



Quick Bally Driver Board Repair / Bulletproofing

v1.1

The original guide was written by vid1900 and can be found at <https://pinside.com/pinball/forum/topic/vids-guide-quick-bally-driver-board-repair-bulletproofing>

PDF produced by bleargh

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So, I'm on the road, at a bar that has a Funhouse and a KISS game. I play a few games and go back to my laptop. A nosy guy apparently is watching me type and says:

Guy: So you are Vid1900?
Me: Eh, no.
Guy: I recognized Pinside a mile away - you are logged in on it!
Me: Yeah, Pinside is great.
Guy: I'm xxxxxxxx on there, glad to meet you!
Me: (we shake hands)

So we drink and the guy tells me he loves pinball, has 2 non working machines and is looking to buy another.

He wants me to come fix his machines, he lives one block over. I tell him my hourly price hoping to scare him away. I also tell him I'm on the road for work and have only basic parts in my van. He cons me into following him to his house.

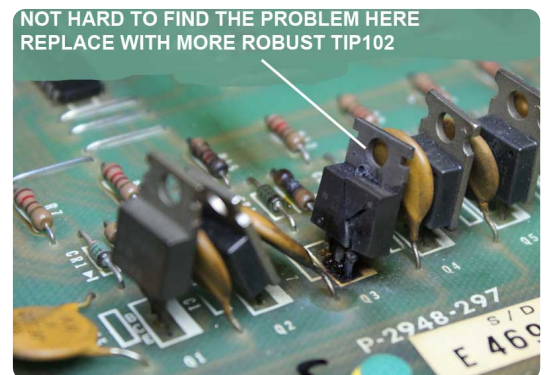
His favorite game is Bally Supersonic and he also has an EM with a missing backglass (some kind of western theme).



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Supersonic is blowing fuses. I open the backbox and see Q3 damaged on the driver board.

Q3 is the knocker, I believed, so we lift the playfield to see what it looks like.





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Inside the cab there are a pile of CPU and Driver boards. I guess somebody decided that it's cheaper to keep replacing them, than to fix them. Two of the driver boards have the same Q3 transistor blown, yeesh.

I cut the knocker out, before it can do any more damage.



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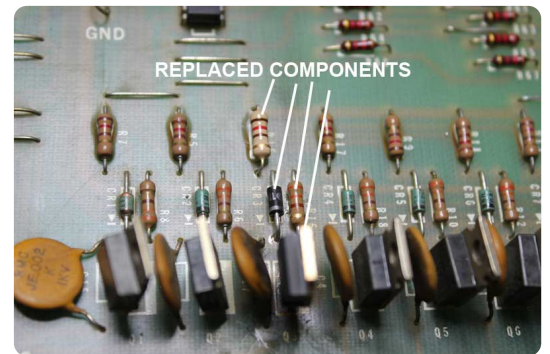
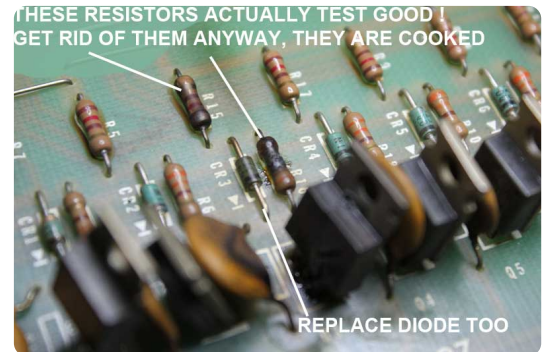
The associated 120 and 330 ohm resistors are nicely blackened, as is the 1N4004 diode.

Believe it or not these resistors still test good!

I pulled them and the diode out. Even though they work now, there is no sense in leaving a ticking time bomb.

The TIP102 transistors are much higher rated parts than the originals, always good to have on hand.

The diode has a band on it that has to be installed in the same direction as the original.



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Any time you have a Bally Driver board out for service, there is some bulletproofing to do.

