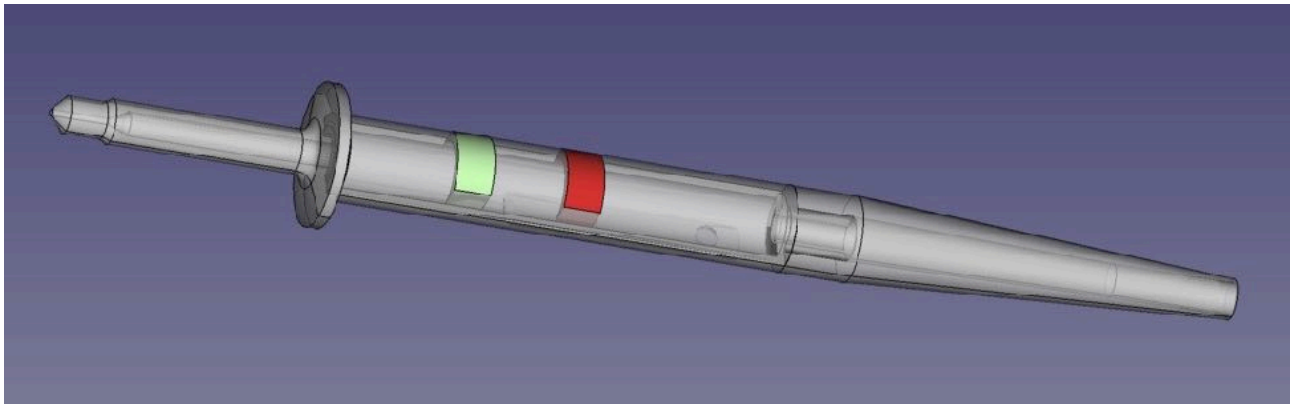
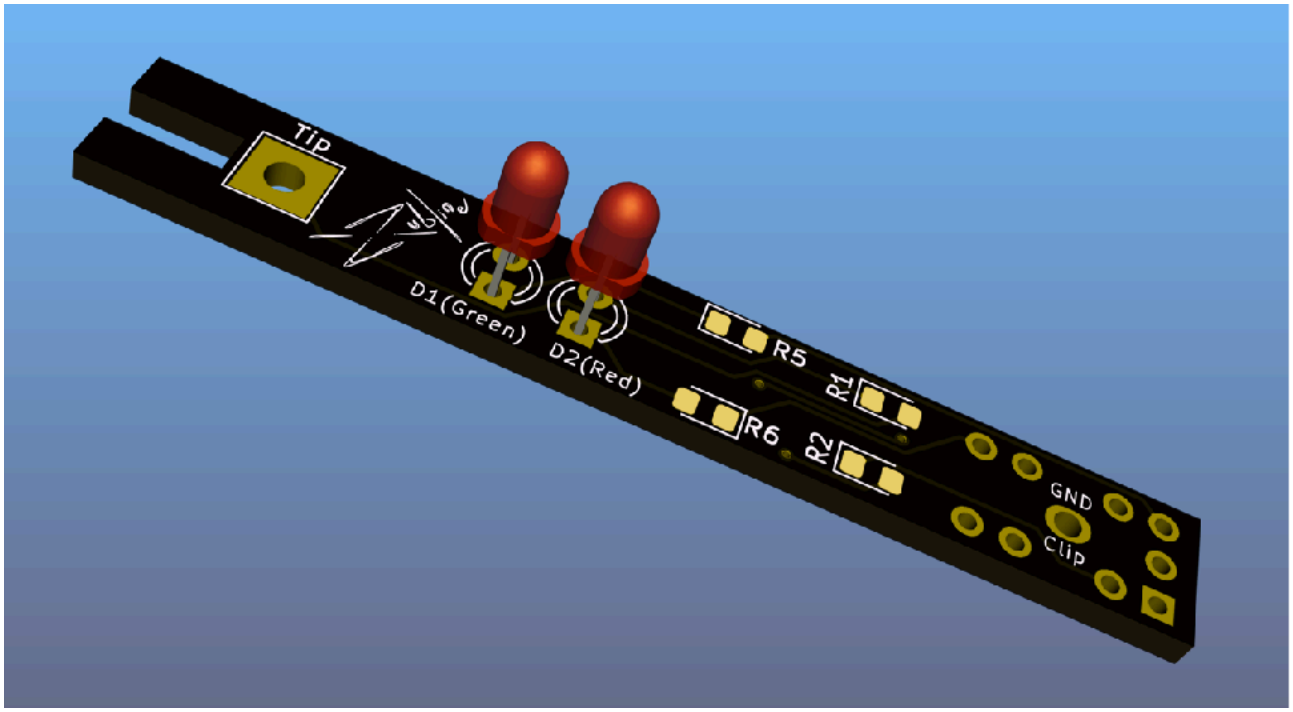
The Fluke 9000a Probe Repro Project





