

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	8493C# 020 8493C# 006	20dB 6 dB
Power Splitter	11667B	
SMS/ SMA (m-m) Adaptor	1250-1159	
SMA(f)/ BNC(m) Adaptor	1250-1700	
SMA Cable	8120-4948	
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)

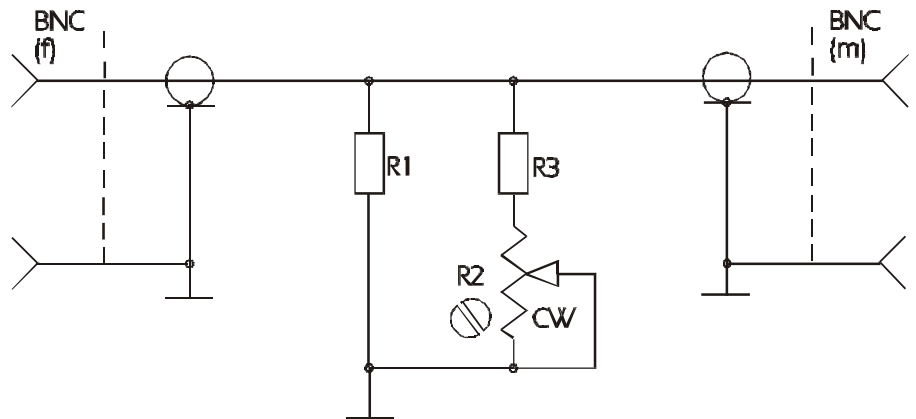
Important:

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:

Mode	Pulse/Pattern	Clock In	Start In	Trigger Out
Freq	15.000000 MHz	Ch 2	Ch 1	
Period	66.6666667 ns	OFF	OFF	
Clock	Internal			
Clock Input		Start Input		
Clock Source	Internal	Start Mode	Disabled	
Termination	AC	Start on	Rising	
Term. Voltage	0 mV	Threshold	1.000 V	
Trigger Output		High	1.000 V	
Mode	Pulse	Low	-1.000 V	
Divider	1	Term. Voltage	0 mV	
Main	Channel	Data	Aux	Config

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- 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 $\pm 10^\circ$

Equipment Needed

Digitizing Oscilloscope with Accessories

Cables 50 Ω , SMA

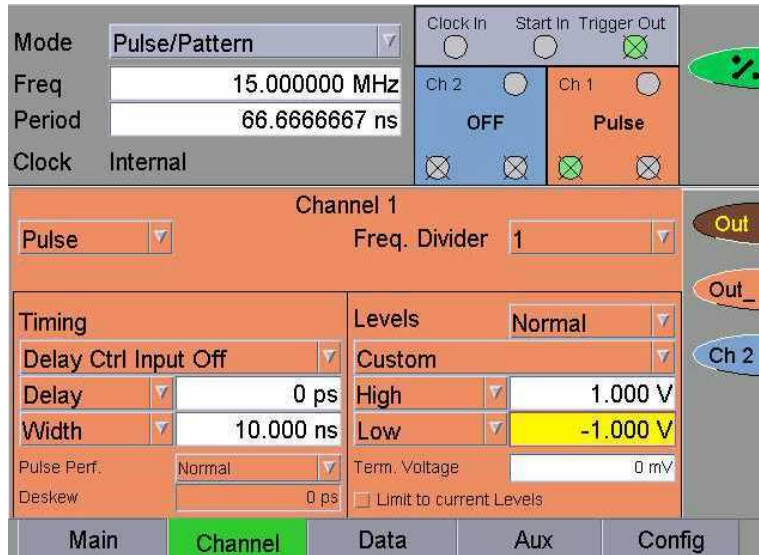
Procedure

- 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:

Mode	Pulse/Pattern	Clock In	Start In	Trigger Out
Freq	15.000000 MHz	Ch 2	Ch 1	
Period	66.6666667 ns	OFF	OFF	
Clock	Internal			
Clock Input		Start Input		
Clock Source	Internal	Start Mode	Disabled	
Termination	AC	Start on	Rising	
Term. Voltage	0 mV	Threshold	1.000 V	
Trigger Output				
Mode	Pulse	High	1.000 V	TrigOut
Divider	1	Low	-1.000 V	
		Term. Voltage	0 mV	
Main	Channel	Data	Aux	Config

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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 $\pm 10^\circ$

