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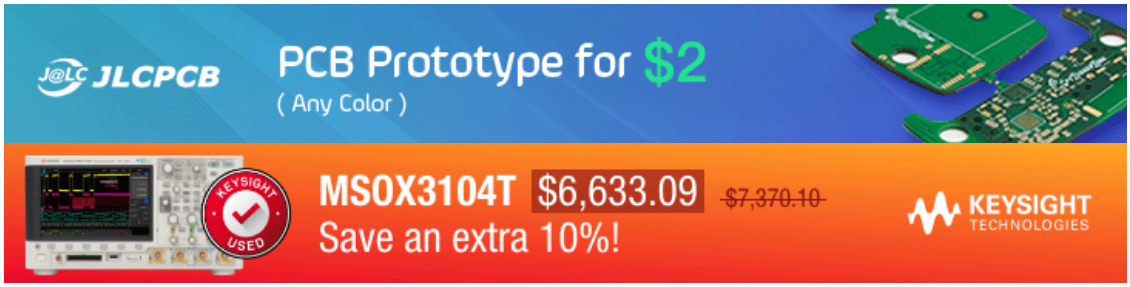

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Author Topic: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2 (Read 35143 times)

volvo_nut_v70 and 0 Guests are viewing this topic.

EEVblog
Administrator

Posts: 28682
Country:

EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **on:** January 02, 2014, 08:23:25 am »

Say Thanks Reply Quote

Part 2
Dave follows a more methodical troubleshooting procedure in order to track down the fault in the Tektronix TDS3054 oscilloscope.
Measuring the low and high frequency differential outputs of the hybrid front end, the voltage rails and other parts. And has the magic smoke escaped?
And he couldn't resist playing with his new Flir E8 thermal imaging camera .

Logged

Monkeh
Super Contributor
Posts: 5747
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #1 on:** January 02, 2014, 09:18:05 am »

Say Thanks Reply Quote

I think I'd probably fix that diode and try swapping ADCs.

Report to moderator Logged

Erwin Ried
Regular Contributor

Posts: 172
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #2 on:** January 02, 2014, 09:28:41 am »

Say Thanks Reply Quote

The "Repair" in the title is usually misleading on the eevblog

Report to moderator Logged

My website: http://ried.cl

sync
Frequent Contributor
Posts: 799
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #3 on:** January 02, 2014, 09:50:39 am »

Say Thanks Reply Quote

I would measure the resistance of the diode (anode and cathode) to the -2.5V rail. Maybe there is a dead short.

Report to moderator Logged

vikpc
Contributor

Posts: 9
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #4 on:** January 02, 2014, 09:56:06 am »

Say Thanks Reply Quote

im think CP140 is Coupler

Report to moderator Logged

trackman44
Regular Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #5 on:** January 02, 2014, 10:00:06 am »

Say Thanks Reply Quote

Quote from: Monkeh on January 02, 2014, 09:18:05 am

> I think I'd probably fix that diode and try swapping ADCs.

Posts: 67
Country:

I would repair the diode first. Then, if that didn't work, reflow all the pins on CH3 ADC. There is the small possibility that a trace on the PCB is cracked, so a continuity check between the hybrid module and ADC, or the ADC and glue logic chip is in order.

Will

Report to moderator Logged

How 'bout them Maple Leafs?

EEVblog
Administrator

Posts: 28682
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #6 on:** January 02, 2014, 10:05:31 am »

Say Thanks Reply Quote

Quote from: trackman44 on January 02, 2014, 10:00:06 am

> There is the small possibility that a trace on the PCB is cracked, so a continuity check between the hybrid module and ADC, or the ADC and glue logic chip is in order.

Checked that, all ok.

Logged

marshallh
Supporter

Posts: 1458
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #7 on:** January 02, 2014, 10:07:29 am »

Say Thanks Reply Quote

The diode pair is probably for input clamping on the diff pair going to the ADC. It is a last ditch defense against some transient blowing the ADC inputs.

I could be wrong, but the fact that it got nuked means somebody probably did something stupid with that input and boogered the ADC itself.
If the ADCs are non-RoHS as they should be, you can swap them with hot air and some swearing.

Report to moderator Logged

Verilog tips
BGA soldering intro

11:37 <@ktemkin> c4757p: marshall has transcended communications media
11:37 <@ktemkin> He speaks protocols directly.

vaualbus
Frequent Contributor

Posts: 296
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #8 on:** January 02, 2014, 10:16:32 am »

Say Thanks Reply Quote

At this point the chances go get it repaired are very few, Although it still be possible to repair it. As far it could also be a calibration data corruption of the channel 3. You could let the scope run spc and see what happen. You need to still check the second most important thigh for the adc, the adc clock. The adcs are syncronized to a clock generated in the board, so if the clock is not perfect it could get some error. It also could be a memory corruption like in my tds540. The diode are securely protection diode. There are more chance to repair the hp dsa at this point. It more probably to be a software problem, try to restore the initial condition and check the nvram production date. It work fine for more than ten year but then fail and could corrupt the calibration data that contain. Also check the bypass capacitor. On my tds540 (it have a similar custom ceramic hybrid for the front end) just for the bad cap the scope not pass spc. I wish to see more videos on both repair. You should also consider the problem to be a board problem like resistor or capacitance.

Probably the center chip is the custom trigger logic and hybrid.
« *Last Edit: January 02, 2014, 10:19:48 am by vaualbus* »

Report to moderator Logged

EEVblog
Administrator

Posts: 28682
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #9 on:** January 02, 2014, 10:37:07 am »

Say Thanks Reply Quote

And for those who have asked, no it's not the voltage rail ripple / decouplers. Looks exactly the same as the other channels.

Logged

Jon86
Frequent Contributor

Posts: 512
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

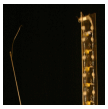
« **Reply #10 on:** January 02, 2014, 10:45:26 am »

As a quick last attempt, maybe stick one of the SOT-23 packages from another channel into channel 3? The voltages on those pins seems really quite strange.

Report to moderator Logged

Death, taxes and diode losses.

mikeselectricstuff
Super Contributor



Posts: 11874
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #11 on:** January 02, 2014, 10:56:28 am »

Scope on the diode on a good channel should tell you if it's for power or for signal clamping

Report to moderator Logged

Youtube channel:Taking wierd stuff apart. Very apart.
Mike's Electric Stuff: High voltage, vintage electronics etc.
Day Job: Mostly LEDs

wn1fju
Regular Contributor

Posts: 194
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #12 on:** January 02, 2014, 11:50:25 am »

I'll relate my recent experiences fixing my Tek TDS350 scope. Even though it is a generation (or two) earlier than the TDS3054, perhaps what happened to me may offer a hint. I had a very flaky second channel that completely disappeared at V/div settings < 50 mV. I stuck an ohmmeter across the BNC input jacks and measured the expected 1M on channel one, but only about 600K on channel #2. On a hunch that maybe there was some voltage present at the jack, I switched the DMM to volts, only to find about 7 VDC coming out of channel #2's BNC. I'm still not sure how since the hybrid preamp daughterboard has Vcc = 5V. Anyway, the 7 volts dropped down significantly with even the slightest load (100K) on it. So my conclusion was that hybrid board #2 was toast. Fortunately, I was able to cheaply procure another one which ultimately fixed the scope. And yes, great fun removing the 45-pin input board! But what I really want to report is that at least in the TDS350, nothing really works correctly until ALL the calibrations have successfully been made (Compensation, Vert, Horiz, Trigger). For instance, even though I thought channel #1 was fine, the variable V/div control was non-functional, the baseline traces were all over the place, the trigger point was incorrect, etc. Even after I cal-ed the Vert, Horiz and Trigger (with the replaced input hybrid #2), it still didn't work right. Only when the final SPC calibration was done did the scope work satisfactorily. While the subject TDS3054's fault may indeed be hardware, keep an eye on the calibration if and when you fix it!

