



Certificate of Calibration



14871712

Certificate Page 1 of 2

Instrument Identification

Company ID: 327841
RECLAIM FILTERS & SYSTEMS
RUSS KELLER
1129 HIDDEN HILLS DR
WAKE FOREST, NC 27587

PO Number: 3278

Instrument ID: **B012367**
Manufacturer: TEKTRONIX
Description: OSCILLOSCOPE

Model Number: 2246A
Serial Number: B012367

Certificate Information

Reason For Service: CALIBRATION
Type of Cal: NORMAL
As Found Condition: IN TOLERANCE
As Left Condition: IN TOLERANCE
Procedure: 070-6555-00
Remarks: *Data report attached.*

Technician: SANDRA GRAHAM
Cal Date 05Aug2019
Cal Due Date: 05Aug2021
Interval: 24 MONTHS
Temperature: 21.8 C
Humidity: 52.1 %

Tektronix certifies the performance of the above instrument has been verified using test equipment of known accuracy, which is traceable to the International System of Units (SI), National Metrology Institutes (NIST, NPL, PTB), derived from ratio type measurements, compared to reference materials or recognized consensus standards. The policies and procedures comply with ANSI/NCSL Z540.1-1994. The quality system complies with ISO9001.

This certificate shall not be reproduced, except in full, without the written consent of Tektronix.

Approved By: SANDRA GRAHAM
Service Representative

Issue Date: 8/5/2019

Calibration Standards

<u>NIST Traceable#</u>	<u>Inst. ID#</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Date Due</u>
14697511	06-0208	CALIBRATOR	FLUKE	5520A-SC600	03Jun2019	03Jul2020
14509570	06-0494	CALIBRATOR	FLUKE	5522A-SC1100,PQ	22Mar2019	22Apr2020
14537830REV1	06-0607	TEMP./HUMIDITY PROBE	OMEGA	ITHP-W-6	08Apr2019	08May2020



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14871712

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Calibration Standards

<u>NIST Traceable#</u>	<u>Inst. ID#</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Cal Date</u>	<u>Date Due</u>
14665414	407410002	FUNCTION GENERATOR	AGILENT	33250A	21May2019	21Dec2020

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units
CH 1 Deflection Accuracy								
2 mV	5.00	4.99	Pass	Same	Pass	4.90	5.10	Div
5 mV	4.00	4.01	Pass	Same	Pass	3.92	4.08	Div
10 mV	5.00	5.01	Pass	Same	Pass	4.90	5.10	Div
20 mV	5.00	5.01	Pass	Same	Pass	4.90	5.10	Div
50 mV	4.00	3.99	Pass	Same	Pass	3.92	4.08	Div
100 mV	5.00	4.98	Pass	Same	Pass	4.90	5.10	Div
200 mV	5.00	5.02	Pass	Same	Pass	4.90	5.10	Div
500 mV	4.00	4.01	Pass	Same	Pass	3.92	4.08	Div
1 V	5.00	4.99	Pass	Same	Pass	4.90	5.10	Div
2 V	5.00	5.01	Pass	Same	Pass	4.90	5.10	Div
5 V	4.00	3.99	Pass	Same	Pass	3.92	4.08	Div
CH 2 Deflection Accuracy								
2 mV	5.00	4.90	Pass	Same	Pass	4.90	5.10	Div
5 mV	4.00	3.96	Pass	Same	Pass	3.92	4.08	Div
10 mV	5.00	5.00	Pass	Same	Pass	4.90	5.10	Div
20 mV	5.00	4.99	Pass	Same	Pass	4.90	5.10	Div
50 mV	4.00	3.99	Pass	Same	Pass	3.92	4.08	Div
100 mV	5.00	4.99	Pass	Same	Pass	4.90	5.10	Div
200 mV	5.00	4.99	Pass	Same	Pass	4.90	5.10	Div
500 mV	4.00	3.99	Pass	Same	Pass	3.92	4.08	Div
1 V	5.00	4.99	Pass	Same	Pass	4.90	5.10	Div
2 V	5.00	4.99	Pass	Same	Pass	4.90	5.10	Div
5 V	4.00	3.99	Pass	Same	Pass	3.92	4.08	Div
CH 3 Deflection Accuracy								
.1 V	5.00	5.00	Pass	Same	Pass	4.90	5.10	Div
.5 V	4.00	4.00	Pass	Same	Pass	3.92	4.08	Div
CH 4 Deflection Accuracy								
.1 V	5.00	5.00	Pass	Same	Pass	4.90	5.10	Div
.5 V	4.00	4.00	Pass	Same	Pass	3.92	4.08	Div
Channel 1 Bandwidth 100MHz								
2 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
5 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
10 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
20 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
50 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
100 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
200 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
500 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
1 V	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 2 Bandwidth 100MHz								
2 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
5 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
10 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
20 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
50 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
100 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
200 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
500 mV	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
1 V	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 3 Bandwidth 100MHz								
.1 V	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
.5 V	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 4 Bandwidth 100MHz								
.1 V	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F