Equipment Needed

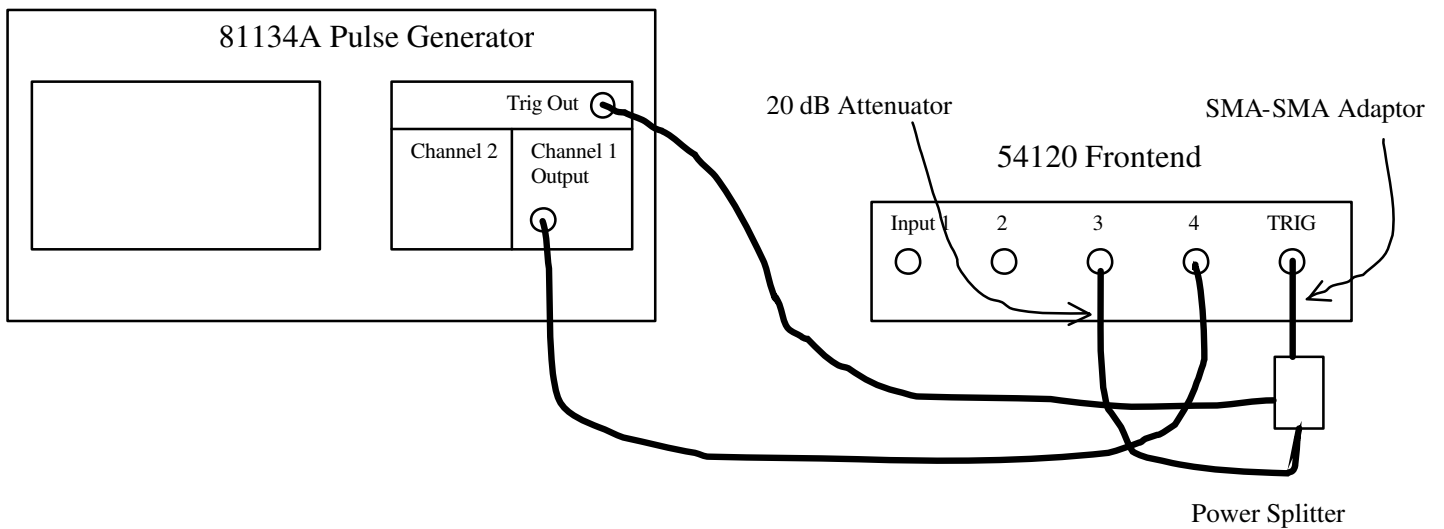
Digitizing Oscilloscope with Accessories

Power Splitter

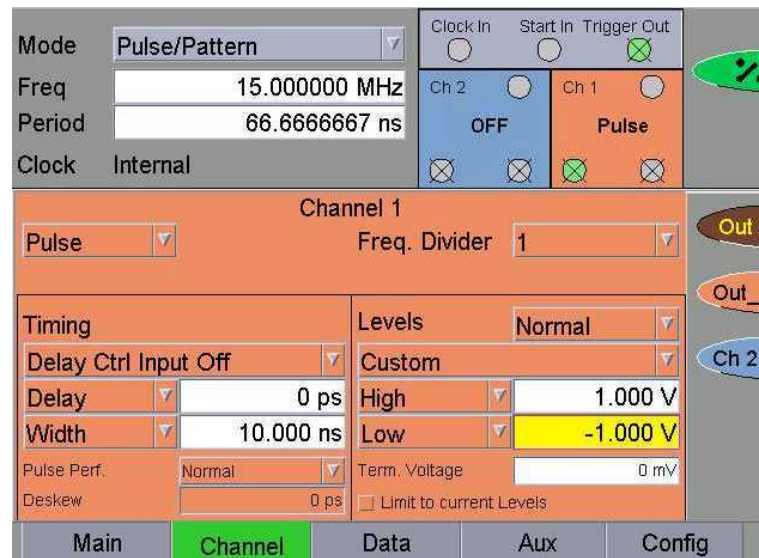
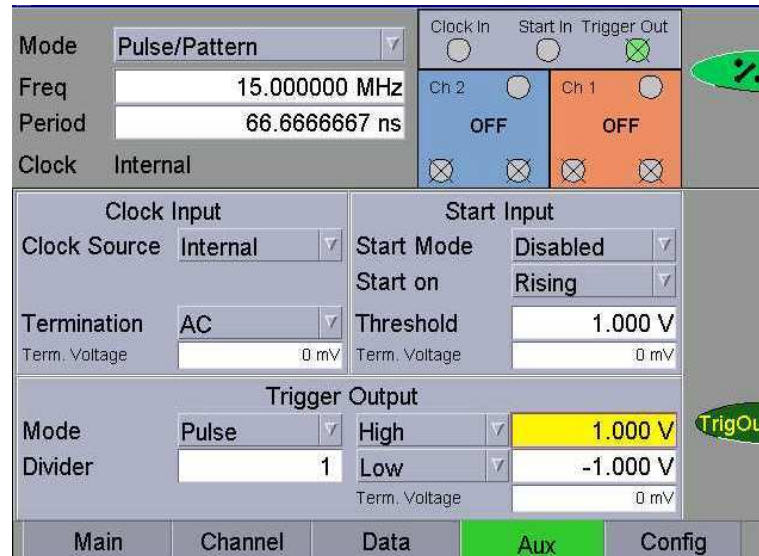
Cables 50 Ω , SMA