Report to moderator Logged

vikpc
Contributor

Posts: 9
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #13 on:** January 02, 2014, 12:18:34 pm »

> **Quote from: EEVblog on January 02, 2014, 10:37:07 am**
>
> And for those who have asked, no it's not the voltage rail ripple / decouplers. Looks exactly the same as the other channels.

but it marked as CP not a CR... and this CP140 is cracked... this is diffecence from other channels.. i try track wires on your video on both sides..

unfunfortunately youtube HD is not enought for tracing....

Untitled-1.jpg (120.78 kB, 1000x593 - viewed 1205 times.)

Report to moderator Logged

Co6aka

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

Supporter

Posts: 241
Country:

« **Reply #14 on:** January 02, 2014, 12:23:32 pm »

Very unlikely the problem here, but you freeze-misting the thing reminded me of a "one for the books" experience...

The short version: I had an insidious electronic device in for repair several times; each time it worked perfectly on my bench, and would then work for a couple of hours to a couple of days when it was back with its owner. I finally tried freezing it, and lo and behold it would go into reset, but NOT not when it was just sprayed (i.e. "still frozen") As soon as the frost cleared away, "CLICK" -- off it would go. But then after a while it would start working again, and I found that thawing it out with the hair dryer caused an almost immediate "fix." That's when it finally clicked it my mind -- the "reset on clearing frost" feature should have snapped me out of my stupor. So then I tried exhaling on it (I have dog breath, obviously) and of course "CLICK!" it reset. Eureka!!!

SO what was the problem? Well, that insidious device's owner lived at the oceanside, so humidity had deposited a dusting of salt on the PCB, and with a tiny bit of humidity/dampness it became conductive. I cleaned up the PCB real good and applied a conformal coating, and that was the end of that.

Anyway... The "noise" on the screen looks like digital crud getting into the ADC somewhere. Perhaps a bad bypass MLCC somewhere? Or a bad ground? Also, it seems the noise switches polarity at neg-something-Volts -- did you notice that?

(GO TO 06:20 IN YOUR VIDEO. Notice how the noise is only either above or below the injected sine wave.)

« Last Edit: January 02, 2014, 12:39:03 pm by Co6aka »

Report to moderator Logged

Co6aka says, "BARK! and you have no idea how humans will respond."

Hydrawerk

Super Contributor

Posts: 2365
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #15 on:** January 02, 2014, 12:26:56 pm »

The main ASIC is too hot. 100°C is a high temperature. It might be dangerous to operate it without a cooling fan near. And I would expect a heatsink, too. Heatsinks are very common at most scopes today. Agilent DSOX2000, Rigol DS2000, GW Instek GDS-2000A...

Report to moderator Logged

Amazing machines. https://www.youtube.com/user/denha (It is not me...)

jonwilhelmjr

Contributor

Posts: 34
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #16 on:** January 02, 2014, 01:49:14 pm »

This might not be relevant but I noticed something on the HF noise. As a novice comment, Why is the noise respective to a voltage? Why is the noise on the top of the waveform until some negative voltage? BTW is that 1KHz sin AC or DC coupled, does it matter? Then on the square wave, why is the noise not consuming the entire screen? Is there a DSP used in this device, if so what is going into it and coming out. I understand the ADC converts volts at some time to binary, is the Analog signal OK going in to the ADC. Is the AC/DC coupling working right. And last thought how does the waveform look for 1x verse 10x on the scope probe or the setting in the scope. Where i am getting at for this is when the relays will click in and out based off the voltage. More importantly what I am getting at is when does the problem occur based off: sin wave, voltage, time, trig points, complex waves, square wave, saw tooth, or i.e. run a full test or hell cal test (need to do this any how for the other channels).

I can't wait to hear what the more knowledgeable thinks.

Thanks,
Jon

Report to moderator Logged

parbro

Contributor

Posts: 21
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #17 on:** January 02, 2014, 02:10:35 pm »

I would take a look at U330 near the blown diode. The chip is marked A00A and appears to be an LMC7101 5-pin SOT. Maybe whatever took out the diode screwed up the op amp. When you heavily sprayed the channel 3 ADC with coolant the scope showed an offset followed by reduction of high frequency noise.

Report to moderator Logged

free_electron
Super Contributor

Posts: 7101
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #18 on:** January 02, 2014, 03:08:04 pm »

Good, so the hybrid is OK

it looks like the supply voltage for the input stage is out.
so the first stage is running into its limits. hence the 'hair' you see

Parbro may be on to something. i'd check that 5 pin sot23 part too….

Report to moderator Logged

Professional Electron Wrangler.
Any comments, or points of view expressed, are my own and not endorsed , induced or compensated by my employer(s).

calexanian
Super Contributor

Posts: 1861
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #19 on:** January 02, 2014, 03:14:26 pm »

This is a good replacement for the TV shows being on mid season break! Tune in for the next episode of will it be fixed before something happens and it breaks even more! O0

Report to moderator Logged

Charles Alexanian
Alex-Tronix Control Systems

AndyC_772
Super Contributor

Posts: 3400
Country:

Will design for cookies

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #20 on:** January 02, 2014, 06:03:02 pm »

There's a major clue in the first video, in that the trace disappears when you switch from 10k points mode to 500 points mode. What possible reason could there be for that to happen if the fault were with the analogue front-end?

For what it's worth, the dc offset in these scopes is known to be temperature sensitive, so I'm not at all surprised you saw an offset when you blasted the board with freezer spray.

Check on one of your other, working TDS3054s; with no signal applied, the dc level you see isn't 0V until the scope has properly warmed up. I've seen it out by about 1/4 of a grid square on my TDS3034B, but it soon drifts into spec once it's warmed up. It's why you have to wait until the scope has been on for a while before running SPC.

Have you tried running SPC?

Report to moderator Logged

hans
Super Contributor

Posts: 1031
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #21 on:** January 02, 2014, 08:38:41 pm »

I noticed in the first video the trace disappearing when the sample rate was below 2.5MSPS. So with a shorter sample length, the sample rate will be lower because otherwise it will run out of memory before the screen is full. Therefore you had to zoom in more to see the trace again at 2.5MSPS+

How does the 'phosphor' display work on this scope? Is it similar how it's done on the recent scopes, where a ginormous sample buffer is used to store x thousands of small waveforms and that's redrawn with a HW accelerated display engine?

Does the front-end change any mode at these instances? Maybe Tektronix is doing some convoluted things like mixing the LF/HF bands at the hybrid which is going wrong.

