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TITLE: FLASH ADC APERTURE WINDOW TEMPERATURE COEFFICIENT

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FLASH ADC APERTURE WINDOW TEMPERATURE COEFFICIENT

Richard J. Lacasse

The aperture window of a flash analog to digital converter is the "instant" at which it samples the analog input. Manufacturers usually supply the width of this window and its jitter. However, the stability or drift of the window with respect to temperature is not specified. This parameter is of interest in the design of the spectral processor since several samplers are required and relative drifts in the aperture window translate directly into relative group delay errors. To get a handle on the magnitude of this problem, the test described below was performed on three flash A/D converters.

The test set block diagram is shown in Figure 1. Flash ADC's on evaluation boards provided by the manufacturer were placed in well regulated oven with sufficiently high airflow. The analog input source was the leveled output of an HP8654A Signal Generator, operating at 10 MHz. The convert signal source was, ultimately, the unleveled output of the same signal generator. A calibrated delay line was inserted in its path to enable small, measurable, delays in this signal path. Finally, a spare clipper from the Model IV system was used to perform the sine to square wave conversion.

The measurement strategy was first to adjust the delay line so that the ADC's LSB dithered between two states, at 20°C, with a 50% duty cycle.* In practice this was accomplished simply by adjusting the delay line to get two equal brightness traces on the oscilloscope. Next the temperature was varied to 30, 40, and 50°C while manually adjusting the delay line to keep the 50% duty cycle LSB dither. Thus, a repeatable relationship between temperature and delay line length was obtained. This was readily converted to temperature vs. picoseconds.

Test results on all three boards were amazingly good. Two of the boards tested were TDC 1029E1C, containing a TRW TDC 1029 ADC. One of these boards had a 0.5 ps/°C tempco and the other a 1.0 ps/°C. The other board tested contained an Analog Devices 5010KD ADC. With a buffer amplifier on the card in the signal path, the tempco was -9 ps/°C; without the amplifier it was -6 ps/°C. (The TRW board had no buffer amplifier.) Both boards had buffer drivers in the CONVERT signal path, so the above tempcos really reflect the sum of these and the ADC itself.

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* Measuring the tempco for all 63 possible output code transitions was not attempted because of the time involved. A sample of three codes was measured with very similar results, on one ADC.

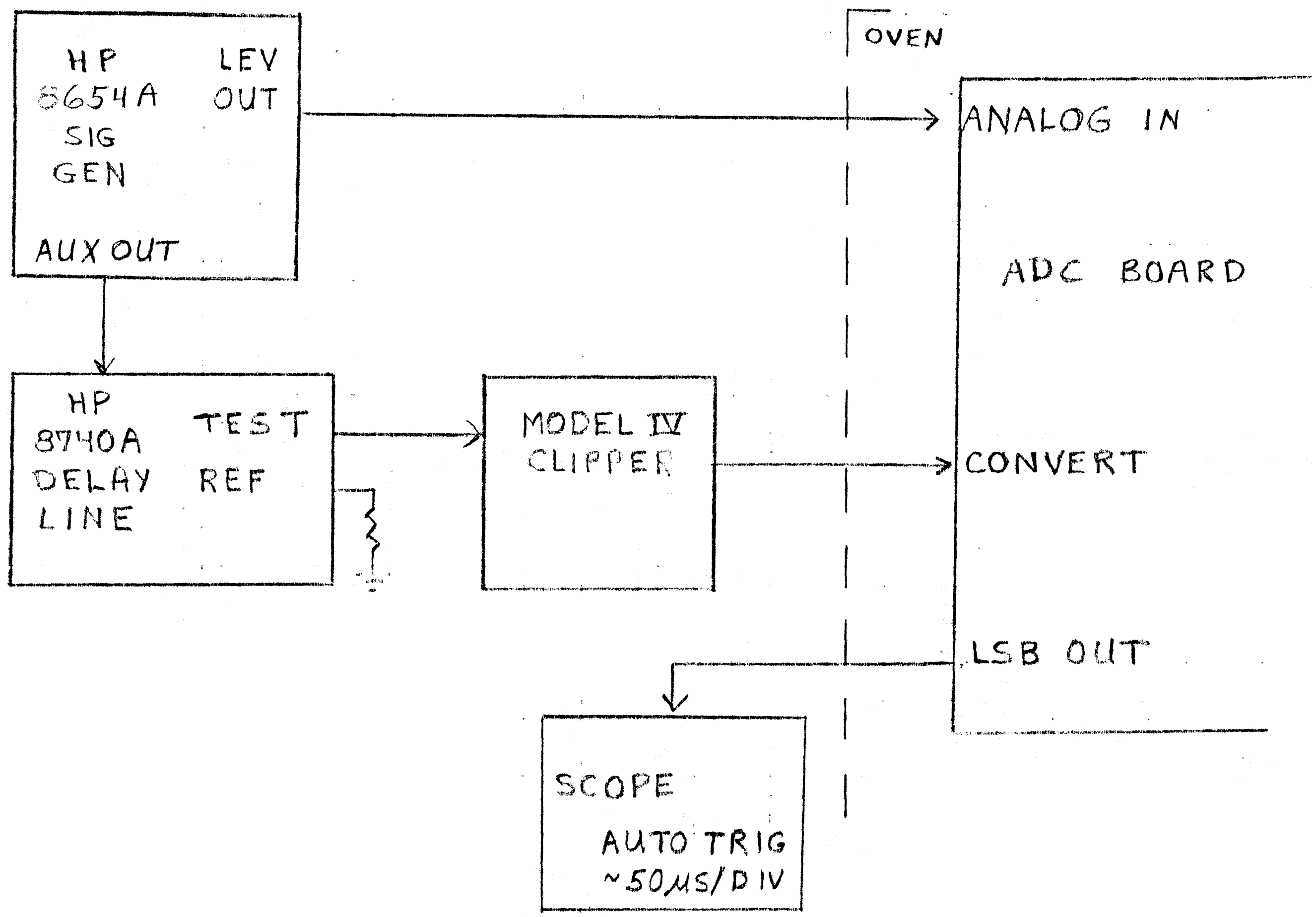

FIG 1: APERTURE TIME TEMPCO TEST SET