Certificate Number: 14871712

Manufacturer: TEKTRONIX
 ID / Asset Number: B012367

Model Number: 2246A
 Calibration Date: 05-Aug-2019

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units
.5 V	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 1 Bandwidth Limit Operation								
BW Limit On	20	18	Pass	Same	Pass	17	23	MHz
Channel 2 Bandwidth Limit Operation								
BW Limit On	20	20	Pass	Same	Pass	17	23	MHz
Common-Mode Rejection Ratio								
BOTH/ADD	≤ 0.6	-0.2	Pass	Same	Pass	No Min	0.8	Div
BOTH	≤ 0.6	-0.2	Pass	Same	Pass	No Min	0.8	Div
Channel 1 Trigger - 500 KHz								
Channel 1 Trigger 500 kHz	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 1 Trigger - 25 MHz								
Channel 1 Trigger 25 MHz	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 1 Trigger - 150 MHz								
Channel 1 Trigger 150 MHz	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 2 Trigger - 500 KHz								
Channel 2 Trigger 500 kHz	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 2 Trigger - 25 MHz								
Channel 2 Trigger 25 MHz	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Channel 2 Trigger - 150 MHz								
Channel 2 Trigger 150 MHz	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units
Sweep Time Accuracy A								
20 ns	0.0	0.5	Pass	Same	Pass	-2.0	2.0	%
50 ns	0.0	0.4	Pass	Same	Pass	-2.0	2.0	%
0.1 us	0.0	0.1	Pass	Same	Pass	-2.0	2.0	%
0.2 us	0.0	0.9	Pass	Same	Pass	-2.0	2.0	%
0.5 us	0.0	-0.2	Pass	Same	Pass	-2.0	2.0	%
1 us	0.0	0.5	Pass	Same	Pass	-2.0	2.0	%
2 us	0.0	-0.4	Pass	Same	Pass	-2.0	2.0	%
5 us	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
10 us	0.0	-0.2	Pass	Same	Pass	-2.0	2.0	%
20 us	0.0	-0.3	Pass	Same	Pass	-2.0	2.0	%
50 us	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
100 us	0.0	-0.3	Pass	Same	Pass	-2.0	2.0	%
200 us	0.0	-0.2	Pass	Same	Pass	-2.0	2.0	%
500 us	0.0	-0.1	Pass	Same	Pass	-2.0	2.0	%
1 ms	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
2 ms	0.0	-0.4	Pass	Same	Pass	-2.0	2.0	%
5 ms	0.0	-0.1	Pass	Same	Pass	-2.0	2.0	%
10 ms	0.0	-0.2	Pass	Same	Pass	-2.0	2.0	%
20 ms	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
50 ms	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
100 ms	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
200 ms	0.0	0.1	Pass	Same	Pass	-2.0	2.0	%
500 ms	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
Sweep Time Linearity A								
20 ns	0.0	-0.6	Pass	Same	Pass	-5.0	5.0	%
50 ns	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
0.1 us	0.0	-1.2	Pass	Same	Pass	-5.0	5.0	%
0.2 us	0.0	-1.0	Pass	Same	Pass	-5.0	5.0	%
0.5 us	0.0	-1.2	Pass	Same	Pass	-5.0	5.0	%
1 us	0.0	-0.9	Pass	Same	Pass	-5.0	5.0	%
2 us	0.0	-0.7	Pass	Same	Pass	-5.0	5.0	%
5 us	0.0	-0.9	Pass	Same	Pass	-5.0	5.0	%
10 us	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
20 us	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
50 us	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
100 us	0.0	-0.7	Pass	Same	Pass	-5.0	5.0	%
200 us	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
500 us	0.0	-0.6	Pass	Same	Pass	-5.0	5.0	%
1 ms	0.0	-0.5	Pass	Same	Pass	-5.0	5.0	%
2 ms	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
5 ms	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
10 ms	0.0	-1.2	Pass	Same	Pass	-5.0	5.0	%
20 ms	0.0	-0.5	Pass	Same	Pass	-5.0	5.0	%
50 ms	0.0	-0.3	Pass	Same	Pass	-5.0	5.0	%
100 ms	0.0	-0.4	Pass	Same	Pass	-5.0	5.0	%
200 ms	0.0	-0.4	Pass	Same	Pass	-5.0	5.0	%
500 ms	0.0	-0.2	Pass	Same	Pass	-5.0	5.0	%

