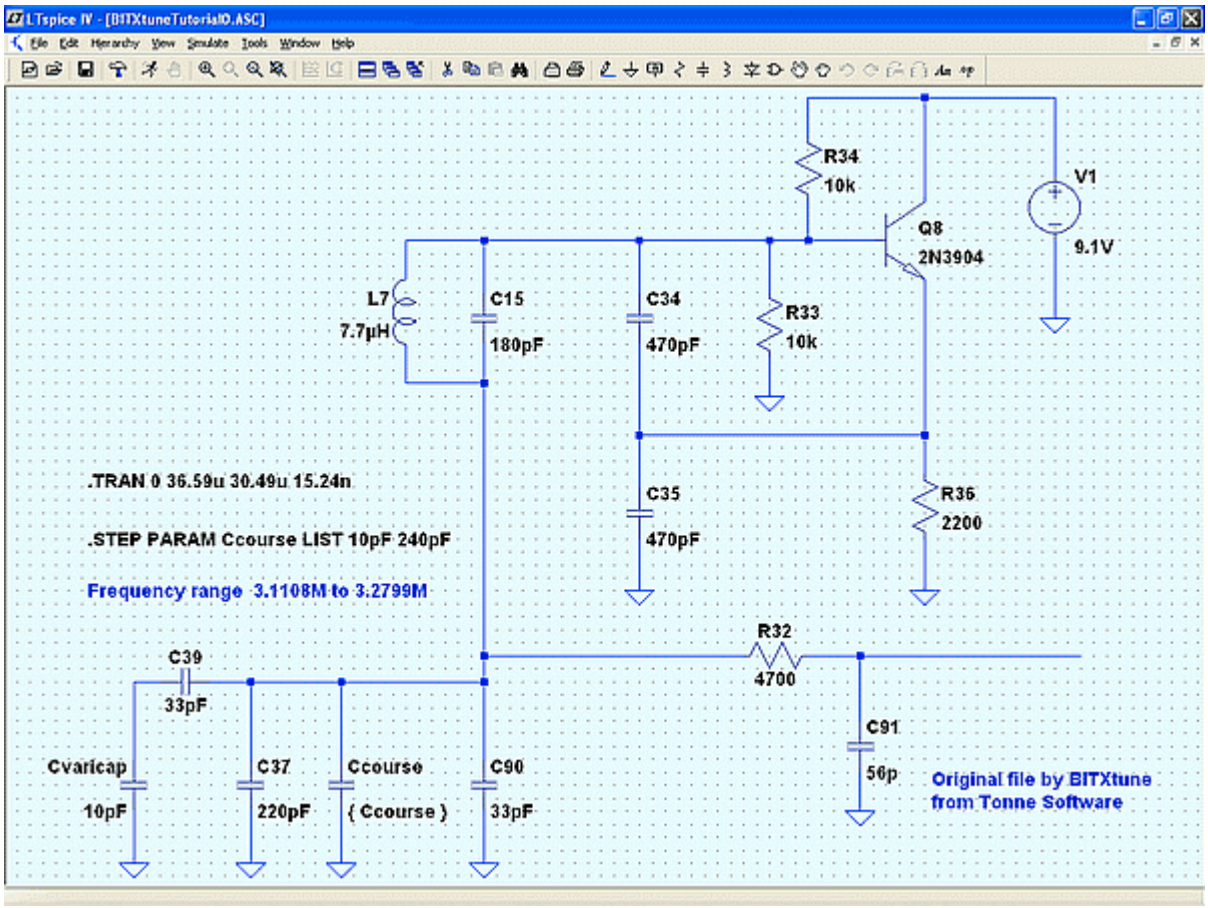
A question has been asked about which components in the BITX are involved in setting the frequency of the VFO. The original schematic shows quite a group of components and it is not really obvious as regards which components have what kind of influence on the frequency. The schematic as published (at least *one* of the schematics as published) is shown here after it has been redrawn for entry into LTspice for analysis:

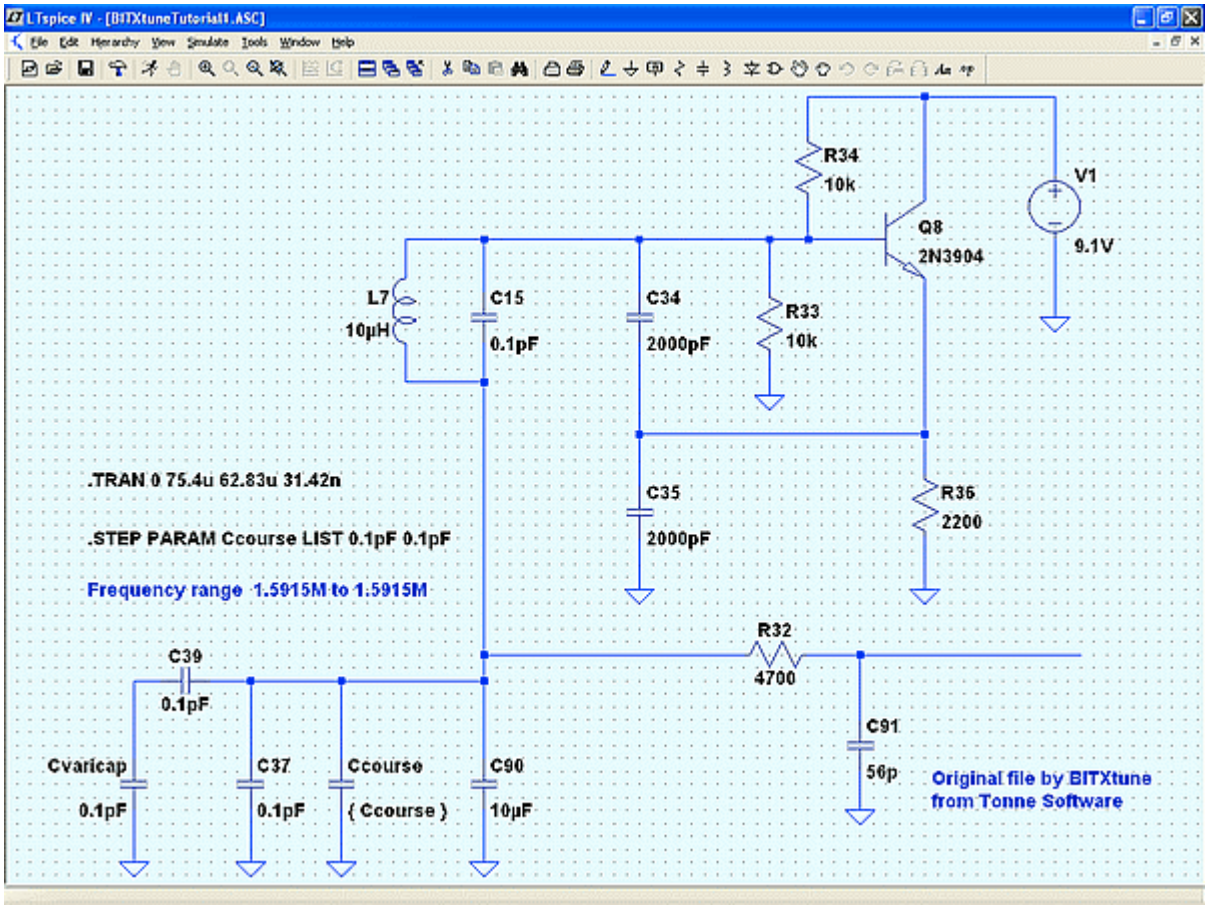


Even if some parts have been changed in their values, even if some modifications have been made to the topology (how the parts are connected), the discussion below will be found valid and, I hope, useful.

The approach we're going to take is to remove some of the parts electrically. This will reduce the circuit down to a very few parts and then the usual arithmetic can be used for predicting the frequency.

First we disable some of the capacitors. This will be done by setting most of them to near-zero value and one of them to a very high value. The varicap will be set to 0.1 pF, as will be C39, C37, "Ccourse" (the tuning capacitor), and C15. This process in effect removes them from the circuit just as if they were unsoldered from the assmebly. C90 will be set to a very high value of 10 uF. This also in effect removes it from the circuit by replacing it with what amounts to a jumper (piece of wire). In addition the tuning inductor is changed to 10 uH. The only reason for doing this is to simplify the arithmetic for calculating the VFO frequency. And C34 and C35 are changed to 2000 pF.

After this little operation is done we have the next schematic:



Above is schematic after disabling most of the tuning components. They show up on the schematic but their values are altered. The entire tuning capacitor area is inoperative (all of the capacitors' values have been set to insignificance) and the bottom of the inductor is at ground potential for RF because the reactance of C90 is close to zero. Directly across the tuning inductor is C15 but it too has in effect been removed. Will this circuit function? Yes, it will.