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 Voltage 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

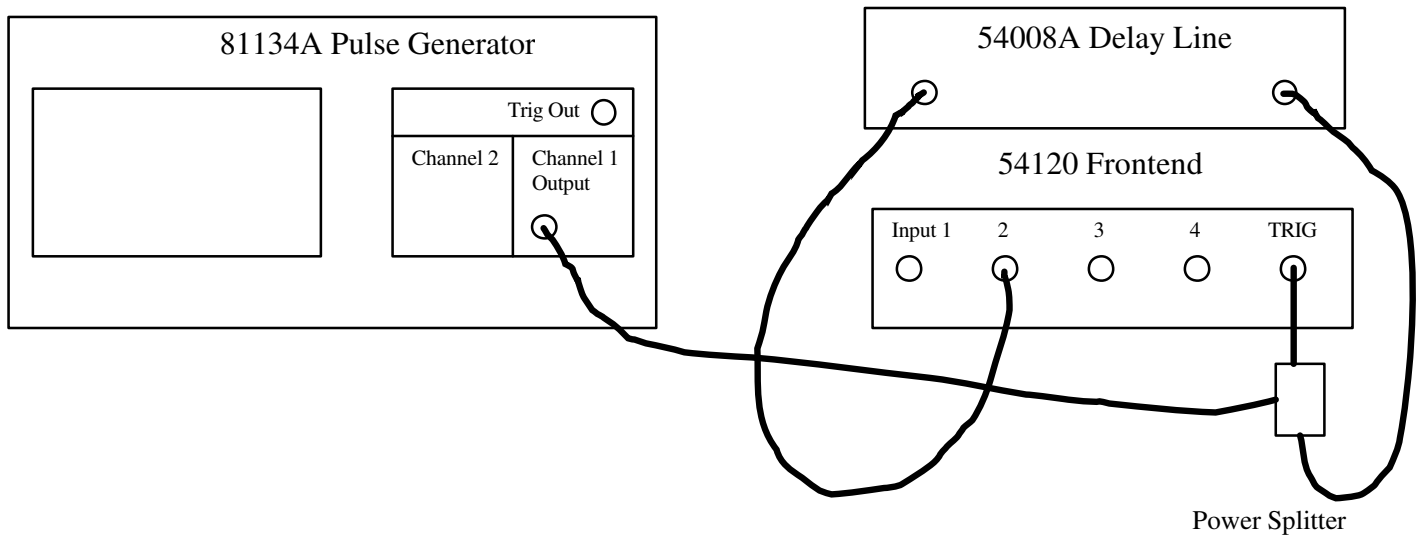
Delay Line

Power Splitter

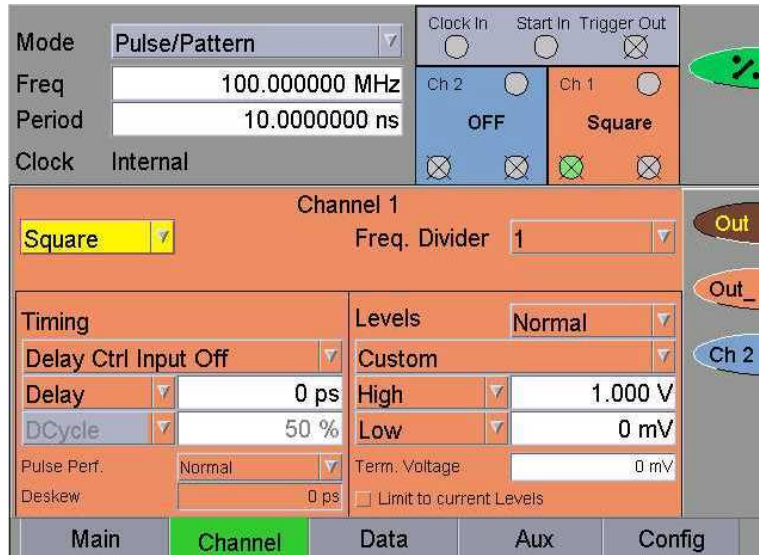
Cables 50 Ω , SMA

Procedure

- 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

The screenshot shows the configuration for Channel 1. The Mode is Pulse/Pattern. The