Are we also certain about the same function of those SOT23 parts on each channel? We would be seeing the same voltages or configuration, I'd presume, on each channel. If we measure 3.3V/2.5V on 1, it may as well be a tiny 2.5V programmable zener diode reference for all 4 channels, while the others do -2.5V or something.
I don't think it would be a logical placement though.

Report to moderator Logged

babi
Contributor

Posts: 12

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2

Say Thanks Reply Quote

« **Reply #22 on:** January 02, 2014, 09:19:45 pm »

Hi Dave.

I suggest trying these:
-Feeding both a positive and negative DC to the channel 3. It seems it does something different to positive and negative input signals.
-Feeding a sweep from low frequency to the highest frequency you can make. This could reveal whether the problem is with the high frequency components or the low frequency components. I think the problem is with low frequency ones.
-Changing the coupling to GND (I think most scopes will not capture anything in this mode, they just show a straight line on the screen). That has to show a clean signal if the Memory and the Processor are doing fine.

And if you show us the FFT domain of channel 3 while feeding different frequencies, we may find something similar in the frequency domain. I mean if the problem is with the ADC clock, it could appear in the FFT while we feed different frequency components.

Report to moderator Logged

hikariuk
Supporter
Posts: 206
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #23 on:** January 02, 2014, 09:36:26 pm »
Say Thanks Reply Quote

Quote from: Hydrawerk on January 02, 2014, 12:26:56 pm

> The main ASIC is too hot. 100°C is a high temperature. It might be dangerous to operate it without a cooling fan near. And I would expect a heatsink, too. Heatsinks are very common at most scopes today. Agilent DSOX2000, Rigol DS2000, GW Instek GDS-2000A...

It's probably too hot because it's outside its enclosure and not getting air blown over it by the fan.

Report to moderator Logged

I write software. I'd far rather be doing something else.

SeanB
Super Contributor
Posts: 15054
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #24 on:** January 02, 2014, 10:08:51 pm »
Say Thanks Reply Quote

Shorted diode possibly was there to protect the 2 power rails. Possibly the short took out an inner layer trace or a via that supplies the HF side with power so it now runs only on a single rail. You really need a pinout of the chip, or trace the 2V5 rail to see which pins it connects to on the other channel and see where the faulty one differs. You probably will find 1 or more pins that are now different.

Report to moderator Logged

TiN
Super Contributor
Posts: 3902
Country:
xDevs.com/live - 24/7 lab feed

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #25 on:** January 02, 2014, 10:33:52 pm »
Say Thanks Reply Quote

27 code SOT-23-3 is likely ON Semi MMBD2104, common cathode dual diode.

I'd probe with 87V to see where those diode pads go, and check those curcuitry if it's differ from other channels

P.S. Good thermal cam, parallax still not as bad as on Fluke Ti32, they put webcam much more far on it

« *Last Edit: January 02, 2014, 10:38:05 pm by TiN* »

Report to moderator Logged

YouTube | **Chat room** | Live-cam | Have documentation to share? Upload here! No size limit, firmware dumps, photos.

JoeO
Frequent Contributor
Posts: 522
Country:
I admit to being deplorable

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #26 on:** January 02, 2014, 10:46:47 pm »
Say Thanks Reply Quote

From the comments made here, some people are not watching the video all the way through?

Report to moderator Logged

The day Al Gore was born there were 7,000 polar bears on Earth.
Today, only 26,000 remain.

tru
Contributor
Posts: 23
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #27 on:** January 02, 2014, 11:40:31 pm »
Say Thanks Reply Quote

> **Quote from: hikariuk on January 02, 2014, 09:36:26 pm**
>
> > **Quote from: Hydrawerk on January 02, 2014, 12:26:56 pm**
> >
> > The main ASIC is too hot. 100°C is a high temperature. It might be dangerous to operate it without a cooling fan near. And I would expect a heatsink, too. Heatsinks are very common at most scopes today. Agilent DSOX2000, Rigol DS2000, GW Instek GDS-2000A...
>
> It's probably too hot because it's outside its enclosure and not getting air blown over it by the fan.

I'm pretty sure he meant that it would be better if Tek had designed in heatsinks for those hot ICs.

I agree with JoeO, you should see video all the way through, and cross check your questions to see if already can be answered. Near the end of the video you can see clearly that there is a green trace going from Pins 1 and 2 of the sot23, so is a designed short, Dave even mentions the trace later on.

@SeanB & TiN:
I don't think the problem is with the analog frontend because Dave probed the outputs of the differential pairs and you can see in the other scope the signal is clear (no funky HF crap).

« *Last Edit: January 02, 2014, 11:44:00 pm by tru* »
Report to moderator Logged

Chupacabras
Regular Contributor
Posts: 51
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #28 on:** January 02, 2014, 11:43:20 pm »
Say Thanks Reply Quote

Man, that is thrilling...
Can't wait to see next parts

Report to moderator Logged

SeanB
Super Contributor
Posts: 15054
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #29 on:** January 03, 2014, 12:07:32 am »
Say Thanks Reply Quote

I was talking about the ADC units, as it is likely that each ADC channel in the chips has a power rail set, and it is possible that the diode dying drew enough current to pop an internal board via or blow open a trace that powers part of the chip, crippling the one part. I saw the hybrids are fine. Thus taking the 2V5 rail, soldering a flylead onto the capacitor and doing a simple resistance check on the pins WRT this supply and on another working channel will likely show up a broken trace. Probably you will find each channel supply has a decoupling resistor on it. Simple enough to do, and not dangerous or tedious. This was brought by the chip diode having the negative supply on both sides, while the others have a positive supply on the one end. Losing a power rail probably did not affect the hot running digital logic of the chip, it could have been a supply to an ADC front end amplifier that went out, and this barely drew any power in the first place so made little difference thermal wise.

If this unit is fixed a set of glue on heatsinks on the bigger chips to cool them down would not go amiss though.

« *Last Edit: January 03, 2014, 12:13:36 am by SeanB* »
Report to moderator Logged

xrunner
Super Contributor
Posts: 3774
Country:
hp>Agilent>Keysight>?

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #30 on:** January 03, 2014, 12:09:20 am »
Say Thanks Reply Quote

A valiant effort in two videos, but it shows why our landfills or recycling centers are filling up with electronic waste - too much non (or not easily) repairable equipment.

Report to moderator Logged

I am a Test Equipment Addict (**TEA**) - by virtue of this forum signature, I have now faced my addiction

Co6aka
Supporter

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #31 on:** January 03, 2014, 07:03:31 am »
Say Thanks Reply Quote

Posts: 241
Country:

> **Quote from: xrunner on January 03, 2014, 12:09:20 am**
>
> ...it shows why our landfills or recycling centers are filling up with electronic waste...

That's because in vampire capitalism everything is about the Benjamins; make it however for less, and so they'll break it, then sell 'em a new one; rinse and repeat.

Anyway... I still think the "noise" changing polarity and being on only one side of the signal is the clue; looks like the ADC has "issues."

Report to moderator Logged

Co6aka says, "BARK! and you have no idea how humans will respond."

