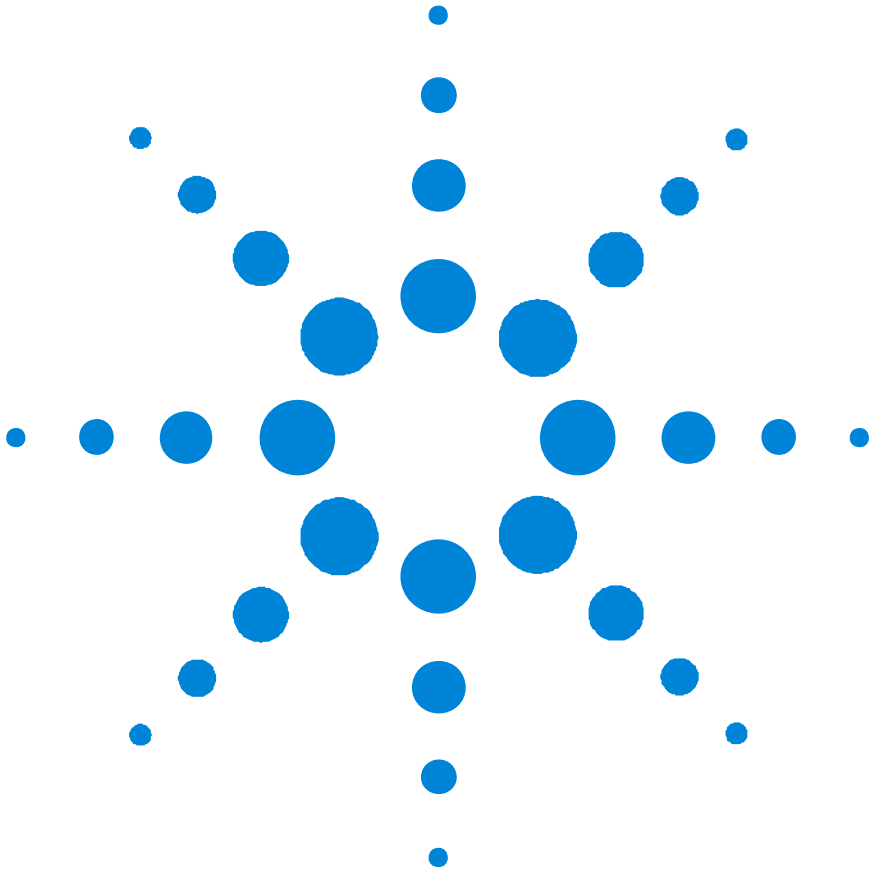


Agilent 81133A/81134A

Performance Verification

Rev. 2.0, December 2003

Agilent Technologies

Introduction

Use these tests if you want to check that the Agilent 81133A / 81134A Pulse / Pattern Generator is working correctly. Before starting any testing allow all test equipment to warm up for at least 30 minutes and make sure that the SELFCAL of the unit was executed.

Test Results Tables

Tables for entering the results of the tests are included at the end of the tests. The tests are numbered and reference numbers for each Test Result (TR) are given in a small table at the end of each test. The reference number shows you where the actual results should be entered in the Test Results Tables.

Recommended Test Equipment and Accessories

The following tables list the recommended test equipment you need to perform all the tests. You can use alternative instruments if they meet the critical specifications given. The test set-ups and procedures assume you are using the recommended equipment.

Test Equipment	Model	Critical Specifications
Oscilloscope or DCA	Agilent 54121T or Agilent 54123 T Agilent 86100B with 86112A channel	20 GHz / 34 GHz, 10 bit vertical resolution, Histogram
Counter	Agilent 53132A #010, 030	Frequency measurements up to 3.35 GHz, High-Stability Timebase
Digital Voltmeter	Agilent 3458A	
Delay Line	Agilent 54008A	22 ns (for 54120 series)

Table 1

Accessories	Model	Critical Specifications
Digitizing Oscilloscopes Accessories		
Attenuators Power Splitter SMS/SMA (m-m) Adaptor SMA(f)/BNC(m) Adaptor SMA Cable	8493C#020 8493C#006 11667B 1250-1159 1250-1700 8120-4948	20dB 6 dB
50 Ω Feedthrough Termination	10100C or better (see Figure)	2 W, 1% 10 W, 0.1 %

Accessories	Model	Critical Specifications
Adaptor	1251-2277	BNC to Banana
Cable Assemblies, BNC	8120-1839	
Torque Wrench	8710-1582	5/16 in, 5 lb-in (56 Ncm)

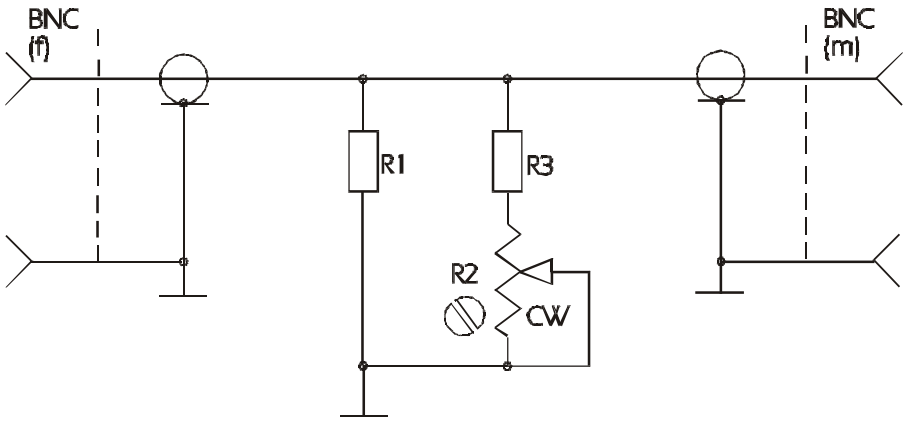
Important:

When you connect the test equipment for the first time, and whenever you change the setup during the course of these tests, always switch off the 81133A/81134A' s outputs.

Use the 8710 - 1582 torque wrench to tighten and loosen SMA connectors. This will ensure that the connectors are at the correct tightness and give the best signal transfer.

50 Ohm, 0.1%, 10 W Feedthrough Termination

The following figure provides a schematic and a parts list except for the case. The case must provide shielding and maintain grounding integrity.



50 Ohm, 0.1%, 10W Feedthrough Termination

The following parts are required:

- R1 = 53.6 Ω, 1%, 10 W
- R2 = 200 Ω, 10%, 0.5 W, Variable Trimmer
- R3 = 681 Ω, 1%, 0.5 W
- Connectors: BNC male, BNC female