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units
Sweep Time Accuracy A X10								
20 ns	0.0	-0.3	Pass	Same	Pass	-3.0	3.0	%
50 ns	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
0.1 us	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
0.2 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
0.5 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
1 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
2 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
5 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
10 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
20 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
50 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
100 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
200 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
500 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
1 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
2 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
5 ms	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
10 ms	0.0	-0.5	Pass	Same	Pass	-3.0	3.0	%
20 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
50 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
100 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
200 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
500 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
Sweep Time Accuracy B								
20 ns	0.0	-0.2	Pass	Same	Pass	-2.0	2.0	%
50 ns	0.0	-0.3	Pass	Same	Pass	-2.0	2.0	%
0.1 us	0.0	-0.3	Pass	Same	Pass	-2.0	2.0	%
0.2 µs	0.0	-0.3	Pass	Same	Pass	-2.0	2.0	%
0.5 µs	0.0	-0.2	Pass	Same	Pass	-2.0	2.0	%
1 µs	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
2 µs	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
5 µs	0.0	-0.1	Pass	Same	Pass	-2.0	2.0	%
10 µs	0.0	-0.5	Pass	Same	Pass	-2.0	2.0	%
20 µs	0.0	0.0	Pass	Same	Pass	-2.0	2.0	%
50 µs	0.0	0.1	Pass	Same	Pass	-2.0	2.0	%
100 µs	0.0	-0.3	Pass	Same	Pass	-2.0	2.0	%
200 µs	0.0	-0.4	Pass	Same	Pass	-2.0	2.0	%
500 µs	0.0	-0.2	Pass	Same	Pass	-2.0	2.0	%
1 ms	0.0	-0.6	Pass	Same	Pass	-2.0	2.0	%
2 ms	0.0	-0.5	Pass	Same	Pass	-2.0	2.0	%
5 ms	0.0	-0.1	Pass	Same	Pass	-2.0	2.0	%

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units
Sweep Time Linearity B								
20 ns	0.0	-0.9	Pass	Same	Pass	-5.0	5.0	%
50 ns	0.0	-1.1	Pass	Same	Pass	-5.0	5.0	%
0.1 us	0.0	-1.0	Pass	Same	Pass	-5.0	5.0	%
0.2 µs	0.0	-1.0	Pass	Same	Pass	-5.0	5.0	%
0.5 µs	0.0	-1.1	Pass	Same	Pass	-5.0	5.0	%
1 µs	0.0	-0.9	Pass	Same	Pass	-5.0	5.0	%
2 µs	0.0	-0.7	Pass	Same	Pass	-5.0	5.0	%
5 µs	0.0	-0.6	Pass	Same	Pass	-5.0	5.0	%
10 µs	0.0	-0.9	Pass	Same	Pass	-5.0	5.0	%
20 µs	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
50 µs	0.0	-0.8	Pass	Same	Pass	-5.0	5.0	%
100 µs	0.0	-0.5	Pass	Same	Pass	-5.0	5.0	%
200 µs	0.0	-0.5	Pass	Same	Pass	-5.0	5.0	%
500 µs	0.0	-0.5	Pass	Same	Pass	-5.0	5.0	%
1 ms	0.0	-0.6	Pass	Same	Pass	-5.0	5.0	%
2 ms	0.0	-0.9	Pass	Same	Pass	-5.0	5.0	%
5 ms	0.0	-0.6	Pass	Same	Pass	-5.0	5.0	%
Sweep Time Accuracy B X10								
20 ns	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
50 ns	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
0.1 us	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
0.2 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
0.5 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
1 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
2 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
5 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
10 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
20 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
50 µs	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
100 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
200 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
500 µs	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
1 ms	0.0	-0.2	Pass	Same	Pass	-3.0	3.0	%
2 ms	0.0	-0.1	Pass	Same	Pass	-3.0	3.0	%
5 ms	0.0	0.0	Pass	Same	Pass	-3.0	3.0	%
Delay Time Accuracy								
1st	0.000	0.000	Pass	Same	Pass	0.000	0.000	ms
2nd	1.000	0.980	Pass	Same	Pass	0.975	1.025	ms
3rd	2.000	2.010	Pass	Same	Pass	1.970	2.030	ms
4th	3.000	3.000	Pass	Same	Pass	2.965	3.035	ms
5th	4.000	4.030	Pass	Same	Pass	3.960	4.040	ms
6th	5.000	5.020	Pass	Same	Pass	4.955	5.045	ms
7th	6.000	6.030	Pass	Same	Pass	5.950	6.050	ms
8th	7.000	6.970	Pass	Same	Pass	6.945	7.055	ms
9th	8.000	8.020	Pass	Same	Pass	7.940	8.060	ms
10th	9.000	9.010	Pass	Same	Pass	8.935	9.065	ms
X Y Check								
Amplitude	5.00	4.90	Pass	Same	Pass	4.85	5.15	div
Bandwidth 3 MHz	0.00	5.00	Pass	Same	Pass	4.20	No Max	div

