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June 01, 2022, 11:36:43 pm

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Topic: Tektronix DPO4104 self test errors. Repair attempt diary (Read 1706 times)

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**analogRF**

Frequent Contributor



Posts: 829

Country:



**Tektronix DPO4104 self test errors. Repair attempt diary**

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« on: September 02, 2020, 02:02:43 am »

I finally received my DPO4104 that currently throws out Acquisition self test errors at power-on and cannot complete SPC.

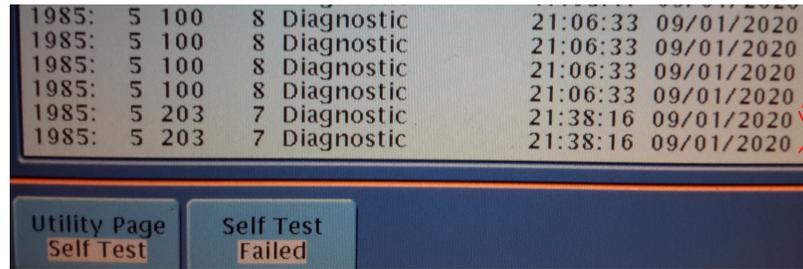
However, the scope seems to work fine on all channels. It shows correct amplitude both with 50 ohm and 1M input on all channels and seems to trigger properly (only checked Edge trigger). In 50 ohm there is a tiny offset which must be normal because the last SPC was run 2 years ago on this unit. So it seems to be working OK but it fails self test and SPC also fails to complete

I have attached a picture of the error log so maybe somebody can help me to figure out what those error codes mean. The first column 1985 is the number of power cycles.

There are 4 identical errors that occur during start up (maybe one for each channel??) and there are two identical errors that appear after running self test

**Anybody has any idea what they could mean?**

By the way, can somebody tell me **where/how I can access the serial debug console** on this machine? Maybe I can get a short description of these errors when they occur.



power on self test fail

Self Test Failed

dpo4104errors.jpg (925.23 kB, 3976x1060 - viewed 315 times.)

« Last Edit: September 04, 2020, 10:07:26 pm by analogRF »

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**analogRF**

Frequent Contributor



Posts: 829

Country:



**Re: Tektronix DPO4104 self test errors. Is there any description available?**

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« Reply #1 on: September 02, 2020, 01:15:04 pm »

by the way my firmware currently is 2.15.  
is that why I cannot see any way to enter a license key or transfer license from app module to scope permanently?

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**analogRF**

Frequent Contributor



Posts: 829

Country:



**Re: Tektronix DPO4104 self test errors. Is there any description available?**

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« Reply #2 on: September 02, 2020, 01:20:27 pm »

I just tried to telnet to the scope as per instructions by "andyturk"  
I can telnet at port 1072 but I cannot connect at port 4000 which enables me to enter manufacturing mode

**anybody knows what port I should be using?**

If I open internet explorer, I can connect to the scope's web page and from there I can send commands to the scope  
but when I enter

Code: [Select]

```
:PASSW INTEKRITY
:MFG:MOD 1
```

**nothing happens, no extra menus appear in Cal menu.** I also tried the same by using USB connection to my laptop and using Keysight Command Expert. I can communicate with the scope but the above commands don't do anything

**is there another mode for DPO4000? or the command is different?**

Report to moderator Logged

**analogRF**

Frequent Contributor



Posts: 829

Country:



**Re: Tektronix DPO4104 self test errors. Is there any description available?**

Say Thanks Reply Quote

« Reply #3 on: September 02, 2020, 01:34:02 pm »

in the DPO4000 backdoor commands published by "tv84" in DPO3000 thread, I can see there is a :MFG:MOD command and also a :DEV:MOD command. But :MFG:MOD 1 didn't do anything for me.

Any hint?

Report to moderator Logged

**analogRF**

Frequent Contributor



Posts: 829

Country:



**Re: Tektronix DPO4104 self test errors. Is there any description available?**

Say Thanks Reply Quote

« Reply #4 on: September 02, 2020, 03:12:05 pm »

OK, some progress here 🤔🧐  
I updated the firmware from 2.15 to the latest 2.68 (probably a dumb thing when the scope is showing Acq errors) but to my surprise the scope passed self tests and also SPC finished successfully 🎉🎉  
I had no explanation, maybe it's been on for a 1.5 hours and warmed up enough to pass or maybe it was because the last SPC was run 2 years ago and now something was corrupted or something and it couldn't pass but after firmware upgrade it completely wiped out the scope and in fact asked me to

run SPC (it showed a huge amount of offset at first start up after upgrade) and it passed and offset is completely gone and several power cycles after that it was still ok.

so I turned it off for about 10min (with a fan blowing at the scope) and when turned back on the self test again fails with the same error codes as before. 🤖🤖🤖🤖

Any idea what I should be looking at? Could it be some Elec caps on the main board are about to die or are bad?