Test 1: Frequency

Test Specifications

Range: 15 MHz to 3.35 GHz

Resolution: 1 Hz

Accuracy: 50 ppm

Equipment Needed

Counter

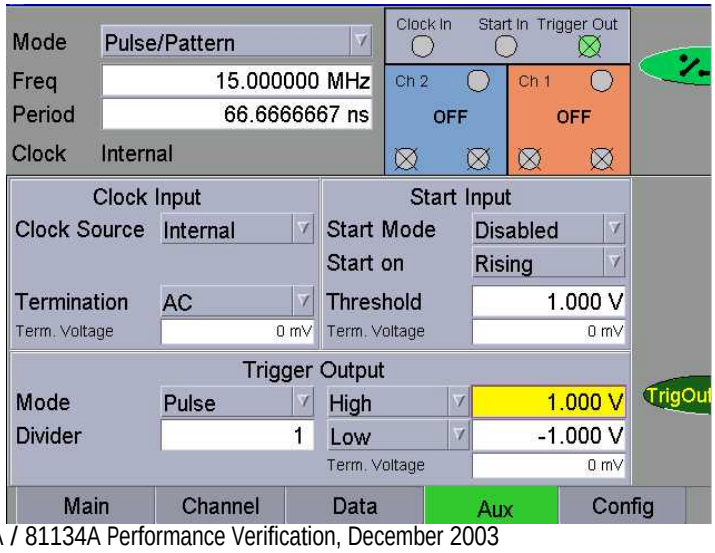
Cable 50 Ω, SMA

Procedure

1 Connect the 81133A/81134A Trigger Output to the Counter Channel 1 Input

2 Reset the 81133A/81134A to default settings

3 Select the [Aux] screen on the 81133A/81134A and set up the unit as follows:



4 Switch on the trigger output and set the counter to measure the frequency at Channel 1

5 Check the frequency at the following settings:

Frequency	Acceptable Measured Frequency			TR Entry
15 MHz	14.99925 MHz	to	15.00075 MHz	1-1
50 MHz	49.9975 MHz	to	50.0025 MHz	1-2
100 MHz	99.995 MHz	to	100.005 MHz	1-3
200 MHz	199.990 MHz	to	200.010 MHz	1-4

6 Connect the 81133A/81134A Trigger Output to the Counter Channel 3 input.

7 Check the frequency at the following settings:

Frequency	Acceptable Measured Frequency			TR Entry
500 MHz	499.975 MHz	to	500.025 MHz	1-5
1.0 GHz	999.950 MHz	to	1.00005 GHz	1-6
2.0 GHZ	1.9999 GHz	to	2.0001 GHz	1-7
3.0 GHz	2.99985 GHz	to	3.00015 GHz	1-8
3.35 GHz	3.34983 GHz	to	3.35016 GHz	1-9

Test 2: Width

Test Specifications

Range: 100 ps to (period - 100 ps)

Resolution: 1 ps

Accuracy: ± 40 ps after autocal within a temperature range of ± 10°

Equiopment Needed

Digitizing Oscilloscope with Accessories

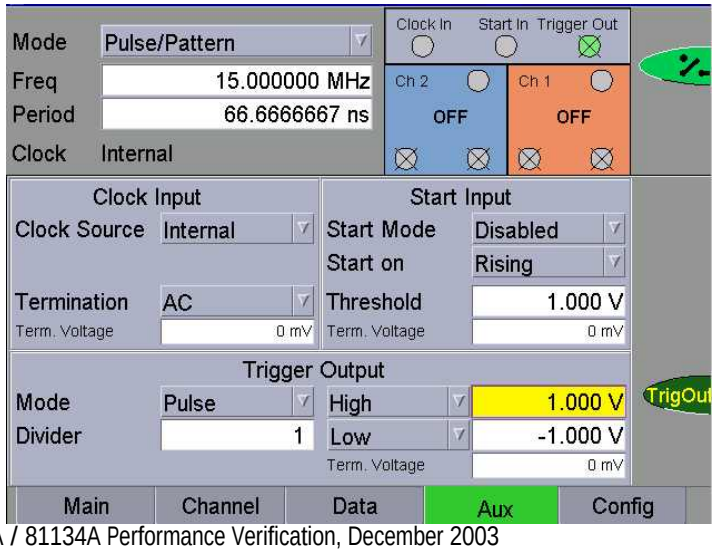
Cables 50 Ω, SMA

Procedure

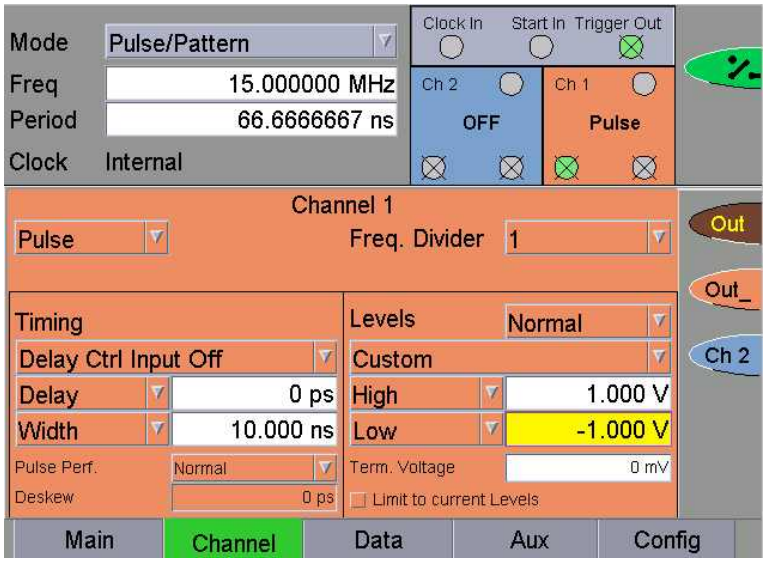
1 Connect the 81133A/81134A Trigger Output to the Oscilloscope Trigger Input, using a 20 dB attenuator

2 Connect the 81133A/81134A Channel 1 Output to the Oscilloscope Channel 4 Input, using a 20 dB attenuator

3 Set up the Pulse Generator as follows:



4 Set up the [Channel] screen as follows:



On the 81134A set up both channels and switch on only the channel that is being tested.

5 Set the Digitizing Oscilloscope Agilent 54121T:

- Press [AUTOSCALE]
- Select the Display menu and set the Number of Averages to 32
- Select the Delta V menu and switch the voltage markers on
- Set the preset levels to 50% - 50% and press [AUTO LEVEL SET]
- Select the Delta T menu and switch the time markers on
- Set START ON EDGE = POS 1 and STOP ON EDGE = NEG 1

6 Change the oscilloscope timebase to 100 ps/div

7 Change the Agilent 81133A/81134A Width to 100 ps

8 Center the pulse in the oscilloscope display

9 Press the [PRECISE EDGE FIND] key for each new width setting

10 Check the Agilent 81133A/81134A pulse width at the following settings:

Oscilloscope Timebase	Width	Acceptable Range	TR Entry
100 ps/div	100 ps	60 ps to 140 ps	2-1
100 ps/div	500 ps	460 ps to 540 ps	2-2
500 ps/div	1 ns	960 ps to 1.040 ns	2-3
500 ps/div	2 ns	1.96 ns to 2.04 ns	2-4

Larger pulse widths are generated with counted delays. The performance is guaranteed by the design and does not need to be verified.

For the 81134A repeat the test for the second channel.

