

Crystal Drift Compensation

By G8MNY

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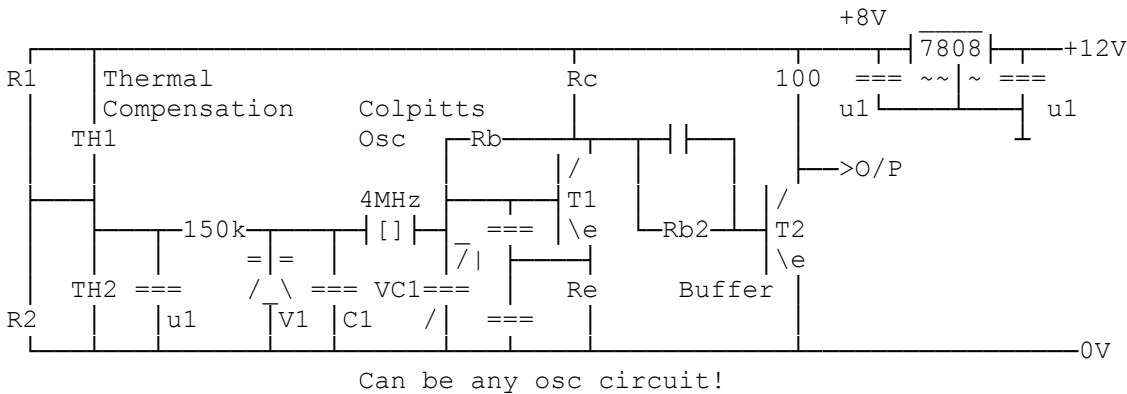
(8 Bit ASCII Graphics use code page 437 or 850)

Here is a design used in my Systron Donner signal generator's master oscillator. That does not waste power & warm up time that a crystal oven needs, it uses thermistor thermal compensation DC to a varicap to cancel temperature drift.

The principles can be applied to any frequency counter, VHF/UHF rig crystal osc etc. to null out thermal drift.

CIRCUIT

This is quite simple all housed in a soldered up copper case. But getting the right tapping resistance values is a factory task.

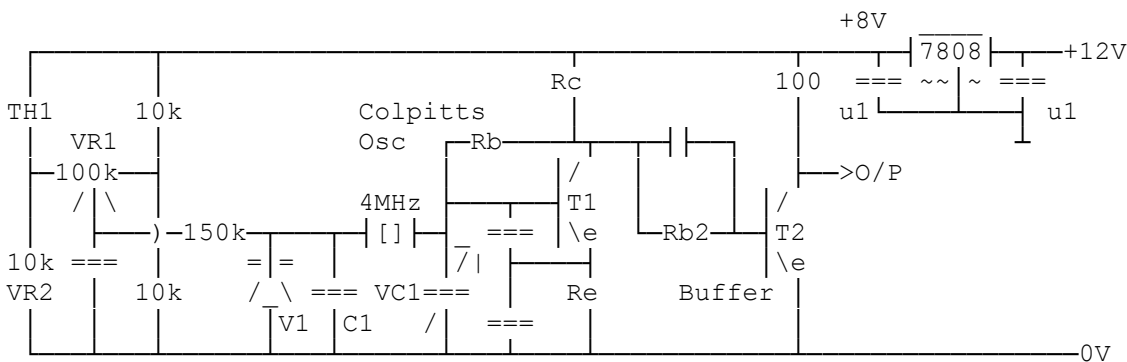


It works by using 2 thermistors one +coefficient & one -ve coefficient that alter the preset standing bias set up by on varicap V1 by R1 & R2. By choosing the right thermistor resistance in parallel with the set resistor twice over, a good temperature compensation range can be made were one thermistor hands over to the other.

The extent of the frequency change possible is limited to the thermistor DC change & the proportion of C1 that the varicap can change, as well as the Q of the crystal etc.

The amateur radio work this arrangement may be too complex & a simpler 1 thermistor system may be better.

SIMPLER CIRCUIT



Note if you are adding a varicap the value of C1 or any other frequency affecting capacitor may need to be changed to compensate for the added capacitance of V1.

In this circuit the varicap V1 bias is set up the 2 10K resistors at 1 end of VR1, & at the other end a thermistor & VR2 set exactly the same voltage at the mid operating temperature (TH1 = VR2).

Now with VR1 set nearest the 10k's then cooling/warming the WHOLE osc will make it drift & adjusting VR2 towards the TH1 end should put it back on frequency.

If the drift gets worse, then reverse the position of VR2 & TH1 to reverse the effect. If the effect is not enough then try altering the amount of varicap C by using say 2-3 varicaps in parallel & no parallel capacitor C1. Or use a higher slope thermistor.

The final adjustment of VR1 will need to be done when the osc is calibrated as thermal drift due to the amount of VC1 trimmer might be significant.

CONCLUSION

The addition of this circuit should null out all drift over a narrow temperature band say 10-25°C. But outside that range more variable rates of compensation may be need. It will of course not stop other mechanical causes of drift like dropping kit or general crystal aging.

See also my "Off air lock for ref osc", "Simple Crystals Oven" & "Calibrating Frequency" buls.

Why don't U send an interesting bul?

73 de John G8MNY @ GB7CIP