Certificate Number: 14871712

Manufacturer: TEKTRONIX
ID / Asset Number: B012367

Model Number: 2246A
Calibration Date: 05-Aug-2019

Function / Range	Nominal Value	As Found	Result	As Left	Result	Min	Max	Units
Measurement Cursors								
Time	1.000	0.990	Pass	Same	Pass	0.975	1.025	ms
1/sec	1.000	1.010	Pass	Same	Pass	0.975	1.025	khz
10th div	100.0	100.1	Pass	Same	Pass	99.3	100.7	Hz
Phase	180.0	179.3	Pass	Same	Pass	177.9	182.1	Deg
Volts	0.500	0.501	Pass	Same	Pass	0.495	0.505	V
Ground volts	0.500	0.504	Pass	Same	Pass	0.495	0.505	V
Tracking	0.000	0.000	Pass	Same	Pass	-0.005	0.005	V
	0.500	0.496	Pass	Same	Pass	0.495	0.505	V
CH 1 DC Volts Accuracy								
mv	0.0	0.1	Pass	Same	Pass	-1.2	1.2	mV
mv	50.0	50.4	Pass	Same	Pass	49.0	51.0	mV
Volts	0.500	0.503	Pass	Same	Pass	0.495	0.505	V
Volts	5.00	5.03	Pass	Same	Pass	4.95	5.05	V
DC Volts normal mode rejection ratio								
Volts	0.000	0.005	Pass	Same	Pass	-0.019	0.019	V
+ Peak - Peak Peak to Peak Volts Accuracy CH 2								
+ Peak	50.0	49.8	Pass	Same	Pass	47.0	53.0	mv
BWL	50.0	49.8	Pass	Same	Pass	47.7	52.3	mv
- Peak	50.0	49.1	Pass	Same	Pass	47.7	52.3	mv
BWL Off	50.0	49.0	Pass	Same	Pass	47.0	53.0	mv
Peak to Peak	50.0	49.2	Pass	Same	Pass	46.5	53.5	mv
+ Peak - Peak Peak to Peak Volts Accuracy CH 2 25MHz								
Peak to Peak	100.0	99.0	Pass	Same	Pass	95.0	105.0	mv
+ Peak	50.0	50.2	Pass	Same	Pass	46.0	54.0	mv
- Peak	50.0	48.4	Pass	Same	Pass	46.0	54.0	mv
+ Peak - Peak Peak to Peak Volts Accuracy CH 2 100MHz								
+ Peak	50.0	42.2	Pass	Same	Pass	34.4	54.0	mv
- Peak	50.0	41.6	Pass	Same	Pass	34.4	54.0	mv
Peak to Peak	100.0	83.4	Pass	Same	Pass	69.7	107.0	mv
gated	0.0	0.0	Pass	Same	Pass	0.0	0.2	div
	50.0	49.1	Pass	Same	Pass	47.0	53.0	mv
	0.0	-0.1	Pass	Same	Pass	-0.5	0.5	mv
External Z Axis input								
Intensity	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Probe Adjust								
Probe Adjust	5.00	4.90	Pass	Same	Pass	4.75	5.25	div
Auto Setup								
Function	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Store Recall								
Function	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F
Make Factory Settings								
Function	Pass	Pass	Pass	Same	Pass	Functional/Visual Check		P/F

Accredited Calibration Datasheets may contain measurements that are not covered by the Scope of Accreditation. These measurements are indicated by a pound sign (#).

Measurements with an (*) indicates an Indeterminate Guardband Pass or Fail - Guardbanding is determined by the Measurement Uncertainty Method

Accredited Calibration Datasheets may contain measurements that are not covered by the Scope of Accreditation. These measurements are indicated by a pound sign(#).

Measurements with an (*) indicates an Indeterminate Guardband Pass or Fail - Guardbanding is determined by the Measurement Uncertainty Method