Test 3: Delay

Test Specifications

Range: Variable Delay - 5 ns to + 230 ns

Resolution: 1 ps

Accuracy: ± 20 ps after autocal within a temperature range of ± 10°

Equipment Needed

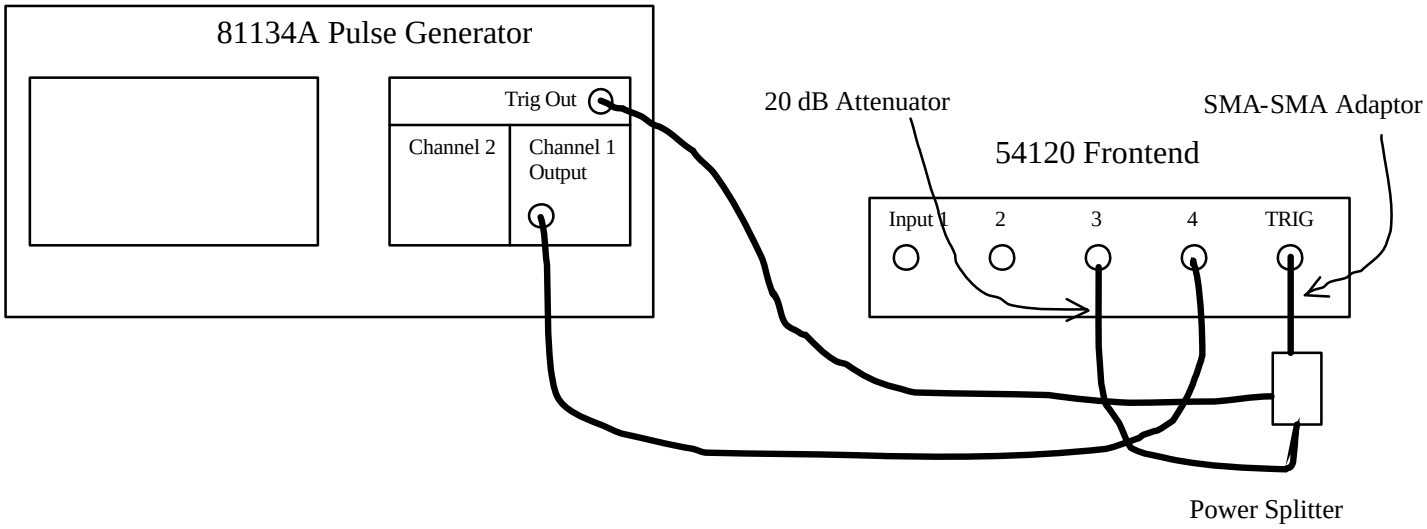
Digitizing Osccilloscope with Accessories

Power Splitter

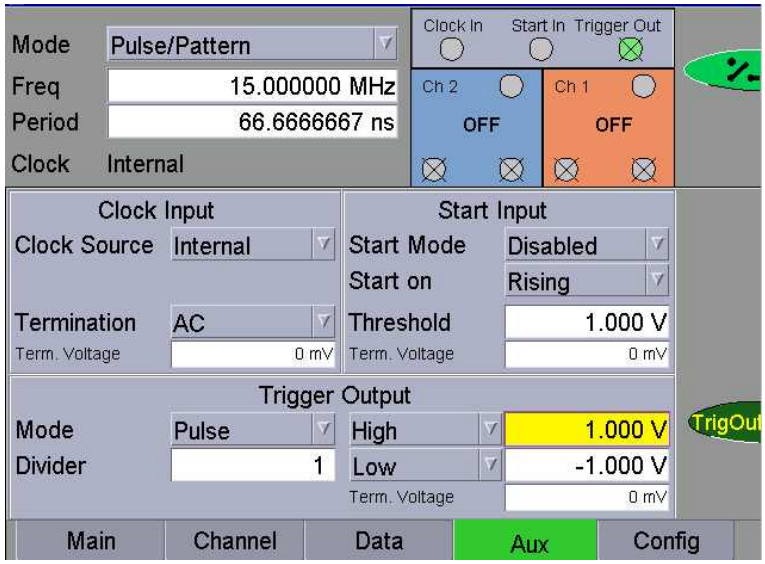
Cables 50 Ω, SMA

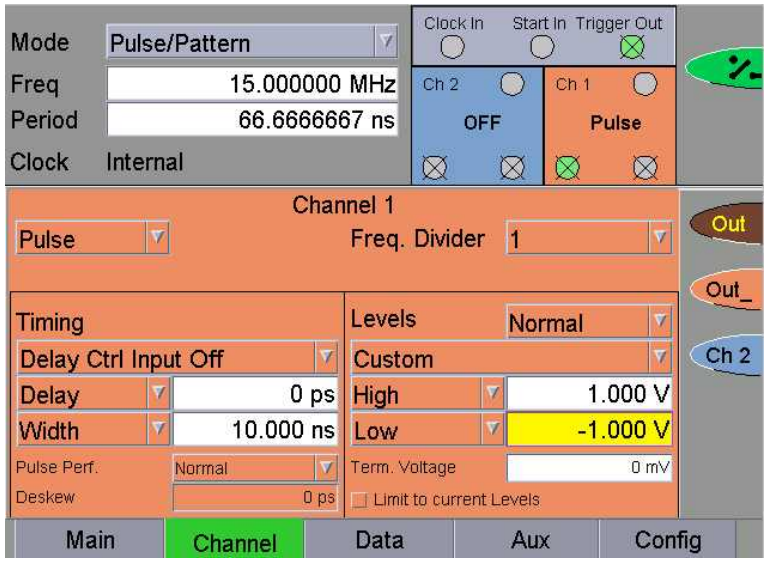
Procedure

1 Connect the 81133A/81134A to the oscilloscope as shown:



2 Set up the Pulse Generator as follows and switch on the trigger and the output channel





On the 81134A set up both channels and switch on only the channel that is being tested.

3 Set the Digitizing Oscilloscope Agilent 54121T:

- Press [AUTOSCALE]
- Set the Timebase to 5 ns/div
- Adjust the Delay to 25 ns
- Select the Display menu and set the screen function to single; set the number of averages to 16
- Select the Delta V menu and switch the Volatge Markers on
- Assign Marker 1 to Channel 3 and Marker 2 to Channel 4
- Set the Preset Levels to 50% - 50% and press Auto Level Set
- Select the Delta t menu and switch the time markers on
- Set START ON EDGE = POS 1 and STOP ON EDGE = POS 1
- Press the [Precise Edge Find] key

4 Record the measured value on the Test Record as the Fixed Delay Δt_0 for the Channel under test

5 Set the 81133A/81134A Delay to 5 ns, then press [CLEAR DISPLAY] and the [Precise Edge Find] key on the scope

6 Check the Delay at the following settings

Oscilloscope Timebase	Delay	Acceptable Range	TR Entry
200 ps/div	1 ns	980 ps to 1.02 ns	3-1
500 ps/div	1.5 ns	1.48 ns to 1.52 ns	3-2
500 ps/div	2 ns	1.98 ns to 2.02 ns	3-3

Larger delays are generated as counted delay. The performance is guaranteed by the design and does not need to be verified.

For the 81134A repeat the test for the second channel.

