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Topic: **TDS3000B TDS3054B strange type rotary encoder repair/replacement** (Read 1939)

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analogRF
 Frequent Contributor

 Posts: 623
 Country: 


TDS3000B TDS3054B strange type rotary encoder repair/replacement

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« on: December 08, 2019, 05:20:47 pm »

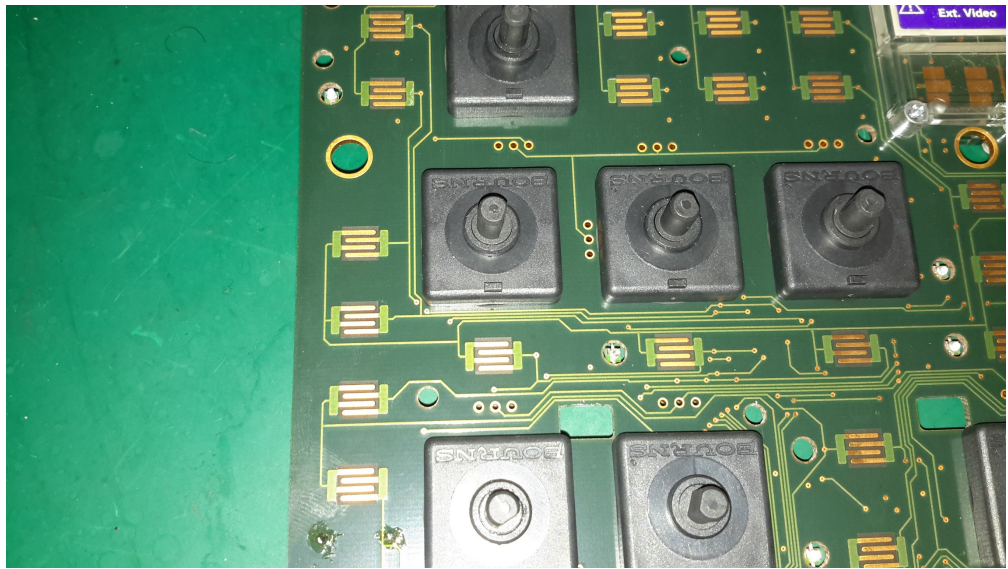
Three rotary encoders on my recently acquired TDS3054B (dead display and dead PSU fixed) are bad , very very bad and totally unusable. I got the front panel board out hoping to repair the encoders or even replace them but look what they are 🤔🙄👉

i have not seen anything like this and I dont know how and if they can be opened without destroying them and if they can be put back together

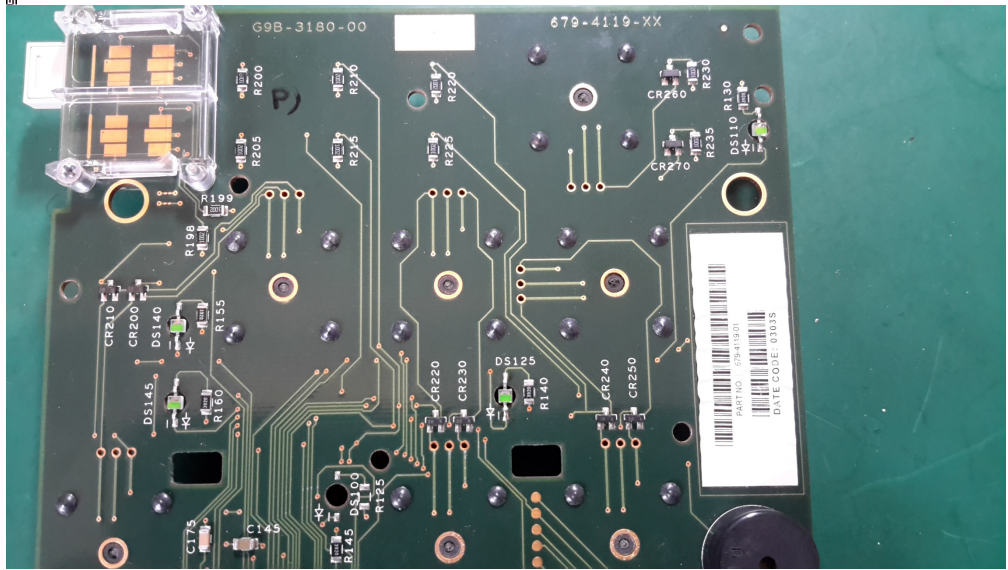
also I cannot find a model part number or replacement, hope someone can help!

they dont seem to be soldered to the board, so perhaps they have pins that just contact the board and then they are mounted by melting the plastic legs on the back side I think? 🤔🙄👉

EDIT: It seems they have also been used on TDS220 scopes



01.jpg (909.8 kB, 2285x1286 - viewed 272 times.)



