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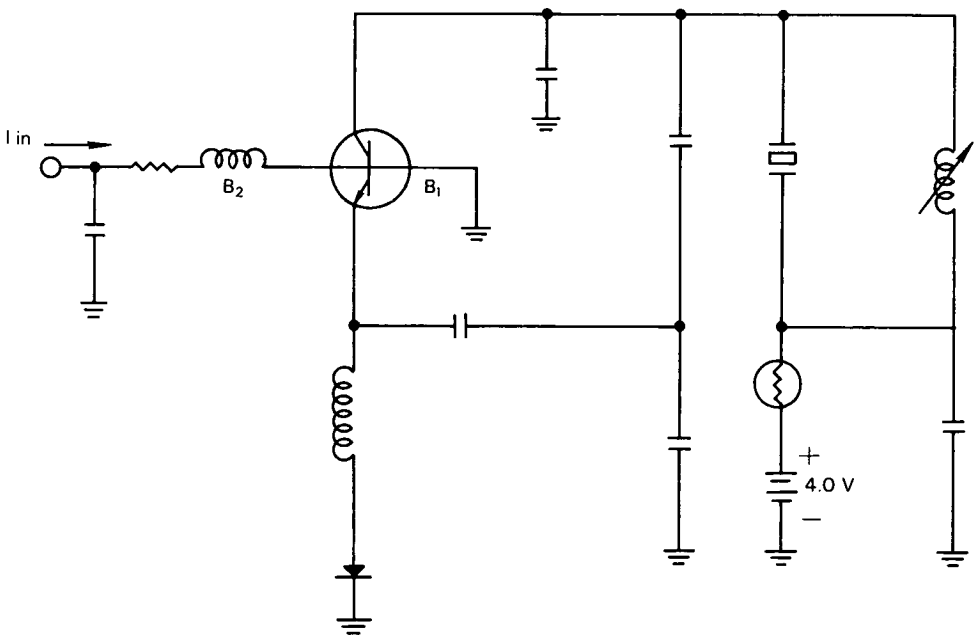
Brief 65-10055

NASA TECH BRIEF

FM Oscillator Uses Tetrode Transistor



The problem: Most frequency-modulated oscillators require complex circuitry to achieve large frequency variations for a given input signal. This is because the reactive parameter being changed to achieve frequency control is masked by the shunting effect of relatively low fixed impedances.

The solution: A tetrode-driven crystal oscillator in which the frequency is controlled by variation of the second base (B_2) current of the tetrode operated in the reverse mode.

How it's done: The circuit uses a crystal as a resonating element in a standard feedback oscillator commonly in use. In normal operation, current flows out of B_2 and input capacitance is shunted by the low resistance of the forward-biased emitter-base diode. This effectively reduces the change in frequency that could otherwise be obtained by varying the input capacitance.

The circuit illustrated operates on the characteristic change in output capacitance achieved by causing B_2 current to flow in the direction opposite (toward or into B_2) flow in the normal mode. Collector bias is such that the thermistor regulates the collector-first base (B_1) voltage and thus the output capacitance to compensate for any decrease in frequency with temperature. In this mode, increases in B_2 current are used to change output capacitance and thus change frequency of oscillation.

(continued overleaf)

Notes:

1. In one configuration used, average frequency control of 0.27 cps per microamp change has been achieved.
2. Using a variable frequency oscillator circuit (not crystal controlled), frequency variations of 0.25 mc at a 0.75-mc center frequency have been realized by increasing B_2 current from 150 to 200 microamps.
3. Inquiries concerning this innovation may be directed to:

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   Reference: B65-10055

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

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(JPL-82)