

Hardware Oscilloscope Vintage Computing

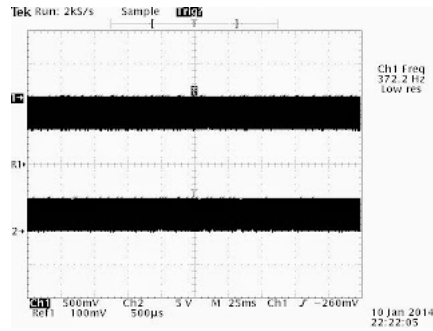
## Calibration and acquisition problems on Tektronix TDS 340 oscilloscope

January 15, 2014 ToughDev 58 Comments



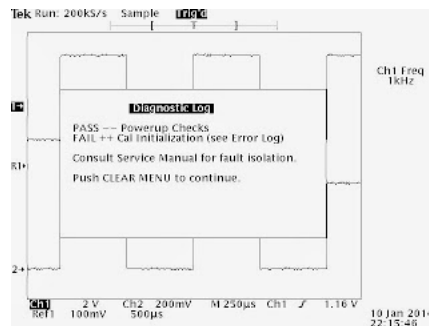
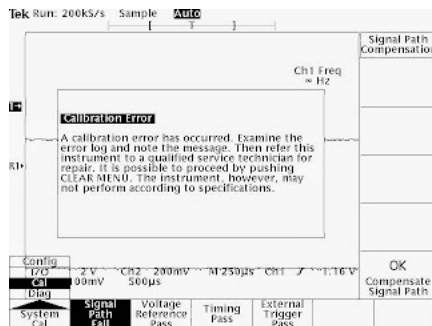
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During one of my experiments with the TDS 340 oscilloscope made by Tektronix, I suddenly noticed that the AUTASET button does not set the correct parameters for most signals, including the 1kHz calibration signal. Although it worked fine for a long time, the button now sets the oscilloscope to 5V/div, 25ms/div with wrong trigger settings, obviously not optimal to display a 1kHz square wave:



### Failed self-calibration and diagnostics test

Thinking that the oscilloscope is out of calibration, I ran a self-calibration using the UTILITY menu, only to find out that things have gotten worse. The calibration process failed after 4 minutes and the oscilloscope reported problems upon power on:



With all input signals removed, I ran a diagnostics test from the UTILITY menu and sure enough, acquisition and calibration errors were reported:

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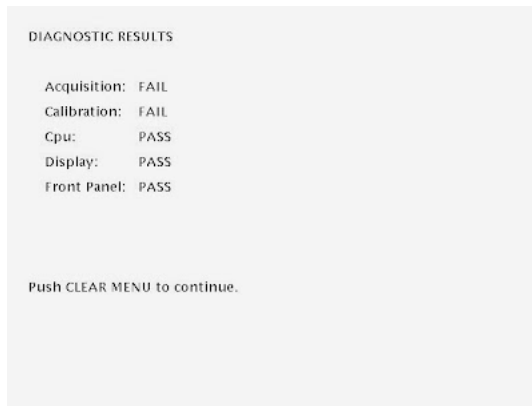
**Tough Developer** @mrtoughdev  
Sylvia Plath was a famous poet who killed herself at age \_\_\_\_\_ by sticking her head into a oven. - Anyone?

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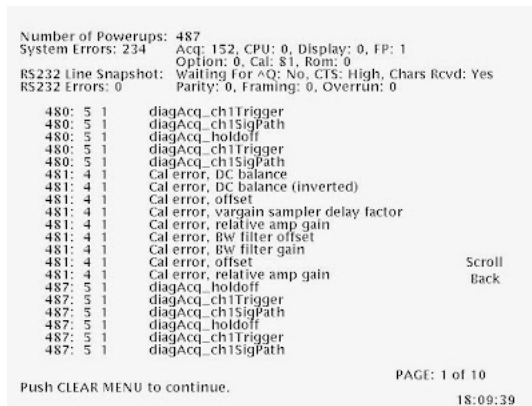
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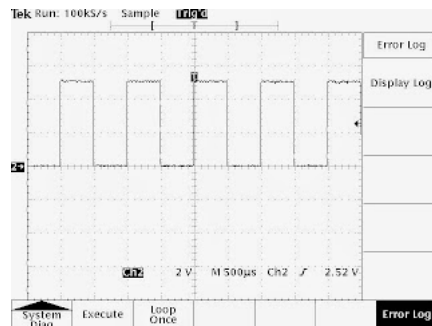