Frequency is 100.000000 MHz and the Period is 10.000000 ns. The Clock is set to Internal. Channel 1 settings include PRBS 2²³-1, NRZ, Freq. Divider 1, Normal levels (High 1.000 V, Low 0 mV), and Delay 0 ps. The Channel tab is selected.

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

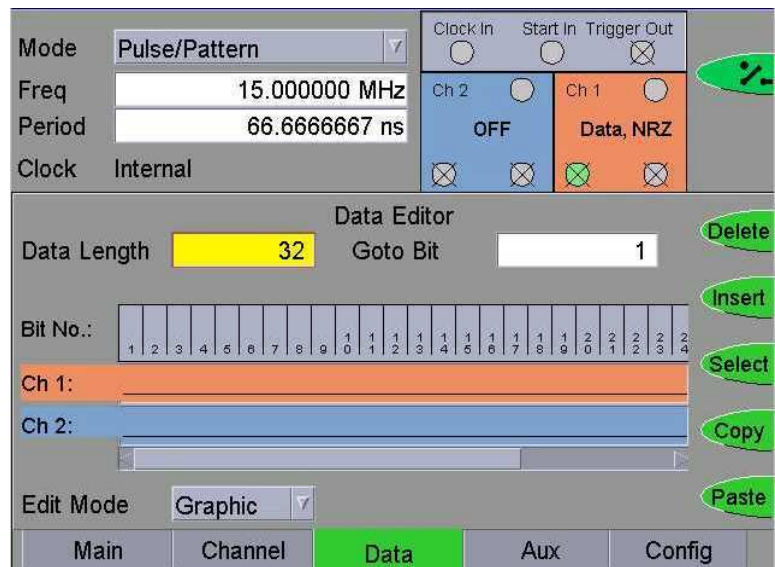
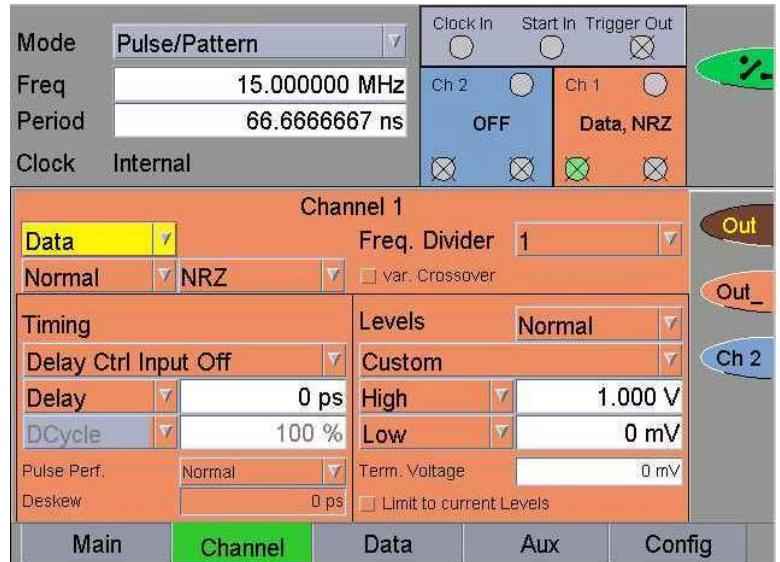
Equipment needed