Test 4: Jitter

Test Specifications

Random Jitter	< 4 ps RMS
Data Jitter	< 5 ps RMS

Equipment Needed

Digitizing Oscilloscope with Accessories

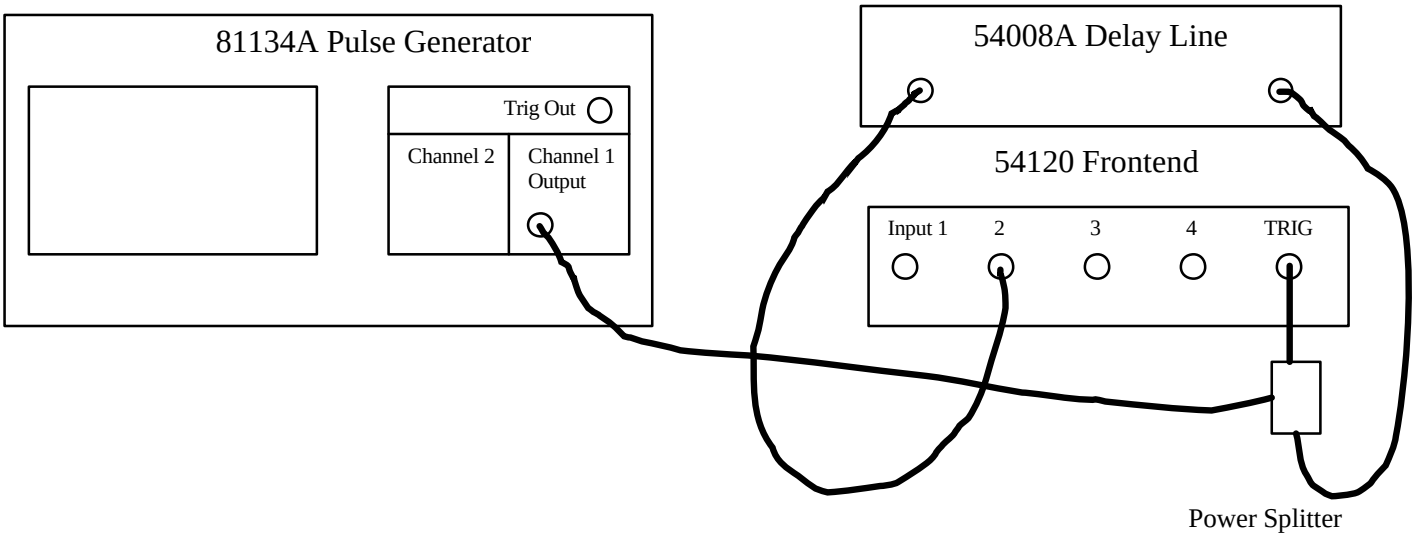
Delay Line

Power Splitter

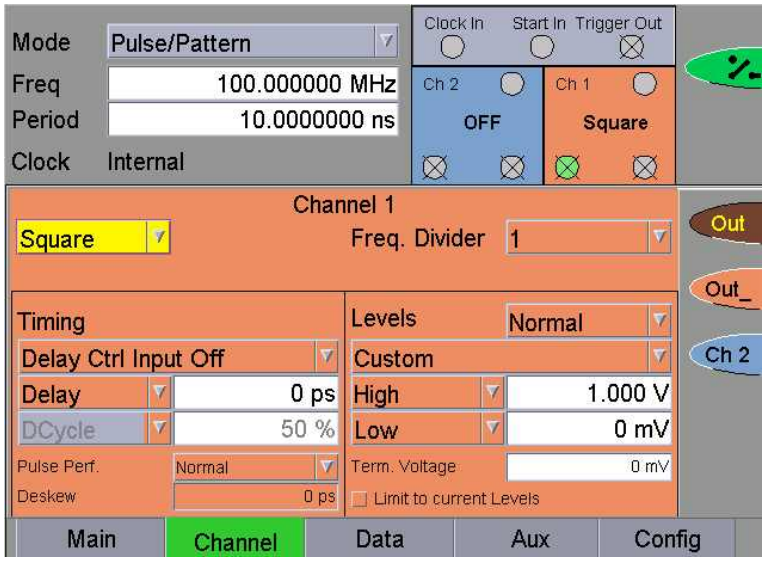
Cables 50 Ω, SMA

Proceure

1 Connect the 81133A/81134A to the oscilloscope as shown



2 Set up the [Channel] screen as follows and switch on the channel



On the 81134A set up both channels and switch on only the channel that is being tested.

3 Set up the Digitizing Oscilloscope Agilent 54121T:

- Press [AUTOSCALE]
- Select the Display menu and set the Number of Averages to 64
- Select the Channel menu and set the Attenuation factor of channel 2 to 2
- Set the VOLTS/DIV of channel 2 to 10 mV/div
- Set OFFSET to 500 mV
- Select the Timebase menu and set the TIME/DIV to 10 ps/div

4 Center the second positive edge of the signal

5 Press [MORE] and [HISTOGRAM]

- Select the Window submenu and set:
- Source is channel 2
- Choose the Time Histogram
- Press [WINDOW MARKER 1] and set it to 490 mV
- Press [WINDOW MARKER 2] and set it to 500 mV

6 Select the Acquire submenu, set the Number of Samples to 1000 and press [START ACQUIRING]

7 After the data for the time histogram has been acquired (#Samples = 100 %) select the Result submenu

8 Press [MEAN] and [SIGMA]. Record the values of sigma as the RMS jitter.

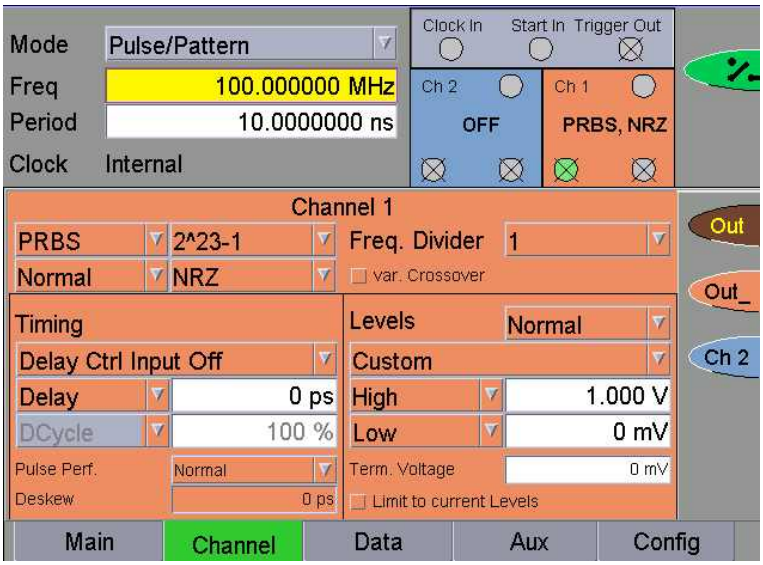
9 Check the jitter at the following frequencies:

Frequency	Acceptable Range	TR Entry
100 MHZ	< 4 ps	4-1
1 GHz	< 4 ps	4-2
2 GHz	< 4 ps	4-3

10 Set the **Channel Frequency Divider** of the 81133A/81134A to 2 and check the clock jitter at 3 GHz. Record the result in TR Entry 4-4.

11 **Data Jitter**

Set up the 81133A/81134A as shown



12 Set up the Digitizing Oscilloscope Agilent 54121T:

- Press [AUTOSCALE]
- Select the Display menu and set the Number of Averages to 64
- Select the Channel menu and set the Attenuation factor of channel 2 to 2
- Set the VOLTS/DIV of channel 2 to 10 mV/div, the OFFSET to 500 mV
- Select the Timebase menu and set the TIME/DIV to 10 ps/div

13 Center a positive edge of the signal

14 Press [MORE] and [HISTOGRAM]

- Select the Window submenu and set:
- Source is channel 2
- Choose the Time Histogram
- Press [WINDOW MARKER 1] and set it to 490 mV
- Press [WINDOW MARKER 2] and set it to 500 mV

15 Select the Acquire submenu, set the Number of Samples to 1000 and press [START ACQUIRING]

16 After the data for the time histogram has been acquired (#Samples = 100 %) select the Result submenu

17 Press [MEAN] and [SIGMA]. Record the values of sigma as the RMS jitter.

18 Check the data jitter at the following frequencies:

Frequency	Acceptable Range	TR Entry
100 MHZ	< 4 ps	4-5
1 GHz	< 4 ps	4-6
2 GHz	< 4 ps	4-7

19 Set the Channel Frequency Divider of the 81133A/81134A to 2 and check the data jitter at 3 GHz. Record the result in TR Entry 4-8.

For the 81134A repeat the tests for channel 2.