I know it can also be a solder joint but since it is a global thing that affect all 4 channels and also because the scope seems to work fine despite the error, my inclination is that it should be a bad cap perhaps, **any idea is appreciated.**

If I had access to serial console, maybe there was a little bit of info about those errors

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The following users thanked this post: wolffy007

 **analogRF**  
Frequent Contributor  
  
Posts: 829  
Country:   


 **Re: Tektronix DPO4104 self test errors. Is there any description available?**

Say Thanks

Reply

Quote

« Reply #5 on: September 02, 2020, 03:28:19 pm »

on the options enabling side:

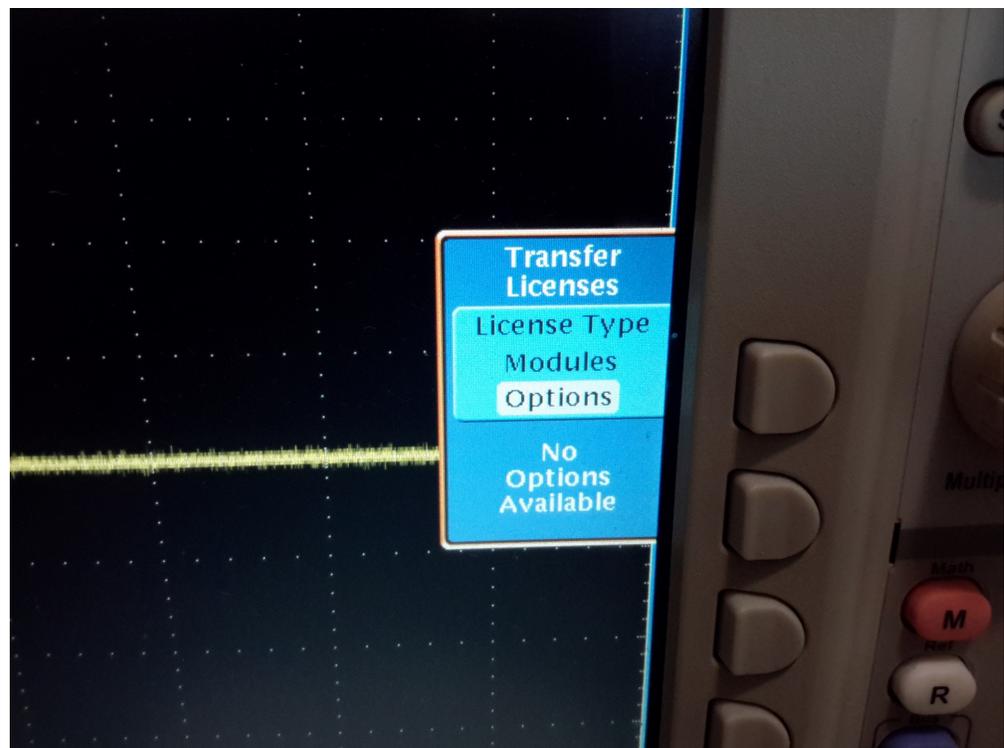
after firmware upgrade, I can now telnet at port 4000 although I dont get a prompt but I can run the PASSW and :MFG:MOD 1 command in there and the command also works on the scopes built in web page. and I get some extra menus although not similar to what andyturk had described for mdo4000. In the menus there is also an Engineering mode that can be turned on and it adds an extra Developer menu to the Utility menu and lots of internals of the scope become accessible 😊😊

anyways, the problem is that there is no place to enter option keys.

Now I do have a menu that enables to transfer options from option module to the scope permanently 🤖 so it seems the only way is to program option module several times and transfer the licenses to the scope. **Is it EXACTLY the same as TDS3000? can somebody confirm this please.**

as you see in the picture below, now there is also a License Type > option menu but then it says No options available (grayed out) and there is no place to enter an option key. Apparently in DPO3000 and MDO4000 one can actually enter an option key.

