5. Performance Verification

5.1 Introduction

This chapter contains procedures suitable for determining if the Wave Expert series wide bandwidth oscilloscope performs correctly and as warranted. They check all the characteristics listed in subsection 5.1.1.

In the absence of the computer automated calibration system based on LeCroy Calibration Software (Calsoft), this manual performance verification procedure can be followed to establish a traceable calibration. It is the calibrating entities' responsibility to ensure that all laboratory standards used to perform this procedure are operating within their specifications and traceable to required standards if a traceable calibration certificate is to be issued for the Wave Expert series wide bandwidth oscilloscope.

5.1.1 List of Tested Characteristics

This subsection lists the characteristics that are tested in terms of quantifiable performance limits.

Main Frame tests:

- Time interval accuracy - Sequential timebase
- Time interval accuracy/trigger input - CIS timebase
- Time interval accuracy/prescaler input - CIS timebase
- Trigger input sensitivity
- Trigger input impedance/EMF
- Trigger level range/Accuracy
- Prescaler sensitivity
- Prescaler Bit Rate Counter Test
- Prescaler PLL lock test
- Time Base Accuracy
- CIS timebase Jitter
- Sequential timebase jitter

Module tests:

- DC input impedance
- Noise level
- DC accuracy
- DC offset accuracy
- TDR risetime - * ST-20 only
- TDR aberrations - * ST-20 only
- Analog Bandwidth – * ST-20, SE-30, SE-50 and SE-70 only

5.1.2 Calibration Cycle

The Wave Expert Oscilloscope requires periodic verification of performance. Under normal use (2,000 hours of use per year) and environmental conditions, this instruments calibration cycle is 12 months.

5.2 Test Equipment Required

These procedures use external traceable signal generators, DC precision power supply and digital multi-meter, to directly check specifications.

Instrument	Specifications	Recommended
Signal Generator Radio Frequency	Frequency : 10 MHz- 67 GHz Frequency Accuracy : 1 PPM 10MHZ- 40GHz for ST-20 and SE-30 only	Anritsu MG3696B or equivalent Anritsu MG3694B for ST-20 and 30 SE-30 only
DC Power Supply	Range of 0 to 1v	Datel DVC8500 or equivalent
Power Meter + Sensor	50MHz- 50GHz, SE-70 requires 50MHz-65GHz sensor Accuracy ±3 %	Anritsu ML2437A +MA2425B w/65 GHz option. Agilent E4418 +8487D
Digital Multimeter Volt & Ohm	Voltmeter Accuracy : 0.1 % Ohmmeter Accuracy : 0.1 %	Keithley2000,Agilent 34401A or equivalent
Adaptor	DC-40 GHz	Anritsu 34VFK50
Adaptor	DC-40 GHZ	Anritsu 34VFVF50
Adaptor	BNC female to SMA female	Pomona 4291
Terminator	50Ω SMA for ST-20 only	Weinschel M1459A
RF Coaxial Cable	50Ω, DC to 65 GHz, length 24cm, used with MG3696	W.L. Gore 65474
RF Coaxial Cable	50Ω, DC to 40 GHz, length 36cm, used with MG3694B	Storm 095-0004-036
Coaxial Cable, qty 2	50Ω,BNC to SMA length 20 cm	Best available
Coaxial Cable, qty 2	DC-12 GHz 50Ω,SMA to SMA length 20 cm	Best available
6 dB splitter	DC - 12 GHz	Suhner 4901.19A or equivalent
T adapter	50Ω, BNC T adapter	

Table 5-1: Test Equipment

5.2.1 Test Records

The last pages of this document contain WaveExpert test records in the format tables. Keep them as masters and use a photocopy for each calibration.

NOTE: The procedures throughout this chapter contain instructions based on menus and controls supported by version 5.1.3.5 release or later of the instrument software. See the LeCroy Web-site for information concerning software upgrading.

5.3 Turn On

If you are not familiar with operating this instrument, refer to the online help or the user information supplied with the instrument.

- Insert sampling module into channel 1
- Switch on the power using the power switch.
- Allow 20 minutes for the scope to reach a stable operating temperature:
- Insert the floppy disk or memory key with the appropriate panel setups

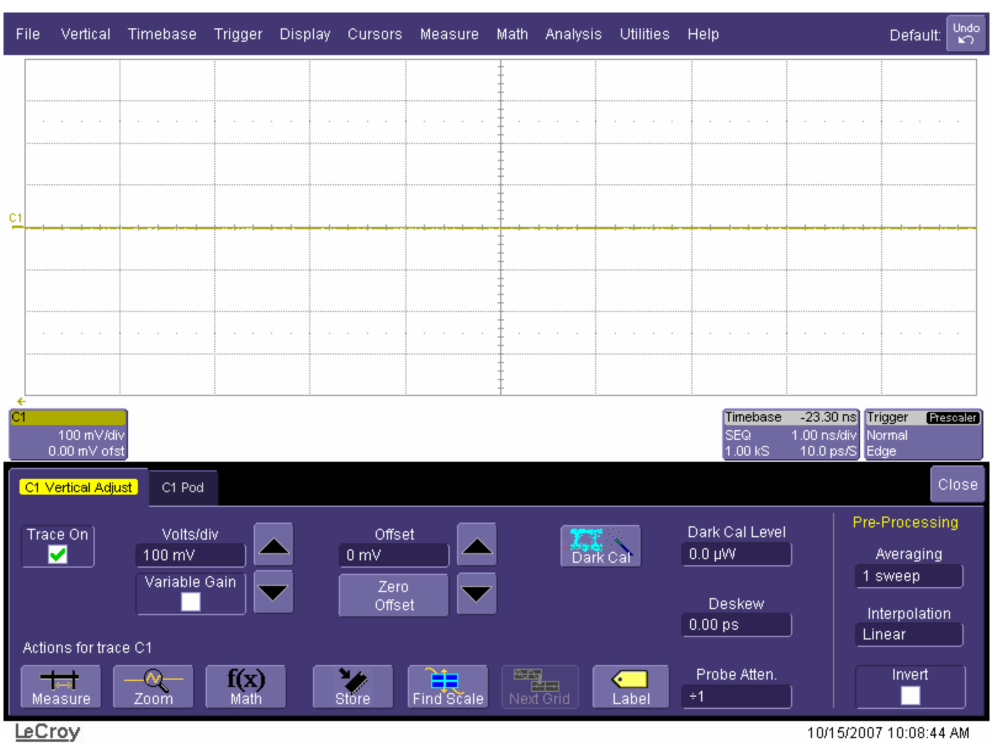
CAUTION

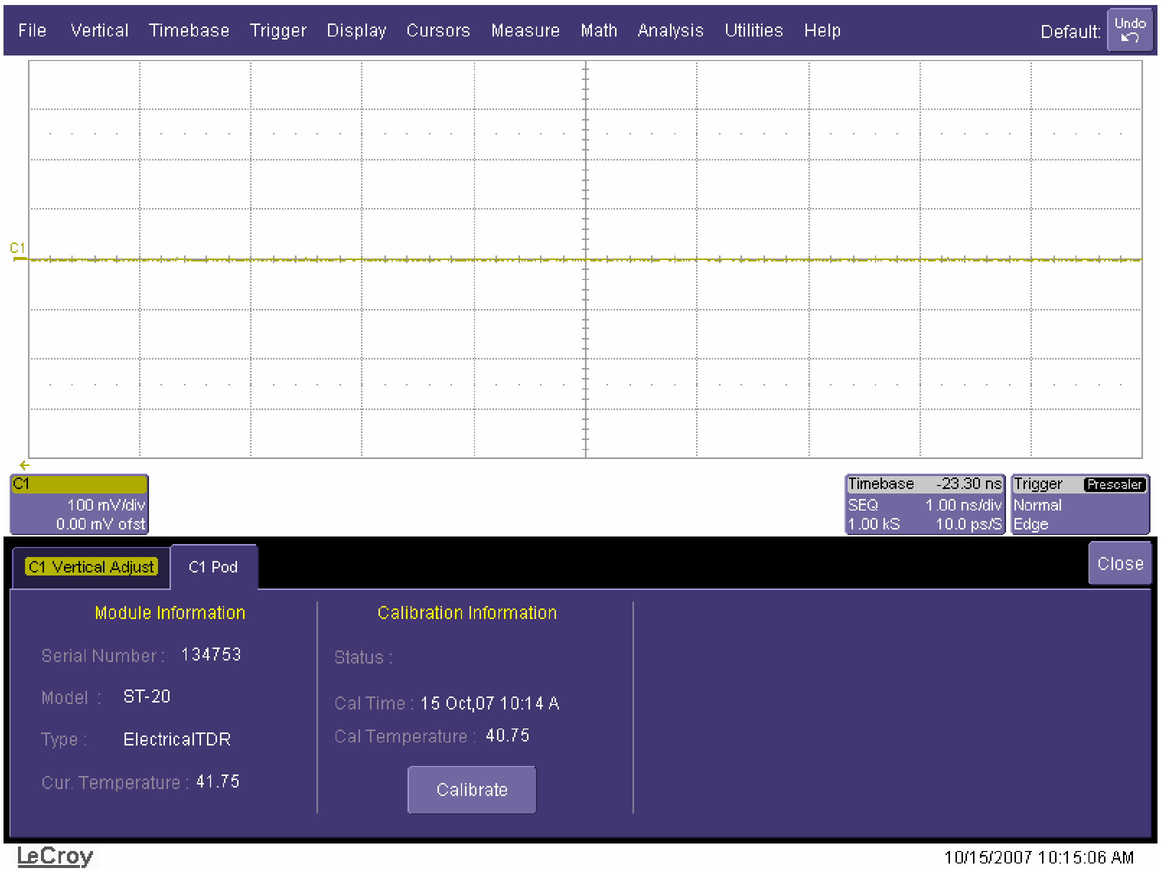
ESD sensitive: The sampling modules inputs are highly static sensitive. A grounding strap must be worn at all times when handling the modules.

5.3.1 Plug in Calibration

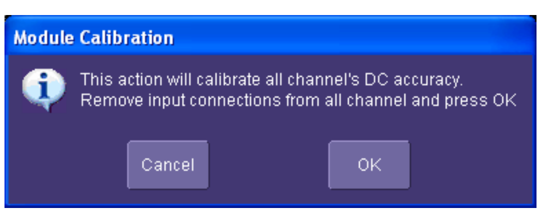
The Plug in module must be calibrated before proceeding with this procedure,

- Press the channel descriptor
- Select C1 pod





- Press Calibrate and then OK.

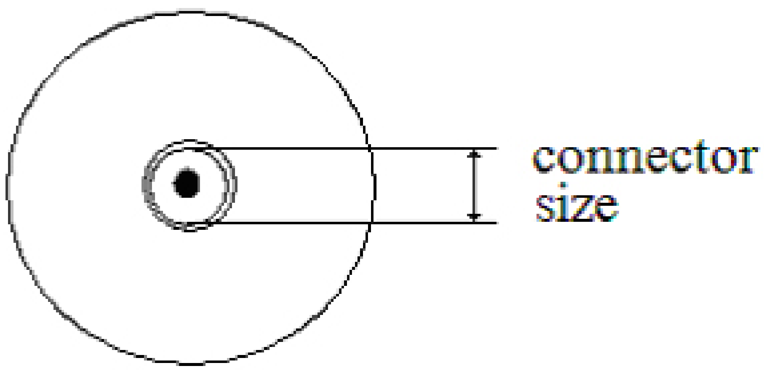


Connecting to a Signal

Electrical Modules

The sampling modules are equipped with RF connectors of different types depending on the bandwidth of the particular module, as indicated in the table below. The modules have male connectors, and each module is shipped with a female-to-female adapter that matches the connector type. This adapter should be attached to the module whenever possible, as it will protect the connector on the module from possible damage caused by incorrect threading of cables or connectors.

The connector types on the modules are named according to the inside diameter of their outer conductor. This diameter must be matched within any connectors or cables attached to the module in order to maintain the specified bandwidth.



Module	Bandwidth	Connector Type
ST-20	20 GHz	2.92 mm
SE-30	30 GHz	2.92 mm
SE-50	50 GHz	2.40 mm
SE-70	70 GHz	1.85 mm
SE-100	100 GHz	1 mm

Connector Torque

In order to maintain bandwidth performance and minimize loss, connections to the instrument modules should be torqued to the appropriate tightness. The connectors all have standard 3/8 inch nuts on them and should be torqued to 8 in-lbs. using an appropriate torque wrench. The 100 GHz module has a unique connector that requires a smaller torque value of 4 in.-lbs. This module is supplied with the appropriate torque wrench.

Keep in mind that these connectors are very expensive. A single 1 mm connector can cost in excess of $1800. The V connectors cost around $500.

1. Do not force connectors. If they do not mate easily, investigate the reason and correct the problem.

2. Connectors perform to rated bandwidth if tightened to the specified torque. Buy and use the proper torque wrench for the connector. 2.4, 2.92 and 1.85 mm connectors should be torqued to 8 in-lb (0.9 Nm). The 1 mm connectors should be torqued to 4 in-lb (0.45 Nm)

3. Never uses pliers to tighten or loosen a connector.

4. Clean connector threads and solid dielectric (not air dielectrics) with a cotton swab moistened with alcohol to insure proper operation and mating. Clean air should be used to blow debris from connectors

5. Only turn the moveable parts of the connector when mating. Do not rotate the fixed parts of the connector as it will increase wear and decrease the useful life of the connector. A wrench and a torque wrench should be used to hold the fixed and moveable parts respectively.