02.jpg (680.84 kB, 2285x1286 - viewed 215 times.)

« Last Edit: December 08, 2019, 05:22:33 pm by analogRF »

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james_s

Super Contributor



Posts: 12821

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #1 on: December 08, 2019, 06:44:18 pm »

They're a known weak point on these scopes. I've had good luck with contact cleaner but it's a bit tricky to get it in there, with care you can get it to wick in around the shaft. It would probably work to drill a tiny hole in the casing somewhere but I would not do that without seeing inside a broken one.

Report to moderator Logged

analogRF

Frequent Contributor



Posts: 623

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #2 on: December 08, 2019, 07:05:45 pm »

I thought about contact cleaner and IPO spary both from around the shaft on the top and from the bottom and hope for the best...but two of them are so bad (universal knob on the top and the vertical position knob) that leave the whole scope really unusable. I feel no amount of cleaner from the outside would help... pity that the scope now works excellent in any other way but with those controls absolutely unusable the scope is very hard to use ...

can tektronix support help? If I knew what model encoder they are, i could perhaps replace them...

Report to moderator Logged

 **pbarton**
Regular Contributor



Posts: 234
Country: 



 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement**

Say Thanks Reply Quote

« Reply #3 on: December 08, 2019, 07:15:51 pm »

Tektronix had these developed by Bourns specifically for Tek scopes. So, they were a joint development and consequently they are proprietary parts, not generally available. They are held on the PCB by 'heat staking' the black plastic square, in the four corners. I bought a 3014B with a broken shaft. The only way to repair it was to source another PCB with the encoders on.


You can take the heads off the four corner rivets to remove the rotary encoder, then clean and replace with a small dab of epoxy in the four corners.

If you ruin something, I can send a spare rotary encoder, removed from my parts board.

« Last Edit: December 08, 2019, 08:26:13 pm by pbarton »

Report to moderator  Logged

 **TheSeven**
Newbie

Posts: 4
Country: 



 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement**

Say Thanks Reply Quote

« Reply #4 on: December 08, 2019, 07:17:22 pm »

My guess would be that they are working similar to these, just "inlined" into the PCB instead of being a module:


<http://redhunter.com/blog/2017/11/25/inside-the-bourns-ace-128-absolute-encoder/>

So spraying some cleaner into the gap between the PCB and plastic part and twisting it might help. If you look very closely, you can see a tiny bit of soldermask pullback from the outer ring protruding beyond the plastic.

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The following users thanked this post: analogRF

 **analogRF**
Frequent Contributor

Posts: 623
Country: 





 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement**

Say Thanks Reply Quote

« Reply #5 on: December 08, 2019, 07:19:55 pm »

it seems the whole board is actually manufactured by Bourns custom made for tektronix (look at the shots from service manual) so the encoders are probably custom made and never available in market

 fp1.JPG (23.8 kB, 1408x72 - viewed 92 times.)

 fp2.JPG (24.33 kB, 1359x97 - viewed 69 times.)

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 **analogRF**
Frequent Contributor

Posts: 623
Country: 



 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement**

Say Thanks Reply Quote

« Reply #6 on: December 08, 2019, 07:23:48 pm »

Quote from: TheSeven on December 08, 2019, 07:17:22 pm

My guess would be that they are working similar to these, just "inlined" into the PCB instead of being a module:
<http://redhunter.com/blog/2017/11/25/inside-the-bourns-ace-128-absolute-encoder/>


So spraying some cleaner into the gap between the PCB and plastic part and twisting it might help. If you look very closely, you can see a tiny bit of soldermask pullback from the outer ring protruding beyond the plastic.

yes, I think you are spot on. spraying with cleaner and hoping for the best seems the only way ... unless the whole board can be found very cheaply with all encoders working which is very unlikely



Report to moderator  Logged

 **analogRF**
Frequent Contributor

Posts: 623
Country: 



 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement**

Say Thanks Reply Quote

« Reply #7 on: December 08, 2019, 07:33:12 pm »

now based on what TheSeven suggested, I can see there are quite a few Bourns encoders on digikey that can be bought but they all have a little PCB mounted underneath them (the whole casing and legs and shaft are identical to the TEK board) I am guessing if that little pcb is removed it can be mounted on the TEK pcb board and then the legs are hot glued or something...i am tempted but I am afraid I might end up destroying the board ... I wish i had a bad front panel board to test this. TDS220/210 front panel is very similar with the same encoders....