This is an attempt at recreating the 9000a Probe for the Fluke 9010a Microsystem Troubleshooter both in electronic and physical layout as close as possible to the original (which has become virtually unobtainable).

It should be possible to assemble the probe with moderate dexterity and halfway decent SMD soldering skills..;)
The smallest parts are 0805 (most of them, actually) so you will need good magnifying glasses and a good way to clamp the board if you are indeed slightly older than the teenager you still are in your mind.

The board was done in KiCAD and the 3d stuff in Freecad. All the files should be included in the archive, including „ready to use“ STLs and a Gerber archive to order the boards with your favorite PCB manufacturer. Of course, I won't be responsible if you damage your Fluke or yourself, all I know is that it worked well for me.

Have fun,
Mirko

3D Printing the Case / Connector Housing

The recommended orientation for printing.

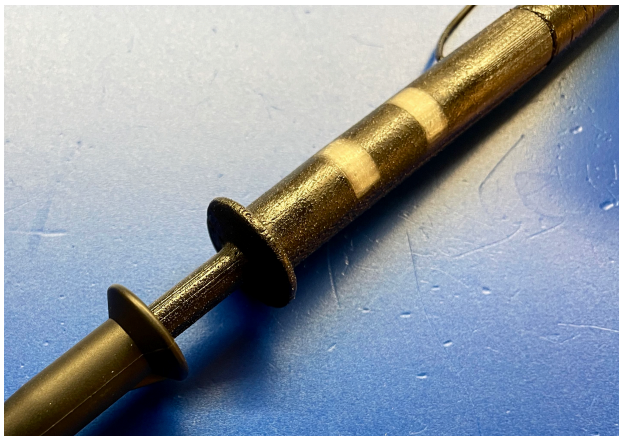
I tried adding „lips“ to the cover but this made the part too finicky to print reliably (at least with my printer).

I would suggest glueing thin strips of plastic to the inside, if you are bothered with the possible gap through which the light of the LEDs can bleed out.

Same for the separator part between the two LEDs.
In real life, this does not seem to be a problem though. I think it is actually a benefit if you can see a bit of the light through the other window, as it helps to tell which is high/low if you use the same color lights.

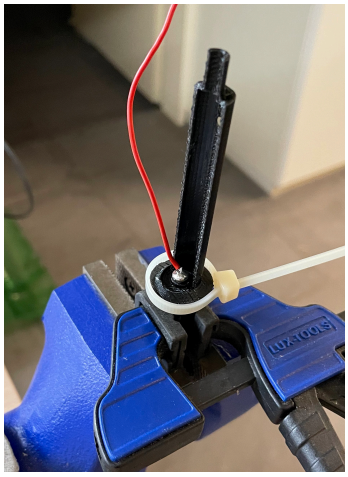
For the cable guide I used some elastic filament (TPU) and spraypainted it black. It does work quite well and is surprisingly strong.