6. Use ‘connector savers’ to minimize wear on the input connectors.

5.4 Time Interval Accuracy

Specification:

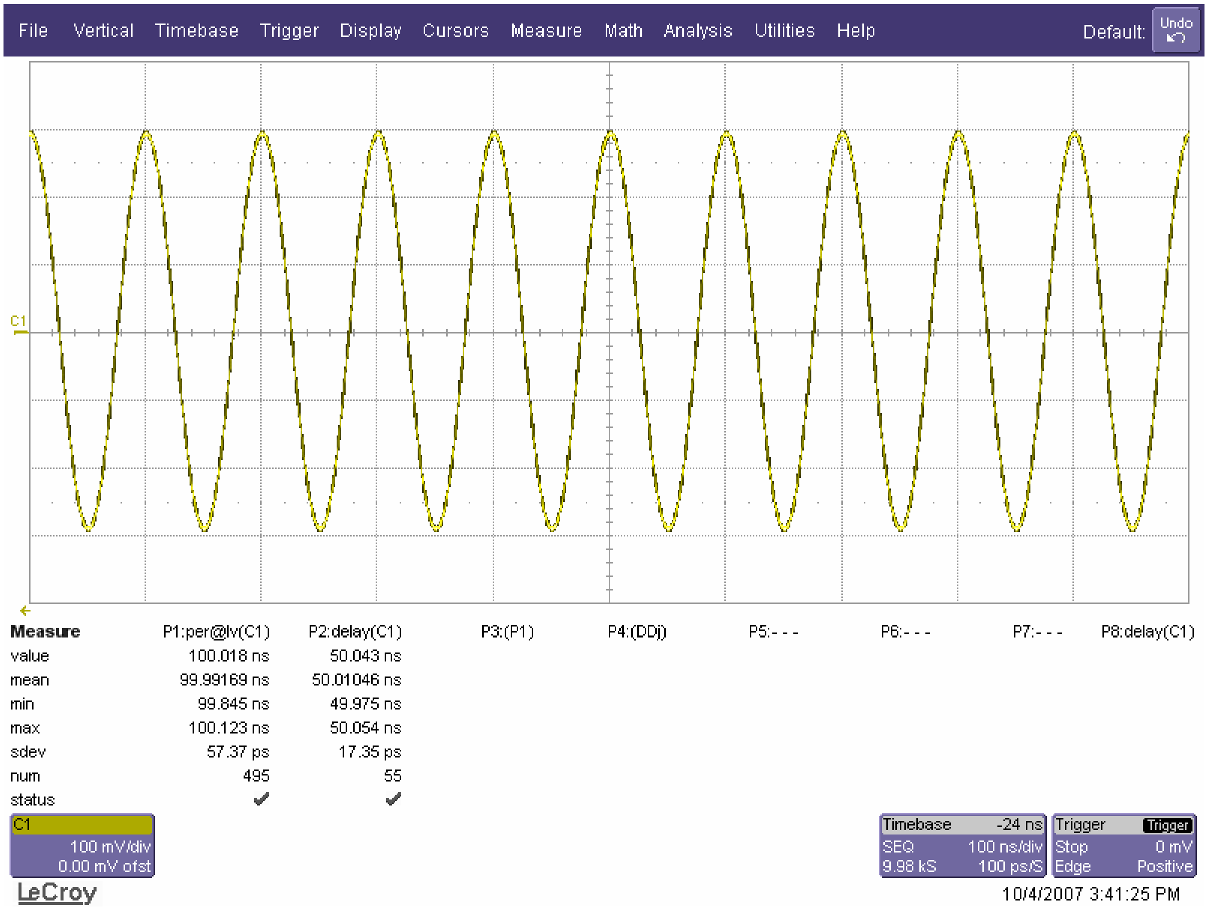
Sequential timebase - +/- 1ps +/- 0.1% of reading
CIS timebase-determined by trigger signal. See RF generator timebase stability specification.

a. Sequential mode

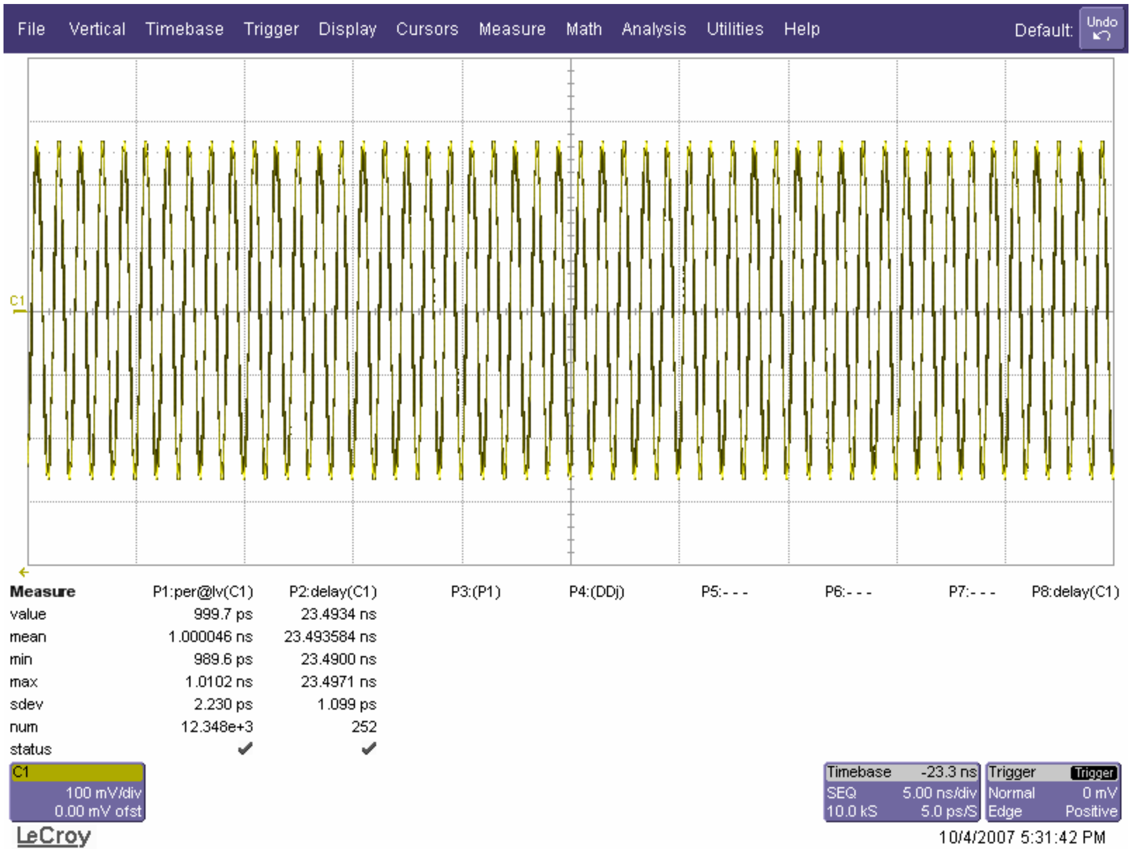
Check that the connector savers supplied are installed at the two trigger inputs

Recall panel setup - Seq time interval acc.lss

- Set the RF generator level to 5.5 dBm
- Set the RF generator frequency to 10 MHz
- Connect RF output to channel 1 input and trigger input through the 6dB RF splitter using the proper RF cables. **See picture below**.
- Press clear sweeps, wait at least 50 sweeps shown in the delay measurement number and press stop trigger.
- Measure the period@level value and enter the **MEAN** value it into the test record table 2 **Seq. time interval accuracy 10 MHz**.



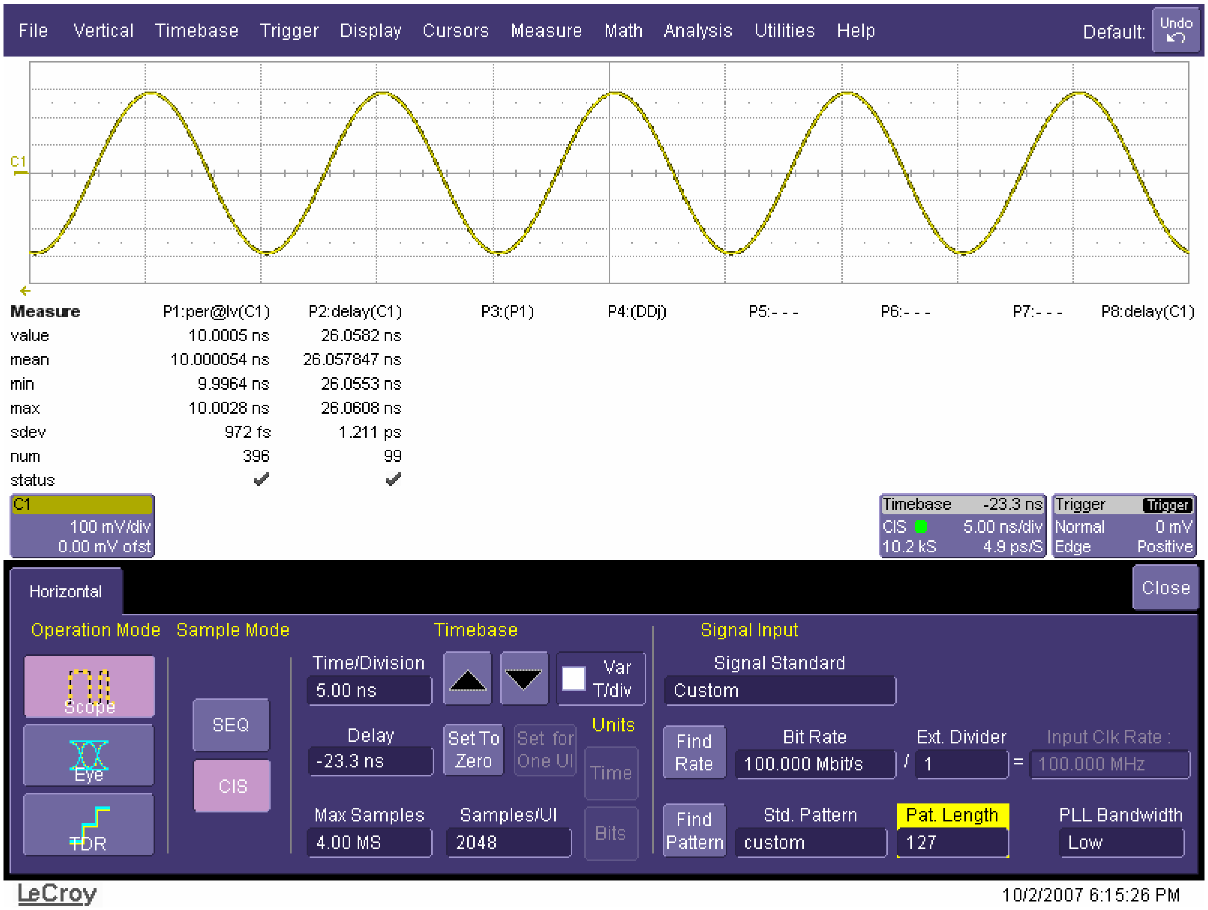
- **Recall panel setup** - Seq time interval acc 1ghz.lss
- Set the RF generator to 1 Ghz
- Press clear sweeps, wait at least 50 sweeps shown in the delay measurement number and press stop trigger.
- Measure the period@level value and enter the **MEAN** value it into the test record table 2 **Seq. time interval accuracy 1 GHz**.



b. Time Interval Accuracy- CIS Timebase

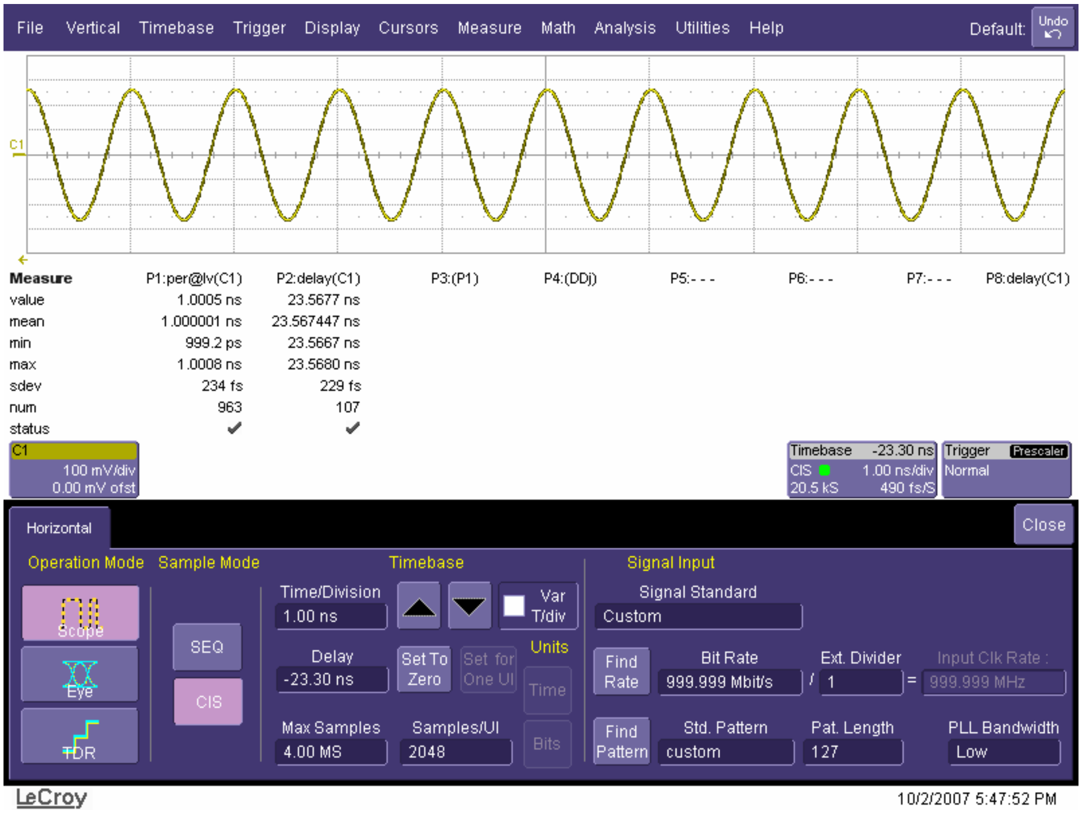
For models NRO9000 and SDA100G only.

- **Recall panel setup** – CIS time interval acc trigger input.lss
- Set the RF generator level to 5.5 dBm
- Set the RF generator frequency to 100 MHz
- In the timebase menu press the **Find rate** selection, the scope should lock onto the input frequency and the CIS light should turn green, see picture.
- Press clear sweeps, wait at least 100 sweeps shown in the delay measurement number and press stop trigger.
- Measure the period@level value and enter the **MEAN** value into the test record table 2 **CIS time accuracy 100 MHz trigger input.**



- Move the RF cable connected from the trigger input and connect it to the Clk/prescale input.
- Set the RF generator frequency to 1GHz, RF level to 5.5 dBm
- **Recall panel setup** - CIS time interval acc prescaler input.lss
- In the timebase menu press the **Find rate** selection, the scope should lock onto the input frequency and the CIS light should turn green, see picture.
- Press clear sweeps, wait at least 100 sweeps shown in the delay measurement number and press stop trigger.
- Measure the period@level value and enter the **MEAN** value into the test record **CIS time interval accuracy 1GHz prescaler input.**

See picture below.