Test 5a: High and Low Levels

Test Specifications

Amplitude:	50 mV_{pp} to 2 V_{pp}
Level Window:	-2.00 V to +3.00 V
Level Resolution:	10 mV
Level Accuracy:	2 % of setting ± 20 mV

Equipment needed

Digitzing Voltmeter

50 Ω Feedthrough Termination, 0.1 %, 10 W

BNC to Dual Banana plug

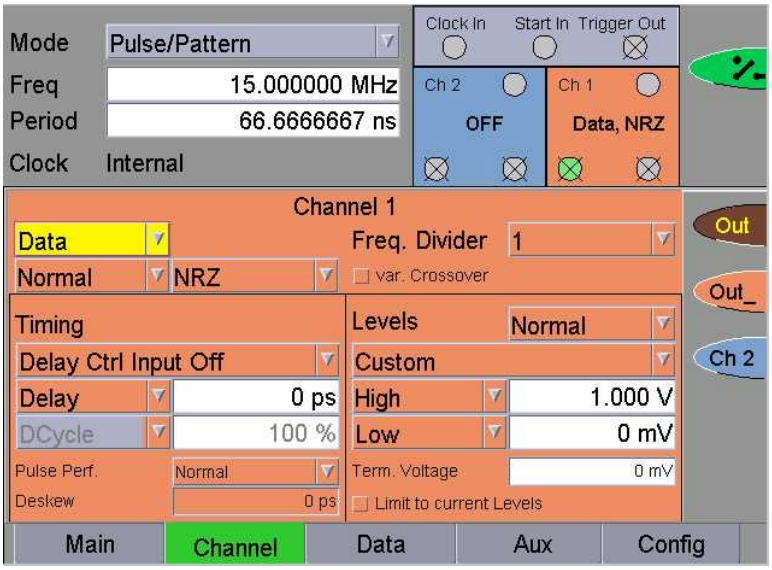
SMA Cables 50 Ω, SMA/BNC Adaptor

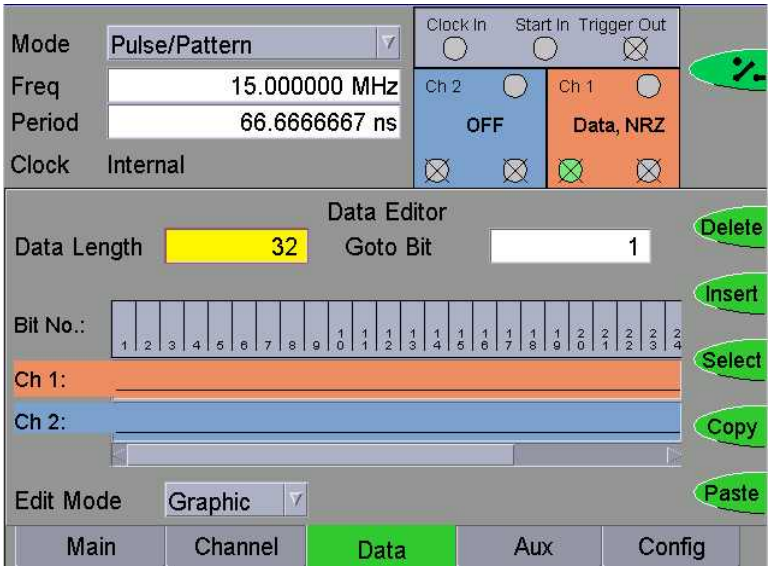
Procedure

1 Connect the 50 Ω Feedthrough Termination to the DVM input, using the BNC to Dual Banana plug

2 Connect the 81133A/81134A channel output to the 50 Ω Feedthrough Termination, using the SMA/BNC adaptor

3 Set up the 81133A/81134A with a "zero" pattern as follows



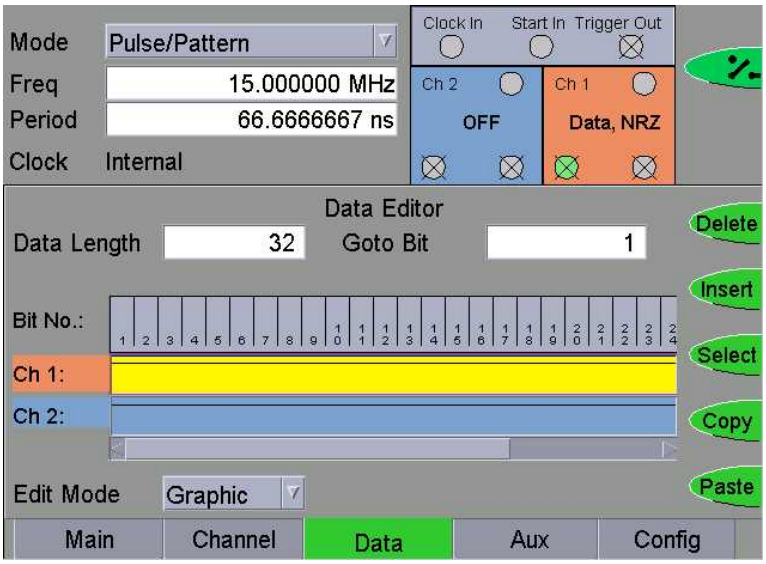


On the 81134A set up both channels and switch on only the channel that is being tested.

4 Switch on the channels and check the low level at the following settings (Program the High Level at least 500 mV larger than the Low Level to be tested)

Low Level	Acceptable Range	TR Entry
- 2.00 V	- 2.06 V to -1.94 V	5-1
-1.00 V	- 1.04 V to -0.96 V	5-2
0 V	- 20 mV to + 20 mV	5-3
1.00 V	0.96 V to 1.04 V	5-4
2.00 V	1.94 V to 2.06 V	5-5

5 Set up a "HI" pattern as follows:



6 Switch on the channel and check the high level at the following settings (Program the Low Level at least 500 mV lower than the High Level to be tested)

High Level	Acceptable Range	TR Entry
-1.00 V	- 1.04 V to -0.96 V	5-6
0 V	- 20 mV to +20 mV	5-7
1.00 V	0.96 V to 1.04 V	5-8
2.00 V	1.94 V to 2.06 V	5-9
3.00 V	2.92 V to 3.08 V	5-10

For the 81134A repeat the test for the second channel.

