Agilent 33500 Series Waveform Generators

PRBS Pattern Generation

Technical Overview

Testing digital devices typically requires sending a series of alternating high and low voltage values (bits) to the device under test (DUT). If these bits are easily predictable, the test coverage will be limited to a small set of possible scenarios. For this reason, it is often helpful to send a near-random stream of bits, such as the one shown in Figure 1, to the DUT.

To generate this type of bit stream, the Agilent 33500 Series waveform generators include a pseudo-random binary sequence (PRBS) waveform generator. A PRBS waveform is generated by a linear feedback shift register (LFSR) like the one shown in Figure 2.

The branches after register cells 5 and 9 are called taps, and the configuration of the LFSR and its taps determines the PRBS waveform.

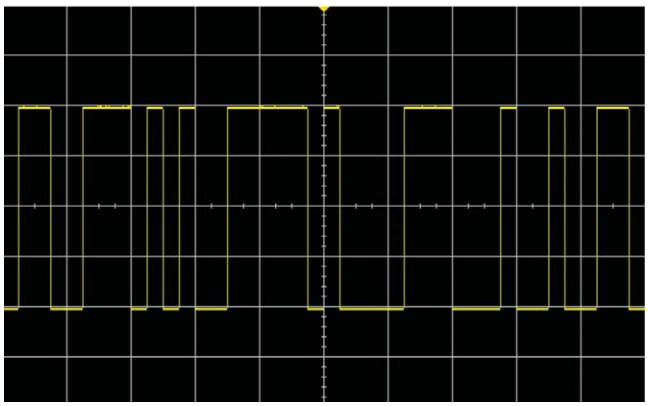

Figure 1. A near-random stream of bits

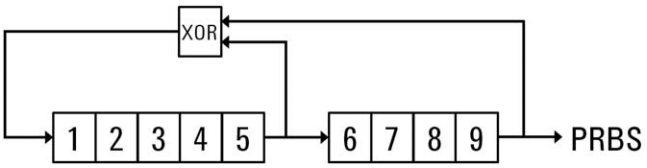

Figure 2. A linear feedback shift register

How to generate a PRBS waveform from the front panel

From the front panel, press **[Waveforms] > More > PRBS > [Parameters]**. You can then specify the polynomial function used to generate the sequence (7, 9, 11, 15, 20 or 23 register cells), the bit rate at which the sequence plays (up to 50 Mbps), and an edge transition time that is used for both rising and falling edges.

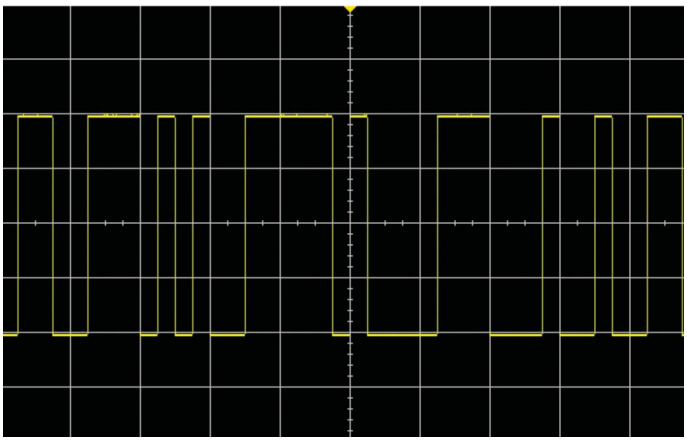

Figure 3. PRBS menu

How to generate a PRBS waveform using SCPI

You also can generate PRBS waveforms using the Standard Commands for Programmable Instruments (SCPI) programming language. The equivalent SCPI commands are:

FUNCtion:PRBS:DATA {PN7|PN9|PN11|PN15|PN20|PN23}	The number after the PN specifies the LSFR length. An LFSR of length L results in a bit sequence of length 2^L-1.
FUNCtion:PRBS:BRATe <*bit_rate*>	The <*bit_rate*> can range from 1 Mbit/s to 50 Mbit/sec
FUNCtion:PRBS:TRANsition[:BOTH] <*seconds*>	The edge transition time for leading and falling edges, from 8.4 ns to 1 µs.

Summary

Use the PRBS waveform to improve the robustness of your digital device tests. By sending a near-random bit stream to your device, you can test your device under a wide variety of conditions.

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