

Re: Calibration Of Electronic Equipment In The Home Workshop

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doug wrote:

Anthony Fremont wrote:

Chris Jones wrote:

Anthony Fremont wrote:

If someone doesn't need traceable calibration, then why should they pay for it? Especially if they have the resources to do it themselves. I'm thinking of buying a cheap used Rb time base from e-bay so I can cal my old Protek freq counter and adjust the timebase on my Hitachi scope, it's certainly cheaper than having it done. Using a PIC driven by an ordinary can xtal, and a quartz wristwatch of known accuracy, I was able to tweak the xtal to within about 1-2ppm over the course of a week or two. Of course you know that's impossible, don't you?

I don't think the oscillator on a PIC would be good to 2ppm absolute accuracy even with a very good xtal, unless you FIRST calibrate it against something that has already been calibrated, therefore it

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Like my analog/quartz watch that has a predictable error. I used the CCP module to time the impulses to the watches stepper motor to the uS. I already knew the error rate of my watch, so I just played with the loading caps until I knew that I was successfully measuring the error of my watch over hours of time. Since my house stayed at a fairly consistent temperature, I think it's safe to say that it was within 2ppm, but I guess I could be wrong.

doesn't get you far. It will however be good enough to calibrate your scope since that would only need 1% or so, and any old crystal should achieve that, even with a fairly primitive oscillator. For frequency calibration, your best bet is to receive an off-air standard, for example GPS or in many countries there are low frequency standard transmissions (50kHz, 60kHz, 77.5kHz or others, look up which ones are available in your country). It is quite feasible to build your own receiver for these. These transmitters are maintained to a higher accuracy than any piece of hardware that a hobbyist could afford (e.g. 2 parts in 10^{12}).
<http://www.npl.co.uk/time/msf/ctm001v05.pdf>

Chris

This is a dangerous way to calibrate crystals. The temperature coefficient will give a drift with temperature of up to around 100ppm. If you breathe on the crystal it will go out of spec. If you want to try this, put a crystal oven on the crystal. There are temperatures where the frequency versus temperature is flat and an oven will give you a stability of maybe a part in 10^7 or so. Then you can do a calibration. Why not look on ebay for an old hp counter such as the 5328 which often come with a very nice oxco which is good to up to 10^{-8} for maybe a year? I have paid as little as \$50 and then you even have a counter to go with it. The 5334 are newer, nicer and quieter but may run a bit more.

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I think 'dangerous' is not really a sensible word to use. If the crystal is not inherently stable enough for your application then blaming the calibration technique is misguided. In any case, the receiver can be set up as a phase locked loop so that the crystal oscillator is continuously kept at the correct frequency. This would obviate the need for an OCXO. A similar technique is used to keep the oscillator of a mobile telephone continually within 0.1ppm of the basestation reference.

Chris

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