Test 5b: Amplitude

Test Specifications

Amplitude: 50 mV_{pp} to 2 V_{pp}

Resolution: 10 mV

Accuracy: 2 % of setting ± 20 mV

Equipment needed

Digitzing Voltmeter

50 Ω Feedthrough Termination, 0.1 %, 10 W

BNC to Dual Banana plug

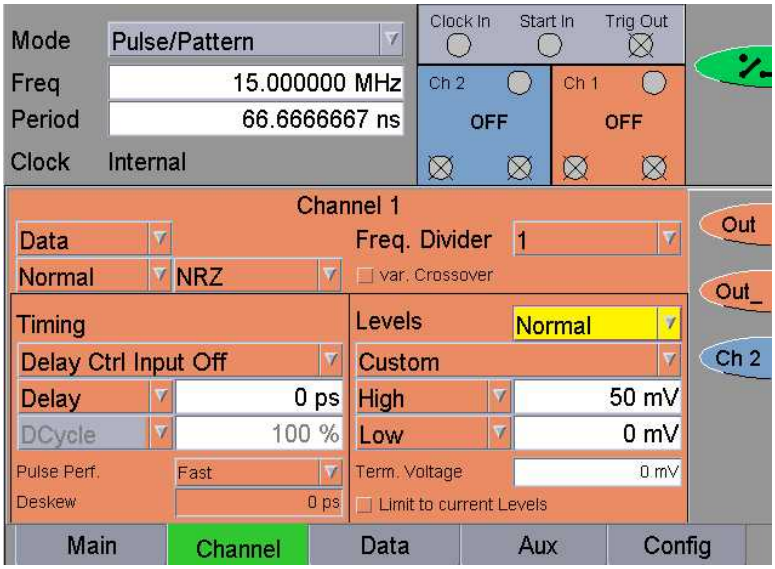
SMA Cables 50 Ω, SMA/BNC Adaptor

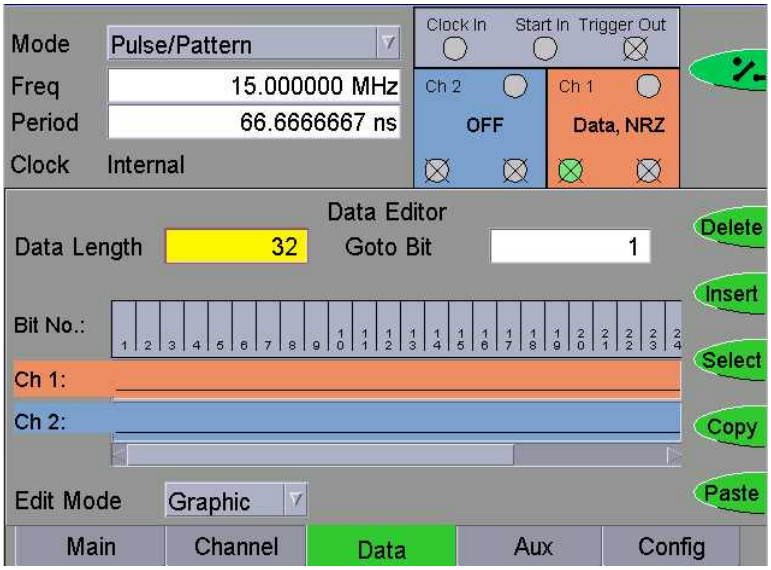
Procedure

1 Connect the 50 Ω Feedthrough Termination to the DVM input, using the BNC to Dual Banana plug

2 Connect the 81133A/81134A channel output to the 50 Ω Feedthrough Termination, using the SMA/BNC adaptor.

3 Set up the 81133A/81134A with a "zero pattern" as follows.





On the 81134A set up both channels and switch on only the channel that is being tested.

4 Write down the measured voltage for the "zero Volt" level.

5 On the "Channel" screen switch to "Inverted" Levels and measure the high level.

6 Calculacte the Amplitude from the measured levels and repeat the test for the following high levels, always measuring additionially the low level as well

High Level	Acceptable Range	TR Entry
50 mV	39 mV to 61 mV	5-11
1.00 V	0.97 V to 1.03 V	5-12
2.00 V	1.95 V to 2.05 V	5-13

For the 81134A repeat the test for the second channel.

Test 6: Transition Times

Test Specifications

Transition Time 10% - 90%	< 90 ps
Transition Time 20% - 80 %	< 60 ps

Equipment Needed

Digitizing Oscilloscope with Accessories

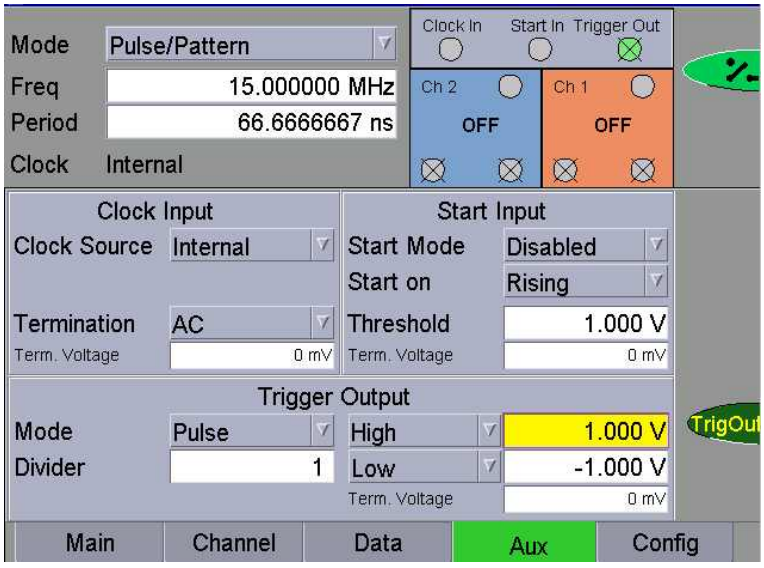
Cable SMA, 50 Ω

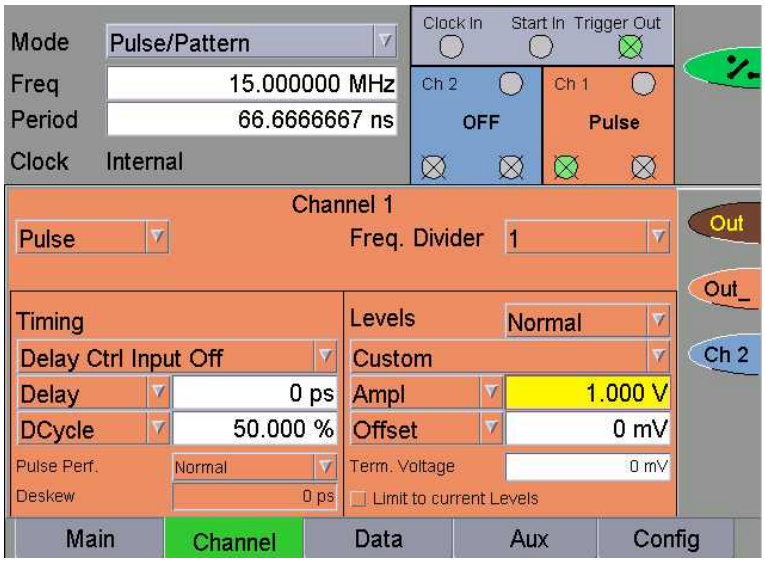
Procedure

1 Connect the 81133A/81134A Trigger Output to the Oscilloscope Trigger Input, using a 20 dB attenuator

2 Connect the 81133A/81134A Channel Output to the Oscilloscope Channel 3 input, using 20 dB attenuator

3 Set up the 81133A/81134A as follows and switch on the channel





On the 81134A set up both channels and switch on only the channel that is being tested.

4 **Rise Time 10% - 90%**

On the Oscilloscope:

- Press [AUTOSCALE]
- Center one pulse on the screen
- Select the Display menu and set the Number of Averages to 32, set the bandwidth to 20 GHz
- Select the Channel menu and set the Attenuation Factor of channel 2 to 10
- Select the Delta V menu and switch on the V markers
- Set the Preset Levels to 10 - 90 % and press Auto Level Set
- Select the Timebase menu and set TIME/DIV = 20 ps/div
- Adjust the delay until a positive edge is centered
- Select the delta t menu and switch on the t markers
- Set START ON EDGE = POS 1 and STOP ON EDGE = POS 1
- Press the Precise Edge Find key

5 Check that the Rise Time 10% - 90% is < 90 ps and record the measured valued in TR entry 6-1

6 **Rise Time 20% - 80 %**

On the Oscilloscope

- Select the Timebase menu and set TIME/DIV to 5 ns/div
- Select the Delta V menu and set the Preset Levels to 20% - 80%, press Auto Level Set
- Select the Timebase menu and set TIME/DIV to 20 ps/div
- Adjust the delay until a positive edge is centered
- Select the Delta t menu and press the Precise Edge Find key

7 Check that the Rise Time 20% - 80% is < 60 ps and record the measured valued in TR entry 6-2

8 **Fall Time 20% - 80 %**

On the Oscilloscope

- Select the Timebase menu and adjust the delay until a negative edge is centered
- Select the Delta t menu and set START ON EDGE = NEG 1 and STOP ON EDGE = NEG 1, press the Precise Edge Find key

9 Check that the Fall Time 20% - 80% is < 60 ps and record the measured valued in TR entry 6-3

10 **Fall Time 10% - 90 %**

On the Oscilloscope

- Select the Timebase menu and set TIME/DIV to 5 ns/div
- Select the Delta V menu and change the Preset Levels to 10% - 90%, press Auto Level Set
- Select the Timebase menu and set TIME/DIV to 20 ps/div
- Select the Delta t menu and press the Precise Edge Find key

11 Check that the Fall Time 10% - 90% is < 90 ps and record the measured valued in TR entry 6-4

For the 81134A repeat the test for channel 2.

