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How to Calibrate an Tektronix OSC

Date ▲ (https://groups.io/g/TekScopes/topic/7637993?p=Created%2C%2C%2C20%2C2%2C0%2C0%3A%3A%2C%2C%2C0%2C0%2C0%2C7637993)

david_jackson@...

2007-06-07 (https://groups.io/g/TekScopes/message/28879)

There is a fast risetime accessory that is used with the PG506 for the faster scopes- I don't recall the part number. It is a tunnel diode that is triggered by the regular output to get <1ns rise times. The rise time of a 1 GHz scope is 350ps, so you have to be faster than that to accurately characterize the scope risetime without calculations. Generally, the recommendation is 5X faster.

Thanks,

Dave WA4OBJ

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samsagazzzz

2007-06-07 (https://groups.io/g/TekScopes/message/28889)

How much you think that can cost the

an TM504 mainframe + PG506/A Standard Amplitude generator + TG501/A Time mark generator + SG503 250MHz levelled sine wave generator + SG504 1050MHz levelled sine wave generator. ?

im preparing the list of stuff that i need to purchase, for example i write the list of small and cheap connectors

- 2 x 50 ohms BNC Cable 012-0482-00
- 2 x 50 ohms BNC Cable 012-0208-00
- 2 x 50 ohms Feedthrough Termination 011-0049-01
- 2 x Dual Banana to BNC Adapter 103-0090-00
- 2 x BNC T 103-0030-00
- 2 x Coupler Dual-Input 067-0525-02

take these products from 2 of my service manuals. Will read other manual to see if need some other accesories.

I really dont and CANT spend 10.000+ Dollars in equipment, i noticed that the products that recommend tektronix Service Manual are damn expensive (+15k)

i want an alternative an cheap one, but are scared if i purchase via ebay some of the ones that you recommend me and are in bad conditions.

--- In TekScopes@..., "Denis Cobley" <denis.cobley@...> wrote:

The "standard' inside Tek for the last 30 years for manual

calibrations has been a TM504 mainframe + PG506/A Standard Amplitude generator + TG501/A Time mark generator + SG503 250MHz levelled sine wave generator + SG504 1050MHz levelled sine wave generator.

This will allow you to cal scopes up to 1GHz (95% of all scopes out

there).

Most of the manuals would call for this package.

You could opt for the CG5011 + SG5030 + TM5006 mainframe but these

are normally more expensive.

You do get the advantage of programmability if this is needed

(Metcal software can drive these).

This will give you the same capabilities as the other package but

only to 500MHz.

If cost is a real problem you can use a DC power supply and a

multimeter to set levels for vertical cal and a function generator + counter for the timebase and forget the bandwidth tests.

Regards

Denis

From: TekScopes@... [mailto:TekScopes@...]

On Behalf Of samsagazzzz

Sent: Wednesday, 6 June 2007 3:08 PM

To: TekScopes@...

Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

well i need to calibrate some old OSC like 2246 (100mhz) and maybe 2465.

but mainly i want to calibrate 100mhz ones (like 2246).

--- In TekScopes@... <mailto:TekScopes%

40yahoogroups.com> , "Lars Ahlstrom" <lea56@> wrote:

First of all you need to define WHAT oscilloscope you want to

calibrate.

Is it the 500-series, the 400-series, the 5000 series, the 7000

series, the

22xx series, 23xx series, the 34xx series, the TDS series or

maybe

a 200

series handheld?

Depending on what series, the more sophisticated instruments you

need. And,

timing instruments has to be calibrated in turn with a good

timing

normal.

As well as the level calibrator. Has to be calibrated with a good

normal.

One way is to buy a bunch of old super precision instruments and

see if they

all agree on levels / timing values.

If they do, you can bet they are correct within the specs you

need.. (again

depending on what series of scope)

F.ex. I purchased a Racal Dana counter that has a super precise

ovenized

10MHz oscillator. But it's the only one that is not correct of

all

my

frequency counters.. =)

I am thinking of calibrating it with my old Trio counter. Hahaha.

No seriously, one need to calibrate such an instrument and it

costs

some

\$200 to do it. But then you have perfection in house.