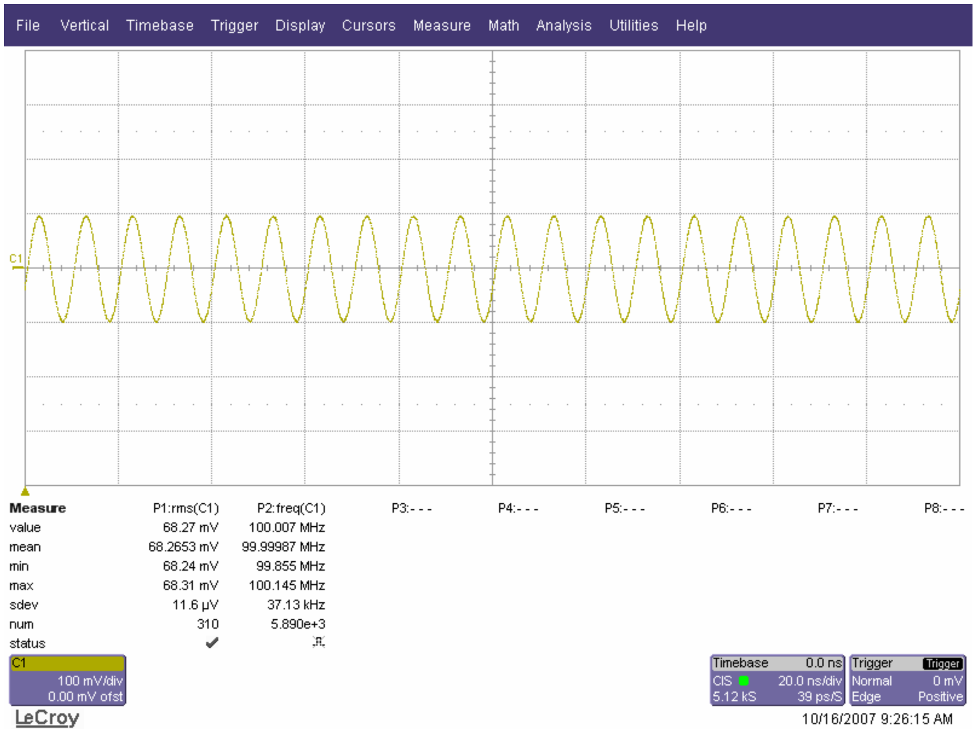
5.5 Trigger input sensitivity

Frequency Range:
Sequential Timebase - DC to 5GHz using the trigger input. 5-14 GHz using CLK/prescale input.
CIS Timebase - 62.5MHz- 125MHz using the trigger input. 125MHz -14GHz using the CLK/prescale input.

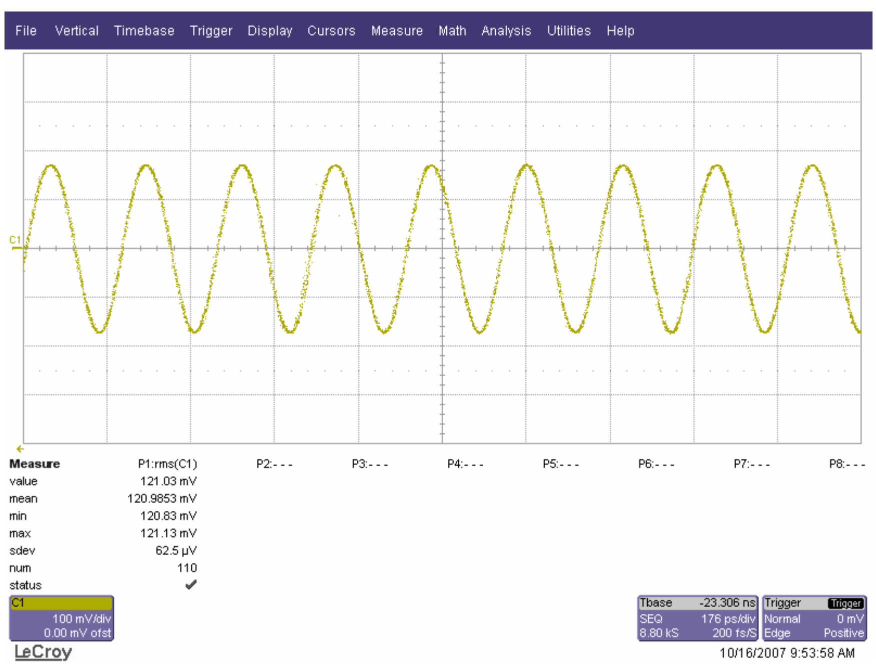
Specification:

Trigger input: -10db at 100MHz, -5dBm at 5GHz
CLK/prescaler input: -5dBm at 14 GHz

- **Recall Panel setup** – trigger input sensitivity test 100MHz.lss
- Remove the trigger cable from the CLK/prescaler input and connect it to the trigger input.
- Set the RF generator frequency to 100MHz, RF level to 5.5 dBm
- In the timebase menu press the **Find rate** selection, the scope should lock onto the input frequency and the CIS light should turn green, see picture below.
- Lower the RF level so the mean RMS value to close to 71mV
- The scope should still trigger in normal mode, see picture below.
- Note Pass or Fail in table 3.

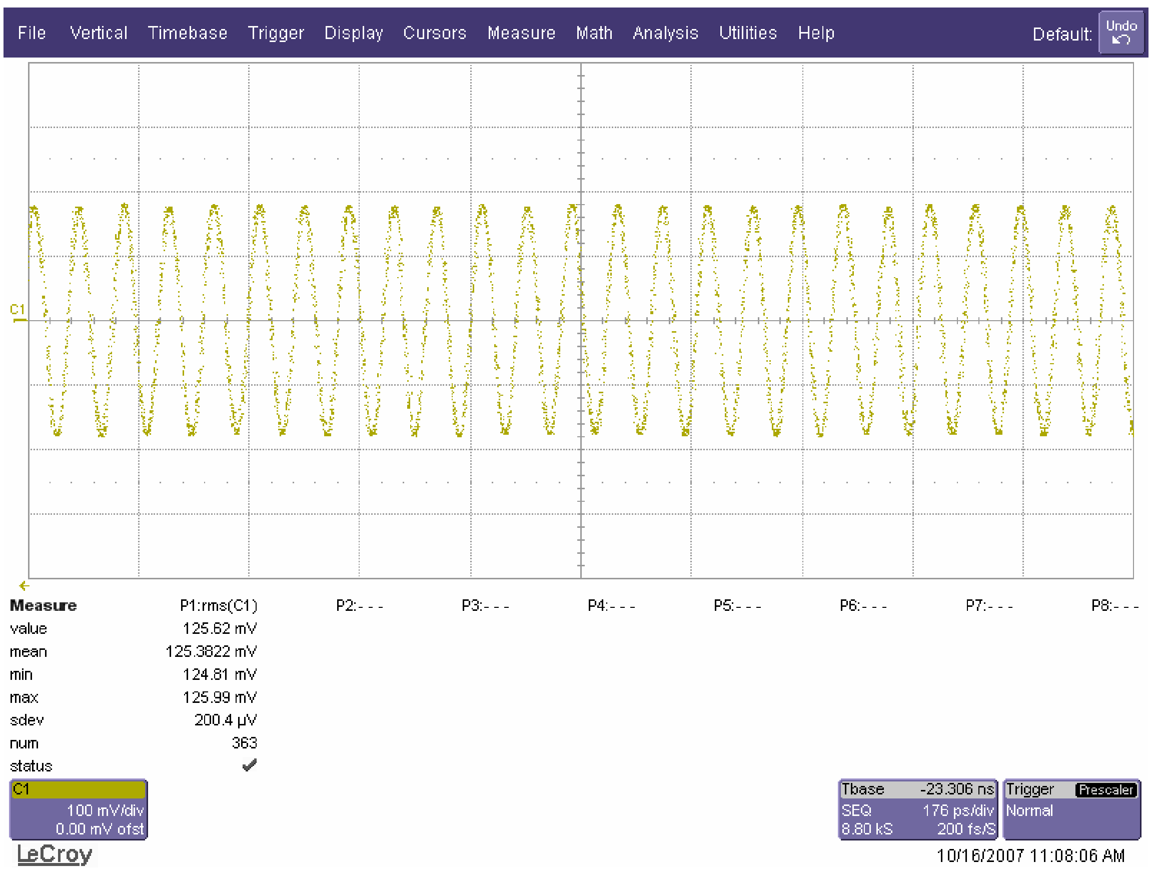


- **Recall Panel setup** – trigger input sensitivity test 5GHz.lss
- Set the RF generator frequency to 5GHz, RF level to 5.5 dBm
- Lower the RF level so the mean RMS value to close to 121mV
- The scope should still trigger in normal mode, see picture below.
- Note Pass or Fail in table 3.



5.5.1 Prescaler input test:

- **Recall panel setup** – prescaler input sensitivity test 14GHz.lss
- Remove the trigger cable from the trigger input, and connect it to the CLK/prescaler input.
- Set the RF generator frequency to 14GHz, RF level to 5.5dBm.
- The scope should trigger in normal mode.
- Lower the RF level so the mean RMS value is close to 126mV, -5dBm.
- The scope should still trigger in normal mode, see picture below.
- Note pass or fail in table 3.



5.5.2 Trigger input resistance test

Specification: 40Ω - 60Ω. EMF limits +/- 10mV

The resistance value for 50Ω coupling are measured with a high precision digital multimeter. The DMM is connected to the DSO in 4 wire configuration (input and sense), allowing for accurate measurements.

- **Recall panel setup -** input resis test.lss
- Set the DMM with **Ohms and Ohms sense** to provide a 4 wire measurement with a BNC tee.
- Measure the **input impedance**, reverse the meter leads and measure the input impedance.
- **Average** these two numbers and record it in Table 4, and compare it to the limits.

5.5.3 Trigger input Leakage Current

Specification: +/- 10mV

- Set the DMM to measure Volts, and connect it to the trigger input.
- Measure the **voltage** and enter it in Table 4. Compare it to the limits.

5.5.4 Trigger Level Accuracy

Specification: +/- 100 mV

The trigger capabilities are tested for several cases of the standard edge trigger:

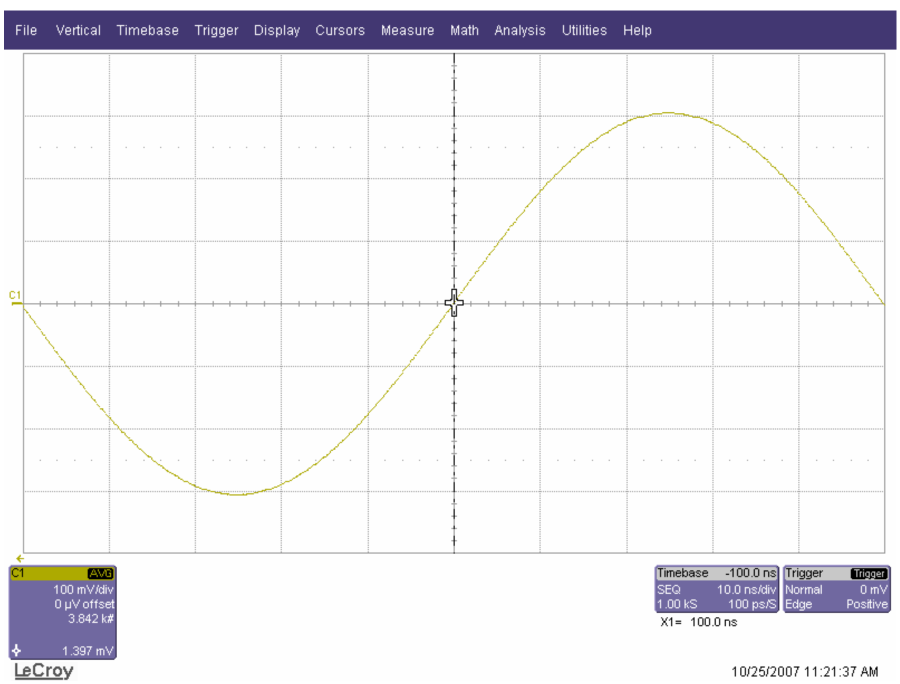
- Trigger input is tested
- Three DC levels: –2.5, 0, +2.5 major screen divisions
- Positive and negative slopes

Perform a pod calibration as done in step 5.3.1

- **Recall panel setup -** trigger acc pos@0.lss
- Set the RF generator frequency to **10 MHz**
- Set the RF level to +3.7dBm
- **Connect the RF output to a BNC tee(male input) using the proper adaptors, connect two 1ns BNC to SMA cables to the female connections on the BNC tee. Connect one cable to the trigger input, and the other cable to the module input.**

- Adjust the RF level to get 80% full scale amplitude.
- Measure the abs cursor value in the channel readout below 100mV
- Compare the test results to the corresponding limit in the test record table 5.
- **Recall panel setup -** trigger acc neg@0.lss

Trigger Level 0 positive edge



Trigger level 0 negative edge

Trigger Level Accuracy cont.

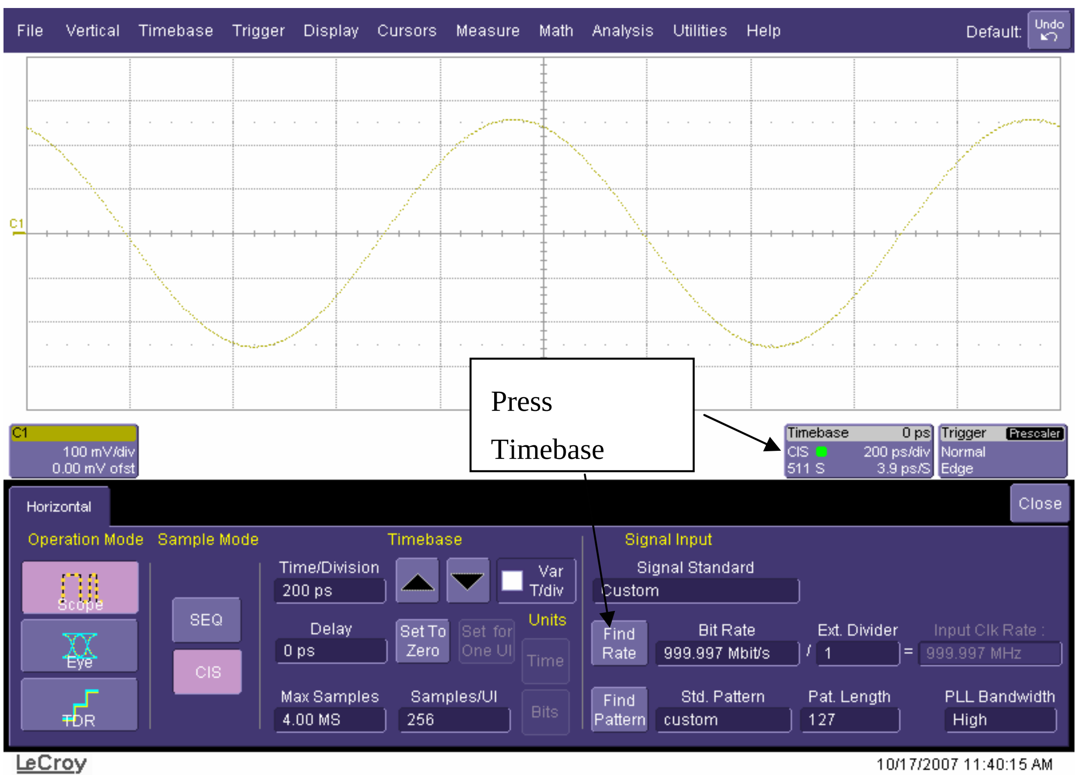
- **Recall panel setup** - trigger acc 250pos.lss and compare the test results to the corresponding limit in the test record table.
- Adjust the trigger level to +375 mV, the scope should stop triggering.