EDIT: no, I checked more closely again, what is found on digikey cannot fit. the shafts are totally different and all are longer than this...these are most probably custom made for TEK

« Last Edit: December 08, 2019, 07:39:34 pm by analogRF »

Report to moderator Logged

pbarton
Regular Contributor



Posts: 234
Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #8 on: December 08, 2019, 07:44:54 pm »

To get spray cleaner into the encoder, you could always drill a 1mm hole into the black plastic square. I would suggest into a corner, where you are likely to do the least amount of damage. Then blast the spray cleaner in, using the supplied aerosol tube. This technique is often used to fix 'noisy' potentiometers, it should work with rotary encoder too.

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analogRF
Frequent Contributor



Posts: 623
Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #9 on: December 08, 2019, 07:49:06 pm »

i think i found the datasheet for these things...they are indeed customized...

01943-1.pdf (33.42 kB - downloaded 114 times.)

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analogRF
Frequent Contributor



Posts: 623
Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #10 on: December 08, 2019, 08:03:22 pm »

Quote from: pbarton on December 08, 2019, 07:44:54 pm

To get spray cleaner into the encoder, you could always drill a 1mm hole into the black plastic square. I would suggest into a corner, where you are likely to do the least amount of damage. Then blast the spray cleaner in, using the supplied aerosol tube. This technique is often used to fix 'noisy' potentiometers, it should work with rotary encoder too.

but any debris falling into the encoder is not gonna come out...for potentiometers it might be tolerable...anyways, if I wanna make a hole into it I might as well cut the legs from the other side and lift the whole housing and then try to glue it back...for now I will only try spraying from all angles and see what happens...

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analogRF
Frequent Contributor



Posts: 623
Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #11 on: December 08, 2019, 08:16:08 pm »

guys I think i found a picture of the board when all encoders were removed



000.jpg (129.36 kB, 960x720 - viewed 307 times.)

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pbarton
Regular Contributor

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

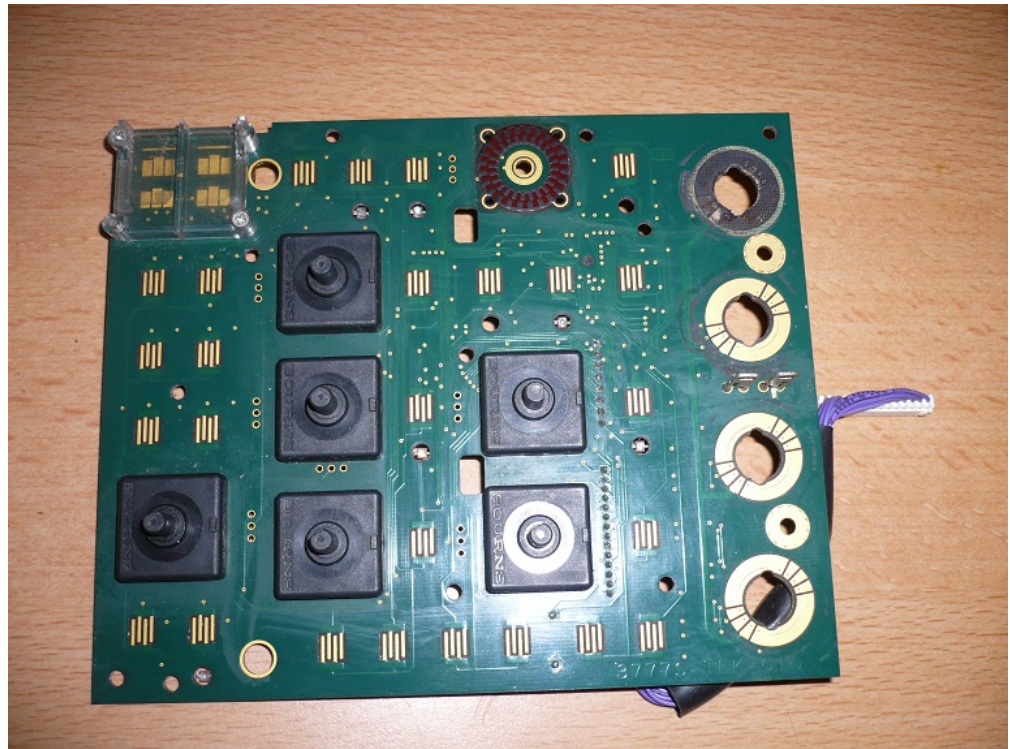
Say Thanks Reply Quote

« Reply #12 on: December 08, 2019, 08:42:26 pm »