Good luck,

Lars

-----Ursprungligt meddelande-----

Från: TekScopes@... <mailto:TekScopes%

40yahoogroups.com> [mailto:TekScopes@...
<mailto:TekScopes%40yahoogroups.com>]

För

samsagazzzz

Skickat: den 6 juni 2007 00:50

Till: TekScopes@... <mailto:TekScopes%

40yahoogroups.com>

Ämne: [TekScopes] How to Calibrate an Tektronix OSC

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Can someone please tellme if exist some text/manual that help

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2007-06-07 [🔗 \(https://groups.io/g/TekScopes/message/28891\)](https://groups.io/g/TekScopes/message/28891)

well i would like to purchase some super precise stuff but dont know which are :)

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För

samsagazzzz

Skickat: den 6 juni 2007 00:50

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samsagazzzz

2007-06-07 <https://groups.io/g/TekScopes/message/28890>

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The automated systems are great for volume - start it up and walk

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come back later and print out the data report / certificate - all

done!

Regards
Denis in Oz

From: TekScopes@... [mailto:TekScopes@...]

On

Behalf Of Johnny Chapman
Sent: Wednesday, 6 June 2007 8:37 PM
To: Tekscopes
Subject: RE: SV: [TekScopes] How to Calibrate an Tektronix OSC

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So, I'd suggest taking a look at the specs of your scope, 2246, a catalog or manual of some of the generators, ... and see what'cha need.

Man, a CG5010 or -5011 can do $\leq 200\text{ps}$ transition times!

Hey, they are all fine instruments; be methodical, and know how much you willing to sacrifice for maintaining those standards, generators,

Also know how good a cal you need, what is most important,

Take care group.

Pinpoint customers who are looking for what you sell.
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Denis Cobley <denis.cobley@...>

2007-06-07 <https://groups.io/g/TekScopes/message/28892>

Hi Sam

I am sure there are a number of guys on this list who may have some spare units that are OK and they want to sell.

If not - try this site - Walter is a good guys and has lots of bits for sale and a lot of good info.

<http://www.sphere.bc.ca/test/index.html> (<http://www.sphere.bc.ca/test/index.html>)

Regards

Denis

From: TekScopes@... [mailto:TekScopes@...] On Behalf Of samsagazzzz
Sent: Friday, 8 June 2007 4:06 PM
To: TekScopes@...
Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

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take these products from 2 of my service manuals. Will read other
manual to see if need some other accesories.

I really dont and CANT spend 10.000+ Dollars in equipment, i noticed
that the products that recommend tektronix Service Manual are damn
expensive (+15k)

i want an alternative an cheap one, but are scared if i purchase via
ebay some of the ones that you recommend me and are in bad conditions.

--- In TekScopes@... <mailto:TekScopes%40yahoogroups.com> , "Denis Cobley" <denis.cobley@...>
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only to 500MHz.

If cost is a real problem you can use a DC power supply and a

multimeter to set levels for vertical cal and a function generator + counter for the timebase and forget the bandwidth tests.

Regards

Denis

From: TekScopes@... <mailto:TekScopes%40yahoogroups.com> [mailto:TekScopes@... <mailto:TekScopes%40yahoogroups.com>]

On Behalf Of samsagazzzz

Sent: Wednesday, 6 June 2007 3:08 PM
To: TekScopes@... <mailto:TekScopes%40yahoogroups.com>
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-----Ursprungligt meddelande-----

Från: TekScopes@... <mailto:TekScopes%40yahoogroups.com> <mailto:TekScopes%

40yahoogroups.com> [mailto:TekScopes@... <mailto:TekScopes%40yahoogroups.com>
<mailto:TekScopes%40yahoogroups.com>]

För

samsagazzzz

Skickat: den 6 juni 2007 00:50

Till: TekScopes@... <mailto:TekScopes%40yahoogroups.com> <mailto:TekScopes%

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Denis Cobleby <denis.cobleby@...>

2007-06-07 [🔗 \(https://groups.io/g/TekScopes/message/28893\)](https://groups.io/g/TekScopes/message/28893)

For scopes that are calibrated manually yes - except you can do scopes up to 1000MHz with the PG+ package.