Ronald1962
Contributor

Posts: 21
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #32 on:** January 03, 2014, 08:40:20 am »

Say Thanks Reply Quote

Hi,

It is unbelivable what kind of equipmnet Dave is using!

The newest "toy" is the FLUKE E8 (not the E4 which is linked in the text of the 2nd repair video).

This funny thing cost almost 6000 EURO...

Even I will never ever use these things, it is incredible interesting to see them working...

Go ahead Dave!

Regards

Ronald

Report to moderator Logged

AndyC_772
Super Contributor

Posts: 3400
Country:

Will design for cookies

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #33 on:** January 03, 2014, 08:44:32 am »

Say Thanks Reply Quote

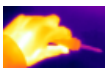
> **Quote from: Ronald1962 on January 03, 2014, 08:40:20 am**
>
> The newest "toy" is the FLUKE E8 (not the E4 which is linked in the text of the 2nd repair video).

I think it's quite noteworthy to see that having expensive diagnostic tools is no guarantee of a quick fix.

The thermal image didn't show up anything unexpected - but even if, for example, the channel 3 ADC were a different temperature to the others, it still doesn't give any clue as to why. Could be power, or clocking, or silicon damage, or some statistical effect to do with the bit pattern it's generating (for whatever reason).

Report to moderator Logged

Frost
Regular Contributor



Posts: 170
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #34 on:** January 03, 2014, 09:02:00 am »

Say Thanks Reply Quote

> **Quote from: Ronald1962 on January 03, 2014, 08:40:20 am**
>
> This funny thing cost almost 6000 EURO...

Not almost, the E8 is more around 7000Euro
http://www.reichelt.de/index.html?ACTION=3;ARTICLE=138176;SEARCH=FLIR%20E8

Report to moderator Logged

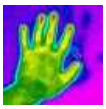
lewis
Frequent Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #35 on:** January 03, 2014, 09:11:36 am »

Say Thanks Reply Quote

I'm sure there's a thread on here somewhere about someone turning an E8 into an E4 or something like that...

Report to moderator Logged



Posts: 704
Country:

Nullius in verba

I will not be pushed, filed, stamped, indexed, briefed, debriefed or numbered.

xrunner
Super Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #36 on:** January 03, 2014, 09:37:24 am »

Say Thanks Reply Quote

Posts: 3774
Country:

hp>Agilent>Keysight>?

> **Quote from: AndyC_772 on January 03, 2014, 08:44:32 am**
>
> I think it's quite noteworthy to see that having expensive diagnostic tools is no guarantee of a quick fix.

There's prolly some technician at the main repair facility that knows exactly what's wrong, he/she probably seen it a hundred times. "Oh yea that fuzzy display on a channel - yea that makes us a lot of money in repairs LOL".

If you could only find that person - but of course you can't get to them. I don't know about Tektronix, but for example Yaesu - an amateur radio manufacturer, sells all the parts for their radios down to the individual resistor and screw, I've ordered several parts for my FT-450 to bring it back up to snuff. The parts are even quite affordable. Does Tektronix even sell repair parts to individuals?

Report to moderator Logged

I am a Test Equipment Addict (**TEA**) - by virtue of this forum signature, I have now faced my addiction

TonP
Contributor

Posts: 8

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #37 on:** January 03, 2014, 09:49:21 am »

Say Thanks Reply Quote

Put the 100% working one (you have a couple of these) next tho the broken one and go measure to find different voltage or signals.

Report to moderator Logged

delmadord
Regular Contributor

Posts: 78
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #38 on:** January 03, 2014, 10:19:44 am »

Say Thanks Reply Quote

> **Quote from: lewis on January 03, 2014, 09:11:36 am**
>
> I'm sure there's a thread on here somewhere about someone turning an E8 into an E4 or something like that...

You think the one from Mike's electric stuff? Is that the same thermal camera?

Report to moderator Logged

envisionelec
Frequent Contributor

Posts: 259
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #39 on:** January 03, 2014, 10:51:54 am »

Say Thanks Reply Quote

I didn't see a cracked diode. I saw a blob of dried glue/flux on it.

But what do I know?

Report to moderator Logged

snoopy
Frequent Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #40 on:** January 03, 2014, 12:37:00 pm »

Say Thanks Reply Quote

Posts: 606
Country:

At the very least a schematic or SM would be helpful.

Are these available ?

Report to moderator Logged

victor
Regular Contributor

Posts: 110
Country:
Boy who writes code and take things apart

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #41 on:** January 03, 2014, 12:38:01 pm »

I don't know if anyone suggested that, but I would try to guess some of the input and output pins on that supposed ADC chip, and then jump wire it to the other ADC's channel, and see if you can mirror that issue on the other channel.

My guess is that you have a most or least significant bit of the ADC floating. probably unrepairable if you can't find that part. At least it is a 3 CH usable scope.

« Last Edit: January 03, 2014, 12:39:32 pm by victor »

Report to moderator Logged

your body is limited, but not your mind

xrunner
Super Contributor

Posts: 3774
Country:
hp>Agilent>Keysight>?

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #42 on:** January 03, 2014, 12:59:14 pm »

OK shot-in-the-dark time.

I noticed in the 1st video that there was some, what looked like fibers, right there on the BNC input. If that isn't a fiber, but a conductive piece of whatever, it might cause a frizzy signal if it was causing a resistive weird path to ground.

Like I said - shot-in-the-dark.

scope_dirt.jpg (40.2 kB, 811x498 - viewed 224 times.)

Report to moderator Logged

I am a Test Equipment Addict (**TEA**) - by virtue of this forum signature, I have now faced my addiction

Co6aka
Supporter

Posts: 241
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #43 on:** January 03, 2014, 01:09:13 pm »

> **Quote from: xrunner on January 03, 2014, 12:59:14 pm**
> ...it might cause a frizzy signal...

But not one that's "fuzzy" only either above or below the input waveform.

I think what we're looking at is a problem during or after the signal has been digitized.

Report to moderator Logged

Co6aka says, "BARK! and you have no idea how humans will respond."

Rasz
Super Contributor

Posts: 2227
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #44 on:** January 03, 2014, 01:10:18 pm »

its just a fur from Daves my little pony costume not to mention signal was clear behind frontend.

I spend good 10 minutes of that video screaming "just lift it off already" at the monitor , that was after feeling all smug because I spotted pcb trace connecting two pins of a diode
Why not solder random diode in that spot just to check? or lift one from other channel? arghhh the anticipation is killing me

Report to moderator Logged

Who logs in to gdm? Not I, said the duck.
My fireplace is on fire, but in all the wrong places.

TiN
Super Contributor

Posts: 3902
Country:
xDevs.com/live - 24/7 lab feed

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #45 on:** January 03, 2014, 03:13:18 pm »

Say Thanks Reply Quote

> **Quote**
>
> Does Tektronix even sell repair parts to individuals?

I bought some mechanical parts (casing covers, screws, knobs, handle) for my CSA7404 scope repair project, so Tek do sell parts.
But I expect not down to component level, I did not asked, but pretty sure that for electronics parts they can just sell a complete board assembly only,
for some big $$$, as that's where the all magic smoke located.