- Recall the remaining trigger level accuracy panel setups and compare the test results to the corresponding limit in the test record table. When at each level adjust the trigger to either +/- 375, the scope should stop triggering.
- trigger acc 250neg.lss
- trigger acc -250pos.lss
- trigger acc -250neg.lss

5.6 Prescaler bit rate count

Specification: Timebase accuracy spec. of source – 1ppm

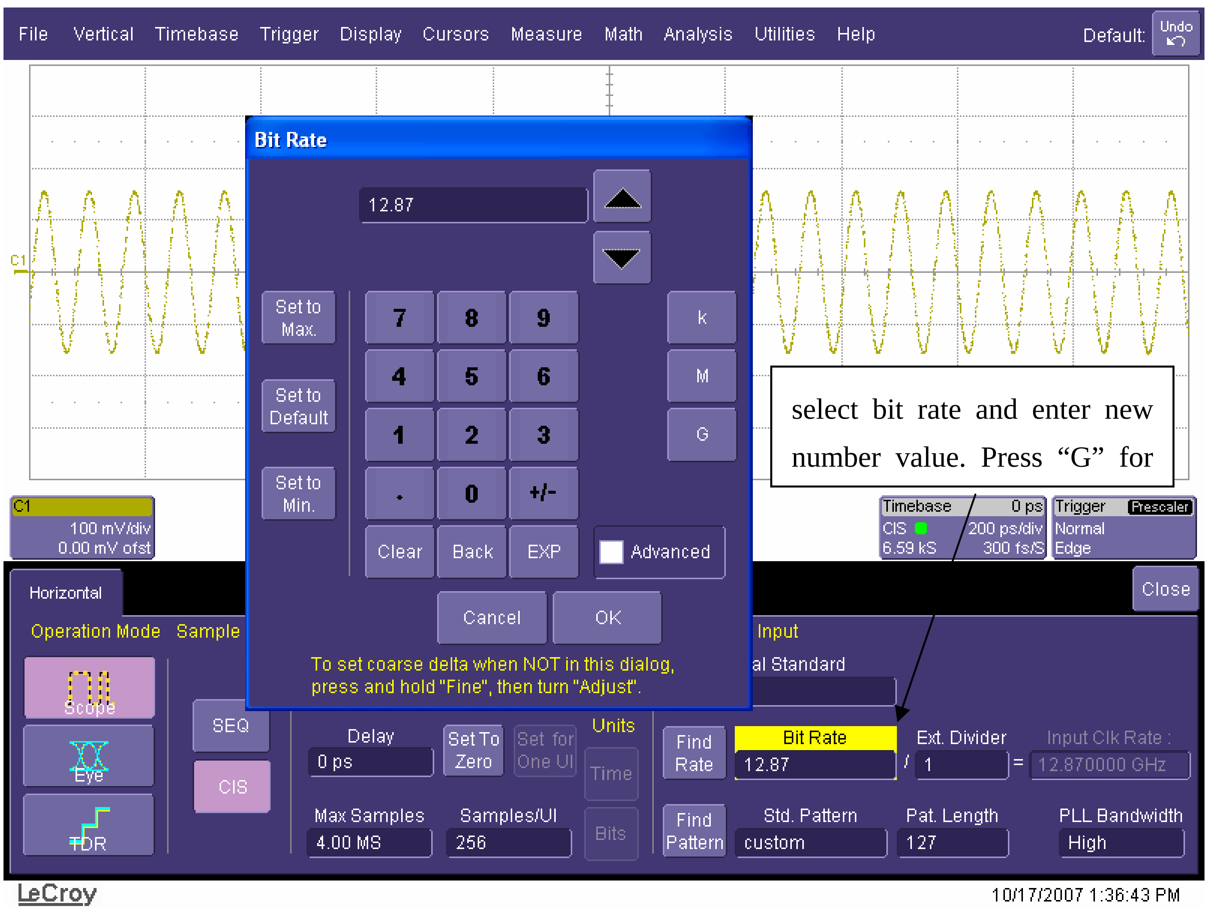
- **Recall panel setup** - prescaler bit rate test.lss
- Set the RF generator frequency to **1GHz**
- Set the RF level to +5.5 dBm
- Connect RF output to channel 1 input and CLK/prescale input through the 6db RF splitter using the proper RF cables.
- Select the timebase menu and press **Find Rate.** The CIS timebase should lock and the LED should be green. Enter the measured bit rate in to the test record and compare it to the limits.
- Change the RF generator to each frequency listed in the test record table 6 and compare the measured bit rate to the limits.



5.6.1 Prescaler PLL lock test

Specification: +/- 1% of nominal

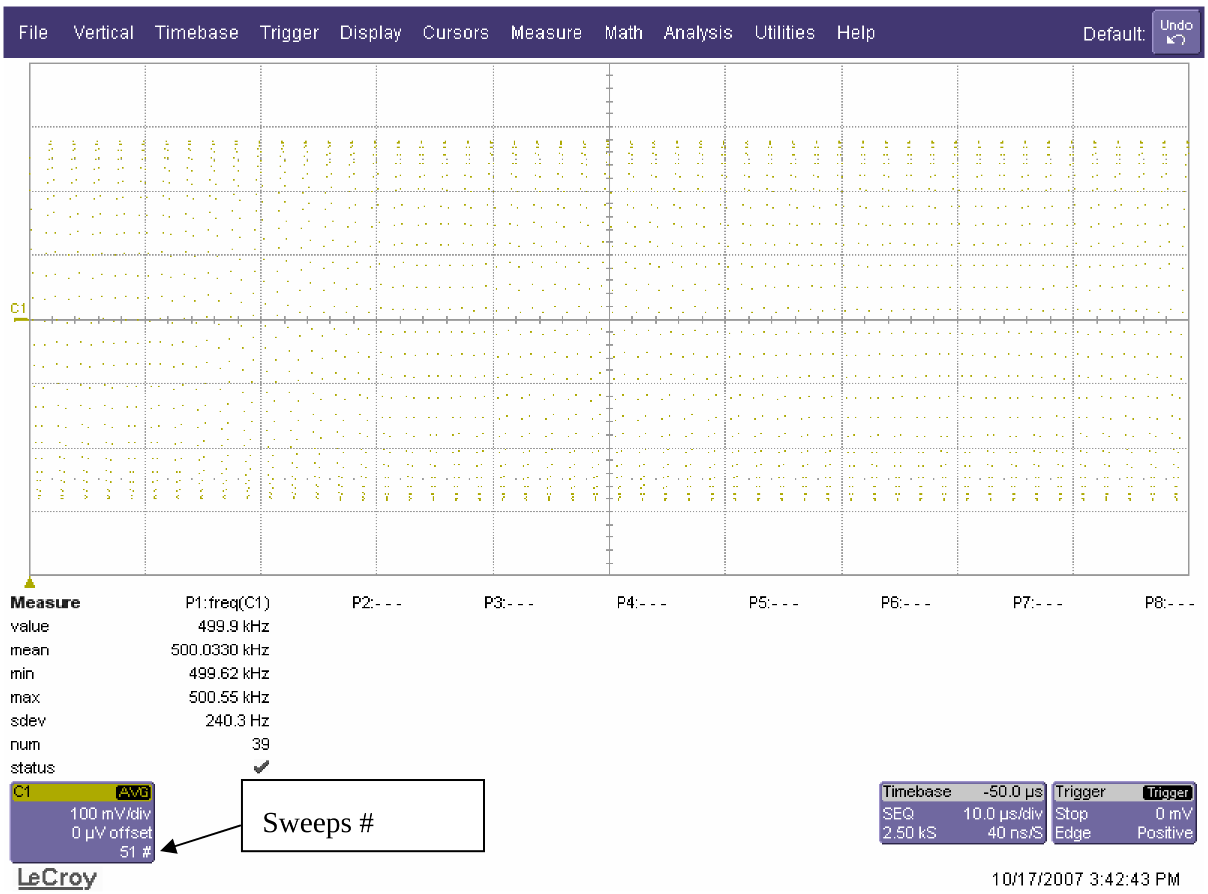
- Continue from Prescaler bit rate count test.
- RF generator frequency should be set to 13GHz
- Modify the bit rate to 12.87GHz – check that the CIS timebase is still locked
- Modify the bit rate to 13.13GHz – check that the CIS timebase is still locked
- Note trigger state in test record, pass/fail.



5.7 Timebase Accuracy Test

Specification: +/- 5ppm

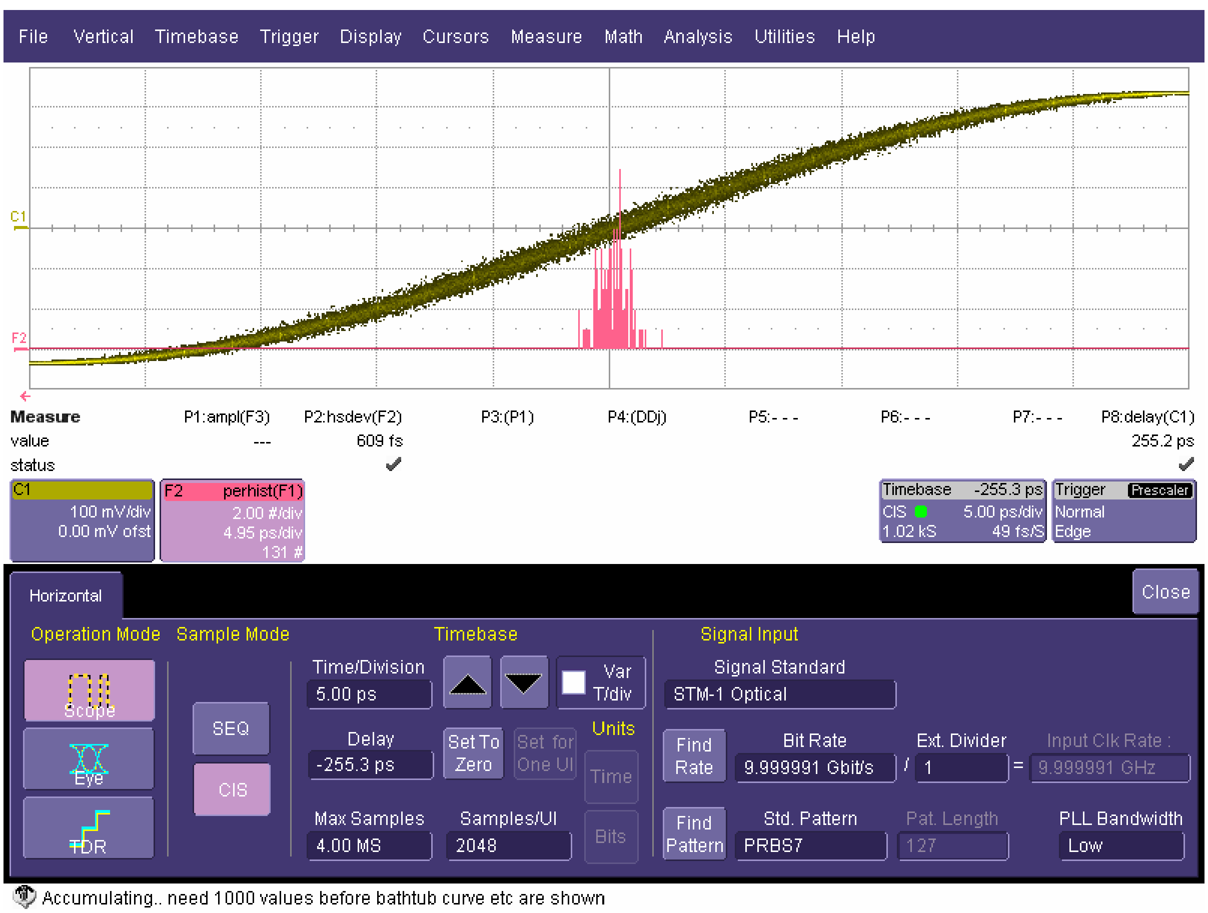
- **Recall panel setup -** we timebase test.lss
- Set the RF generator frequency to **100.5MHz**
- Set the RF level to +5.5 dBm
- Connect RF output to channel 1 input and the trigger input through the 6db RF splitter using the proper RF cables.
- Stop the acquisition after 25 sweeps
- Record the **C1 Freq. mean value** in the test record and compare it the limits.