The Fluke 5500A/SC600 can only do bandwidth to 600MHz (and will cost around \$40,000)

Keep in mind that Tek sold the PG506 and similar modules for \$5,000-10,000 each so in their day they were also expensive.

There are a lot of them around the used market because Tek and other companies have upgraded to the Fluke 9500 or 5500A/SC600 or similar (5520A/SC1100)

Regards

Denis

From: TekScopes@... [mailto:TekScopes@...] On
Behalf Of samsagazzzz
Sent: Friday, 8 June 2007 4:11 PM
To: TekScopes@...
Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

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TM504 you get the same result than using the Fluke 5500A/SC600 ?

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"Denis Coble" <denis.coble@...>
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2 BNC's are for.

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(measured on a 7K sampling system with an S6 head).

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30ps

rise times.

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The automated systems are great for volume - start it up and walk

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Regards

Denis in Oz

From: TekScopes@... <mailto:TekScopes%40yahooogroups.com>

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samsagazzzz

2007-06-10 <https://groups.io/g/TekScopes/message/28908>

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samsagazzzz

2007-06-10 <https://groups.io/g/TekScopes/message/28909>

What about TM506? i noticed that this mainframe support 6 modules!

--- In TekScopes@..., "samsagazzzz" <samsagazzzz@...> wrote:

--- In TekScopes@..., "Denis Coble" <denis.coble@...> wrote:

For scopes that are calibrated manually yes - except you can do

scopes

up to 1000MHz with the PG+ package.

The Fluke 5500A/SC600 can only do bandwidth to 600MHz (and will

cost

around \$40,000)

Keep in mind that Tek sold the PG506 and similar modules for \$5,000-10,000 each so in their day they were also expensive.

There are a lot of them around the used market because Tek and

other

companies have upgraded to the Fluke 9500 or 5500A/SC600 or

similar

(5520A/SC1100)

Regards

Denis

From: TekScopes@...

[mailto:TekScopes@...]

On

Behalf Of samsagazzzz
Sent: Friday, 8 June 2007 4:11 PM
To: TekScopes@...
Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

Sorry for my ignorance Denis, but with PG506 / TG501/ SG503 /

SG504 /

TM504 you get the same result than using the Fluke 5500A/SC600 ?

--- In TekScopes@... <mailto:TekScopes%

40yahoogroups.com> ,

"Denis Cobley" <denis.cobley@>
wrote:

Hi Jonny

The PG506/A can deliver sub 1ns rise/fall times - that's what

the

other

2 BNC's are for.

I have tested several and I have seen some that are around 700ps (measured on a 7K sampling system with an S6 head).

If you have a 7K sampling system with the S52 head you can get

sub

30ps

rise times.

The CG with skewed markers can simulate timebase markers to

2GHz

but

this is no good on a DSO.

Non commercial low budget cal's can be done with good accuracy

using a

DMM / power supply + sig gen / counter - often found on hobby

benches or

amateur radio shacks.

Most non commercial owners don't need to test risetime /

bandwidth

and

adjusting such without good cal gear and knowledge is not

advised.

We use a number of systems in our operation.

A Tek Scopecal fully automated system + Fluke 5500A/SC600 (meter calibrator with scope option) running Metcal, CG5011/SG5030

also

running

Metcal or manually + a couple of PG506 / TG501/ SG503 / SG504 /

TM504

packages.

We find it's horses for courses - 99% of DSO's we do with the

software

based systems - the analogue scopes we do manually.

The automated systems are great for volume - start it up and

walk

away -

come back later and print out the data report / certificate -

all

done!

Regards

Denis in Oz

From: TekScopes@... <mailto:TekScopes%

40yahoogroups.com>

[mailto:TekScopes@... <mailto:TekScopes%

40yahoogroups.com>]

On

Behalf Of Johnny Chapman
Sent: Wednesday, 6 June 2007 8:37 PM
To: Tekscopes
Subject: RE: SV: [TekScopes] How to Calibrate an Tektronix OSC

I may be mistaken, however a CG5011 will give you tests to perform that will allow 2GHz performance in calibrating timebases and the same performance if not better than a PG506/A for amplitude level adjustments, risetime, transient response,

The CG5010 would be a better match; however, a CG5001 or CG551AP would do it also.