Job number one, ALWAYS replace the capacitors C26 and C23.

The new caps are always smaller in size, even though I always use higher voltage parts.

Parts made to withstand higher voltages will last longer when used at lower voltages.

C23 was a 11,000uf 20v cap - I replaced it with a 15,000uf 35v unit.

C26 was a 150uf 350v cap - I replaced it with a 150uf 450v unit.

(uf is pronounced "micro farad")





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I can hear you guys now, why replace a cap if it is still good?

Caps have about a 12 year life span, and these caps are almost 3x that age, and have had a very hard life.

Lets look at the 11,000uf unit, C23.

It tests good as a capacitor & it looks good on the ESR meter.

For how long is anybody's guess, but right now it's good.



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Now we look at the 150uf cap, C26.

The capacitance reading is good, but look at that high ESR reading!

Your normal VOM meter would have said this cap is good, but the ESR meter tells the whole story. This cap is on its way out.

For reference, the replacement cap had an ESR of .06 ohms.

You can use the ESR test in circuit. I tested these caps really as an afterthought. From experience, I would have replaced the caps no matter the reading.

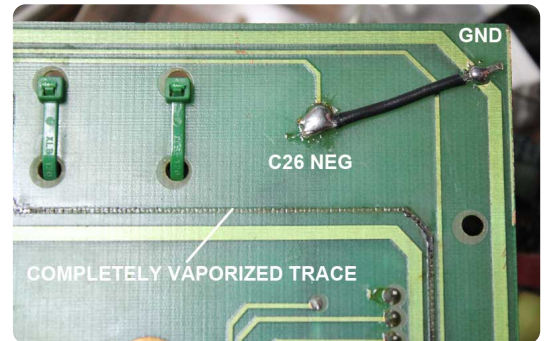


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Next on the bulletproofing is to tie C26's NEG leg to ground.

These Bally boards had some strange designs and we can make them more reliable .

Note also the completely vaporized board trace. I replaced that trace with a wire, hot glued to the board.



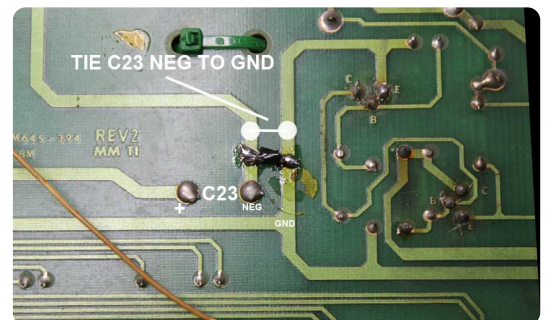
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We also need to tie C23s NEG leg to ground.

Just scrape off some of the conformal coating and solder in your jumper.

Note the not too bad solder joints on the transistors that have been replaced in the past.

I checked all the transistors on the board before reinstalling it.





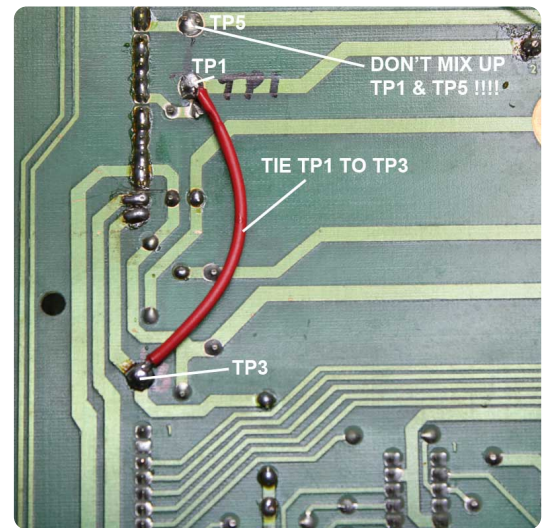
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Next we always tie Test Point 1 to Test Point 3.

Otherwise the voltages take a crazy run off the board and back through the connectors.