Report to moderator Logged

YouTube | **Chat room** | Live-cam | Have documentation to share? Upload here! No size limit, firmware dumps, photos.

Stonent
Super Contributor

Posts: 3824
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #46 on:** January 03, 2014, 03:38:27 pm »

Say Thanks Reply Quote

In the first video, I was thinking Dave should attempt to swap hybrid modules to see if the problem followed it.

But after this one I'm wondering if the problem isn't even in the analog at all, maybe there's something between the ADC and the display?

Report to moderator Logged

The larger the government, the smaller the citizen.

peter.mitchell
Super Contributor

Posts: 1568
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #47 on:** January 03, 2014, 05:54:09 pm »

Say Thanks Reply Quote

it almost certainly isnt a analog issue and it seems like the adc is functioning correctly, i would expect something far worse if it were to be the case.

I'm leaning haaard on it being memory. In 1 off qty, avail stock, compatible chips, digikey, you're looking $10-11 per chip. If you've got a order coming from digikey, may as well throw some in anyway.

Report to moderator Logged

bktemp
Super Contributor

Posts: 1623
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #48 on:** January 03, 2014, 07:48:59 pm »

Say Thanks Reply Quote

If it is a purely digital bit issue I would expect a distorted sine wave at the MSB boundary and not only noise outside the waveform.
The SRAM ist much too slow for 5GS/s (3x 18bit 100MHz -> 600MByte/s), so there must be some other sample memory. Does somebody have information about how the scope works?
The scope is quite old and 5GS/s is much for such an old scope and the ADCs do not look as special as I would have expected from a 5GS/s 9bit adc for that time. So my guess is, the adc is actually running much slower and there is some sort of analog sample memory in front of it, slowing the signal down befor it goes into the adc.
Another guess: Could this scope use 2 interleaved adcs and one of it beeing completely faulty? That would explain the good shape if the waveform (coming from the working adc) plus the additional noise (every odd sample) and also the disappearance of the waveform at slow samplerates when it uses only the one faulty adc.

Report to moderator Logged

peter.mitchell
Super Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #49 on:** January 03, 2014, 09:28:09 pm »

Say Thanks Reply Quote

watch the section of the video with the scope in dots mode, it shows a bit more clearly what is happening, would be nice if dave used a ramp or a sawtooth wave.

Posts: 1568
Country:

Report to moderator Logged

deephaven
Frequent Contributor

Posts: 783
Country:

Civilization is just one big bootstrap

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #50 on:** January 03, 2014, 11:40:31 pm »

Say Thanks Reply Quote

Simple suggestion: Try pushing down on all the chips and run your finger nail around the pins of the chips. It could just be a dry joint somewhere.

Report to moderator Logged

Bored@Work
Super Contributor

Posts: 3932
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #51 on:** January 03, 2014, 11:58:37 pm »

Say Thanks Reply Quote

Dave, wouldn't this be something for a live show?

You take diagnosis suggestions live from the audience (or from this thread), the audience maybe quickly votes which suggestions to take first, and then you perform the suggested diagnosis. Of course, at the end of the live session you can junk the whole instrument. But hey, you can't have everything

Report to moderator Logged

I delete PMs unread. If you have something to say, say it in public.
For all else: Profile->[Modify Profile]Buddies/Ignore List->Edit Ignore List

EEVblog
Administrator

Posts: 28682
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #52 on:** January 04, 2014, 12:02:43 am »

Say Thanks Reply Quote

> **Quote from: Bored@Work on January 03, 2014, 11:58:37 pm**
>
> Dave, wouldn't this be something for a live show?

You mean live debugging with hundred of nerds watching over my shoulder all screaming something different? Yeah, that sounds like fun

Logged

electronics man
Frequent Contributor

Posts: 686
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #53 on:** January 04, 2014, 12:09:41 am »

Say Thanks Reply Quote

just a sugestion but the diode doesnt seem to be the problem but may it be the symptom of one of a problem whith one of the ics the diode could have just prevented the magic smoke from escaping from another device whitch may have got damaged anyway.

Report to moderator Logged

follow me on twitter @get_your_byte

Bored@Work
Super Contributor

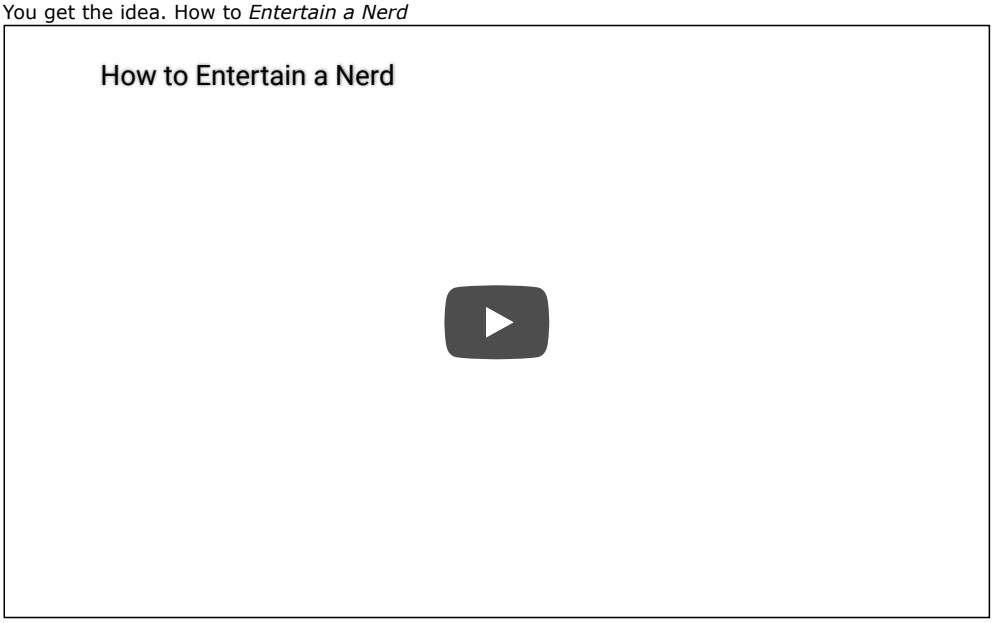
Posts: 3932
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #54 on:** January 04, 2014, 12:13:41 am »

Say Thanks Reply Quote

> **Quote from: EEVblog on January 04, 2014, 12:02:43 am**
>
> > **Quote from: Bored@Work on January 03, 2014, 11:58:37 pm**
> >
> > Dave, wouldn't this be something for a live show?
>
> You mean live debugging with hundred of nerds watching over my shoulder all screaming something different? Yeah, that sounds like fun

You get the idea. How to *Entertain a Nerd*



Report to moderator Logged

I delete PMs unread. If you have something to say, say it in public.
For all else: Profile->[Modify Profile]Buddies/Ignore List->Edit Ignore List

joseph.anand
Regular Contributor
Posts: 56
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #55 on:** January 04, 2014, 12:15:52 am »

Back seat driving with electronics debugging. Fun indeed. BTW, do the ADC's have an internal reference/common external reference or do they use individual voltage references (I'm too lazy to check through your videos).