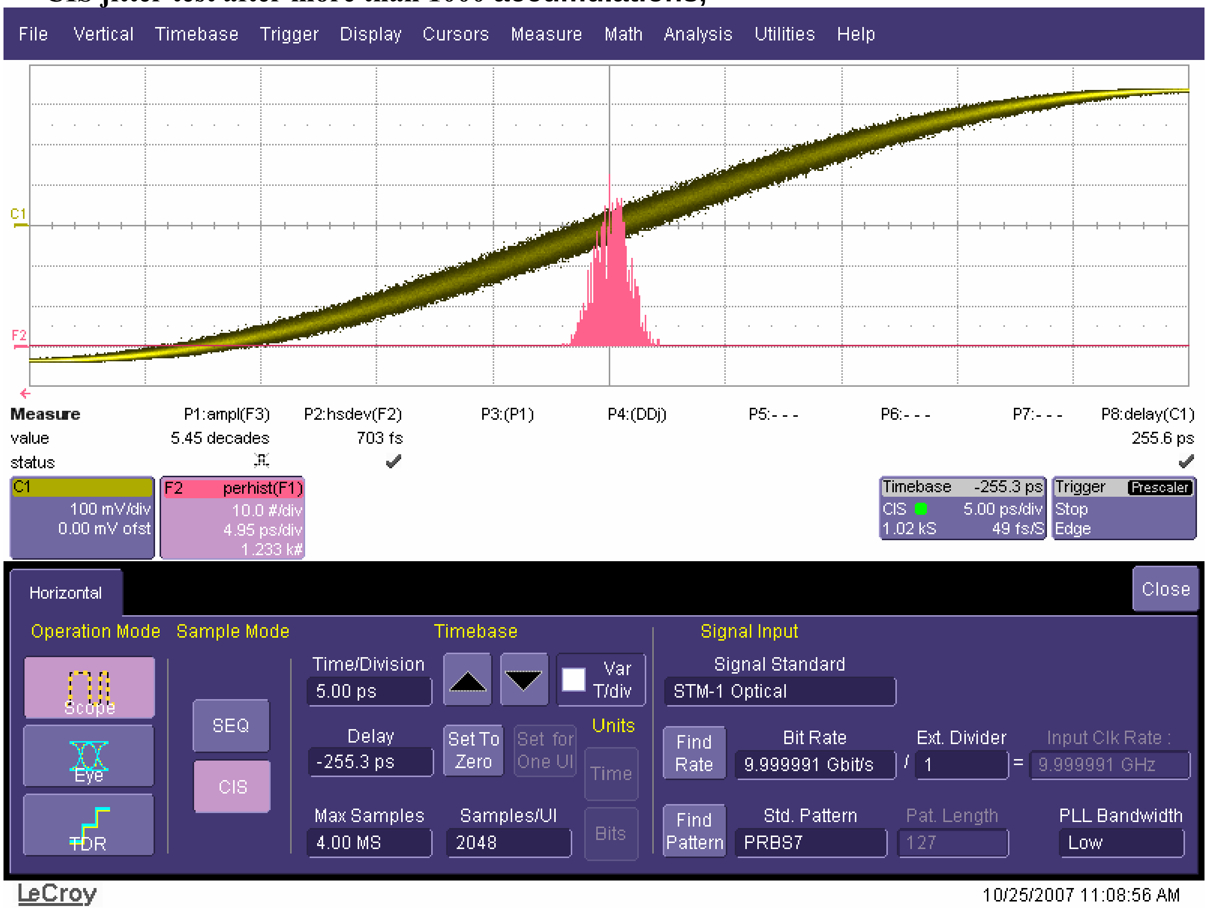
5.7.1 CIS Timebase Jitter

Specification:NRO9000\SDA100G- 800 fs
WE100H with CIS option - 600 fs
WE100H with HCIS option - 250 fs

- **Recall panel setup -** we cis jitter test.lss
- Set the RF generator frequency to **10 GHz**
- Set the RF level to +9 dBm
- Connect RF output to channel 1 input and the **CLK/Prescale** input through the 6db RF splitter using the proper RF cables.
- Press **Find Rate** and then clear sweeps button on front panel.
- Adjust horiz. delay so the histogram is in the center of the display.
- Wait for at least 1000 values to accumulate, see lower left of the display for message to disappear then press **STOP.**
- Record the **P2 hsdev value** in the test record and compare it the limits in table 9.



CIS jitter test after more than 1000 accumulations,



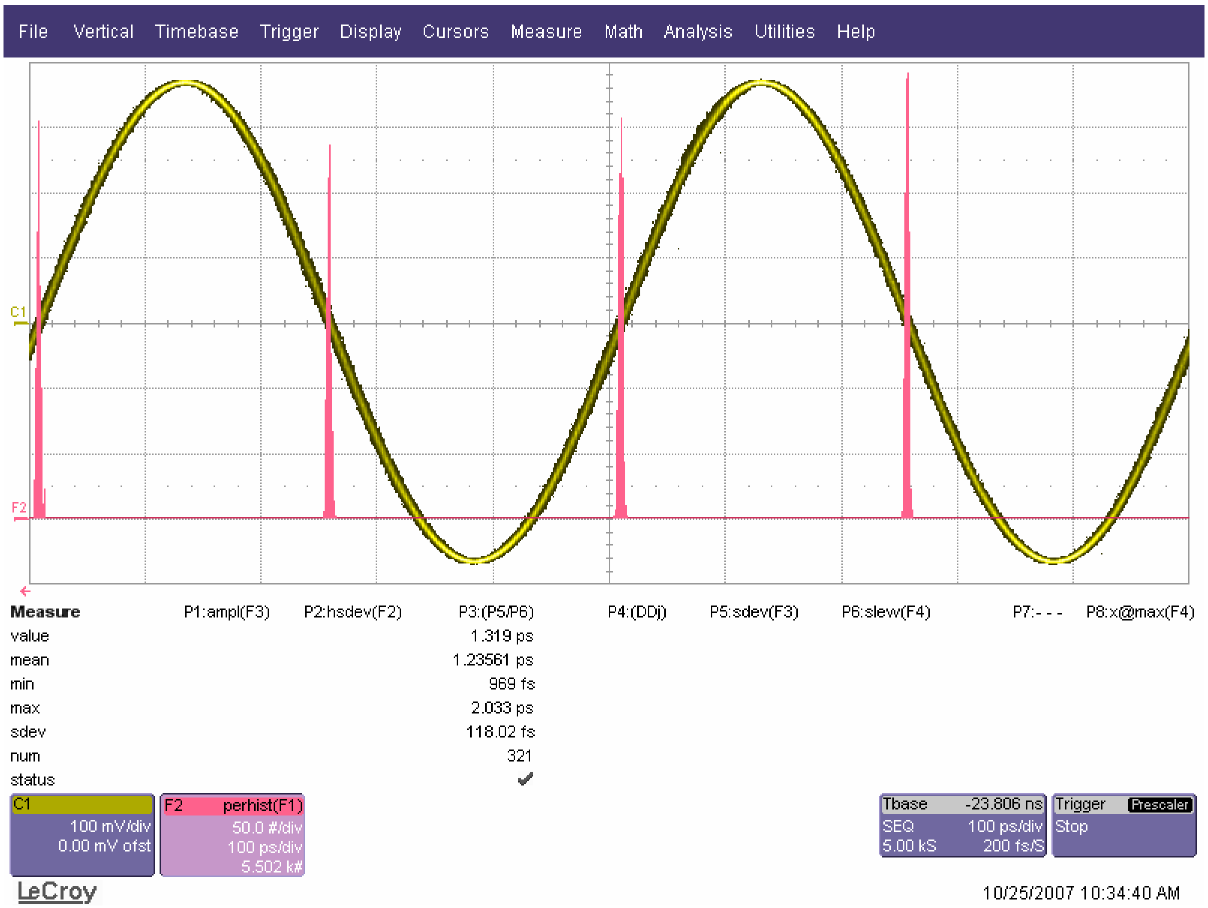
5.7.2 SEQ Timebase Jitter

Specification: WE9000 \NRO9000\SDA100G- 1.8 ps
WE100H – 1.2 ps

- **Recall panel setup -** we seq jitter test.lss
- Set the RF generator frequency to **2 GHz**
- Set the RF level to +9dBm
- Connect RF output to channel 1 input and the **CLK/Prescale** input through the 6db RF splitter using the proper RF cables.
- Press Find Rate and then clear sweeps button on front panel.
- Wait for at least 300 triggers values to accumulate in F2 then press **STOP.**
- Record the **P3 MEAN value** in the test record and compare it the limits in table 9.

See picture below

Sequential timebase jitter test



5.8 Module Performance Tests

5.8.1 DC input resistance test

Caution ! Always use proper connector adaptors to prevent damage to the input.

Specification: 49Ω - 51Ω.

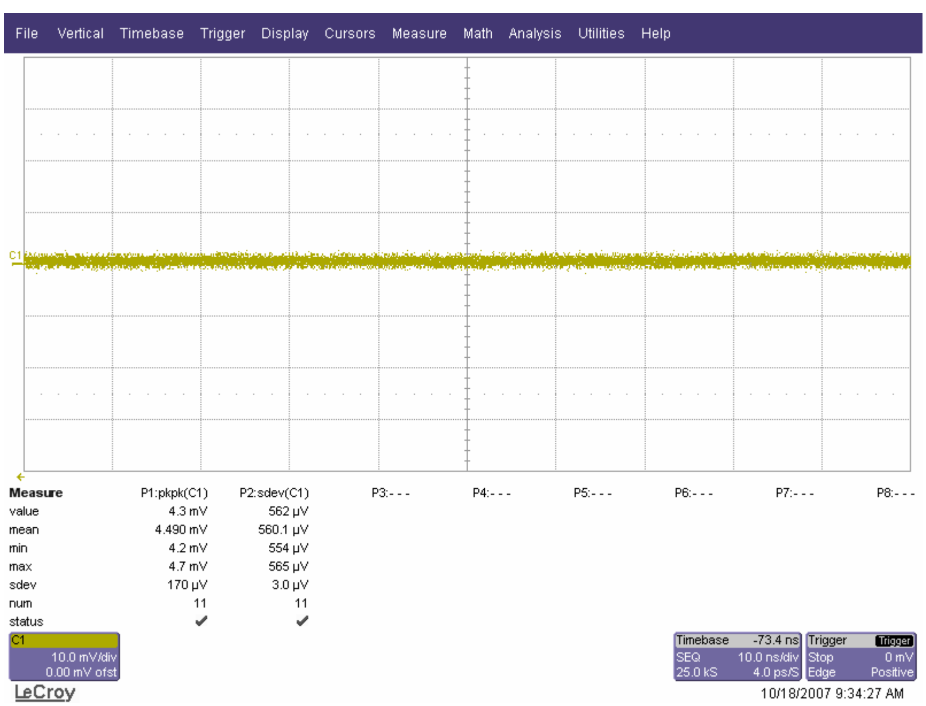
The values for 50Ω coupling are measured with a high precision digital multimeter. The DMM is connected to the DSO in 4 wire configuration (input and sense), allowing for accurate measurements.

- **Recall panel setup -** input resis test.lss
- Set the DMM with **Ohms and Ohms sense** to provide a 4 wire measurement with a BNC tee.
- Measure the **input impedance**, reverse the meter leads and measure the input impedance.
- **Average** these two numbers and record it in table 10, and compare them to the limits.

5.8.2 Noise test

Specification: See the test record table.

- Remove all connections from scope
- **Recall panel setup -** noise test seq.lss
- Press stop trigger after a min of 10 sweeps.
- Record the **MEAN sdev** for the module under test in the test record table 11 and compare them to the limits



5.8.3 DC accuracy

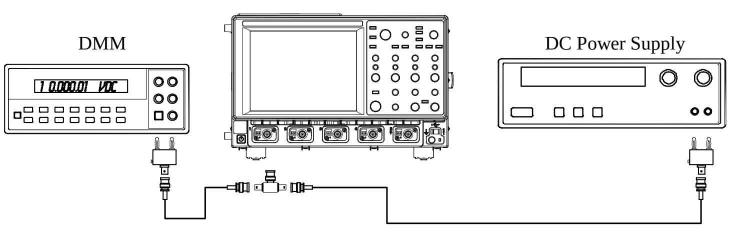
Specification: 1.2% of reading +1.6mV at 0.00 v offset.

Description:

This test measures the DC Gain Accuracy within the gain range specified.
It requires a DC source with a voltage range of 0 V to 1 V minimum adjustable in steps of no more than 1 mV, and a calibrated DMM that can measure voltage to 0.1 %. Measurements are made using voltage values applied by the external voltage reference source, measured by the DMM, and in the oscilloscope using the measurement parameters. For each known input voltage, the deviation is checked against the tolerance. ***! Caution- The input rating of the module is +/- 2.5v max.***

- **Recall panel setup -** DC acc test.lss
- Set the DC source to 0.00v
- Calibrate the module as in step 5.3.1
- Connect the DC source to the module under test
- Set the DC source to the voltages listed in the test record
- Connect the DC source and DMM as shown in figure 5-1, requires a BNC tee and BNC female to SMA male adaptor.

Figure 5-1

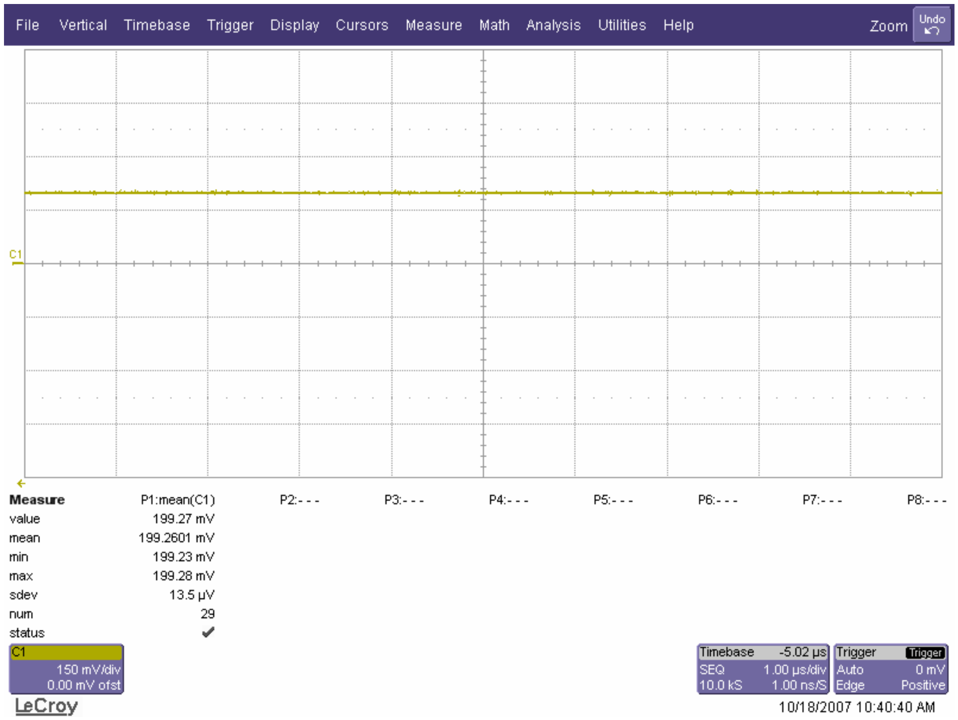


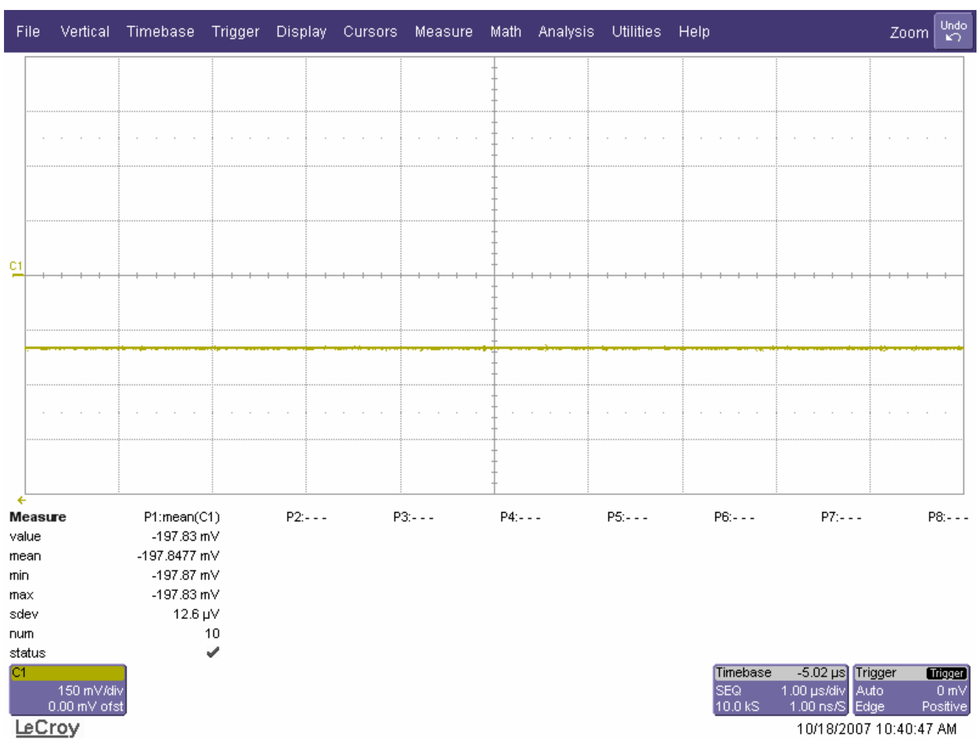
1) Record the **voltage reading** in Table 12, column **DMM.**
2) Press **Clear Sweeps**

3) After 25 sweeps, read off the **DSO mean parameter**, and record the measurement in Table 12, column **Mean**.