Posts: 234
Country:

My rotary encoder parts mule.
Looks like Ch4 BNC caught fire!
I have used one rotary encoder, others available.




Bourns rotary encoder.jpg (220.03 kB, 768x576 - viewed 234 times.)

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The following users thanked this post: analogRF

james_s
 Super Contributor





 Posts: 12821
 Country: 
 

 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement** Say Thanks Reply Quote
 « **Reply #13 on:** December 08, 2019, 09:18:35 pm »

Yikes, I wonder what happened to that thing? Maybe someone tried to probe a really high energy circuit with a 1x passive probe?

I hadn't realized the encoders were etched right into the PCB like that. I've doused them in contact cleaner before and achieved significant improvement but had not ever tried taking one apart. I wonder why they did it that way? Kind of silly since mechanical encoders are notorious for getting flaky.

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analogRF
 Frequent Contributor

 Posts: 623
 Country: 
 

 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement** Say Thanks Reply Quote
 « **Reply #14 on:** December 08, 2019, 09:57:26 pm »

Quote from: pbarton on December 08, 2019, 08:42:26 pm

My rotary encoder parts mule.
Looks like Ch4 BNC caught fire!
I have used one rotary encoder, others available.

is there any trick if I decide to take the encoders out for repair/cleaning? also is it possible to glue them back to the board easily such that they are stable and solid?

Report to moderator  Logged

pbarton
 Regular Contributor




Posts: 234
 Country: 
 

 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement** Say Thanks Reply Quote
 « **Reply #15 on:** December 08, 2019, 10:23:10 pm »

Use a sharp blade around the edge the plastic rivet 'heat staked' head and lever the rivet edge away from the PCB.

A peripheral annular plastic ring should break away from the original central shaft. You only need to remove this peripheral annular plastic ring (the central bit should remain). Indeed there should be sufficient plastic remaining on the central shaft to re-stake the encoder when you come to reassemble it.


I don't think that I even bothered to use any epoxy in my repair. There should be just about, sufficient plastic remaining, to re-stake the encoder.

« Last Edit: December 08, 2019, 10:26:34 pm by pbarton »

Report to moderator  Logged

Ordinaryman1971
 Frequent Contributor








Posts: 298
 Country: 
 

 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement** Say Thanks Reply Quote
 « **Reply #16 on:** December 08, 2019, 10:36:00 pm »

I have TDS3012 scope with three of those broken... they work... just the shaft is sheered off. I'm using scope like this hoping to stumble upon a donor board. I've seen a replacement board on ebay for \$250 if I'm correct.

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analogRF
 Frequent Contributor

 Posts: 623
 Country: 
 

 **Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement** Say Thanks Reply Quote
 « **Reply #17 on:** December 09, 2019, 02:05:59 am »

Quote from: Ordinaryman1971 on December 08, 2019, 10:36:00 pm

I have TDS3012 scope with three of those broken... they work... just the shaft is sheered off. I'm using scope like this hoping to stumble upon a donor board. I've seen a replacement board on ebay for \$250 if I'm correct.

yeah, it's \$299 and two people have actually bought that for \$299 🙌

Report to moderator  Logged

james_s

Super Contributor



Posts: 12821

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks

Reply

Quote

« Reply #18 on: December 09, 2019, 03:06:41 am »

I think the same parts are used in all of the TDS3000 scopes. Given the higher spec instruments can sell for around \$2k and a brand new TDS3054C still retails for over \$20k, \$299 doesn't sound too bad if it has the parts you need.

Sure would be nice if they used off the shelf encoders but Tek scopes are a bit like high end luxury cars, expensive things are made of expensive parts. A 10 year old luxury car may be worth a fraction of what it cost new but new parts are still expensive.