Digitizing 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

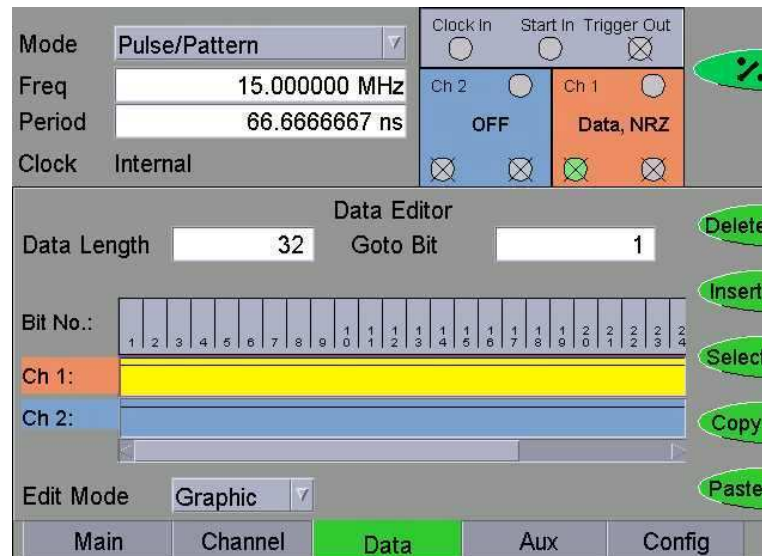


On the 81134A set up both channels and switch on only the channel that is being tested.

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

Digitizing Voltmeter

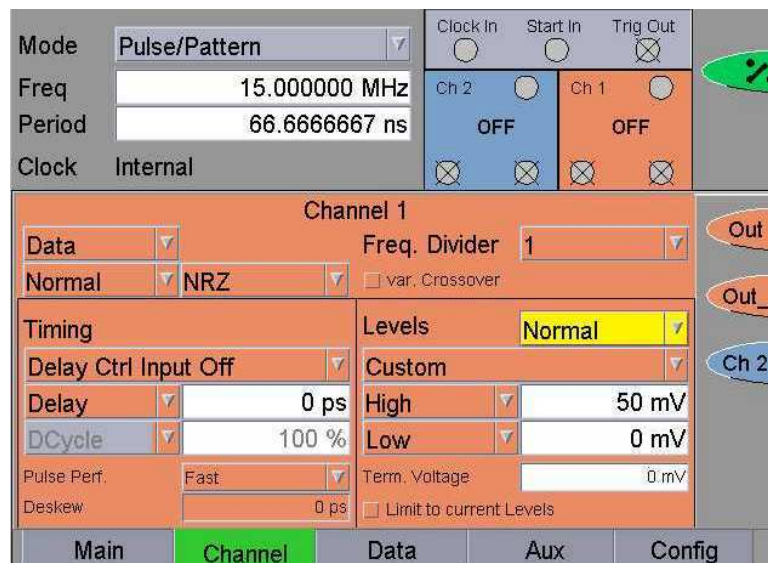
50 Ω Feedthrough Termination, 0.1 % 10 W

BNC to Dual Banana plug

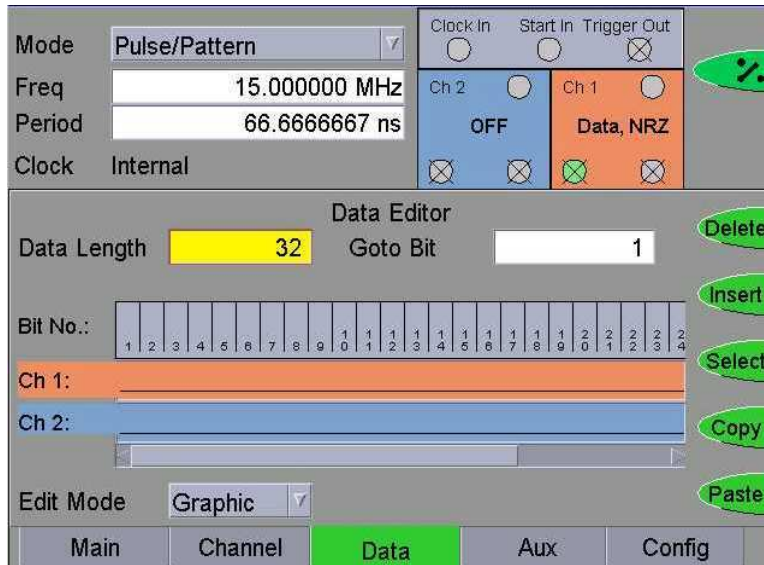
SMA Cables 50 Ω, SMA/BNC Adaptor

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.