Tek CG5 series however lack bandwidth testing facilities (leveled sinewave outputs).

The separates are definitely the way to go most of the time. Just maintaining a CG along with its cal costs are steep. Heads are hard to find and expensive. Extender cards,

If one gets a CG, however, you can pair it with a SG503 or -504, yes the SG5030 or the -5050.

I'm trying to get a CG 551AP/5001 (rise and fall times given as $\leq 1.3\text{ns}$) up and running to pair with an existing SG503. Then I will add an SG504. I've got the heads but need to make some repairs on the CG. For risetime measurements, in particular, I'm awaiting a Tektronix 067-1094-99 Pulse Generator with risetime less than or equal to 400ps.

On a side note, the best risetime figure a PG506/A can do terminated into 50Ohms is 10ns. The risetime of my 2465 DVS (300 MHz) is given as 1.17ns for most of the vertical deflection range.

So, I'd suggest taking a look at the specs of your scope, 2246, a catalog or manual of some of the generators, ... and see what'cha need.

Man, a CG5010 or -5011 can do $\leq 200\text{ps}$ transition times!

Hey, they are all fine instruments; be methodical, and know how much you willing to sacrifice for maintaining those standards, generators,

Also know how good a cal you need, what is most important,

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J Forster <jfor@...>

2007-06-10 <https://groups.io/g/TekScopes/message/28910>

You can use any of the TM-500 mainframes with the TG-501/PG-506/SG-50x, even the TM-501. I've never needed to use more than one of them at a time. The TM-503 and 504 are good choices though. The 504 gives you a slot for a DMM which is nice. The 506 is a bit big to lug around but goes in a rack well.

-John

samsagazzz wrote:

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 samsagazzz

2007-06-11 <https://groups.io/g/TekScopes/message/28917>

if i purchase an CG501 with other modules i think? I found an guy that sell it for 700USD in Ebay.

i can save some bucks in shipping fee if purchase just one equipment from one guy instad purchase the mainframe + 3 or 4 modules :S

--- In TekScopes@..., Johnny Chapman <jones_chap@...> wrote:

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Man, a CG5010 or -5011 can do $\leq 200\text{ps}$ transition times!

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Also know how good a cal you need, what is most important,

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Denis Coble <denis.coble@...>

2007-06-11  (<https://groups.io/g/TekScopes/message/28922>)

Hi Sam

You will need a TM5006 to use that one (leaves room for the SG5030 500MHz levelled sinewave generator or SG503/504 package.

Regards

Denis

From: TekScopes@... [mailto:TekScopes@...] On Behalf Of samsagazzzz
Sent: Monday, 11 June 2007 5:24 PM
To: TekScopes@...
Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

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 samsagazzzz

2007-06-28  (<https://groups.io/g/TekScopes/message/29271>)

Is not possible to use products from other brand like Hewlett Packard ? i was not lucky finding all the modules that i need to calibrate the Tektronix OSC, want to know if purchase some products from HP will be possible.

Regards
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--- In TekScopes@..., "Denis Cobley" <denis.cobley@...> wrote:

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Regards

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On

Behalf Of samsagazzzz
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Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

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Ashton Brown <ashton@...>

2007-06-28  (<https://groups.io/g/TekScopes/message/29274>)

Sam, I think the same 'rules' apply across any brand: the general idea that, you want a signal source to be capable of better accuracy than what you're testing (and hopefully: calibrated by Yet Another Better unit !! so as to achieve its stated accuracy / via suitable precision of calibration.) Seems simple, but

Discretion about the 'simple' scheme is also needed:

for some purposes, a 'standard' need not be better than say, 3-4X of the DUT (device under test.) But where you need to use an instrument (scope) near its limits - you might need a 8-10X-better specification. I'm sorry, but -- "mensuration" (measuring stuff) is concerned with statistical methods and sometimes a lot of math/physics: especially in the last few decimal points.

There's no easy slogan that covers all projects. Remember though, that a scope is a nom. "3%" device, typically. They can be 'tweaked' to achieve ~1% on most Tek.