So my only chance seems to be reprogramming modules and transferring to scope, **any other suggestion is welcome**



 dpo4000.jpg (594.57 kB, 1959x1469 - viewed 189 times.)

« Last Edit: September 02, 2020, 09:06:41 pm by analogRF »

Report to moderator  Logged **analogRF**

Frequent Contributor



Posts: 829

Country:  **Re: Tektronix DPO4104 self test errors. Is there any description available?**

Say Thanks

Reply

Quote

« Reply #6 on: September 02, 2020, 09:12:05 pm »

the scope has been running for quite some time and even though it works (at least I have not found any fault with it yet but I have not done very fancy triggering stuff) and measurements are OK, it still fails self tests with the same errors (see the original post)     

In MFG:MOD 1, I noticed that the **errors refer to U271,U370-B** in the errorlog  

Any idea what I should be checking? The stupid service manual sucks and is useless. Could it be some caps going bad and causing problem just during self tests (and SPC)? Because the scope seems to be working OK...

« Last Edit: September 03, 2020, 01:21:00 am by analogRF »

Report to moderator  Logged **analogRF**

Frequent Contributor



Posts: 829

Country:  **Re: Tektronix DPO4104 self test errors. Is there any description available?**

Say Thanks

Reply

Quote

« Reply #7 on: September 02, 2020, 11:37:07 pm »

I just checked the BW and **all 4 channels show 1.13GHz BW** and can trigger w/o problem up to around 1.6-1.7GHz where it becomes unstable

still cannot figure out what those errors might be doing...

« Last Edit: September 03, 2020, 01:56:50 pm by analogRF »

Report to moderator  Logged **analogRF**

Frequent Contributor



Posts: 829

Country:  **Re: Tektronix DPO4104 self test errors. Is there any description available?**

Say Thanks

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Quote

« Reply #8 on: September 03, 2020, 01:54:33 pm »

ok, so it seems i am only talking to/for myself in here but what the heck...I'll use it as my repair diary for now .

I measured the offset in baseline on all channels at different settings and the results are in the attached picture. The scope settings are also in there.

**I appreciate if someone with a DPO4000 scope can share his/her results.**

Note that the unit did pass SPC once right after I upgraded the firmware but since that it has not been able to finish spc as it fails self test (just like before firmware upgrade) I think that one time was a fluke no pun intended!

Another thing that I noticed is that setting the input to GND does not completely kill the signal    
 it has a high pass behavior

For example on channel 1 (all channels behave **exactly** the same) I tried a 1Vpp signal at 10KHz,10MHz,100MHz with input set to GND50

and GND\_1M. Here are the results  

@10KHz 0 div

@10MHz ~0.4 div (does not change with V/div)

@100MHz ~1.6div for GND50 and ~1div for GND\_1M (no change with V/div)

**can somebody with a DPO4000 share his/her measurements?**

**Still I am not sure if any of these indicate the symptoms of the self test errors though**

as I mentioned, I found out that the **self test errors refer to U271/U370-B**. Anybody has any idea what these chips are?

Is the demux or ADC or something else?

Also when the SPC failed, in :MFG:MOD 1 I can see a broken message in the error log saying this:  
**Ch3 linearity Cal failed max sig re-cente --> it is cut off at the end of the line after cente**

normally you dont get any of these messages in the error log, just a number...

	DC50	DC1M/AC1M	GND50	GND1M
CH1	30uV	100uV	0	0
Ch2	270uV	350uV	0	0
Ch3	400uV	400uV	~40uV	~40uV
Ch4	400uV	500uV	0	0
AVG16	10us/div	1mV/div	100kpnts	1Gs/s

 dcoffset.JPG (39.93 kB, 596x244 - viewed 133 times.)