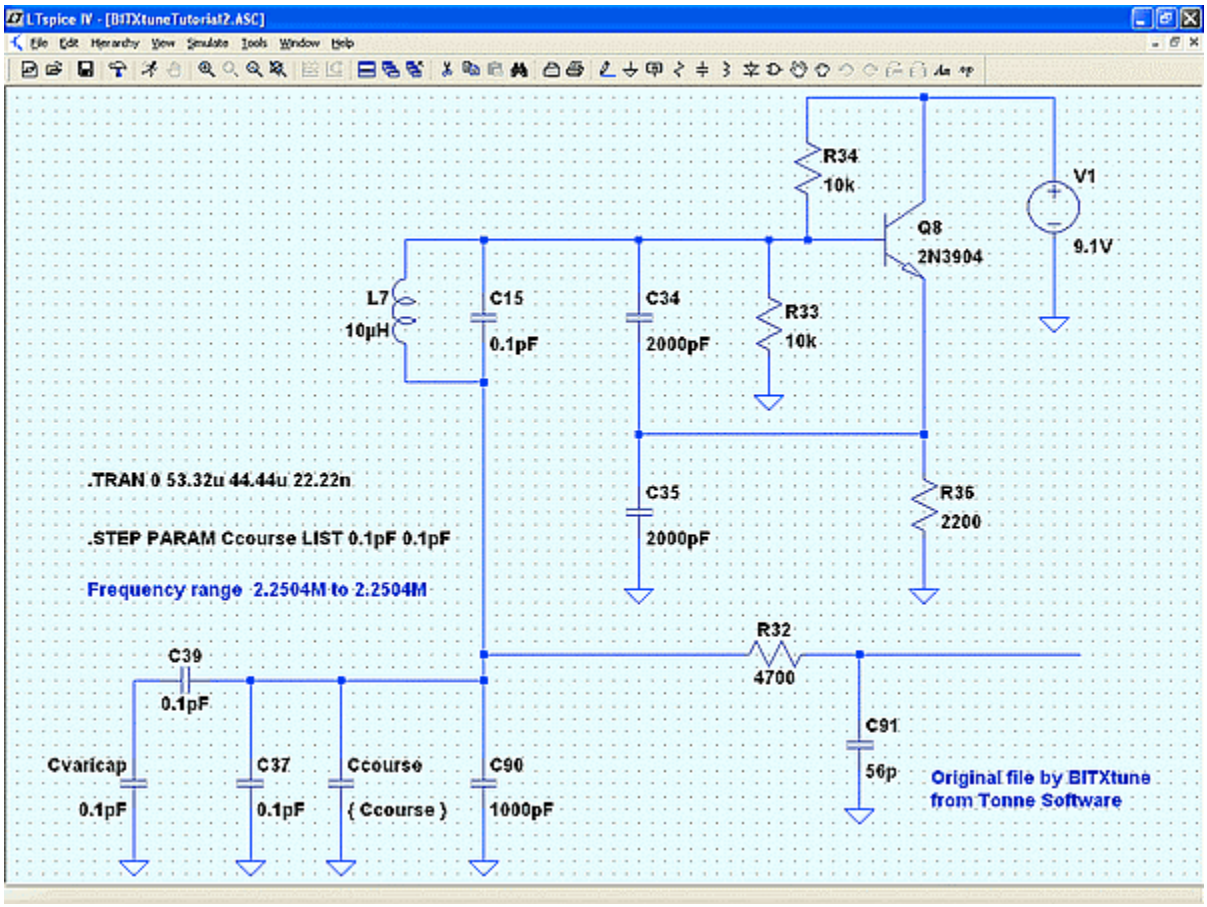
Now let's "walk the path" of those components that affect frequency, starting at the top of L7.

From the top of L7 we go to the top of C34, then on through C34 to the top of C35. Then we go through C35 to ground and then to the bottom of C90. Then we go through C90 up to the bottom of L7. The two capacitors in series - C34 and C35 - are in effect 1000 pF. C90 is a piece of wire. So the frequency is determined by L7 (10 uH) and the 1000 pF equivalent of C34 and C35.

As shown on the graphic the resulting frequency is 1.5915 MHz.

We have a simple circuit which yields nicely to analysis.

Now let's modify that circuit by bringing C90 back into the circuit. Let's change C90 from a huge value (which is really operating as a piece of wire) to 1000 pF. The result is seen here:



Let's again walk the path of components that affect the frequency.