Crystal timebases (as in some hP units, later Tek models) and outboard counters are what you use <with the scope> --

when 3% isn't good enough. Similarly: any precision DC power supply can verify the accuracy of all the attenuation steps - you don't *need* to use the specific generators, handy as these are.

As to the "levelled" sine wave gens, used to verify bandwidth of a scope:

if you lack one, do remember that you can employ a different approach to this problem -- use of a fast-enough, clean pulse generator and rather simple math, can verify 'Risetime', surely to around "one dB difference" in sinewave terminology, say. The only algebra needed to convert this figure to 'bandwidth' is: a 350 MHz scope will be capable of a "1 nSec rise time." (You can even say it without 'algebra' ;-)

(You use the "square root of the sum-of-the-squares" approach.)

The faster your test pulse, the less the %error, when you "subtract out" the claimed/verified Tr of the pulser itself, since what you see on the scope display IS: The rms (root-mean-square) summation of the various risetimes; those of the generator itself, any cabling mismatches, the scope preamp.. on through final vertical amp and the CRT's own limits.

Finally - I'm not sure where you are heading with all this (?)

It can never/rarely? make economic sense to acquire a complete set of calibration equipment: to calibrate one scope! (even periodically.)

This becomes more certain: the faster the one scope you need calibrated.

Can you borrow, rent a generator or two - or farm out the scope calibration?

See, many regulars here possess truly phenomenal arrays of equipment, personal labs which --10+ years ago -- would have cost \$100K USD (some, much more than that figure - a Spec Analyzer alone could cost 30-60K.) But to repair audio amps, for one example: requires neither this precision nor, much of an array of equipment -- unless you mean to design something with vanishing levels of THD or Intermodulation distortion -- from scratch.

That would make you a fledgling engineer (?) If so: then, carry on collecting neat-o equipment. It's what Engineers Do, especially when it's being given away: like nowadays.

My perhaps too-many- \bar{i}_L $\frac{1}{2}$ worth

Luck,
Ashton

samsagazzzz wrote:

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Behalf Of samsagazzzz
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Denis Cobley <denis.cobley@...> 2007-06-28 (<https://groups.io/g/TekScopes/message/29275>)

Nicely put Ashton

Also if you own that cal gear you need to get it calibrated too - which requires more gear of higher accuracy - called the Traceability chain.

For a one off use a DMM and adjustable power supply for vertical gain - most DMM's have very good specs on DC compared to a scope.

Bandwidth - not important as you either have enough or not.

Timebase - most of the earlier Tek scopes had Calibrator Out functions - the 24XX range could produce crystal accurate outputs from 5Hz to 5MHz - perfect for checking timebases on any scope.

The supply mains is also very accurate compared to a scope to the output from any AC wall wart or LV transformer will give you a good stable 50/60Hz (or 100/120 rectified).

However, if you need to adjust the scope then often you need the right gear.

Tek scopes seldom need adjustment unless repairs have been done to calibrated sections of the scope.

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From: TekScopes@... [mailto:TekScopes@...] On Behalf Of Ashton Brown
Sent: Friday, 29 June 2007 9:19 AM
To: Tekscopes
Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

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 samsagazzz

2007-06-28  (https://groups.io/g/TekScopes/message/29281)

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samsagazzzz wrote:

Is not possible to use products from other brand like Hewlett Packard ? i was not lucky finding all the modules that i need to calibrate the Tektronix OSC, want to know if purchase some

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--- In TekScopes@... <mailto:TekScopes%

40yahoogroups.com> , "Denis Coble" <denis.coble@>

wrote:

Hi Sam

You will need a TM5006 to use that one (leaves room for the

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500MHz levelled sinewave generator or SG503/504 package.