Also why do we get service manuals with not schematics these days (http://exodus.poly.edu/~kurt/manuals/manuals/Tektronix/TEK%20TDS%203000%20series%20Service.p

Quote from: EEVblog on January 04, 2014, 12:02:43 am

> You mean live debugging with hundred of nerds watching over my shoulder all screaming something different? Yeah, that sounds like fun

Report to moderator Logged

xrunner
Super Contributor

Posts: 3774
Country:
hp>Agilent>Keysight>?

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #56 on:** January 04, 2014, 12:16:22 am »

Quote from: TiN on January 03, 2014, 03:13:18 pm

> But I expect not down to component level, I did not asked, but pretty sure that for electronics parts they can just sell a complete board assembly only, for some big $$$, as that's where the all magic smoke located.

Yep, and unless it's a broken BNC connector or wire or some standard blown cap or the like, we're back to the landfill or recycling center. It's just not economically worth it to fix complex electronics these days.

Report to moderator Logged

I am a Test Equipment Addict (**TEA**) - by virtue of this forum signature, I have now faced my addiction

snowl
Contributor
Posts: 13
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #57 on:** January 04, 2014, 12:18:38 am »

How does the Error on the sine wave look like? Has it the same Amplitude as with the square signal or do the peaks follow the sine wave curve? What is the Frequence of the Error spikes?

Report to moderator Logged

vlad777
Frequent Contributor
Posts: 296
Country: 00

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #58 on:** January 04, 2014, 12:22:35 am »
Say Thanks Reply Quote

I think it is a SDRAM problem, like when your (old PC) graphics card starts displaying gibberish.

There are four SDRAM chips (NEC D4516821) and they may be in address space of Motorola XPC but channel three may be statically addressed always in the same chip.

Or it is a chip per channel than also same error.

Report to moderator Logged

Mind over matter. Pain over mind. Boss over pain.
---

electronics man
Frequent Contributor
Posts: 686
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #59 on:** January 04, 2014, 12:26:17 am »
Say Thanks Reply Quote

How old is the scope?

Report to moderator Logged

follow me on twitter @get_your_byte

Simeon
Contributor
Posts: 8
Country:
Student

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #60 on:** January 04, 2014, 12:58:43 am »
Say Thanks Reply Quote

Hi everybody !
Dave, check for open resistors.
Those SMD fuckers like to go open circuit very easily !
My cheapass multimeter died because of such a sucker.
I have looked all over it, to find it is a reference resistor for the resistance measurement range. WTF!
I released the magic smoke when i accidently probed the 320V charged caps on a SMPS...
So, check for open circuit resistors.
I have posted in the youtube comments- what if is the optocoupler U330 at around 24:44 ?
Check all the IC's and opamps if there are any.

Report to moderator Logged

Rufus
Super Contributor
Posts: 2094

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #61 on:** January 04, 2014, 01:40:04 am »
Say Thanks Reply Quote

I say again a more detailed study and intelligent analysis of what is seen on the screen would get you closer to locating the fault than we are now without even opening the case.

I initially suspected a digital intermittent hot bit fault but from the few more seconds of screen we see in the video it now looks more like noisy/intermittent gain. Just sweeping a dc level across the input would be telling and how hard is that?

Presumably all attenuation/gain is in the hybrid and the output from that looked OK so it is probably the ADC reference voltage which is noisy or intermittently collapsing or possibly one of the ADC supplies. If you are lucky it might have an external cause but the ADC is probably knackered. I would put the same signal on two channels and compare ADC signals between channels pin by pin. They are TQFPs so swapping ADC chips between channels isn't a terrible job either.

I guess Dave needs to decide if he wants a working 3 channel scope or is willing risk trashing it.

Report to moderator Logged

Co6aka
Supporter

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote

« **Reply #62 on:** January 04, 2014, 04:52:15 am »

Posts: 241
Country:

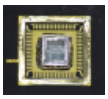
After thinking-while-sleeping on this funky problem... Here's something that has yet to be considered:

Maybe it's a symptom of NSA spyware! (It was an ADF scope, so...)

Report to moderator Logged

Co6aka says, "BARK! and you have no idea how humans will respond."

bitwelder
Frequent Contributor



Posts: 782
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #63 on:** January 04, 2014, 04:55:29 am »

Say Thanks Reply Quote

Quote from: victor on January 03, 2014, 12:38:01 pm

> My guess is that you have a most or least significant bit of the ADC floating. probably unrepairable if you can't find that part. At least it is a 3 CH usable scope.

Hmm... in that case would it be possible to simulate the oscilloscope acquisition chain e.g. in Matlab, then try to reproduce a flipping/noisy LSB on the ADC, and see what is the result on the 'simulated oscilloscope' ?

Report to moderator Logged

RandomLogic
Newbie

Posts: 1

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #64 on:** January 04, 2014, 05:22:55 am »

Say Thanks Reply Quote

I wonder, is the CH3 data just displayed incorrectly or is the data itself wonky. Is the purple noise also visible on possibly a screen capture or an USB data capture? Is the noise really random? If the noise is not random I would suspect the DRAM. Can one possibly activate the FFT on CH3 to check for possible anomalies in the frequency domain?

Report to moderator Logged

vlad777
Frequent Contributor

Posts: 296
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #65 on:** January 04, 2014, 05:29:49 am »

Say Thanks Reply Quote

Lets say every second memory location is corrupted (and it is a memory problem).
Then your "noise" signal should have upper and lower bound since 2^9=512.
So set vertical scale to most volts per division and see if the noise is bounded.

Report to moderator Logged

Mind over matter. Pain over mind. Boss over pain.
---

owiecc
Frequent Contributor

Posts: 289
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #66 on:** January 04, 2014, 05:45:34 am »

Say Thanks Reply Quote

Do a single shot, dump the data and see if there is a pattern.

Report to moderator Logged

Stonent
Super Contributor

Posts: 3824
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #67 on:** January 04, 2014, 06:15:34 am »

Say Thanks Reply Quote

Quote from: electronics man on January 04, 2014, 12:26:17 am

> How old is the scope?

The chip dates that I saw were late 90s.

Report to moderator Logged

The larger the government, the smaller the citizen.

electronics man
Frequent Contributor

Posts: 686
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #68 on:** January 04, 2014, 08:56:15 am »

Say Thanks Reply Quote

Mabe dave should save a waveform to a floppy and open it to see if the problem is still there if not then it would be a problem whith the display controller might that be the problem?

Report to moderator Logged

follow me on twitter @get_your_byte

calexanian
Super Contributor

Posts: 1861
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #69 on:** January 04, 2014, 09:54:13 am »

Say Thanks Reply Quote

> **Quote from: electronics man on January 04, 2014, 08:56:15 am**
>
> Mabe dave should save a waveform to a floppy and open it to see if the problem is still there if not then it would be a problem whith the display controller might that be the problem?

I thought about that as well, but it is unlikely the controller would only affect one channel. It would most likely effect all In the same manner. That virtual phosphorus algorithm is nagging at me though.

