

# DESIGN NOTES

## A Broadband Random Noise Generator – Design Note 70

Jim Williams

Filter, audio and RF communication testing often requires a random noise source. The circuit in Figure 1 provides an RMS amplitude regulated noise source with selectable bandwidth. The RMS output is 300mV with a 1kHz to 5MHz bandwidth selected in decade ranges.

The A1 amplifier, biased from the LT1004 reference, provides optimum drive for D1, the noise source. AC coupled A2 takes a broadband gain of 100. The A2 output feeds a gain control stage via a simple selectable lowpass filter. The filter's output is applied to LT1228 A3, an operational

transconductance amplifier. A3's output feeds LT1228 A4, a current feedback amplifier. A4's output, the circuit's output, is sampled by the A5 based gain control configuration. This closes a gain control loop back at A3. A3's  $I_{SET}$  input current controls its gain, allowing overall output level control.

To adjust this circuit, place the filter in the 1kHz position and trim the 5k potentiometer for maximum negative bias at A3, pin 5.

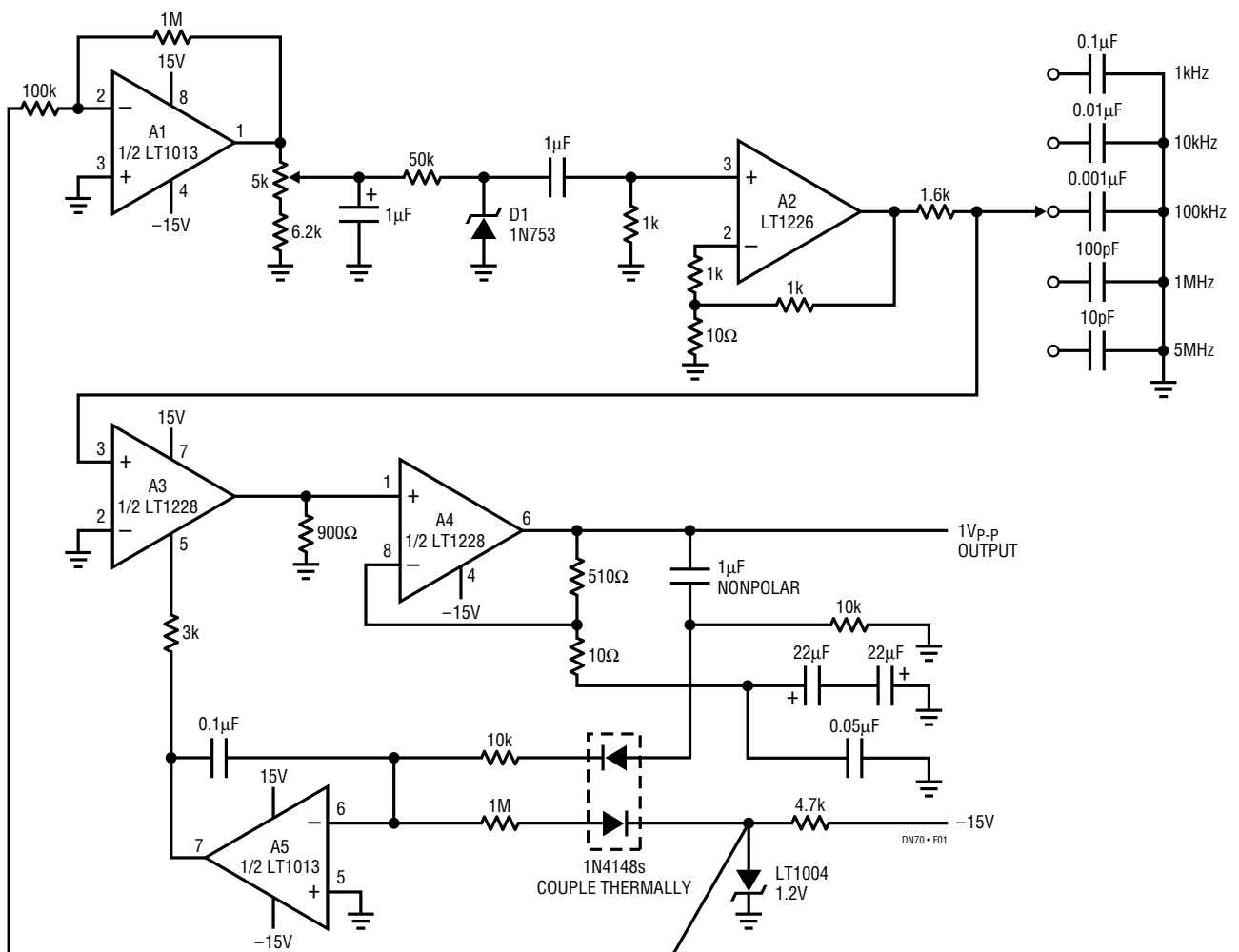


Figure 1. Random Noise Generator with Selectable Bandwidth and RMS Voltage Regulation

Figure 2 shows noise at a 1MHz bandpass while Figure 3 plots amplitude vs RMS noise in the same bandpass. Figure 4 plots similar information at full bandwidth. RMS output is essentially flat to 1.5MHz with about  $\pm 2$ dB control to 5MHz before sagging badly.

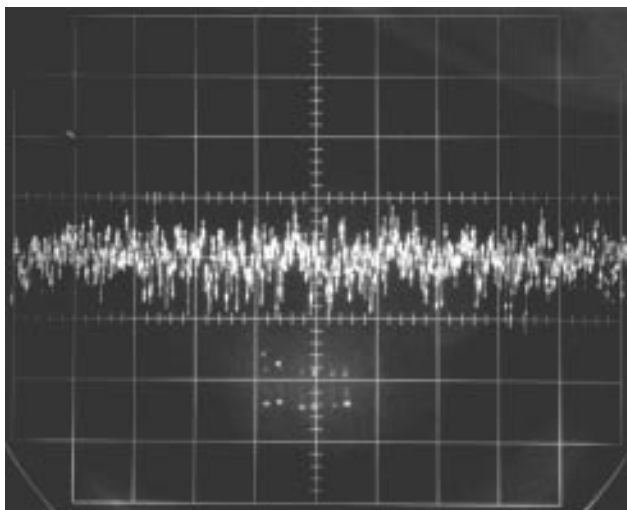
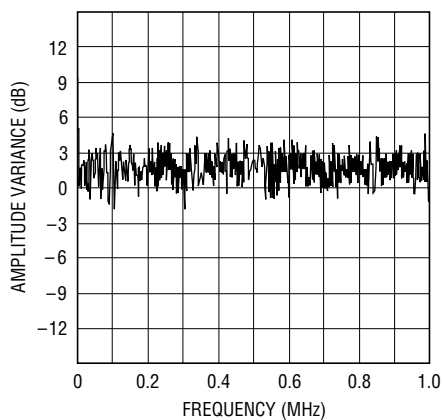
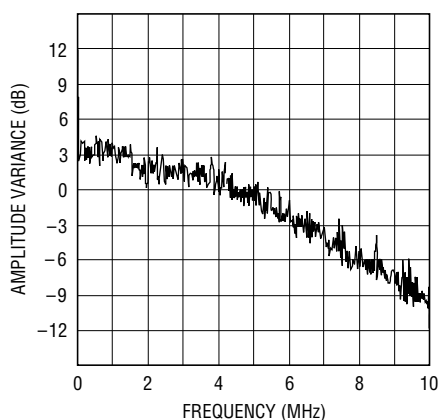


Figure 2. Figure 1's Output in the 1MHz Filter Position



DN70 • F03

Figure 3. RMS Amplitude vs Frequency for the Random Noise Generator Is Essentially Flat to 1MHz.



DN70 • F04

Figure 4. RMS Amplitude Holds Within  $\pm 2$ dB Before Sagging Beyond 5MHz

For literature on our Voltage References, call **(800) 637-5545**. For applications help, call (408) 432-1900, Ext. 525