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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 Calculate the Amplitude from the measured levels and repeat the test for the following high levels, always measuring additionally 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

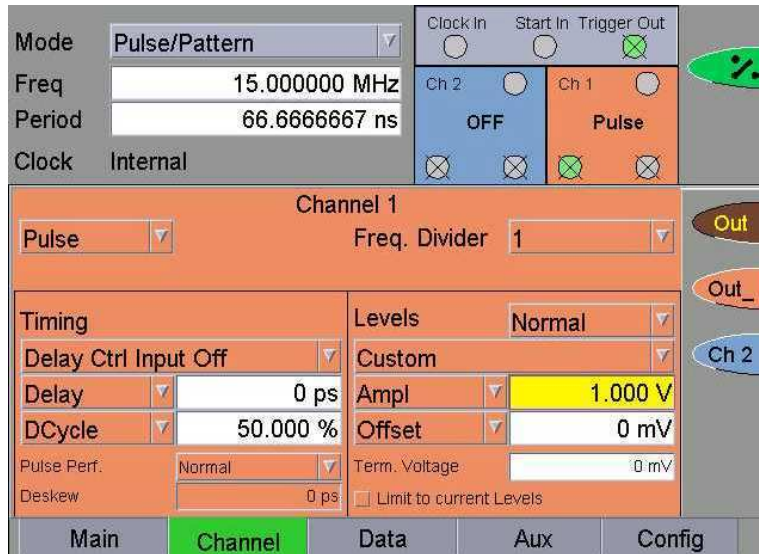
Digitizing Oscilloscope with Accessories

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

Mode	Pulse/Pattern	Clock In	Start In	Trigger Out
Freq	15.000000 MHz	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Period	66.666667 ns	Ch 2	Ch 1	
Clock	Internal	OFF	OFF	
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Clock Input		Start Input		
Clock Source	Internal	Start Mode	Disabled	
Termination	AC	Start on	Rising	
Term. Voltage	0 mV	Threshold	1.000 V	
		Term. Voltage	0 mV	
Trigger Output				
Mode	Pulse	High	1.000 V	
Divider	1	Low	-1.000 V	
		Term. Voltage	0 mV	
Main	Channel	Data	Aux	Config



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 value 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 value 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 value in TR entry 6-4

For the 81134A repeat the test for channel 2.

Test 7: Overshoot and Ringing

Test Specifications

Overshoot, Ringing $< 10 \% \pm 10 \text{ mV}$

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

Mode	Pulse/Pattern	Clock In	Start In	Trig Out
Freq	315,000000 MHz	Ch 2	Ch 1	
Period	3,17460317 ns	OFF	Pulse	
Clock	Internal	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Clock Input		Start Input		
Clock Source	Internal	Start Mode	Disabled	
Termination	AC	Start on	Rising	
Term. Voltage	1,000 V	Threshold	1,000 V	
		Term. Voltage	1,000 V	
Trigger Output				
Mode	Pulse	High	1,000 V	
Divider	1	Low	-1,000 V	
		Term. Voltage	1,000 V	
Main	Channel	Data	Aux	Config

Mode	Pulse/Pattern	Clock In	Start In	Trig Out
Freq	315,000000 MHz	Ch 2	Ch 1	
Period	3,17460317 ns	OFF	Pulse	
Clock	Internal			
Channel 1				
	Pulse	Freq. Divider		1
Timing		Levels		
Delay Ctrl Input	Off	Custom	Normal	
Delay	0 ps	High	2,000 V	
DCycle	50,000 %	Low	0 mV	
Pulse Perf.	Fast	Term. Voltage	0 mV	
Deskew	0 ps	<input type="checkbox"/> Limit to current Levels		
Main	Channel	Data	Aux	Config

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 $\pm 10\%$ 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 ps/div
- 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 $\pm 10\%$ of the amplitude limits and record the result in TR Entry 7-2

Important

The maximum specified overshoot is actually $\pm 10\% \pm 10\text{ mV}$ which is $\pm 220\text{ mV}$ for an amplitude of 2 V. If the Overshoot is not within the $\pm 10\%$ of amplitude limits, make a precise measurement against the specification of $\pm 220\text{ mV}$.

For the 81134A repeat the test for channel 2.