Before you tie them together, you will see that they are often different voltages.

Don't mix up TP1 and TP5 or you will cause lots of damage!



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So back to the knocker coil. I sure did not have one with me, and the existing one did not have a diode on it - probably taken from the EM machine next to it.

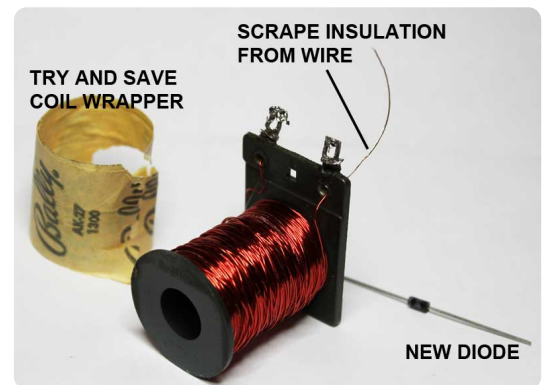
The coil did not smell burnt.

It did have a puncture through the wrapper that had chipped off the red insulation.

I removed the wrapper and looked at the chip, it seemed that maybe the chip was shorting the coil (the coil resistance was something like 2 ohms).

After snipping the end of the wire off, I unwound the coil until I was passed the damaged part.

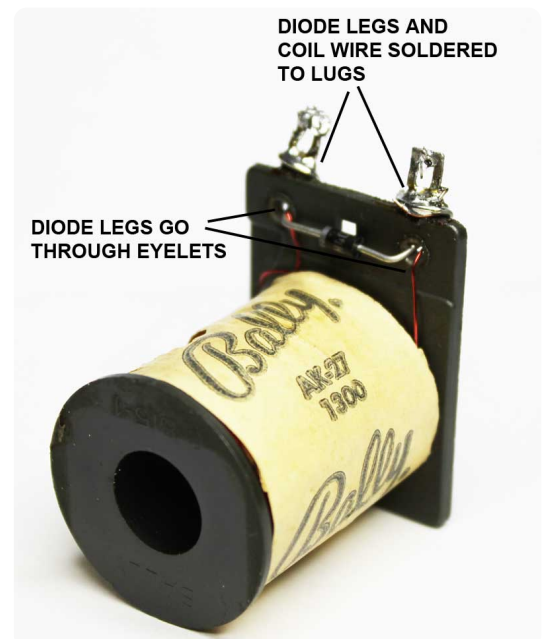
Then I scrapped off the insulation and wrapped the bare wire around the lug. I tested the resistance and we had a good coil again.



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Next I stuck in a new diode and wrapped its legs around the lugs.

I soldered both lugs and the coil was ready for action again.





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So we put everything back together again and played ourselves some Supersonic.

He still needs to install a remote battery holder (I did not have one with me) and needs a new speaker (the old one is completely torn all the way around).

He paid me and gave me all the dead boards from inside of the game (very cool).



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Here was another fix that I had forgotten I had taken a picture of.

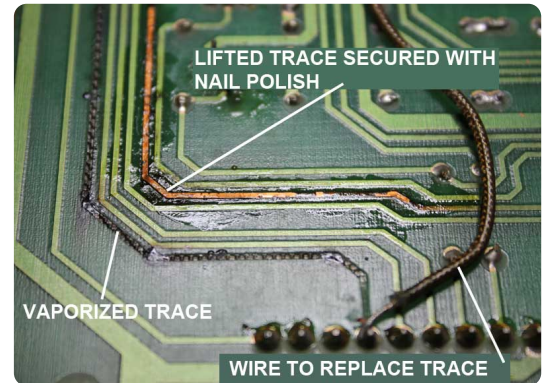
One of the traces from the Q3 transistor had lifted from the heat of too much current being run through it, but it still had continuity.

I used clear nail polish to "glue" it back down to the circuit board. Nail polish dries very fast, so put some under the trace, wait about 20 seconds and then hold it down with the tip of a resistor lead.