Report to moderator Logged

pbarton

Regular Contributor



Posts: 234

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks

Reply

Quote

« Reply #19 on: December 09, 2019, 10:18:20 am »

Quote from: Ordinaryman1971 on December 08, 2019, 10:36:00 pm

I have TDS3012 scope with three of those broken... they work... just the shaft is sheered off. I'm using scope like this hoping to stumble upon a donor board. I've seen a replacement board on ebay for \$250 if I'm correct.

Send me a PM identifying the specific encoder type you require and your email address. You can have them for the cost of postage.

You need three?

'To lose one parent, Mr Worthing, may be regarded as a misfortune; to lose both looks like carelessness.'

With apologies to Lady Bracknell in Oscar Wilde's, The Importance of Being Earnest;

Report to moderator Logged

Ordinaryman1971

Frequent Contributor



Posts: 298

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks

Reply

Quote

« Reply #20 on: December 09, 2019, 03:33:59 pm »

PM send, let me take the scope apart and see which one are the ones that are broken...

Report to moderator Logged

analogRF

Frequent Contributor



Posts: 623

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks

Reply

Quote

« Reply #21 on: December 11, 2019, 01:33:55 pm »

I literally soaked the encoders by super contact cleaner with PPE (<https://www.mgchemicals.com/products/cleaning-products-for-electronics/cleaners/contact-cleaners/super-contact-cleaner-with-ppe-801b>) by spraying underneath them and after rotating them quite a bit and let it dry (also used compressed air to hopefully push the dirt away) I repeated the same thing again with IPA spray and put everything back together and Voila 🙌
All encoders work flawlessly at least for now... I hope it lasts for a while...Next time I will have to open the encoders 😬

that cleaner was the only thing I had available but I have had good results with it in other occasions too.

Thank you guys 🙌

EDIT: now I need to replace the time keeping NVRAM. Scope is made in 2003 and the battery has died 😬

« Last Edit: December 11, 2019, 01:39:48 pm by analogRF »

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james_s

Super Contributor



Posts: 12821

Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks

Reply

Quote

« Reply #22 on: December 12, 2019, 06:19:06 am »

Quote from: analogRF on December 11, 2019, 01:33:55 pm



EDIT: now I need to replace the time keeping NVRAM. Scope is made in 2003 and the battery has died 😞

You can cut it out with a razor knife and solder a CR2032 or similar holder to it.

Or you can make one of the adapters I came up with to replace the DS1742W in my TDS3000 with a DS1744WP. This is the PowerCap variety which has the battery and crystal in a replaceable snap-on cap. I laid out the board in an hour or two one afternoon so it's not the most polished I've ever done but it works perfectly.

<https://github.com/james10952001/DS1744WP-to-DS1742W-adapter>

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The following users thanked this post: coromonadalix, analogRF

james_s

Super Contributor



Posts: 12821

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #23 on: December 12, 2019, 06:30:03 pm »

I forgot to mention, the scope power-on hours are stored in this NVRAM, it's stored as the number of minutes in locations x7E0-x7E4. My device programmer doesn't properly handle these but I was able to program it by hand. I used an FPGA dev board that has a bunch of switches and LEDs with the FPGA being used as essentially just a patch panel. It would be trivial to write some code for an arduino or other microcontroller of choice to do the same thing.

All other data can be programmed into the blank chip by the scope itself, it's just all the configuration settings and state, the error log and of course the date and time.

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analogRF

Frequent Contributor



Posts: 623

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #24 on: December 13, 2019, 02:01:53 pm »

i dont have the means to program the chip. i just want to replace its battery. am I gonna lose anything important other than the number of power on and number of hours?

is it possible to rewrite these numbers in the new chip through LAN connection for example?

by the way how come I have not lost those numbers if the chip's battery cannot keep the time/date?

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james_s

Super Contributor



Posts: 12821

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #25 on: December 13, 2019, 05:23:28 pm »

The number of power on cycles is stored elsewhere, the hours is the only thing that I found no other way to set. There may be a way to write it via ethernet console, I don't know. Programming the part manually is pretty trivial since there are only 5 bytes that matter, it could be done in a breadboard with a bunch of jumper wires.

Report to moderator Logged

Jwalling

Supporter



Posts: 1392

Country:

This is work?



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #26 on: December 13, 2019, 05:33:53 pm »

Quote from: analogRF on December 13, 2019, 02:01:53 pm

by the way how come I have not lost those numbers if the chip's battery cannot keep the time/date?

