Measuring Precise Timing Delays

By: Agilent Technologies

Purpose:
In this hands-on exercise, you will observe the effects of a digitizing scope's sample rate on the accuracy and resolution of precise high-speed timing measurements.

Equipment:
- Agilent 54520-Series Oscilloscope
- Agilent 54520-66506 Application Training Board

1. Using two 50W(Ohm) BNC cables, connect J4 and J5 of the Agilent 54720-66506 training board to CH1 and CH2 of the 54542A scope.

   a. "Close" switch #2 on S1. All other switches should be open.

   b. All switches on S3 should be open.

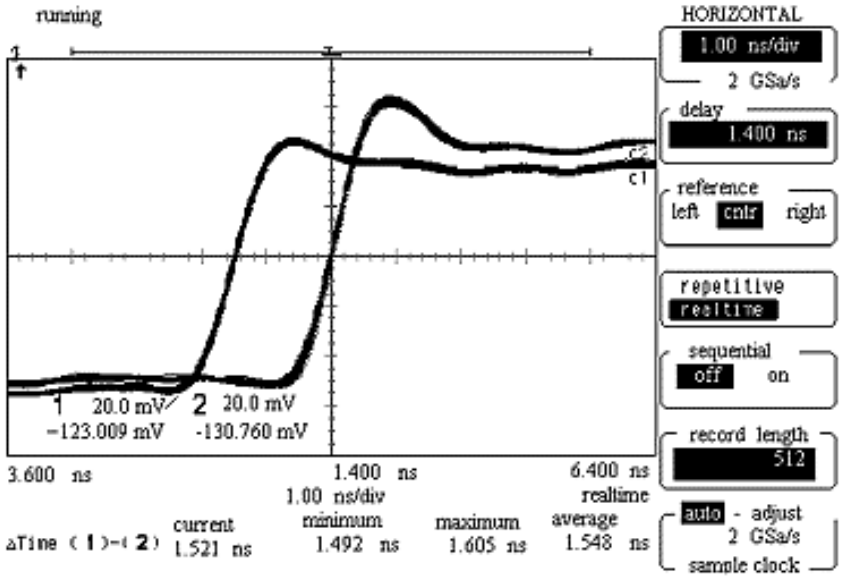
2. Load the scope setup from the disk file.

   a. Press the **[blue shift key]** and then press **[Disk]**.

   b. Select the ***load scope*** soft key and then select ***Set***.

   c. Turn the general entry knob to select setup from file **[LAB4.SET].**

   d. Press ***execute***.



3. Press the [Autoscale] key.

4. Set the timebase at 1 ns/div with at 1.4 ns of delay.

5. Press the DISPLAY menu key and then select "infinite persistence" to show worst-case variation in the displayed waveform.

6. Using the automatic parametric measurements, select a D ***Time*** measurement from channel 1 to channel 2. (Press the **[blue shift]** key**, [D Time]** key, **[1]**, and then **[2]**.)

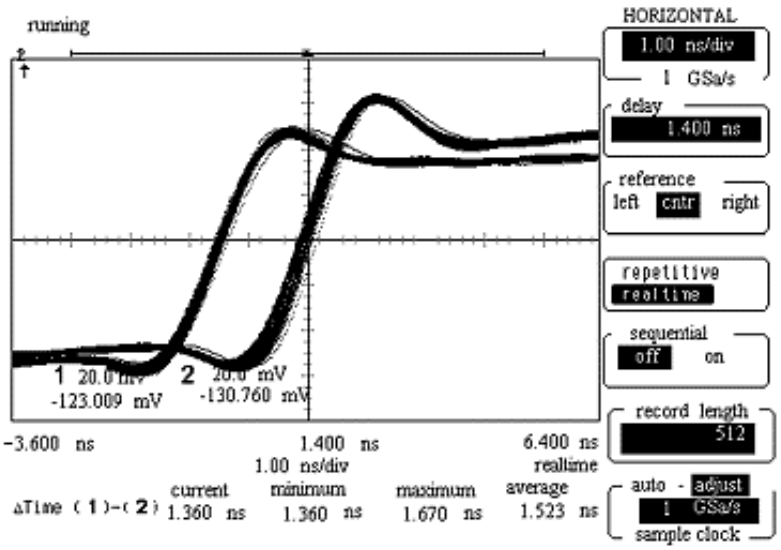
7. Press the **[Define meas.]** key and then select ***Statistics*** to ***ON***.

   What is the maximum variation in measurements?

   (Hint: Max - Min) _____ At 2 GSa/s, what is the approximate accuracy of these measurements?

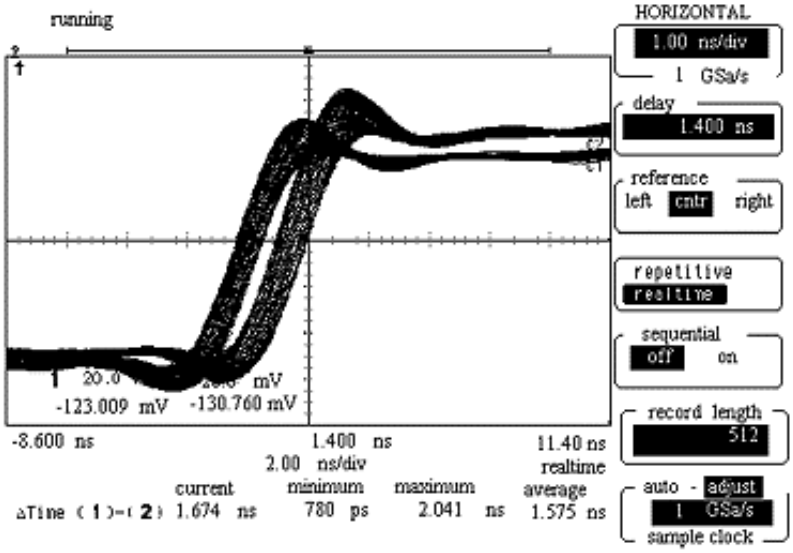
   (Hint: +/- 0.5 x [max - min])_____

8. Press the ***HORIZONTAL*** **[Setup]** menu key and then select the ***adjust*** sample rate mode. Now rotate the general entry knob to select a sample rate of ***1 GSa/s.***



9. What is the approximate measurement accuracy at 1 GSa/s?

10. Change the timebase setting to ***2 ns/div*** and then set the adjustable sample rate to ***500 MSa/s.***



11. What is the approximate measurement accuracy at 500 MSa/s?

12. Change the timebase setting to ***5 ns/div*** and then set the adjustable sample rate to ***250 MSa/s***.
13. What is the approximate measurement accuracy at 250 MSa/s?
14. Is the oscilloscope's sample rate important for measuring precise single-shot waveform timing delays?