A digital SQUID controller

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We describe the design, performance and limitation of an improved dc SQUID controller base upon a PC data acquisition board with a single digital signal processor (DSP). The main DSP algorithm that handles the flux-locked-loop, is optimally written in the DSP assembly language to minimize total execution time. The system is mostly built based upon commercially available instruments. To improve the performance of the controller, we have added a custom built frequency converter circuit that matches the modulation frequency of a commercial SQUID sensor and preamplifier. The noise level of the dc SQUID controller system is comparable with a commercial analog system, $\sim 4\mu\Phi_0/\sqrt{Hz}$ at 100Hz. The current system could control up to 5 SQUID channels.