From the top of L7 we go to the top of C34, then on through C34 to the top of C35, then through C35 to ground and to the bottom of C90. Then we go through C90 (which we have now set to 1000 pF) up to the bottom of L7.

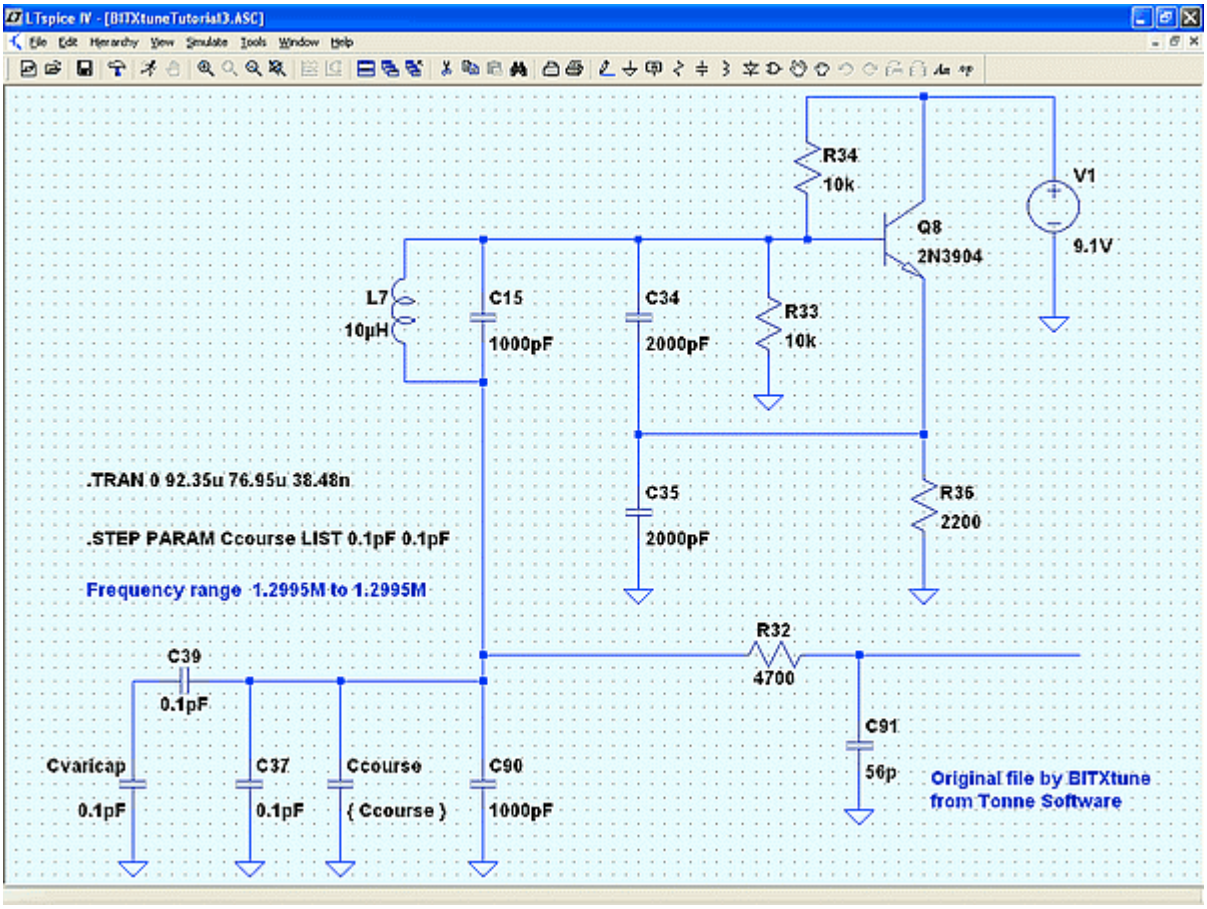
Capacitors C34 and C35, in effect form a capacitance of 1000 pF and that capacitance is in series with C90 (which is 1000 pF). So the effective capacitance across L7 is now 500 pF.

As shown on the graphic the resulting frequency is 2.2504 MHz.

Now let's add capacitance directly across L7. So far in this run we have set it to zero pF. Let us now change it to 1000 pF.

That will be in addition to the above-determined 500 pF. The "walk the path" capacitance remains at 500 pF but we add to it 1000 pF for a total of 1500 pF.

The resulting frequency is 1.2995 MHz as seen in the next graphic:



NOW you can go ahead and add in any of the various tuning components as you wish to predict the operating frequency of this VFO using components of your choosing.

73,

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