Battery has enough voltage left to power SRAM, but not enough to run the oscillator.

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Jay

System error. Strike any user to continue.

The following users thanked this post: analogRF

analogRF

Frequent Contributor



Posts: 623

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #27 on: December 13, 2019, 06:26:46 pm »

Quote from: Jwalling on December 13, 2019, 05:33:53 pm

Quote from: analogRF on December 13, 2019, 02:01:53 pm

by the way how come I have not lost those numbers if the chip's battery cannot keep the time/date?

Battery has enough voltage left to power SRAM, but not enough to run the oscillator.

yes, makes perfect sense. Why didnt i think of that 😞

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analogRF

Frequent Contributor



Posts: 623

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #28 on: December 13, 2019, 06:29:21 pm »

if there is a way to change the model number and smapling rate through LAN and GPIB...i think there must be a way to set the hours and No of power cycles, too.

Does anybody know?

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james_s

Super Contributor



Posts: 12821

Country:



Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #29 on: December 14, 2019, 04:14:09 am »

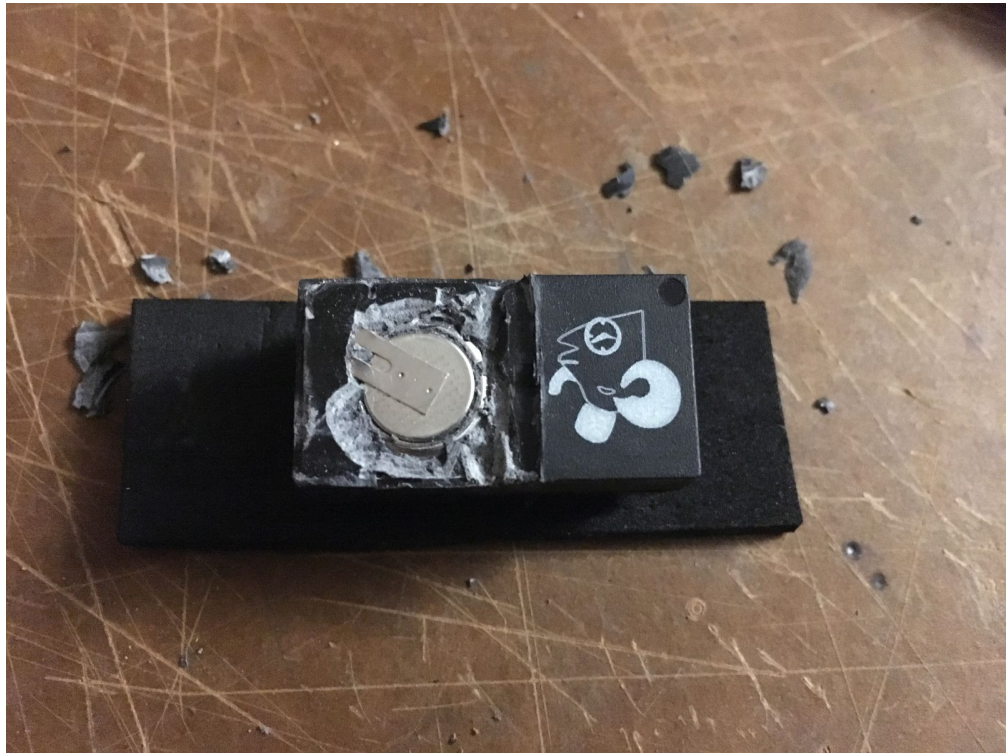
Quote from: Jwalling on December 13, 2019, 05:33:53 pm

Battery has enough voltage left to power SRAM, but not enough to run the oscillator.

That was exactly what mine was doing. When I cut the battery out it measured 0.6V, pretty remarkable really that it was enough to keep the RAM going.

I attached a new battery and it worked for a while and then failed. Later I discovered I had tugged a little too hard and cracked the solder joint at the PCB but I had already gone down the path of designing an adapter to install the DS1744 so I took that route in order to verify my design.

If you want to try replacing the battery while preserving the RAM contents, wire up a socket to a 3.3V power supply and plug the chip into that while you carve into it and cut the battery out. With care it's not too hard, I've "fixed" a number of other Dallas chips without issue.



ds1742 surgery.jpg (258 kB, 1600x1200 - viewed 80 times.)

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analogRF
 Frequent Contributor

 Posts: 623
 Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #30 on: December 14, 2019, 06:38:17 pm »

how do you take that battery out? to what points do you solder the new one? I mean, do I necessarily need a spot welder or something? because i dont have one.