Report to moderator Logged

Charles Alexanian
Alex-Tronix Control Systems

electronics man
Frequent Contributor

Posts: 686
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #70 on:** January 04, 2014, 09:59:02 am »

Say Thanks Reply Quote

i still think he should try that just to be 100% sure

Report to moderator Logged

follow me on twitter @get_your_byte

vaualbus
Frequent Contributor

Posts: 296
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #71 on:** January 04, 2014, 10:28:11 am »

Say Thanks Reply Quote

Despite all that it has been said on the blog I still think that the problem is either logic or ralated to nvram corruption (try to run a couple of time SPC and restart the scope. I manged to restore option 1M on my TDS540 using this technique), I will exclude the voltage reference noise, repetitive noise, burn op amp, becuase in this cases the self tests shouldn't pass but it passes.

Also I take this opportunity to share a photo of my attunuation hybrid on my TDS540, they are completly made by ceramic, on the other side there is a similar hybrid ic and a couple of relays and some capicito and resistorsr.
The interst thing to notice is the connection of the hybrid. There is a little pieces of gold in the plastic shell that than make contact with the attenuator pcb.
This hybrids are very fragile, I've broken one when I remount the attenuation pcb board in place, than another one in the same way.
Fortuanlly I was able to repair the second hybrid!
Only god know hoae much those hybrids cost when they were in prduction. Any ideas on the original price?
And why they use this type of connections and not use direct pins?
The TDS540 was just only a 500Mhz scope!

hybridAtten.jpg (271.27 kB, 2048x1536 - viewed 357 times.)

Report to moderator Logged

burra7
Contributor
Posts: 5
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #72 on:** January 04, 2014, 11:42:03 pm »
Say Thanks Reply Quote

Home with with flue so I tried to make a block schema. I think we have some voltage problem. U300 (ADC3) does not get correct voltages. Or some bypass has gone bad. The C929 tantalium might gone bad when it is so close to the hot chips.

But have a look yourselfs and improve on schema
https://www.dropbox.com/s/i4kxi8sqwzslniu/tek%203054%20blockschema%20r1.odg
https://www.dropbox.com/s/vylmxa4nonqpr1h/tek%203054%20blockschema%20r1.pdf

some images
https://www.dropbox.com/s/wpwertu1x05t71d/Capture3.PNG
https://www.dropbox.com/s/027hj2wut8xjyoa/Capture4.PNG
https://www.dropbox.com/s/5lzzpv4hle8aqzn/Capture5.PNG

Report to moderator Logged

ivanjh
Supporter
Posts: 15

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #73 on:** January 05, 2014, 01:14:27 am »
Say Thanks Reply Quote

I'm sure Dave's driving to Chester Hill on Monday to pickup a MMBD1204.

Report to moderator Logged

burra7
Contributor
Posts: 5
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #74 on:** January 05, 2014, 01:49:20 am »
Say Thanks Reply Quote

Looking really hard at time 23.10 in the video one can see more components.

U320 and U330
I can't see what the values are. These might be in the signal path.

https://www.dropbox.com/s/netuerv42t9vojs/tek%203054%20blockschema%20r2.odg
https://www.dropbox.com/s/9bwbkhca8j2p5z3/tek%203054%20blockschema%20r2.pdf

Edit:
looking some more video. One can see that U320 and U330 are not in the signal path. But one can make out the markings on them

U320 AAAG 5pin
U330 A00A 5pin

Then I also noticed that there is actually a some differance between channel3 and the others. One can clearly make out a Ferrite beed time 28.11 that is only on channel 3 and none of the other channels. Might be a problem somewhere else that only shows on channel3.

« *Last Edit: January 05, 2014, 02:27:34 am by burra7* »

Report to moderator Logged

vaualbus
Frequent Contributor
Posts: 296
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #75 on:** January 05, 2014, 02:33:24 am »
Say Thanks Reply Quote

I think that the central asic is not a mux (that indeed should be a demux) but the trigger asic, when dave freaze it the trigger point move and the wave not trigger for a moment.
Is more probably that the mux is near the memory or even inside the main fpga.

Report to moderator Logged

burra7

Contributor
Posts: 5
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #76 on:** January 05, 2014, 03:42:23 am »

Seems like newer tds 3000c series uses the same frontend and singal processing chips.
See page 72

http://www.afc-ingenieros.com/uploads/Afc/Productos/Tektronix/Manuales/Osciloscopios%20TDS3000C/TDS3000C%20Se%20071-2507-00.pdf

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burra7
Contributor
Posts: 5
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #77 on:** January 05, 2014, 04:17:14 am »

More updates: rev 3

https://www.dropbox.com/s/054heh5j2penkfk/tek%203054%20blockschema%20r3.odg
https://www.dropbox.com/s/4wixip0lpix6vc7/tek%203054%20blockschema%20r3.pdf

Edit: added to here for future modifications:
https://bitbucket.org/burra/tds-3054
« *Last Edit: January 05, 2014, 05:28:00 am by burra7* »

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toomas
Contributor
Posts: 13

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #78 on:** January 05, 2014, 09:57:42 am »

If the adc is 9 bits, then maybe it outputs them all in parallel. If you could locate those pins, then maybe you can probe them or force them to high or low and see what the waveform on the screen does.

Report to moderator Logged

vaualbus
Frequent Contributor
Posts: 296
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #79 on:** January 05, 2014, 10:41:36 am »

Definitly the middle chip is the trigger asic.
Indeed there is this patent associted with that: http://www.google.com.tr/patents/US6219094

Report to moderator Logged

Fryguy
Regular Contributor
Posts: 51
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #80 on:** January 13, 2014, 05:53:57 am »

Has anyone noticed the "Dallas Timekeeper Ram" chip at the top center of the board ? If i'm not mistaken , these chips will KILL the scopes when the lithium battery inside drops dead !
I remember seeing them on old computer mainboards (i386 + i486) and on gamemachine mainboards . The ram is hooked up to the battery inside the chip - and when the battery voltage has dropped below a certain level , the ram loses it's programm and the machine drops dead - most likely forever .

If that is the case here , all these scopes will definitely die in 100% working condition . . . and i will stop buying Tek equipment forever . People who put self-destruction-devices in expensive top quality lab equipment deserve the spanish inquisition .

Sorry if i'm a bit emotional on this but nothing drives me as crazy as some a**h***s wasting perfectly good stuff .

Report to moderator Logged

May the forces of evil get confused on their way to your home !

Hydrawerk
Super Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #81 on:** January 13, 2014, 06:22:01 am »

Oh shit, there is a 3V battery in my DSOX2002A, too. But is there a Dallas-Timekeeper-Ram??
« *Last Edit: January 13, 2014, 08:01:18 am by Hydrawerk* »

Report to moderator Logged

Amazing machines. https://www.youtube.com/user/denha (It is not me...)

Posts: 2365
Country: 00

Fryguy
Regular Contributor

Posts: 51
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #82 on:** January 13, 2014, 06:36:26 am »

You should feel lucky if you can replace the battery in your scope - The "Dallas-Timekeeper-Ram" or "Dallas-Clock-Chip" was specifically designed to kill the machines . . .

Keyword : planned obsolescence

Seeing the datecodes on the chips (98/99) and knowing the nominal lifespan of the "Dallas" devices is about 10-15 years makes me wonder how long these scopes will continue to work . . .