Test 7: Overshoot and Ringing

Test Specifications

Overshoot, Ringing < 10 % ± 10 mV

Equipment Needed

Digitizing Oscilloscope with Accessories

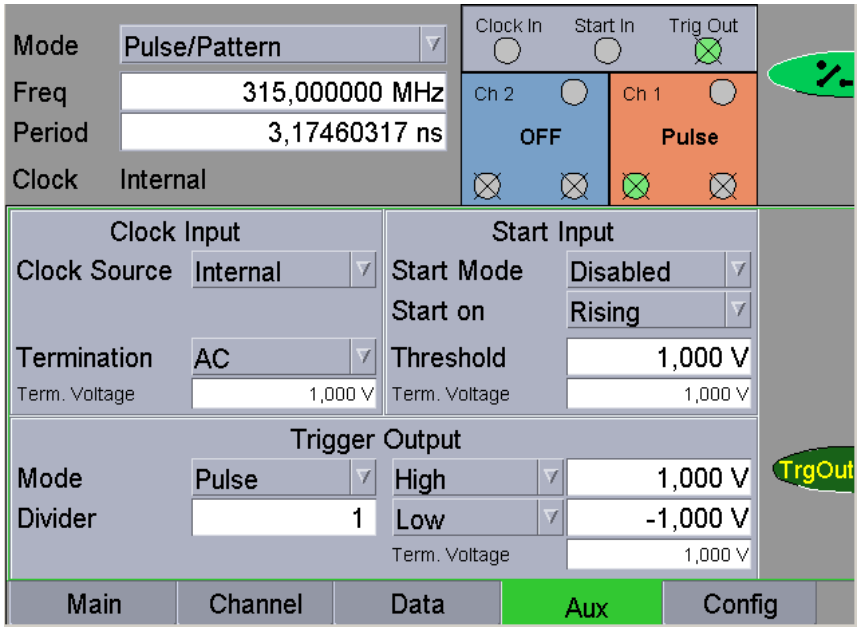
Cable SMA, 50 Ω

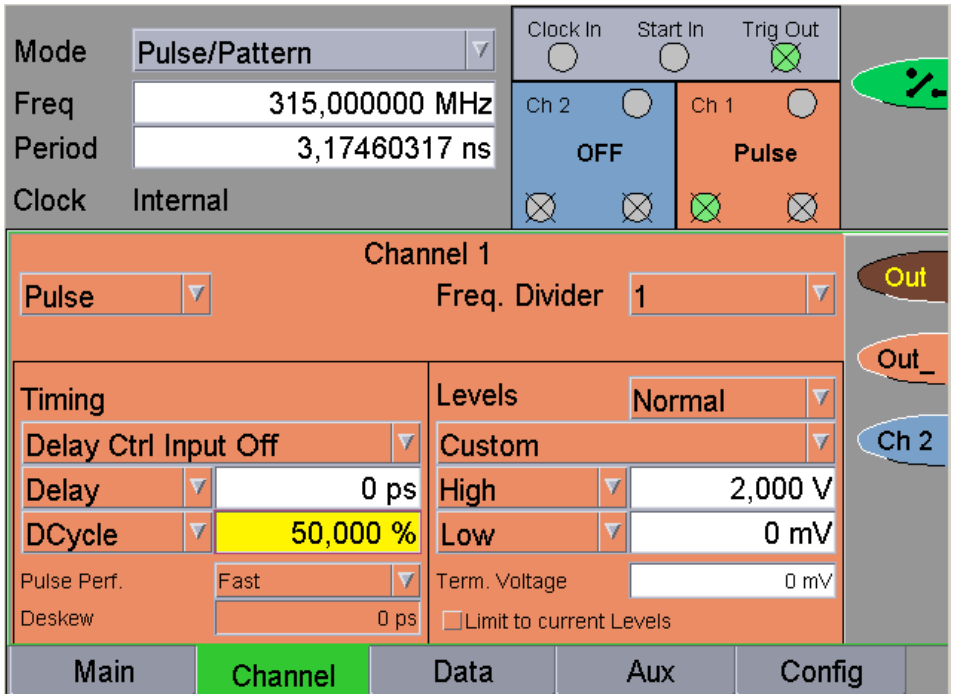
Procedure

1 Connect the 81133A/81134A Trigger Output to the Oscilloscope Trigger Input, using a 20 dB attenuator

2 Connect the 81133A/81134A Channel Output to the Oscilloscope Channel 3 input, using 20 dB attenuator

3 Set up the 81133A/81134A as follows and switch on the channel





On the 81134A set up both channels and switch on only the channel that is being tested.

4 On the Oscilloscope:

- Press [AUTOSCALE]
- Select the Display menu and set the Number of Averages to 64
- Select the Timebase menu and set TIME/DIV to 2 ns/div
- Select the Delta V menu and switch on the V markers
- Set the Preset Levels to Variable Levels and set the Variable Levels to 90 % and 110 %
- Press Auto Level Set
- Select the Timebase menu and set the TIME/DIV to 500 ps/div
- Adjust the delay to center the positive edge
- Select the Channels menu and set the channel 3 offset to 0.95 V
- Set VOLTS/DIV to 200 mV/div

5 Check that the Overshoot of the positive edge is within the ± 10 % of the amplitude limits and record the result in TR Entry 7-1

6 **Negative Edge Overshoot**

On the Oscilloscope

- Select the Channels menu and set the channel 3 Offset to 0 V and VOLTS/DIV to 500 mV/div
- Select the Timebase menu and set the Variable Levels to -10% and 10%
- Press Auto Level Set
- Select the Timebase menu and set TIME/DIV to 500 ps7div
- Adjust the delay to center the negative edge
- Select the Channels menu and set the channel 3 offset to - 0.95 V
- Set VOLTS/DIV to 200 mV/div

7 Check that the Overshoot of the negative edge is within the ± 10 % of the amplitude limits and record the result in TR Entry 7-2

Important

The maximum specified overshoot is actually ± 10 % ± 10 mV which is ± 220 mV for an amplitude of 2 V. If the Overshoot is noth within the ± 10% of amplitude limits, make a precise measurement against the specification of ± 220 mV.

For the 81134A repeat the test for channel 2.