- For each DC voltage applied to the DSO input, repeat parts 1), 2), and 3).

- Calculate the **Difference (Δ)** by subtracting the **DMM voltage** reading from the **DSO mean** voltage reading. Record the test result in Table 12, and compare the **Difference (Δ)** to the corresponding limit in the test record.


File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help Zoom Undo
C1
Measure P1:mean(C1) P2:- - - P3:- - - P4:- - - P5:- - - P6:- - - P7:- - - P8:- - -
value 199.27 mV
mean 199.2601 mV
min 199.23 mV
max 199.28 mV
sdev 13.5 µV
num 29
status ✔
C1 150 mV/div 0.00 mV ofst
Timebase -5.02 µs SEQ 1.00 µs/div 10.0 kS 1.00 ns/S
Trigger Auto 0 mV Edge Positive
LeCroy
10/18/2007 10:40:40 AM


File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help Zoom Undo
C1
Measure P1:mean(C1) P2:- - - P3:- - - P4:- - - P5:- - - P6:- - - P7:- - - P8:- - -
value -197.83 mV
mean -197.8477 mV
min -197.87 mV
max -197.83 mV
sdev 12.6 µV
num 10
status ✔
C1 150 mV/div 0.00 mV ofst
Timebase -5.02 µs SEQ 1.00 µs/div 10.0 kS 1.00 ns/S
Trigger Auto 0 mV Edge Positive
LeCroy
10/18/2007 10:40:47 AM

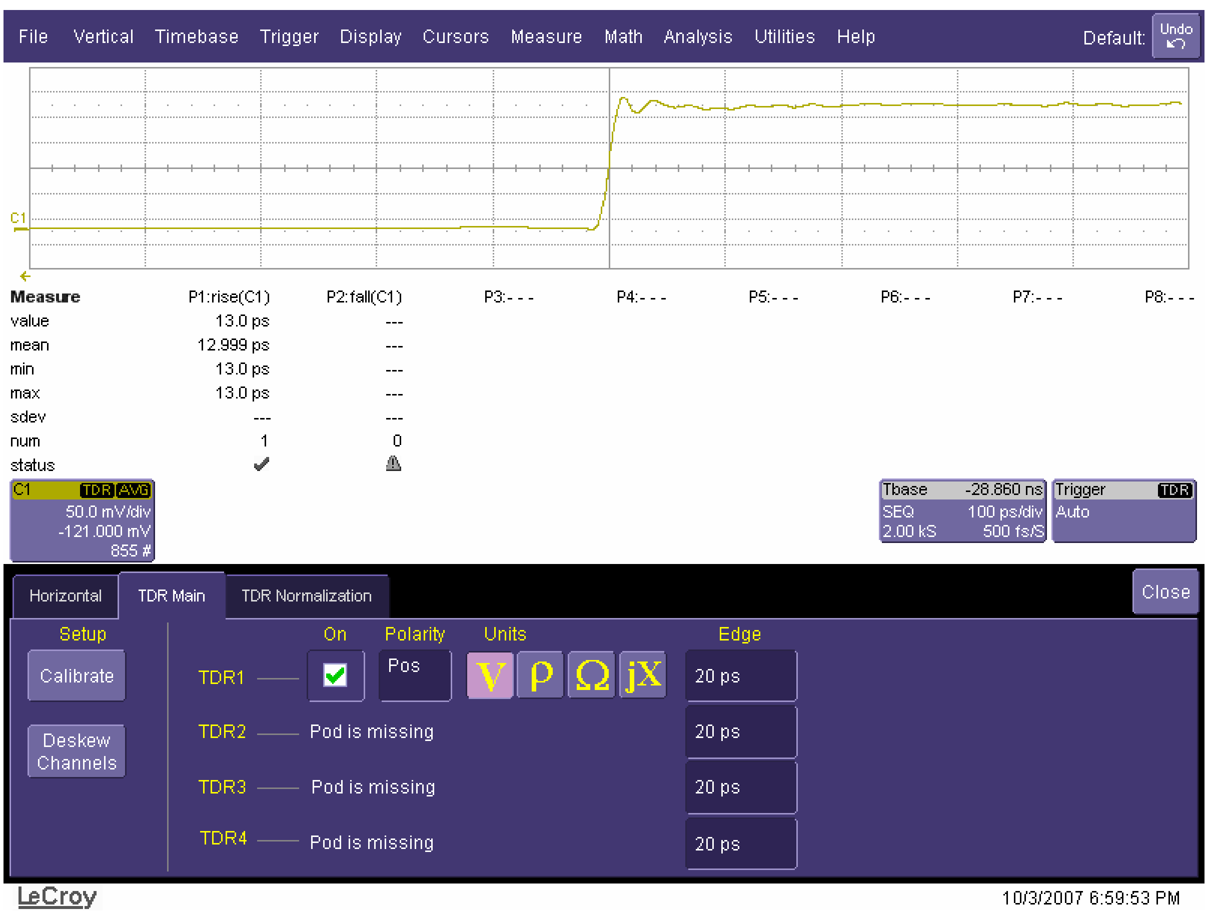
5.8.4 Typical TDR Risetime/Falltime ST-20 module only

Specification: 22 ps for serial numbers starting with #4
26.5 ps for serial numbers starting with #1

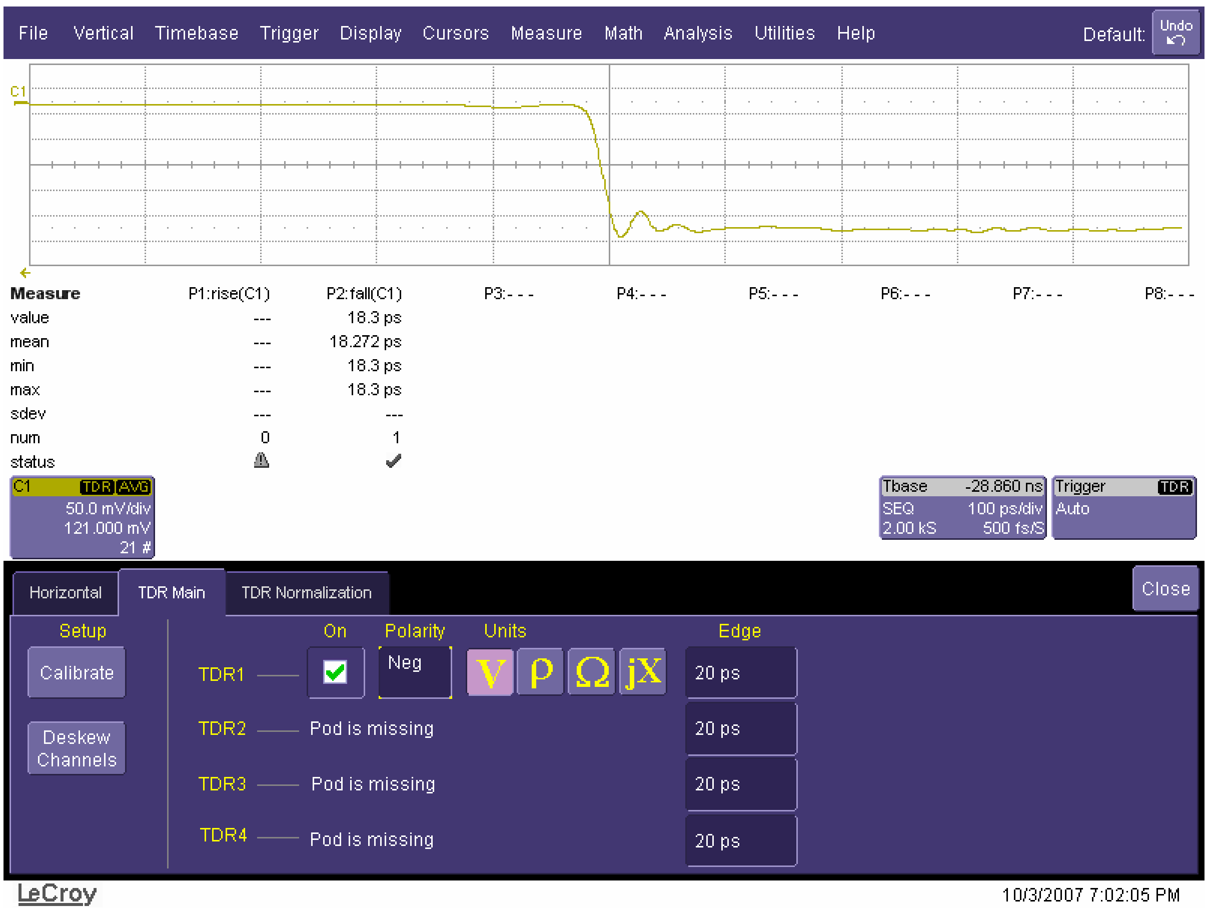
Description:

The ST-20 module has a TDR feature that can be used in several applications. The rise time and fall time of this signal is checked.

- **Recall default panel**
- Perform a module calibration
- Attach the precision 50 ohm terminator to the module
- **Recall panel setup -** ST-20 TDR risetime pos test.lss**,** you may have to recall the panel setup a second time if the channel offset was not correctly loaded.
- **If needed adjust the Horiz. Delay to bring the signal to the center of the display.**
- Record results in the test record table 13 and compare them to the limits



- **Recall panel setup** – ST-20 TDR risetime neg test.lss**,** you may have to recall the panel setup a second time if the offset was not correctly loaded.
- **If needed adjust the Horiz. Delay to bring the signal to the center of the display.**
- Record results in the test record and compare them to the limits

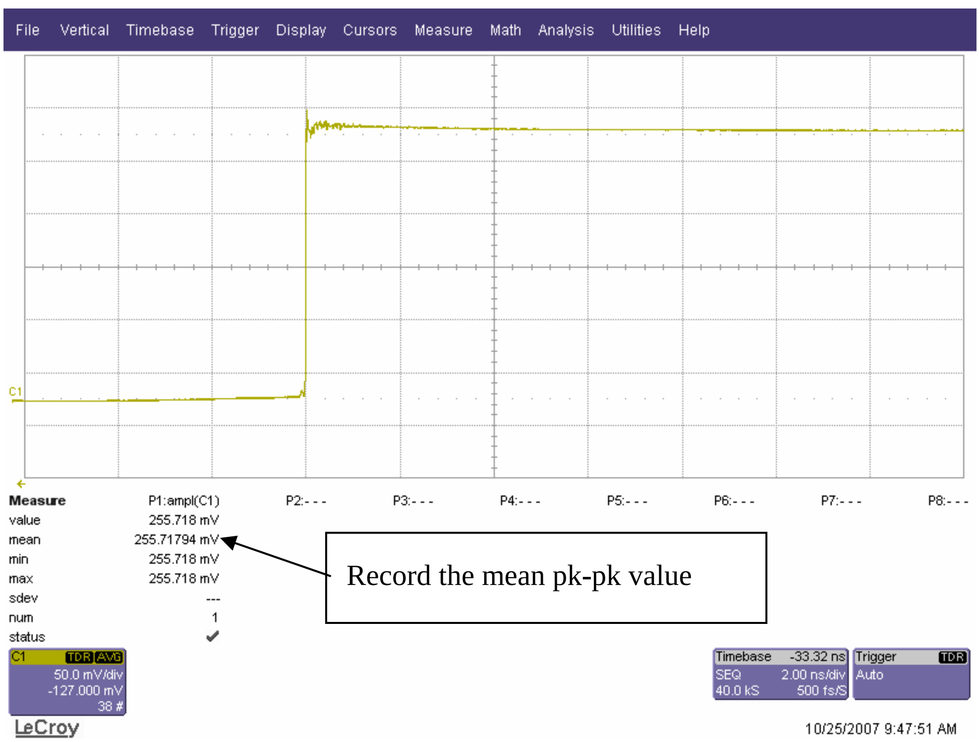


5.8.5 TDR Aberations ST-20 module only

Specification: First 40ps +/- 10%, 40ps-200ps +/- 5%, 200ps-10ns +/- 2% * Note - The test record limits include the Module aberrations+ TDR step flatness.