« Last Edit: September 03, 2020, 02:25:42 pm by analogRF »

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### analogRF

Frequent Contributor



Posts: 829

Country: 



### Re: Tektronix DPO4104 self test errors. Is there any description available?

« Reply #9 on: September 03, 2020, 03:12:23 pm »

Say Thanks

Reply

Quote

I just checked the GND state in a DPO7254 and TDS3054B to compare

in DPO7254, when I set the input to GND, I get a real ZERO no matter what other settings 

in TDS3054B, again there is some leak but less than the DPO4104 and it responds to V/div (so in fact remains a constant pp)

again with a 1Vpp input

@ 10KHz ~ 1mVpp (responds to V/div, so it remains 1mVpp)

@10MHz ~ 6.4mVpp with GND\_1M and ~3.5mVpp with GND50 (responds to V/div)

@100MHz ~11.6mVpp with GND\_1M and ~6.4mVpp with GND50 (responds to V/div)

so the numbers are small and it makes sense that they respond to V/div and remain a fixed Vpp leakage

but **in the DPO4104 under question, I get a quite high leakage that remain fixed number of division on screen no matter what V/div**

does that make sense? can anyone check please?

still I might be chasing a wild goose here...

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### cgz2001

Contributor

Posts: 15

Country: 



### Re: Tektronix DPO4104 self test errors. Is there any description available?

« Reply #10 on: September 04, 2020, 02:54:18 am »

Say Thanks

Reply

Quote

I have a DPO4034. I want to try and help but I'm real busy in the near term and very unfamiliar with telnet. I am following your posts so you aren't talking to yourself . I'll try and take a further look at this soon, possibly this weekend if not tomorrow.

Report to moderator  Logged

### analogRF

Frequent Contributor



Posts: 829

Country: 



### Re: Tektronix DPO4104 self test errors. Is there any description available?

« Reply #11 on: September 04, 2020, 04:42:15 pm »

Say Thanks

Reply

Quote

Here is a picture of the Acq part of the main board in DPO4104.

I think ADC1 (U271) takes care of Ch3&4 and ADC0 (U251) is for Ch1&2 and then there are 4 demux for 4 channels.

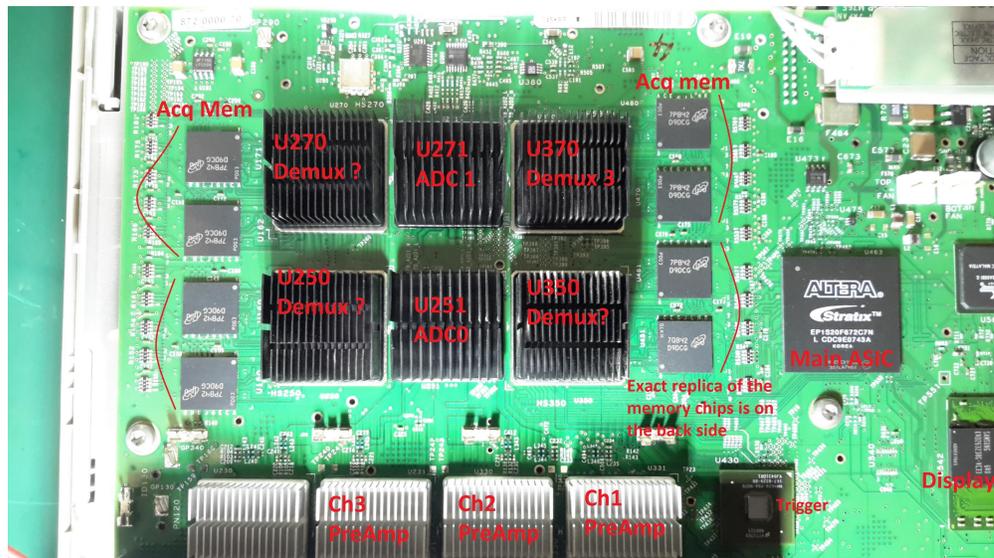
I dont know what U370-B (in my error log) means. **any suggestion?**

The memory chips are Micron MT47H32M16CC-3 revB. I cannot figure out why/how they used these chips and so many of them here?

Each channel has maximum 10MS record length, with 8 bit ADC it is 10MB, right?

But each of these chips is 32M x 16bit and there are 4 of them for each channel, why so much?

besides they could have used the 64Mx8bit configuration but they didn't. **Any explanation of this config is welcome**



dpo4104acq.jpg (1880.01 kB, 3264x1836 - viewed 134 times.)

Pages from D9DCG - MT47H32M16CC-3 revB.pdf (227.81 kB - downloaded 74 times.)

