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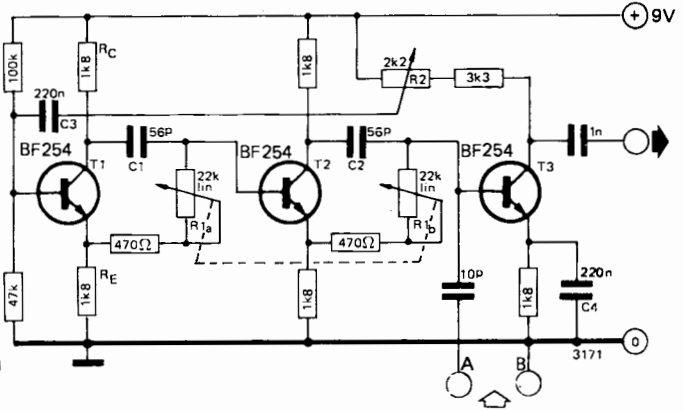
selective amplifier

This selective amplifier can be continuously tuned, by means of R1a and R1b (stereo-gang potentiometer), from 100 kHz to 2 MHz. The same relative tuning range, about a lower frequency, can be obtained by increasing the values of all the capacitors.
The circuit contains two phase-shifters and an amplifying stage. The first of these phase-shifters is built up around T1, using C1 and R1a. The voltage gain of this stage approaches the ratio R_C/R_E, which is unity, so that the signal is almost unattenuated. The phase shift varies slowly from 0° tot 180° as the frequency is increased, equalling 90° at a frequency determined by C1 and the setting of R1a.
The second phase shifter, built up with T2, C2 and R1b, is identical to the first. The amplifying stage, with T3, produces a phase reversal, i.e. a further 180°. At the critical frequency set by R1a+b the total phase shift going around the feedback loop will be 360°, which means: positive feedback ('reaction'). R2 sets the amount of this feedback. If the total gain inside the loop exceeds unity the circuit will oscillate. When the gain is just marginally below unity the circuit behaves as a high-Q tuned circuit.
To use the design as a selective amplifier the 'tuning' control R1 (stereo potentiometer) is set to give the required frequency. As the feedback control R2 is now advanced from zero the circuit will become increasingly selective with respect to the frequency of the input signal at A-B. As the oscillation threshold is approached, where the highest Q values are obtained, it may be necessary to set R1 more precisely. If oscillations once start it will be necessary to back off R2 some distance (log potentiometer!) and try again.
A second application of the circuit is as synchronised oscillator. The tuning range in this case is the same as for the selective amplifier (and can once again be lowered by using suitably increased C-values), only now the feedback control is advanced to obtain oscillation and then slightly backed off so that this oscillation is only just maintained.
If a signal very close in frequency to the circuit oscillations is now applied to the input, the oscillator will be pulled into synchronism. The beating that occurs just before 'sync' is achieved can be observed at T3 collector.
It is also possible to synchronise the oscillator to an input at one of its subharmonics. Once again the trick is to set R2 for barely-maintained oscillations, then use an input signal just strong enough to secure synchronisation. The circuit will latch without difficulty onto a frequency $1/20^{th}$ of that of its own oscillation.



During mono broadcasts, the red LED