- **Recall default panel**
- Perform a module calibration.
- Attach the precision 50 ohm terminator to the module if not already connected.
- **Recall panel setup -** ST-20 TDR aber amp.lss you may have to recall the panel setup a second time if the channel offset was not loaded.
- Record the **Mean amplitude** value into the test record. This value will be used to calculate the ratio for each limit. **Adjust the delay to bring the pulse as close to the center of the display as possible.**

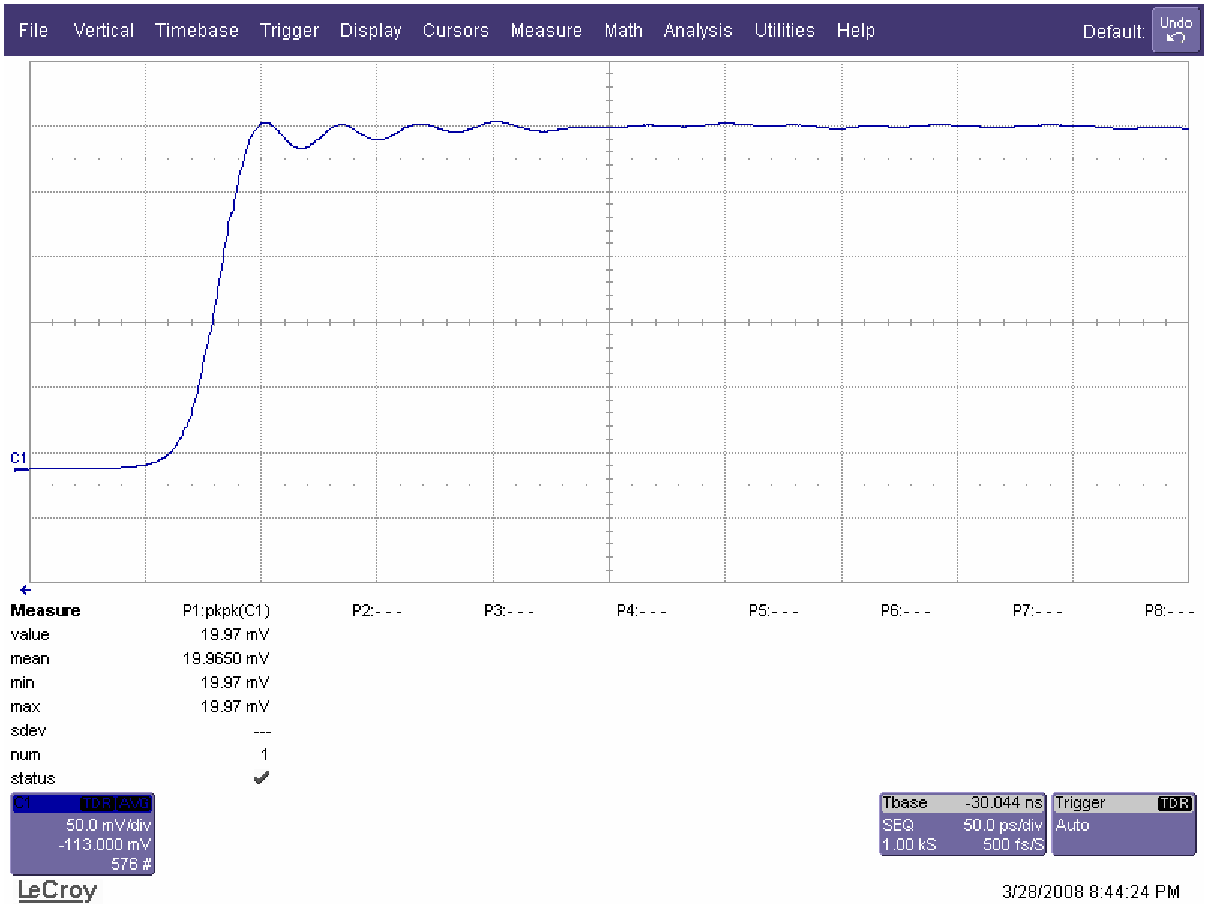
- **Recall panel setup-** ST-20 TDR Aber 40ps test.lss, you may have to recall the panel setup a second time if the channel offset was not loaded, or adjust it manually.



TDR amplitude measurement positive edge

- **Adjust the Horiz. Delay to bring the first peak to the second division from the**

left.

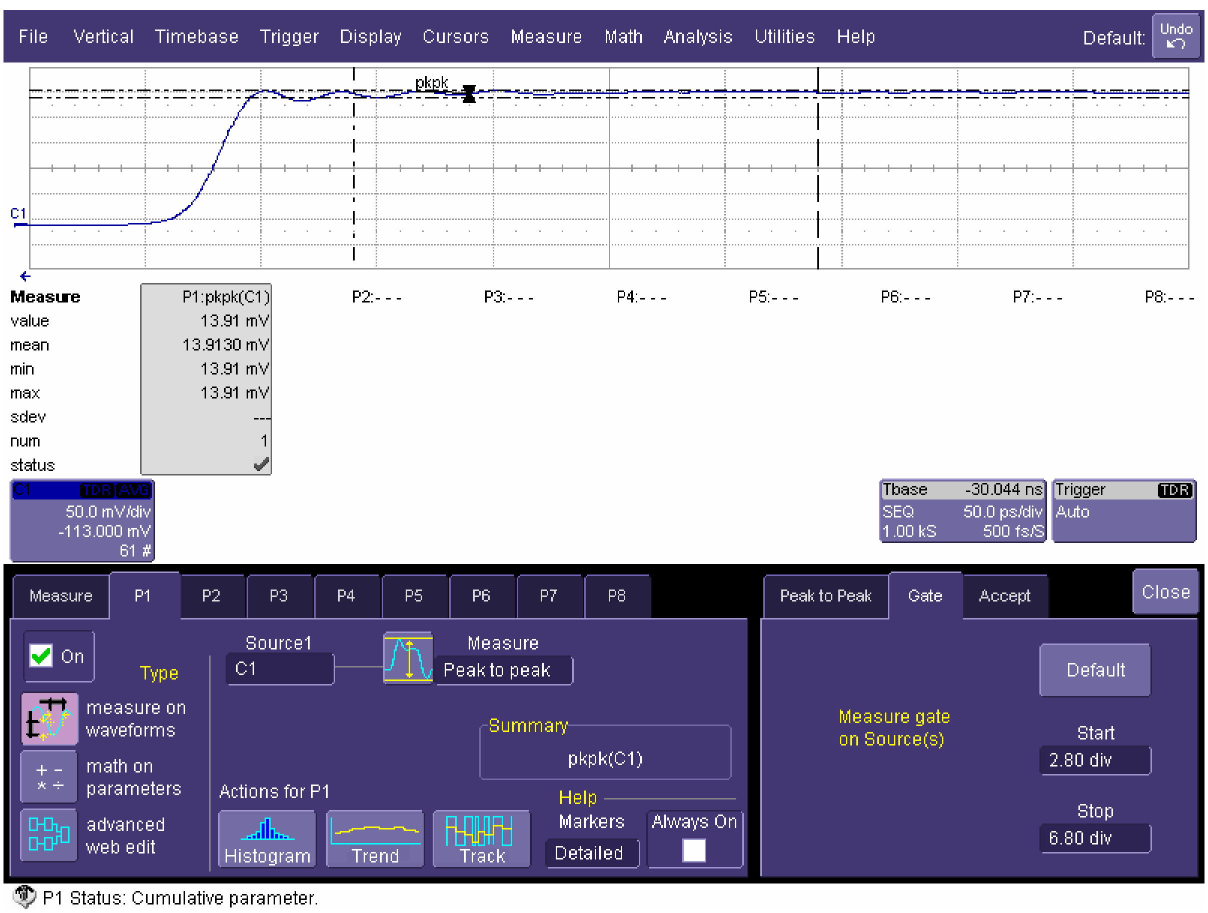


TDR Aberations test continued, 40 ps.

- Check that the parameter gate is properly set, select the P2: parameter group and select the gate feature, see picture below. The gate start should be 2.0 div, the stop should be 2.8 div, 40 ps gate.
- Record the C1 Pk-Pk MEAN value into the test record.

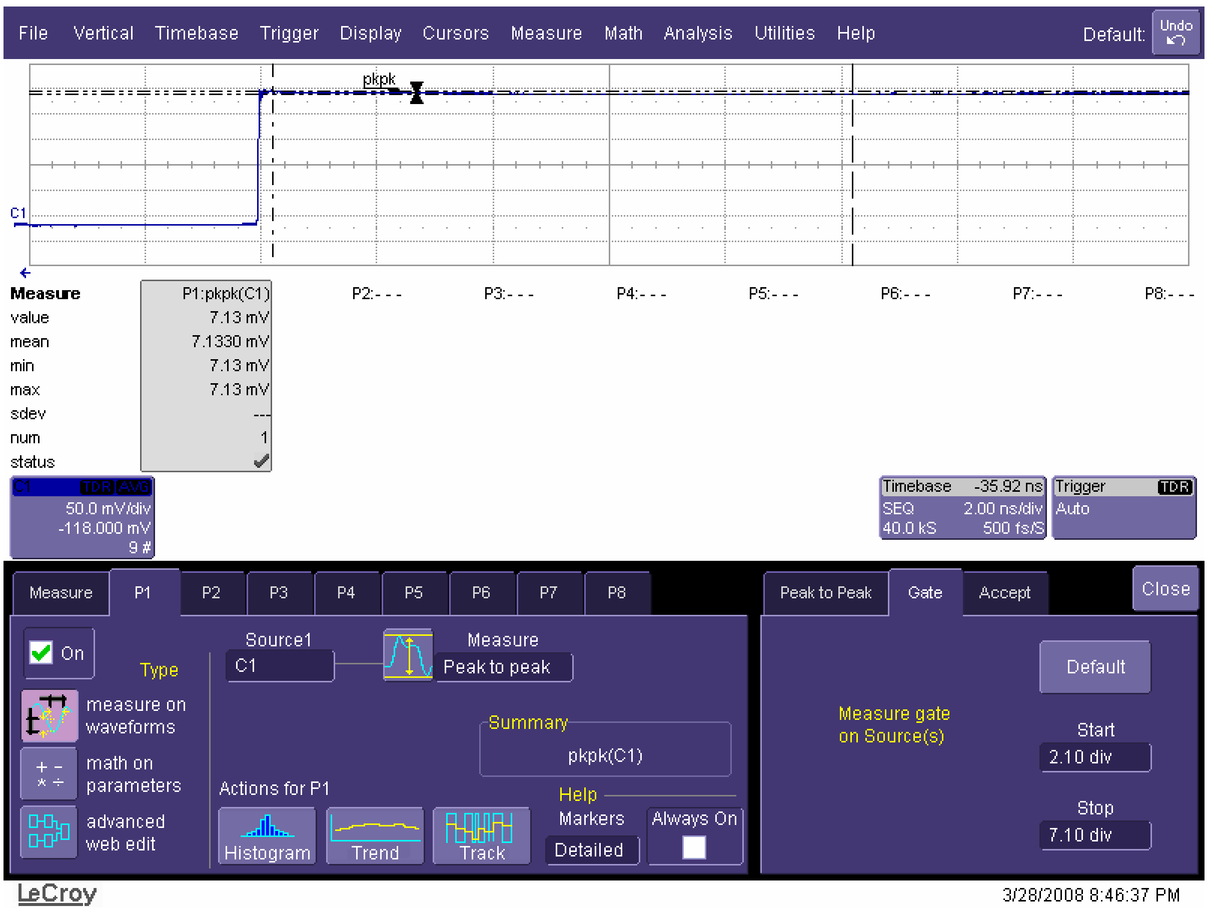
TDR Aberations test - 200 ps.

- **Recall panel setup** – ST-20 TDR Aber 200ps test.lss, you may have to recall the panel setup a second time if the channel offset was not loaded.
- **If needed adjust the Horiz. Delay to bring the signal peak to the second division from the left, see picture below.**
- Check that the parameter gate is properly set, select the P2: parameter group and select the gate feature, see picture below. The gate start should be 2.8 div, the stop should be 6.8 div, 200 ps gate.
- Record the C1 Pk-Pk MEAN value into the test record.



TDR Aberations test – 10ns

- **Recall panel setup -** ST-20 TDR Aber 10ns test.lss, you may have to recall the panel setup a second time if the channel offset was not loaded.
- **If needed adjust the Horiz. Delay to bring the signal peak to the second division from the left, see picture below.**
- Check that the parameter gate is properly set, select the P2: parameter group and select the gate feature, see picture below. The gate start should be 2.1 div, the stop should be 7.1 div, 10 ns gate.
- Record the C1 Pk-Pk MEAN value into the test record.



5.8.6 TDR Aberations Negative edge

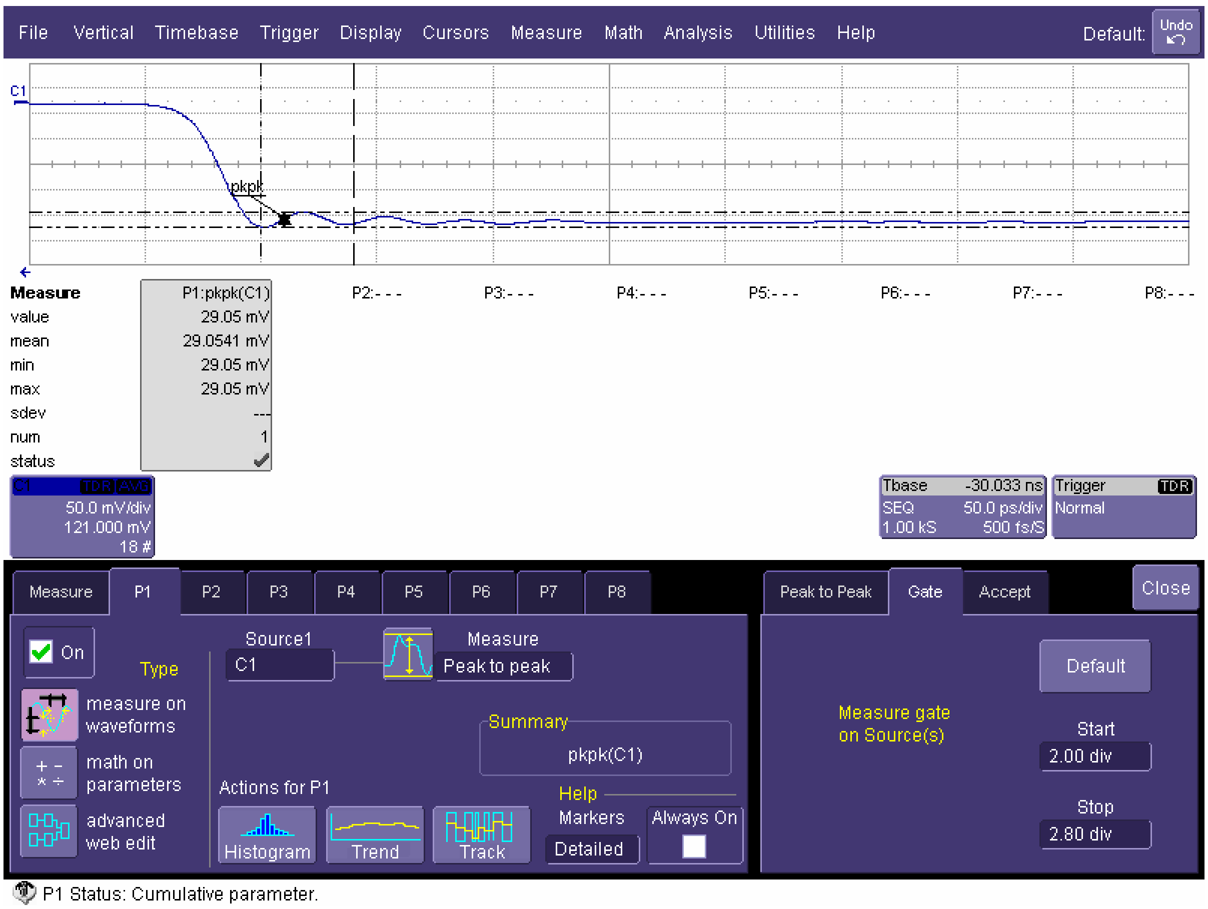
Specification: First 40ps +/- 10%, 40ps-200ps +/- 5%, 200ps-10ns +/- 2% * Note - The test record limits include the Module aberrations+ TDR step flatness.