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From: TekScopes@... <mailto:TekScopes%

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<mailto:TekScopes%40yahoogroups.com>]

On

Behalf Of samsagazzzz
Sent: Monday, 11 June 2007 5:24 PM
To: TekScopes@... <mailto:TekScopes%>

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Subject: Re: SV: [TekScopes] How to Calibrate an Tektronix OSC

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from one guy instad purchase the mainframe + 3 or 4 modules :S

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-----< snip >----- save old Tekscope posts

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2007-06-28 <https://groups.io/g/TekScopes/message/29282>

--- Denis Cobleby <denis.cobleby@...> wrote:

Nicely put Ashton

Also if you own that cal gear you need to get it calibrated too - which requires more gear of higher accuracy - called the Traceability chain.

For a one off use a DMM and adjustable power supply for vertical gain - most DMM's have very good specs on DC compared to a scope.

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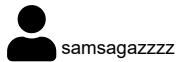
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2007-06-28 <https://groups.io/g/TekScopes/message/29283>

Thanks Ashton, i need to re-read all what you type because my english is not very good, but i understand the mainly of your message, and you are right, i really dont need very good equipment, i just purchasing equipment from USA and sell here in Argentina, im interested in sell the scopes calibrated!, Some times have some faults and i fix it, other times are really non calibrated, i just want to fix it and sell it in good conditions.

Maybe i will waste my money if purchase some calibrator stuff, i mainly want to calibrate less than 400-50mhz scopes, People here just use 100mhz oscilloscopes, and for example noone have tektronix ones, is really strange to see people that have that brand in equipment, here we use all chinese shits. our economy really sux.

--- In TekScopes@..., Ashton Brown <ashton@...> wrote:

Sam, I think the same 'rules' apply across any brand: the general

idea

that, you want a signal source to be capable of better accuracy

than

what you're testing (and hopefully: calibrated by Yet Another

Better

unit !! so as to achieve its stated accuracy / via suitable

precision of

calibration.) Seems simple, but

Discretion about the 'simple' scheme is also needed:
for some purposes, a 'standard' need not be better than say, 3-4X

of the

DUT (device under test.) But where you need to use an instrument

(scope)

near its limits - you might need a 8-10X-better specification. I'm
sorry, but -- "mensuration" (measuring stuff) is concerned with
statistical methods and sometimes a lot of math/physics: especially

in

the last few decimal points.

There's no easy slogan that covers all projects. Remember though,

that a

scope is a nom. "3%" device, typically. They can be 'tweaked' to
achieve ~1% on most Tek's. Crystal timebases (as in some hP units,

later

Tek models) and outboard counters are what you use <with the

scope> --

when 3% isn't good enough. Similarly: any precision DC power

supply can

verify the accuracy of all the attenuation steps - you don't *need*

to

use the specific generators, handy as these are.

As to the "levelled" sine wave gens, used to verify bandwidth of a

scope:

if you lack one, do remember that you can employ a different

approach to

this problem -- use of a fast-enough, clean pulse generator and

rather

simple math, can verify 'Risetime', surely to around "one dB

difference"

in sinewave terminology, say. The only algebra needed to convert

this

figure to 'bandwidth' is: a 350 MHz scope will be capable of a "1

nSec

rise time." (You can even say it without 'algebra' ;-)

(You use the "square root of the sum-of-the-squares" approach.)
The faster your test pulse, the less the %error, when you "subtract

out"

the claimed/verified Tr of the pulser itself, since what you see on

the

scope display IS: The rms (root-mean-square) summation of the

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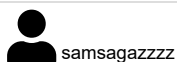
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-----< snip >----- save old Tekscope posts

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2007-06-29 <https://groups.io/g/TekScopes/message/29292>

I have an Fluke too, 189 one, will purchase an power supply soon, but want an good one, and HP or stuff like that, im watching some auctions about it.

Really dont know if my Fluke are out of calibration, i purchased it NEW 3 months ago, i hope that are calibrated.

--- In TekScopes@..., John Chung <kravnus@...> wrote:

--- Denis Cobley <denis.cobley@...> wrote:

Nicely put Ashton

Also if you own that cal gear you need to get it calibrated too - which requires more gear of higher accuracy - called the Traceability chain.

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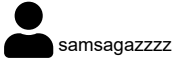
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samsagazzz

I really need again the info about the products that i need to calibrate the osc, i will purchase it this week, but i get my HD crashed where i have stored all the info about the products taht i need :(

i want to spend 1000 to 1500USD

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