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 Fail
1-2	50 MHz	49.9975 MHz	_____	50.0025 MHz	Pass Fail
1-3	100 MHz	99.995 MHz	_____	100.005 MHz	Pass Fail
1-4	200 MHz	190.990 MHz	_____	200.010 MHz	Pass Fail
1-5	500 MHz	499.975 MHz	_____	500.025 MHz	Pass Fail
1-6	1.0 GHz	999.950 MHz	_____	1.00005 GHz	Pass Fail
1-7	2.0 GHz	1.9999 GHz	_____	2.0001 GHz	Pass Fail
1-8	3.0 GHz	2.99985 GHz	_____	3.00015 GHz	Pass Fail
1-9	3.35 GHz	3.34983 GHz	_____	3.35016 GHz	Pass Fail

Width (Output 1)

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

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 Fail
2-2	500 ps	460 ps	_____	540 ps	Pass Fail
2-3	1.0 ns	960 ps	_____	1.04 ns	Pass Fail
2-4	2.0 ns	1.96 ns	_____	2.04 ns	Pass Fail

Delay (Output 1)

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
Δt_0	0.00 ns	N/A	_____	Fixed Delay	
3-1	1.00 ns	980 ps	_____	1.02 ns	Pass Fail
3-2	1.50 ns	1.48 ns	_____	1.52 ns	Pass Fail
3-3	2.00 ns	1.98 ns	_____	2.02 ns	Pass Fail

Delay (Output 2) only for 81134A

TR Entry	Test	Limit Min.	Actual	Limit Max.	Pass/Fail
Δt_0	0.00 ns	N/A	_____	Fixed Delay	
3-1	1.00 ns	980 ps	_____	1.02 ns	Pass Fail
3-2	1.50 ns	1.48 ns	_____	1.52 ns	Pass Fail
3-3	2.00 ns	1.98 ns	_____	2.02 ns	Pass Fail

Clock Jitter (Output 1)

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

Data Jitter (Output 1)

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

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 Fail
4-2	1.0 GHz	N/A	_____	4 ps RMS	Pass Fail
4-3	2.0 GHz	N/A	_____	4 ps RMS	Pass Fail
4-4	3.0 GHz	N/A	_____	4 ps RMS	Pass Fail

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 Fail
4-6	1.0 GHz	N/A	_____	5 ps RMS	Pass Fail
4-7	2.0 GHz	N/A	_____	5 ps RMS	Pass Fail
4-8	3.0 GHz	N/A	_____	5 ps RMS	Pass Fail

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 Fail
5-2	-1.00 V	-1.04 V	_____	-0.96 V	Pass Fail
5-3	0 V	-20 mV	_____	20 mV	Pass Fail
5-4	+1.00 V	0.96 V	_____	1.04 V	Pass Fail
5-5	+2.00 V	1.94 V	_____	2.06 V	Pass Fail

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 Fail
5-7	0 V	-20 mV	_____	20 mV	Pass Fail
5-8	+1.00 V	0.96 V	_____	1.04 V	Pass Fail
5-9	+2.00 V	1.94 V	_____	2.06 V	Pass Fail
5-10	+3.00 V	2.92 V	_____	3.08 V	Pass Fail

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 Fail
5-2	-1.00 V	-1.04 V	_____	-0.96 V	Pass Fail
5-3	0 V	-20 mV	_____	20 mV	Pass Fail
5-4	+1.00 V	0.96 V	_____	1.04 V	Pass Fail
5-5	+2.00 V	1.94 V	_____	2.06 V	Pass Fail

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 Fail
5-7	0 V	-20 mV	_____	20 mV	Pass Fail
5-8	+1.00 V	0.96 V	_____	1.04 V	Pass Fail
5-9	+2.00 V	1.94 V	_____	2.06 V	Pass Fail
5-10	+3.00 V	2.92 V	_____	3.08 V	Pass Fail

Amplitude (Output 1)

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

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 Fail
5-12	1.00 V	0.96 V	_____	1.043 V	Pass Fail
5-13	2.00 V	1.94 V	_____	2.06 V	Pass Fail

Transition Times (Output 1)

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

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 Fail
6-2	Rise 20 / 80	N/A	_____	60 ps	Pass Fail
6-3	Fall 20 / 80	N/A	_____	60 ps	Pass Fail
6-4	Fall 10 / 90	N/A	_____	90 ps	Pass Fail

Overshoot and Ringing (Output 1)

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