- Recall default panel
- Perform a module calibration
- Attach the precision 50 ohm terminator to the module if not already connected.
- **Recall panel setup -** ST-20 TDR neg amp.lss you may have to recall the panel setup a second time if the channel offset was not loaded.
- Record the **Mean amplitude** value into the test record. This value will be used to calculate the ratio for each limit. See picture below.
  Adjust the delay to bring the pulse as close to the center of the display as possible.
- **Recall panel setup** – ST-20 TDR neg Aber 40ps test.lss, you may have to recall the panel setup a second time if the channel offset was not loaded, or adjust the offset manually.

- **If needed adjust the Horiz. Delay to bring the signal peak to the second division from the left, see picture.**
- Record the C1 Pk-Pk MEAN value into the test record.

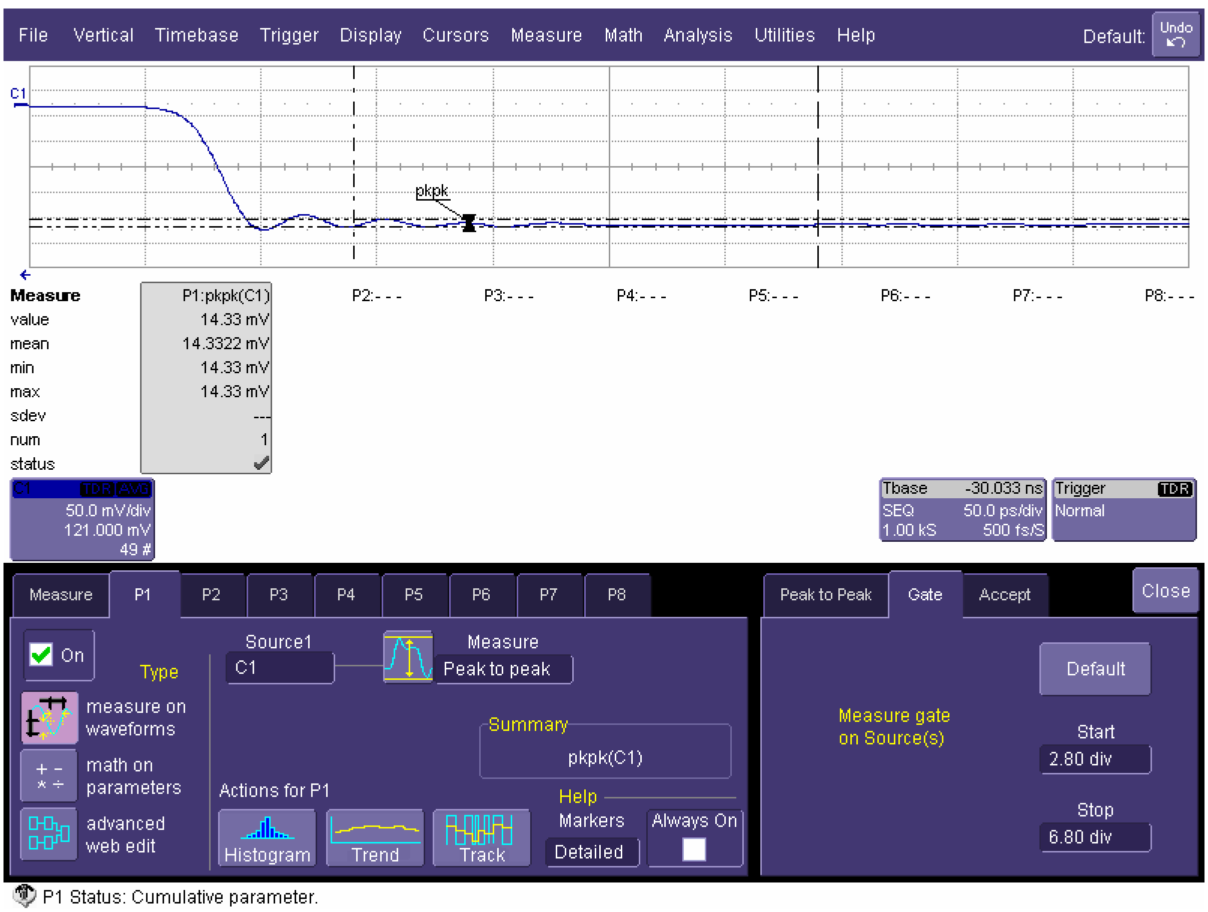
TDR Aberations test continued, 40 ps.

- Check that the parameter gate is properly set, select the P2: parameter group and select the gate feature, see picture below. The gate start should be 2.0 div, the stop should be 2.8 div, 40 ps gate.
- Record the C1 Pk-Pk MEAN value into the test record.



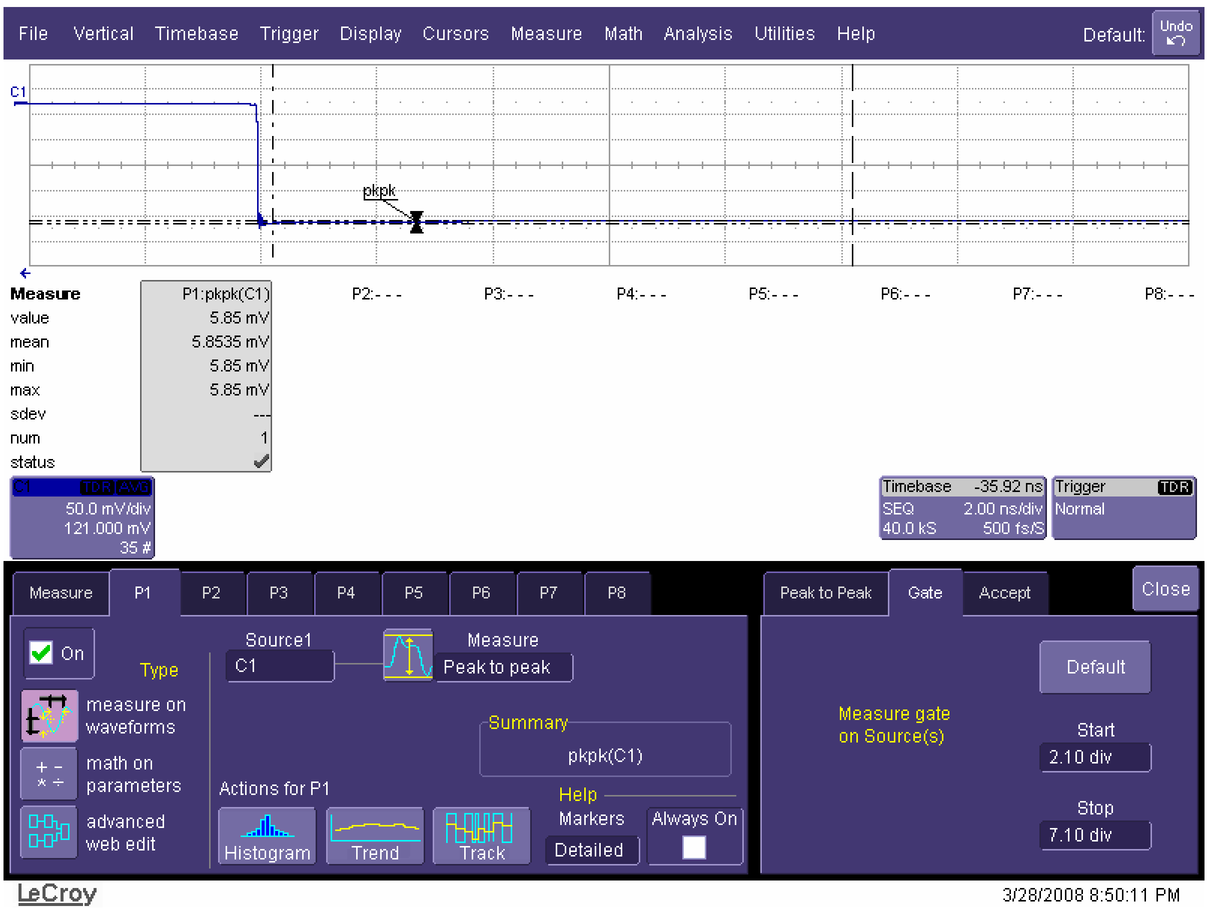
TDR Aberations test negative edge- 200 ps.

- **Recall panel setup -** ST-20 TDR neg Aber 200ps test.lss, you may have to recall the panel setup a second time if the channel offset was not loaded.
- **If needed adjust the Horiz. Delay to bring the signal to the second division from the left, see picture below.**
- Check that the parameter gate is properly set, select the P2: parameter group and select the gate feature, see picture below. The gate start should be 2.8 div, the stop should be 6.8 div, 200 ps gate.
- Record the C1 Pk-Pk MEAN value into the test record.



TDR Aberations test negative edge- 10ns

- **Recall panel setup** – ST-20 TDR neg Aber 10ns test.lss, you may have to recall the panel setup a second time if the channel offset was not loaded.
- **If needed adjust the Horiz. Delay to bring the signal edge to the second division from the left, see picture below.**
- Check that the parameter gate is properly set, select the P2: parameter group and select the gate feature, see picture below. The gate start should be 2.1 div, the stop should be 7.1 div, 10ns gate.
- Record the C1 Pk-Pk MEAN value into the test record.



Calculate the Ratio of TDR amplitude to Pk-Pk aberrations and enter this value into the test record.

Ratio = measured Pk-Pk value/measured TDR amplitude * 100

5.8.7 Module Bandwidth test.

Description

The purpose of this test is to ensure that plug in module used meets the speciation. An external source is used as the reference to provide a signal where amplitude and frequency are well controlled.

The amplitude of the generator and cable as a function of frequency and power is calibrated using an Anritsu ML2437A power meter and MA2425B sensor.

- Zero and **calibrate** the power sensor using the power meter **Power Ref output**. (refer to the power meters operators manual)

- Connect a 50Ω precision RF cable to the **RF output** of the signal generator and then through the necessary adapters to the power sensor. It is very important that the same cable/generator be used throughout this BW procedure and that the all connectors are torqued at all their mating locations.

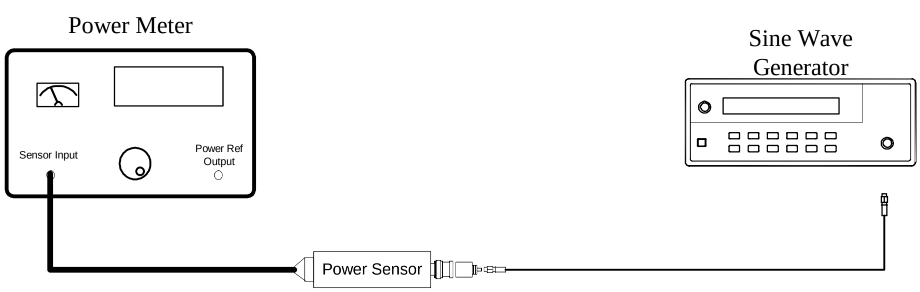


Figure 5-2 : Power Meter Equipment Setup

- Set the generator frequency to 50 MHz
- Set the power meter correction to the same frequency

- Set the generator amplitude to measure 0 dBm on the power meter.

- Read the displayed generator output amplitude, and record it as generator amplitude in the 50 MHz section in table 15.

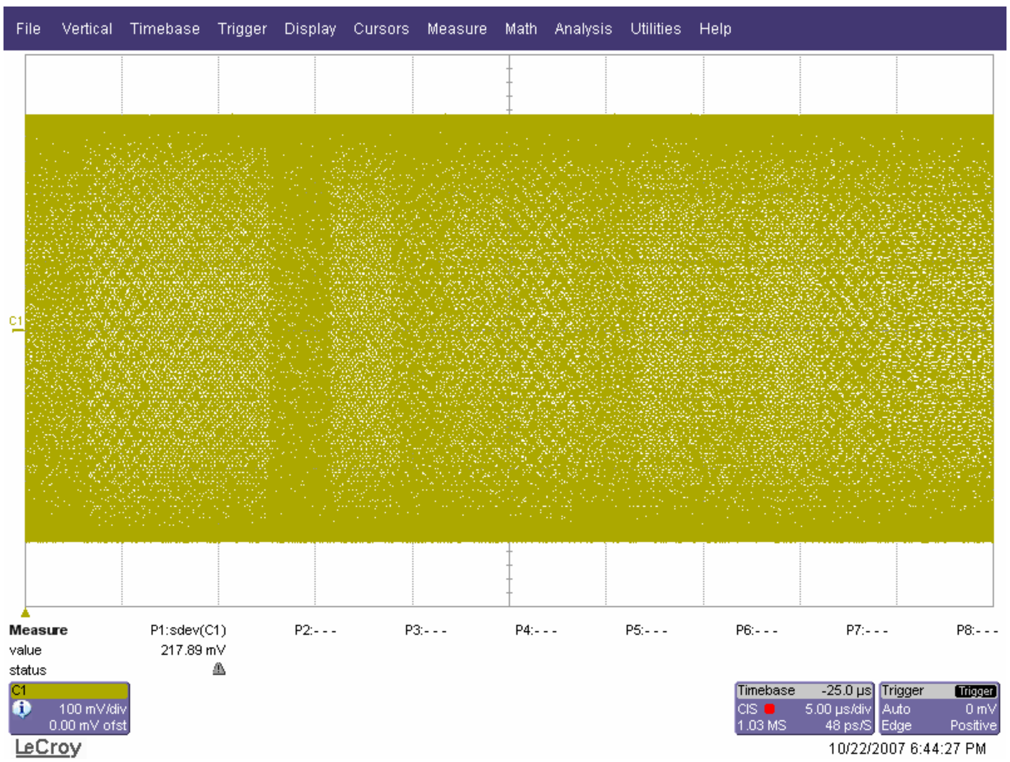
- Repeat the above measurement to the maximum bandwidth of the module under test for each frequency listed in the test record. Record the generator output amplitude readout in the test record.

- Disconnect the RF output of the generator from the power sensor.

- Connect the RF output of the generator through the same cable that was calibrated in the previous step into Channel 1.

Figure 5-3 : 50Ω Bandwidth Equipment Setup

- Set the generator frequency to **50 MHz**.
- **Recall panel setup -** BW test.lss
- From the generator, apply the **recorded generator signal amplitude** to Channel 1.
- Measure the value of **Sdev** in table 15
- See picture below.



- Apply the **recorded generator signal amplitude** for each frequency listed up to the maximum bandwidth of the module under test so the power remains constant, and record the Sdev value for channel 1 in table 15.
- Calculate the ratio to 50 MHz for each frequency listed up to the maximum for the module under test, $sdev_{freq}/sdev_{50MHz}$ and compare the results to the limits in the test record.