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james_s
 Super Contributor

 Posts: 12821
 Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

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« Reply #31 on: December 14, 2019, 08:36:21 pm »

I stuck the chip into a cheap IC socket to protect the pins, then I used a razor knife to cut the plastic potting cup off the side with the battery (confirmed with a magnet) and then started digging into the epoxy with a screwdriver. A heat gun or hot air tool is very helpful to soften the epoxy, then I pried up the corner of the nickel strip and used pliers to peel it off the battery. After that I dug around the battery a bit more until I could pry the whole battery out enough to cut the strip welded to the other side. Then I simply soldered wires to the ends of the strips that were formerly welded to the battery and soldered those to a CR2032 holder which can be glued right on top of the chip or mounted remotely.

Just be careful not to yank too hard on the strips as you're prying the battery out of there, that's how I broke the solder joint on mine. At some point I'll dig in further and repair that but my replacement adapter is working perfectly well so I plan to just leave that in the scope.

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The following users thanked this post: analogRF

analogRF
 Frequent Contributor

 Posts: 623
 Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #32 on: January 01, 2020, 02:18:29 am »

My TL866 programmer can read and write DS1220 and it has exactly the same pin out as the DS1742. It seems to be the same NVRAM as ds1220 plus the clock which only reserves the top (or bottom?) 8 bytes as clock registers.

so I am thinking of buying a DS1742 and then reading mine and writing it into the new chip as a DS1220. what do you think the problem would be?

people have done this for DS1486 firmware IC on TDS700 series by reading/writing it as a DS1250 (offset by 8 bytes for the clock registers maybe)

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james_s
 Super Contributor

 Posts: 12821
 Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #33 on: January 01, 2020, 08:02:10 am »

Quote from: analogRF on January 01, 2020, 02:18:29 am

My TL866 programmer can read and write DS1220 and it has exactly the same pin out as the DS1742. It seems to be the same NVRAM as ds1220 plus the clock which only reserves the top (or bottom?) 8 bytes as clock registers.

so I am thinking of buying a DS1742 and then reading mine and writing it into the new chip as a DS1220. what do you think the problem would be?

people have done this for DS1486 firmware IC on TDS700 series by reading/writing it as a DS1250 (offset by 8 bytes for the clock registers maybe)

Been there, tried that, it doesn't work.

I wasn't entirely sure why until I lashed up a rig to manually twiddle the address and data pins with switches and monitor the outputs and then studied the datasheet. You have to set a bit in a control register then write the desired data in the timekeeping and configuration areas and then clear the bit you set to enable writing. The pinout is the same as a plain NVRAM but it requires a more complex procedure to work with it. Once the battery has gone dead it defaults to frequency test mode where the LSB data line is pulsing at 512Hz.

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The following users thanked this post: analogRF

analogRF
 Frequent Contributor

 Posts: 623
 Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #34 on: January 01, 2020, 12:28:32 pm »

my theory was also flawed because DS1742W is a 3.3V chip and DS1220 (and DS1742) are 5V chips so in any case R/W with TL866 would not have been possible

but there is GQ-4x programmer which can be had with a pretty good price and it has listed 1742 and 1742W specifically in the list of supported chips. Does anybody have any experience with this?

Also Xeltek SuperPRO 610P lists 1742/1742W as supported but that is an expensive gear not worth the money...

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james_s
 Super Contributor

 Posts: 12821
 Country:

Re: TDS3000B TDS3054B strange type rotary encoder repair/replacement

Say Thanks Reply Quote

« Reply #35 on: January 01, 2020, 07:16:21 pm »

I was able to read my DS1742W in a TL866, pretty sure it just hit it with 5V which eventually would likely harm it but in the short term it didn't seem to do anything. I found an interesting behavior though, the first time I read it I got garbage, but if I read it twice I was able to successfully dump it. Writing however did not work, at least not in the clock and config areas.

I tried a borrowed GQ-4X also and that didn't work for me either but I've had some general problems with that unit and suspect it may have a fault.

In the case of the DS1742 the easiest thing I found was to just twiddle it manually, I used a FPGA board but an arduino or even just a breadboard with some jumpers or dip switches would work fine. I recently picked up an Arduino mega clone with the thought of making an adapter to read and write these NVRAM/RTC chips.

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The following users thanked this post: analogRF



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