Did the "Australian Forces" know about it . . . ?
« *Last Edit: January 13, 2014, 07:54:14 am by Fryguy* »
Report to moderator Logged

May the forces of evil get confused on their way to your home !

philpem
Frequent Contributor

Posts: 292
Country:
That Sneaky British Bloke

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #83 on:** January 13, 2014, 08:00:03 am »

> **Quote from: Fryguy on January 13, 2014, 06:36:26 am**
>
> You should feel lucky if you can replace the battery in your scope - The "Dallas-Timekeeper-Ram" or "Dallas-Clock-Chip" was specifically designed to kill the machines . . .
>
> Keyword : planned obsolescence
>
> Seeing the datecodes on the chips (98/99) and knowing the nominal lifespan of the "Dallas" devices is about 10-15 years makes me wonder how long these scopes will continue to work . . .
>
> Did the "Australian Forces" know about it . . . ?

They weren't designed specifically for that reason -- they were designed to maintain data (typically data which is updated often enough to wear out an EEPROM) across power cycles. If the manufacturers choose to use it to store program code or critical data without providing a means to reprogram said data then that's their decision and may hellfire rain upon them for it.

Report to moderator Logged

Phil / M0OFX -- Electronics/Software Engineer
"Why do I have a room full of test gear? Why, it saves on the heating bill!"

c4757p
Super Contributor

Posts: 7805
Country:
adieu

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #84 on:** January 13, 2014, 08:07:18 am »

> **Quote from: Fryguy on January 13, 2014, 05:53:57 am**
>
> People who put self-destruction-devices in expensive top quality lab equipment deserve the spanish inquisition .

They *deserve* it, yes, but can you really blame them for not expecting it?

Report to moderator Logged

No longer active here - try the IRC channel if you just can't be without me

Hydrawerk
Super Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #85 on:** January 13, 2014, 08:15:40 am »

Here is the dallas killer scope device. There is probably no similar component in my DSOX2002A.
http://www.flickr.com/photos/eevblog/sets/72157626631250619

Posts: 2365
Country: 00

dallas timekeeping ram.jpg (318.79 kB, 1280x1024 - viewed 791 times.)

Report to moderator Logged

Amazing machines. https://www.youtube.com/user/denha (It is not me...)

Fryguy
Regular Contributor
Posts: 51
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #86 on:** January 13, 2014, 08:26:18 am »

Quote from: philpem on January 13, 2014, 08:00:03 am

Quote from: Fryguy on January 13, 2014, 06:36:26 am

You should feel lucky if you can replace the battery in your scope - The "Dallas-Timekeeper-Ram" or "Dallas-Clock-Chip" was specifically designed to kill the machines . . .

Keyword : planned obsolescence

Seeing the datecodes on the chips (98/99) and knowing the nominal lifespan of the "Dallas" devices is about 10-15 years makes me wonder how long these scopes will continue to work . . .

Did the "Australian Forces" know about it . . . ?

They weren't designed specifically for that reason -- they were designed to maintain data (typically data which is updated often enough to wear out an EEPROM) across power cycles. If the manufacturers choose to use it to store program code or critical data without providing a means to reprogram said data then that's their decision and may hellfire rain upon them for it.

These chips were keeping the bios data on the old computer mainboards - how often was that updated in it's lifetime ? once ? or twice ? that won't wear out an EEPROM . On the gamemachines i've seen the "bios" getting updated literally zero times .

I'm pretty sure they were expecting it at some point c4757p - they put the timebombs in there

Hydrawerk - the battery is inside the "Dallas" device (that's why the chip is 3x thicker than the other chips - it contains a RAM chip , a realtime clock chip , a clock crystal and a lithium battery - if i'm not mistaken - i teared some of those chips apart a long time ago) - if you see a battery , you don't have to look for that chip .

However - i'm curious what Dave's got to say about this huge .

« *Last Edit: January 13, 2014, 08:59:37 am by Fryguy* »

Report to moderator Logged

May the forces of evil get confused on their way to your home !

vaualbus
Frequent Contributor
Posts: 296
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #87 on:** January 13, 2014, 10:18:52 am »

The real name of this chips are nvram,
no volatile ram. In almsot old 80/90 instruments are used to mantained calibration data and information about the instrument options.
This chips not spread acid on the board. They are made by dallas semicondactors, now is maxim (some of this ics still be in free sample on the maxim site indeed) and just not mantain data when the internal battery go away.
There is good reason to not place the calibration data on eeprom sometime calibration is made every time you turn on the intrument (for example in network analyzer) and there is no reason to place the data on a eeprom.
The IC maxim life time is about 10 years but the ic still work also for a longer time (recently I change on of this ic and was made in the late of 92 but still work).
Best regards, Alberto.

Report to moderator Logged

sync
Frequent Contributor

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
Say Thanks Reply Quote
« **Reply #88 on:** January 16, 2014, 11:50:04 am »

Posts: 799
Country:

Quote from: Fryguy on January 13, 2014, 08:26:18 am

> These chips were keeping the bios data on the old computer mainboards - how often was that updated in it's lifetime ? once ? or twice ? that won't wear out an EEPROM .

They hold the BIOS data. Uncritical data. They didn't contain the BIOS code.

Report to moderator Logged

EEVBlogViewer
Newbie
Posts: 1

Please bring your projects to an end
« **Reply #89 on:** January 22, 2014, 08:20:17 pm »
Say Thanks Reply Quote

There are a a couple of repair videos in the eevblog - but when its not a damaged fuse it seems that a repair is impossible.

Report to moderator Logged

EEVblog
Administrator
Posts: 28682
Country:

Re: Please bring your projects to an end
« **Reply #90 on:** January 22, 2014, 08:26:17 pm »
Say Thanks Reply Quote

Quote from: EEVBlogViewer on January 22, 2014, 08:20:17 pm

> There are a a couple of repair videos in the eevblog - but when its not a damaged fuse it seems that a repair is impossible.

That's murphy at work every time.

Logged

Hydrawerk
Super Contributor
Posts: 2365
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #91 on:** June 01, 2014, 02:48:56 am »
Say Thanks Reply Quote

What is going on, Dave?

Daves TDS3000.jpg (122.49 kB, 1024x768 - viewed 727 times.)

Report to moderator Logged

Amazing machines. https://www.youtube.com/user/denha (It is not me...)

SeanB
Super Contributor
Posts: 15054
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #92 on:** June 01, 2014, 05:40:34 am »
Say Thanks Reply Quote

The case was worth more than the scope on Ebay?

Report to moderator Logged

wesphillips
Contributor
Posts: 5
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #93 on:** January 12, 2015, 05:37:57 pm »
Say Thanks Reply Quote

Dave,
How can you say that the hybrid is working? you didn't check the output of the hybrid when the ch3 timebase setting caused the display to disappear. I would be interested to see the output of ch3 when there is no display at all for ch3.

Report to moderator Logged

Monittosan
Regular Contributor

Posts: 146
Country:

Re: EEVblog #565 - Tektronix TDS3054 Oscilloscope Repair - Part 2
« **Reply #94 on:** January 13, 2015, 09:13:12 pm »

Say Thanks Reply Quote

The scope sold on ebay for a pretty penny so it may just stay a 3ch scope for now

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