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**analogRF**  
Frequent Contributor



Posts: 829  
Country:



**Re: Tektronix DPO4104 self test errors. Is there any description available?**

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« Reply #12 on: September 04, 2020, 04:51:47 pm »

now, back to my problem, in manufacturing mode and Engineering mode, I ran the self tests and also checked the temperatures

I get those errors that I mentioned before and they refer to U271 (ADC1), U370-B (demux 3)

however, in temp monitor, I noticed that demux0,demux1,demux2 always show 0 but demux3 is hovering around 59C

**maybe demux temp only shows a number if it is above a certain value to indicate a problem?**

all preamps always show 0 even though they are the hottest chips on the board 🤔🤔

ADC0 always shows around 65-67c while ADC1 always shows around 82-83C 🤔🤔

I dont think these numbers are that accurate but the **relative values must be telling something...** **maybe the heatsink is not sitting tight on ADC1?** I had that issues once in an Agilent 6014. Taking off those glued heatsinks is a huge pain in the a\*\*

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**analogRF**  
Frequent Contributor



Posts: 829  
Country:



**Re: Tektronix DPO4104 self test errors. Is there any description available?**

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« Reply #13 on: September 04, 2020, 05:26:55 pm »

**can somebody please check the temp monitor in their DPO4000 and share the results? also the result of GND state measurements in post #8?**

temp monitor appears under self test> warmup timer when you enter the manufacturing mode (can do it easily from the scope built in web page)

« Last Edit: September 04, 2020, 05:45:35 pm by analogRF »

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**analogRF**  
Frequent Contributor



**Re: Tektronix DPO4104 self test errors. Is there any description available?**

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« Reply #14 on: September 04, 2020, 08:55:16 pm »

Posts: 829  
Country:   
 

For those who might be interested, here is the uart console boot log and also the list of debug console commands when you telnet to the scope as per instruction by andytuk in other old threads. notice that the commands are a bit different than MDO4000 that he was playing with. still I have not found the RX pin of UART and need more testing but the boot log has some good information for those who are interested also the self test errors that I am getting are visible near the end of that log.

none of these are of any interest to me at the moment though...I just need to figure out how/if the scope can be repaired to get rid of those errors although it seems to be working...I love its interface, the DPO7254 is THE worst interface ever made by any vendor although the scope itself rocks

-  DPO4000\_tcpip\_cosole\_commands.txt (25.32 kB - downloaded 85 times.)
-  DPO4000\_serial\_console\_boot\_log.txt (4.28 kB - downloaded 111 times.)

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The following users thanked this post: cgz2001

**cgz2001**  
Contributor  
Posts: 15  
Country:   
 

 **Re: Tektronix DPO4104 self test errors. Repair attempt diary**

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« **Reply #15 on:** September 05, 2020, 06:42:47 pm »

DEMUX0: NA DEMUX1: NA DEMUX2: 0 DEMUX3: 51  
TRIGGER:0 DISPLAY: NA mia: 0  
AMP0: 0 AMP1: 0 AMP2: 0 AMP3: 0  
ADC0: NA ADC1: 72 AMBIENT: 48  
Top Fan: 1 Hz Bottom Fan: 1 Hz PS Fan: 1 Hz

I'll look at your other request and get back to you.

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The following users thanked this post: analogRF

**cgz2001**  
Contributor  
Posts: 15  
Country:   
 

 **Re: Tektronix DPO4104 self test errors. Repair attempt diary**

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« **Reply #16 on:** September 05, 2020, 08:03:36 pm »

analogRF, please advise what exact commands did you use to get the log file out of the instrument? I would like to get this information out of my instrument but after a few hours or so studying this I am moving on to your other request.

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**cgz2001**  
Contributor  
Posts: 15  
Country:   
 

 **Re: Tektronix DPO4104 self test errors. Repair attempt diary**

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« **Reply #17 on:** September 05, 2020, 08:49:20 pm »

8 usec / div  
1.25 GS/s  
100k points  
16 Average (Average Mode).  
FULL Bandwidth (350 MHz, not limited to 250 MHz or 20 MHz)

I used a Rigol DG1032 signal generator, which maxed out at 30 MHz.  
I used the mean function on the scope.

All data was rounded up to nearest uV. Largest reading was 42 uV. This scope passed SPC about a half hour before I ran this test. See attachment.

	A	B	C	D	E	F	G
1		10 kHz		10 MHz		30 MHz	
2		1MEG	50 Ohms	1MEG	50 Ohms	1MEG	50 Ohms
3	Ch 1	2	1	2	2	3	2
4	Ch 2	3	7	3	7	3	7
5	Ch 3	35	40	35	42	34	38
6	Ch 4	32	33	31	34	32	33
7	All values in $\mu\text{V}$ (micro Volts)						

 Capture.PNG (8.35 kB, 614x149 - viewed 65 times.)