**Error log**

The error log provided some more details – the calibration issues may have been due to the acquisition problems affecting certain tests during the calibration process. Problems with trigger and signal path of Channel 1 (error codes diagAcq\_ch1Trigger, diagAcq\_ch1SigPath and diagAcq\_holdoff) were reported:



No errors were reported with channel 2. Are these errors related to my autoseed problems? To answer this, I performed a simple test by turning off channel 1 waveform display, feeding a signal to channel 2 and press AUTOSET. Surprisingly, autoseed worked just fine and selected the correct settings to display a stable waveform on channel 2:



The suspect: faulty acquisition board

So some problems with channel 1 prevented the oscilloscope from detecting the correct settings in autoseed mode. Determined to find the issue, I opened up the oscilloscope and located the acquisition board:



To my disappointment, unlike other Tektronix oscilloscope models, this acquisition board is also the mainboard of the oscilloscope and is very compact with mostly surface-mounted components. There are

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no through-hole electrolytic capacitors on the board which may cause problem as the capacitors become dry and fail with time. Although I did find some posts [here](#) and [here](#) referring to a problem similar to mine, my limited time and the nature of the problem prevented me from putting in more efforts to fix the issue. Except for the autoset feature, the oscilloscope still seems to be stable and works well even at high frequencies. I decided to live with the issue and manually select the correct settings for each input signal until some other more serious problems occur.

**UPDATE (Jan 2018):** You may find the service manual, schematics, and various other interesting technical documents for the TDS 520 and other similar oscilloscopes by Tektronix [here](#). Thanks to PrecisionAnalytic for providing the files.

See also:

[Programming the Tektronix TDS 340 100MHz digital storage oscilloscope](#)

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## 58 thoughts on “Calibration and acquisition problems on Tektronix TDS 340 oscilloscope”

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ToughDev Post author  
 January 18, 2018 at 9:49 pm  
 Permalink

Hi,

From the TCON diagram on the link you sent, it appears that header 10X2 (20-pin edge connector) is for something else, probably parallel data input/output. R/W stands for Read/Write, with 5V indicating a Read operation and 0V indicating a Write operation. IRQ is Interrupt Request, RST is Reset and CS is Chip Select. I do not believe it is trivial to interface via this connector, at least not without some documentation on the protocols being used.

On the other hand, the schematics at the bottom right of the diagram with the MAX232D converter IC is for converting the serial data output on the OTX, IRX, BCTS and BRTS pins to standard RS232 signals that can be read by any computer with a serial port and a suitable terminal software such as Putty. You will find these 4 pins on the U1 chip. Just connect them to the pins on the MAX232 chip following the diagram and you should see the debug info on your computer terminal.

The MAX232 is a very common chip and can be easily ordered from Maxim or Mouser. Let me know how it goes after you have tried it. 😊

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📅 April 10, 2018 at 7:20 am  
🔗 Permalink

Hi,

We had a warmer dryer period so I've been busy working outside and on other projects not as much related to the electronics diagnostics and repair or workshop to actually work in.

I did practice soldering more and feel with the finer tips that a better temperature controlled device was worth the investment. So I picked up a used FM-202 that is 140W and can use multiple irons like the tweezers and desoldering gun. I'm going to use the FM-2028 that I am still waiting for in the mail, though did receive the smaller size tips I ordered (T15-SB02 & JL02) and the FM-2028 comes with a T12-BL.