Agilent Technologies

Performance Verification Test Report
Agilent 81133A/81134A

Date:_____ RMA#:_____

Serial #:_____ Temperature:_____

Technician #:_____ Humidity:_____

Frequency:

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
1-1	15 MHz	14.99925 MHz	_____	15.00075 MHz	Pass ð Fail ð
1-2	50 MHz	49.9975 MHz	_____	50.0025 MHz	Pass ð Fail ð
1-3	100 MHz	99.995 MHz	_____	100.005 MHz	Pass ð Fail ð
1-4	200 MHz	190.990 MHz	_____	200.010 MHz	Pass ð Fail ð
1-5	500 MHz	499.975 MHz	_____	500.025 MHz	Pass ð Fail ð
1-6	1.0 GHz	999.950 MHz	_____	1.00005 GHz	Pass ð Fail ð
1-7	2.0 GHz	1.9999 GHz	_____	2.0001 GHz	Pass ð Fail ð
1-8	3.0 GHz	2.99985 GHz	_____	3.00015 GHz	Pass ð Fail ð
1-9	3.35 GHz	3.34983 GHz	_____	3.35016 GHz	Pass ð Fail ð

Width (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
2-1	100 ps	60 ps	_____	140 ps	Pass ð Fail ð
2-2	500 ps	460 ps	_____	540 ps	Pass ð Fail ð
2-3	1.0 ns	960 ps	_____	1.04 ns	Pass ð Fail ð
2-4	2.0 ns	1.96 ns	_____	2.04 ns	Pass ð Fail ð

Width (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
2-1	100 ps	60 ps	_____	140 ps	Pass ð Fail ð
2-2	500 ps	460 ps	_____	540 ps	Pass ð Fail ð
2-3	1.0 ns	960 ps	_____	1.04 ns	Pass ð Fail ð
2-4	2.0 ns	1.96 ns	_____	2.04 ns	Pass ð Fail ð

Delay (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
Δt_o	0.00 ns	N/A	_____	Fixed Delay	
3-1	1.00 ns	980 ps	_____	1.02 ns	Pass ð Fail ð
3-2	1.50 ns	1.48 ns	_____	1.52 ns	Pass ð Fail ð
3-3	2.00 ns	1.98 ns	_____	2.02 ns	Pass ð Fail ð

Delay (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
Δt_o	0.00 ns	N/A	_____	Fixed Delay	
3-1	1.00 ns	980 ps	_____	1.02 ns	Pass ð Fail ð
3-2	1.50 ns	1.48 ns	_____	1.52 ns	Pass ð Fail ð
3-3	2.00 ns	1.98 ns	_____	2.02 ns	Pass ð Fail ð

Clock Jitter (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
4-1	100 MHz	N/A	_____	4 ps RMS	Pass ð Fail ð
4-2	1.0 GHz	N/A	_____	4 ps RMS	Pass ð Fail ð
4-3	2.0 GHz	N/A	_____	4 ps RMS	Pass ð Fail ð
4-4	3.0 GHz	N/A	_____	4 ps RMS	Pass ð Fail ð

Data Jitter (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
4-5	100 MHz	N/A	_____	5 ps RMS	Pass ð Fail ð
4-6	1.0 GHz	N/A	_____	5 ps RMS	Pass ð Fail ð
4-7	2.0 GHz	N/A	_____	5 ps RMS	Pass ð Fail ð
4-8	3.0 GHz	N/A	_____	5 ps RMS	Pass ð Fail ð

Clock Jitter (Output2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
4-1	100 MHz	N/A	_____	4 ps RMS	Pass ð Fail ð
4-2	1.0 GHz	N/A	_____	4 ps RMS	Pass ð Fail ð
4-3	2.0 GHz	N/A	_____	4 ps RMS	Pass ð Fail ð
4-4	3.0 GHz	N/A	_____	4 ps RMS	Pass ð Fail ð

Data Jitter (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
4-5	100 MHz	N/A	_____	5 ps RMS	Pass ð Fail ð
4-6	1.0 GHz	N/A	_____	5 ps RMS	Pass ð Fail ð
4-7	2.0 GHz	N/A	_____	5 ps RMS	Pass ð Fail ð
4-8	3.0 GHz	N/A	_____	5 ps RMS	Pass ð Fail ð

Low Level (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
5-1	-2.00 V	-2.06 V	_____	-1.94 V	Pass ð Fail ð
5-2	-1.00 V	-1.04 V	_____	-0.96 V	Pass ð Fail ð
5-3	0 V	-20 mV	_____	20 mV	Pass ð Fail ð
5-4	+1.00 V	0.96 V	_____	1.04 V	Pass ð Fail ð
5-5	+2.00 V	1.94 V	_____	2.06 V	Pass ð Fail ð

High Level (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
5-6	-1.00 V	-1.04 V	_____	-0.96 V	Pass ð Fail ð
5-7	0 V	-20 mV	_____	20 mV	Pass ð Fail ð
5-8	+1.00 V	0.96 V	_____	1.04 V	Pass ð Fail ð
5-9	+2.00 V	1.94 V	_____	2.06 V	Pass ð Fail ð
5-10	+3.00 V	2.92 V	_____	3.08 V	Pass ð Fail ð

Low Level (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
5-1	-2.00 V	-2.06 V	_____	-1.94 V	Pass ð Fail ð
5-2	-1.00 V	-1.04 V	_____	-0.96 V	Pass ð Fail ð
5-3	0 V	-20 mV	_____	20 mV	Pass ð Fail ð
5-4	+1.00 V	0.96 V	_____	1.04 V	Pass ð Fail ð
5-5	+2.00 V	1.94 V	_____	2.06 V	Pass ð Fail ð

High Level (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
5-6	-1.00 V	-1.04 V	_____	-0.96 V	Pass ð Fail ð
5-7	0 V	-20 mV	_____	20 mV	Pass ð Fail ð
5-8	+1.00 V	0.96 V	_____	1.04 V	Pass ð Fail ð
5-9	+2.00 V	1.94 V	_____	2.06 V	Pass ð Fail ð
5-10	+3.00 V	2.92 V	_____	3.08 V	Pass ð Fail ð

Amplitude (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
5-11	50 mV	29 mV	_____	71 mV	Pass ð Fail ð
5-12	1.00 V	0.96 V	_____	1.04 V	Pass ð Fail ð
5-13	2.00 V	1.94 V	_____	2.06 V	Pass ð Fail ð

Amplitude (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
5-11	50 mV	29 mV	_____	71 mV	Pass ð Fail ð
5-12	1.00 V	0.96 V	_____	1.043 V	Pass ð Fail ð
5-13	2.00 V	1.94 V	_____	2.06 V	Pass ð Fail ð

Transition Times (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
6-1	Rise 10 / 90	N/A	_____	90 ps	Pass ð Fail ð
6-2	Rise 20 / 80	N/A	_____	60 ps	Pass ð Fail ð
6-3	Fall 20 / 80	N/A	_____	60 ps	Pass ð Fail ð
6-4	Fall 10 / 90	N/A	_____	90 ps	Pass ð Fail ð

Transition Times (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
6-1	Rise 10 / 90	N/A	_____	90 ps	Pass ð Fail ð
6-2	Rise 20 / 80	N/A	_____	60 ps	Pass ð Fail ð
6-3	Fall 20 / 80	N/A	_____	60 ps	Pass ð Fail ð
6-4	Fall 10 / 90	N/A	_____	90 ps	Pass ð Fail ð

Overshoot and Ringing (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
7-1	pos. edge	N/A	_____	± 10 % of ampl. ± 10 mV	Pass Fail
7-2	neg. edge	N/A	_____	± 10 % of ampl. ± 10 mV	Pass Fail

Overshoot and Ringing (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
7-1	pos. edge	N/A	_____	± 10 % of ampl. ± 10 mV	Pass Fail
7-2	neg. edge	N/A	_____	± 10 % of ampl. ± 10 mV	Pass Fail