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The following users thanked this post: analogRF

 **analogRF**

Frequent Contributor



Posts: 829

Country: 



 **Re: Tektronix DPO4104 self test errors. Repair attempt diary**

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« Reply #18 on: September 06, 2020, 03:19:12 am »

**Quote from: cgz2001 on September 05, 2020, 06:42:47 pm**

```
DEMUX0: NA DEMUX1: NA DEMUX2: 0 DEMUX3: 51
TRIGGER:0 DISPLAY: NA mia: 0
AMP0: 0 AMP1: 0 AMP2: 0 AMP3: 0
ADC0: NA ADC1: 72 AMBIENT: 48
Top Fan: 1 Hz Bottom Fan: 1 Hz PS Fan: 1 Hz
```

I'll look at your other request and get back to you.

your scope does not have half of the ADC/Demux chips compared to mine and they run at lower clock frequency as well

so these numbers although inconclusive, but tell me that my temps are perhaps not source of concern. problem must be something else...

I'm gonna open the scope again tomorrow and this time play with the chips, poking at them, pushing them around and spraying with cold spray to see if something changes. I am beginning to think that this is a solder joint issue in one of those BGA chips 🤔 🤔 🤔 🤔

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 **analogRF**

Frequent Contributor



Posts: 829

Country: 



 **Re: Tektronix DPO4104 self test errors. Repair attempt diary**

Say Thanks Reply Quote

« Reply #19 on: September 06, 2020, 03:25:56 am »

**Quote from: cgz2001 on September 05, 2020, 08:49:20 pm**

```
8 usec / div
1.25 GS/s
100k points
16 Average (Average Mode).
FULL Bandwidth (350 MHz, not limited to 250 MHz or 20 MHz)
```

I used a Rigol DG1032 signal generator, which maxed out at 30 MHz.  
I used the mean function on the scope.

All data was rounded up to nearest  $\mu\text{V}$ . Largest reading was 42  $\mu\text{V}$ . This scope passed SPC about a half hour before I ran this test. See attachment.

just to make sure, these are GND state readings on scope when you applied a 1Vpp signal to input, right?

well, these are kick ass and almost close to what I get on my DPO7254 on which I get really zero.

However, there is a caveat and that is the front end of my scope is different than DPO4034 (I think quite a bit). So maybe the results are not comparable but in any scope when you set to GND it should read zero! 🤔

In any case, since I am reading ""exactly"" the same on all channels and the error clearly refers to U271/U370 and also Ch3 fails in SPC, I dont think this is the cause of my self test errors. Besides the scope actually works, so if something catastrophic had happened to all channels causing the relays to blow up, then I should be having lots of issues with the scope I think

« Last Edit: September 06, 2020, 12:48:46 pm by analogRF »

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**darkstar49**  
 Frequent Contributor  
  
 Posts: 293

**Re: Tektronix DPO4104 self test errors. Is there any description available?**

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« Reply #20 on: September 06, 2020, 09:02:28 am »

**Quote from: analogRF on September 02, 2020, 03:28:19 pm**

anyways, the problem is that there is no place to enter option keys.

Now I do have a menu that enables to transfer options from option module to the scope permanently so it seems the only way is to program option module several times and transfer the licenses to the scope. **Is it EXACTLY the same as TDS3000? can somebody confirm this please.**

as you see in the picture below, now there is also a License Type > option menu but then it says No options available (grayed out) and there is no place to enter an option key. Apparently in DPO3000 and MDO4000 one can actually enter an option key.

So my only chance seems to be reprogramming modules and transferring to scope, **any other suggestion is welcome**

I can confirm reprogramming any TDS3 module with the DPO4000 option name and transfer it to the scope works... a bit tedious, although anything but complicated...

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**koziymf**  
 Newbie  
 Posts: 2  
 Country:

**Re: Tektronix DPO4104 self test errors. Repair attempt diary**

Say Thanks Reply Quote

« Reply #21 on: September 06, 2021, 07:52:09 pm »

Do by any chance you know the location of UART RX pin on MDO4000 series?  
 I am trying to debug intermittent hangs on logo screen after the unit being off for 1+ day.

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