I have the chip-quick and authentic AMTECH flux and with a little more practice on some salvage video cards under the microscope... I'll be ready and confident to work on the TDS's.

I did want to share that I've been busy writing also and there is a fundraiser going on at the Vintage Tektronix Museum to get microfiche scanned. There are some others who have microfiche also so will be interesting to see how those will be scanned too.

Here is the info (please donate and/or share... we're almost there):

<https://www.youcaring.com/vintagetekmuseum-1085244>

<https://vintagetek.org/vintagetek-microfiche-scanner-fundraiser/>

<https://vintagetek.org/>

I'll be sure to update once I get working and also wanted to share this interface update also by Doctor Forbin: <https://drive.google.com/open?id=0B3kLL6AnKjj5UGVhY0txaEN6S29PQXB2eGttWmZGcWpuYUw4>

Here is the Option 13 Card version by charlyd:

<https://drive.google.com/drive/u/0/folders/0B3kLL6AnKjj5WU9zSF9tOVR4ejA>

I'll keep you posted when I get working. I've been writing on the Old Tek Scopes facebook and Hackaday often too. 😊



👤 ToughDev Post author  
📅 May 21, 2018 at 10:40 pm  
🔗 Permalink

Hi,

Sorry I somehow missed this comment. The links were great. Thanks so much for sharing the schematics for the TDS Debug interface as well as the resources on the Option card. Now I feel tempted to bring out my Tektronix oscilloscope from the store room and play with it again!

I am so excited that you reached your fundraising target for the microfiche scanner just a few days ago (18 May). Look forward to seeing you purchasing the device and do some nice projects with it. Keep me posted. I have never played with a microfiche scanner before 😊

Have you received your FM-2028 yet? Does it work well for you? For me I have been playing with PCB design for the past few weeks, in particular designing an Adlib sound card clone. See this <http://www.toughdev.com/content/2018/04/rebuilding-the-adlib-music-synthesizer-card-1987/> for more info.

What is your username on Old Tek Scopes and Hackaday? I'd love to read your articles. I also read Hackaday quite often, but have not yet contributed anything. Maybe it's time for me to try 😊

👤 PrecisionAnalytic  
📅 May 22, 2018 at 1:18 am

[Permalink](#)

Hi,

No need to be sorry or apologize. I've been busy with the dryer weather and light rains we've been having, so working outside more other than when reading and writing. Finally got the moles to start moving away from the house and further out into the perimeter of the yard and just last week caught one. There must be two or more still.

James Analytic or jafinch78 are the names I usually use. I use the later on Youtube also. I've been writing just thoughts and sharing information though do contemplate being more serious in producing better written and video works. You can definitely contribute your work. I can recommend also. Go for it! 😊

I started getting into advocating Directed Energy Weapons awareness also and that is interesting to see the developments, albeit really slow, in regards to countering dangerous operations on civilians that most wouldn't even believe exist.

I haven't even touched electronics other than unboxing for visual inspection, driving the Prius around, the cell phone and reading/typing on the computer. I decided to invest in an analog oscilloscope, made an offer on Shopgoodwill.com on a Tektronix 7904 and you can read on Facebook Old Tek Scopes group if you have the time regarding the deal I got as well as other components. That will be an interesting system to use, update and repair the modules that need repair.

Wow, your adlib music synthesizer card project is really nice looking and thoroughly detailed. Thanks for sharing... that is really interesting and well documented. Amazing how cost effective some of the PCB board manufacturing shops are. I've looked at jlcpcb and oshpark and started making a PLCC68 to DIN 68 socket adapter board with the online CAD program from jlcpcb... though wound up finding a cost effective adapter set and bought.

I remember playing on the old Zenith desktops (other friends also had over the years since Zenith Data Systems was headquartered down the road in the next city over Benton Harbor) Commander Keen. While cleaning out the basement at my parents old place a few months back, I found the old Super Sport laptop and I think is the 286 desktop. The 286 is corroded, though the Super Sport seems to only have corrosion on the battery connectors. Was thinking can remove the internal cells and replace with Lithium cells sometime. The 286 I'm sure is restorable also. The case is heavy duty steel and I want to use that for sure since better RFI/EMI shielding.