Put some polish over the top also, to help insulate it.

The other trace in the picture was not so lucky. It completely burned up.

I use a wire to replace it, and latter glued it down with hot glue.

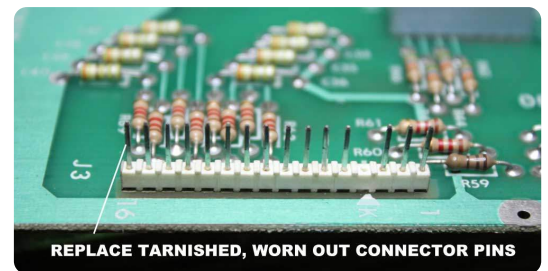


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I want to bulletproof the whole board so I can avoid any other callbacks.

Job one: get rid of these old and tarnished connectors.

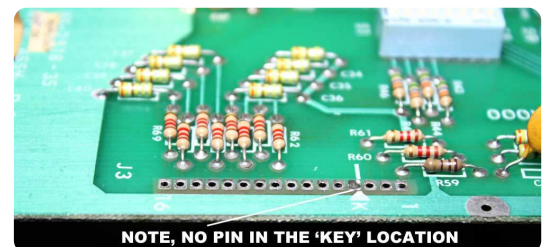
You can see that they have been sanded many times over the years to try and clean off the oxidation.



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Since I'm on the road, I have to use my Hakko desoldering gun rather than my benchtop Metcal. The Hakko makes quick work of removing the old connectors.

Note that I leave the "key" position full of solder - you can't make a mistake that way and leave a pin in the new connector housing.





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The old Bally connectors were about as crappy as you can get.

The new ones are much more robust and have a backing spring finger that puts positive pressure on the female part of the connector, locking it in place.

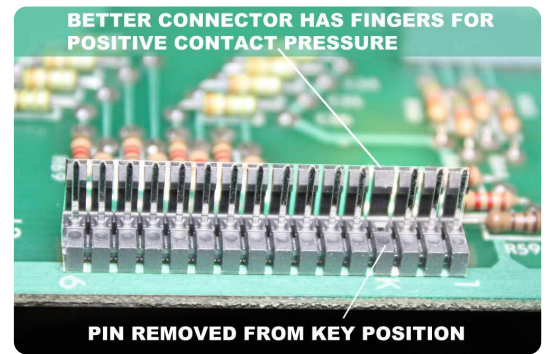
These better connectors are 2 cents more expensive than the originals, and are cut to any needed length - no need to stock a bunch of different pinned connectors.

I pulled the Key pin out with a pair of needle nose pliers, and soldered the connector in.

Next, all the old IC sockets were removed.

Some of them were so weak that I could pry up one end of the chip with my fingers (normally you need a flat screwdriver to remove a chip).

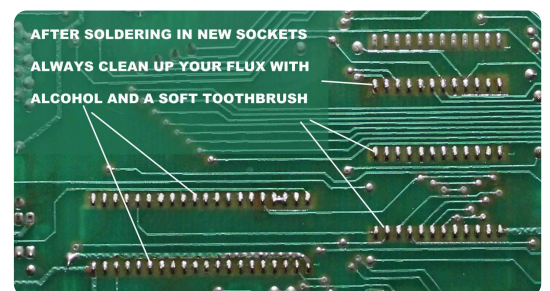
I replaced all the sockets with SIP sockets. SIPs are cut to any length, so you don't have to keep a ton of different IC sockets in your inventory. SIPs have an amazingly strong grip on the chips, you are not going to pull any chips out by hand - that's for sure.



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After soldering, make sure you clean up all the flux with Alcohol.

It is a sign of good workmanship, and it keeps the flux from further corroding the board, or high voltage arcing.





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Finally I replaced the battery holder with a remote unit and replaced the female connectors on the wiring harness.

I powered up the game and it ran flawlessly for over an hour.

This MPU is now bulletproofed.