Thinking I'm not going to be seriously working on electronics projects until next winter or really hot summer days that drive me indoors where cooler. To much farm development, truck restore and home restoration work. 😊

I'll be sure to update you once I get back on the TDS projects and use the FM-2028 (looks like a clone). I did find a site that gave a little insight into the clones: <https://www.youtube.com/watch?v=zWo3dMRpZME&t=2s> I'll see once I get around to using the FM-202 which is genuine.



 ToughDev Post author

 May 22, 2018 at 6:44 pm

 [Permalink](#)

Hi,

Great to hear from you again 😊

I'd love to live on a farm and spend my time exploring nature too, and perhaps have more space for me to make full use of my electronics equipments. But too bad currently most of my electronics stuff (both



vintage and modern) are in the same room. I do layout them nicely using wooden shelf and cabinets but it can't beat having an entire big house on a farm available to use 😊




I have a Zenith SuperSport 286 here in my store room, purchased from the local Salvation Army for \$5 in 2015. It did boot up upon powered on for the first time when I got home after I bought it, but after a while it powered off automatically. Now if I turn it on again, it will just beep continuously. Still have not found the time to debug it yet.

I do not think replacing the battery with Lithium is a good idea. The Lithium battery may explode since the original circuit has a different charging algorithm meant for Ni-Cd. That is unless you want to build your own charging circuit ...

I love vintage computers, especially early MS-DOS and compact Macintoshes. I have quite a few old PCs in my room just to play Prince of Persia or Commander Keen. 😊

I'll check out your posts on Hackaday and think of something to contribute. Keep me updated on your TDS projects when you have the time to work on it again 😊



 PrecisionAnalytic  
 May 23, 2018 at 2:48 am  
 Permalink

Hi,

Yes, great to read you're doing well with neat projects going on. I sent Hackaday a tip on their tip line website about your Adlib sound card project to see if they will write an article regarding. I think that is a great detailed project to show and I see vintage computer projects show up occasionally.




In regards to the farm house... wow... the property that we still own is next to the older huge farm house that unfortunately isn't used now for some reason. I'm thinking since dates back to my Great Great Grandparents. The barns and new house were donated to a Youth Farm by my Great Grandparents and Grandparents farm hand that bought that property. We have old timber cut over and some fields still to wild (hunt/forage) and domesticated farm on. I did just build a farm building last year though is small under 100sqft. There is a camp there also that was more a fish and hunting camp.

I double checked and wanted to correct the typo as I actually have a MinisPort. Reads like that is the newer model with 2" drive. Yes, I was thinking something like a TP4056 lithium battery charge controller with fault protection... though due to the current limit either upgrading the components for higher voltage and current or finding a higher voltage and current version. Thanks for the concern... as like capacitors... batteries have a range of operations, specifications and safe use issues. I prefer the Lithium INR as those are the safest outside of the LiFePO4 technologies from my understanding. 😊

I will definitely keep you posted on the TDS projects. I picked up a TDS-620A also that isn't working though does make some sort of sound like a power supply humming and a TDS-540 that has some data acquisition startup errors. I got carried away buying... though will have some fun projects along with the ~\$25 7904 I've been collecting components for and a ~\$25 475A I just won last night and have to pick up at the Minneapolis Goodwill. 😊

Looking forward to working on the electronics projects and reading more!



 Konstantin  
 September 24, 2018 at 7:39 am  
 Permalink

Whats about changing NVRAM from DALLAS? It keeps calibration constants and can be reason for problems with calibration.





Ken

February 3, 2022 at 10:11 am

Permalink

Did you ever resolve the Autoset and the Calibration issues? Did you try replacing the DS1644+ Dallas Semiconductor NVRAM? (It contains a battery which fails eventually.)

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