The windows were printed with clear/natural PLA, sanded and then glued in using clear epoxy. Then the whole cover was sanded flush.



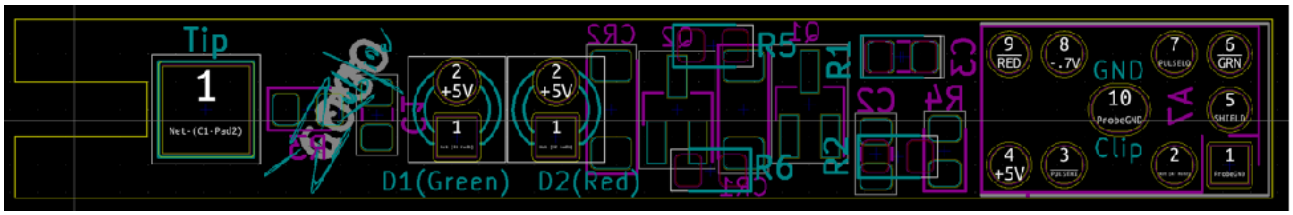
After assembly the probe was spraypainted black (the windows covered, of course) and then a clear „structure“- finish was applied.

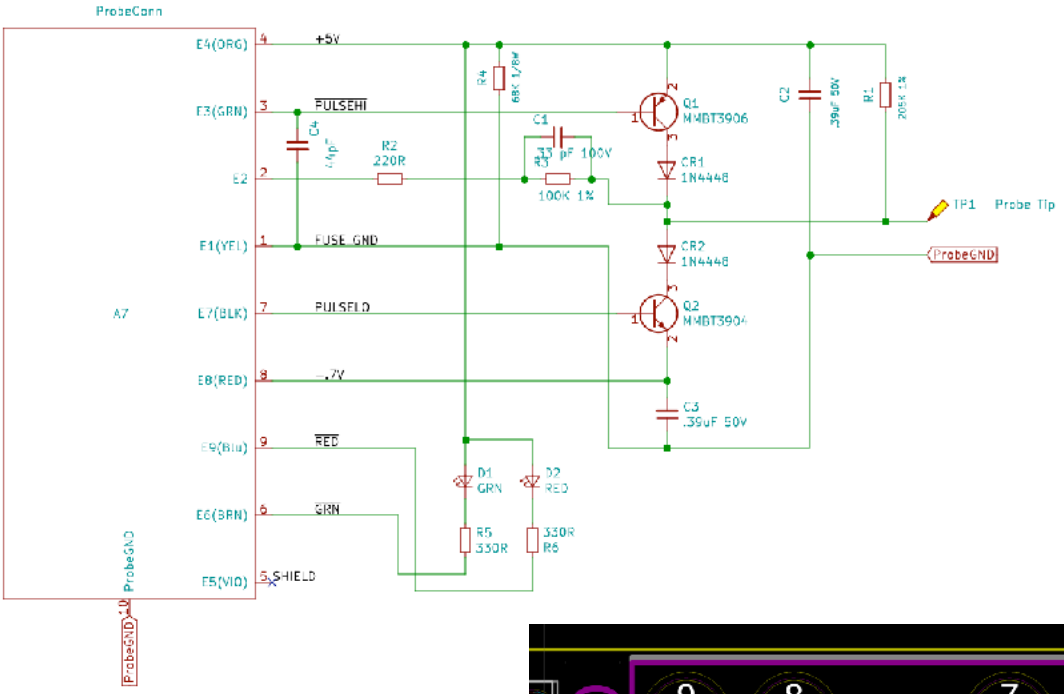
The probe does fit into standard oscilloscope addon- clips.

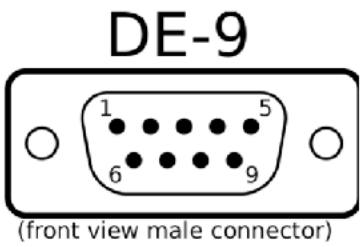


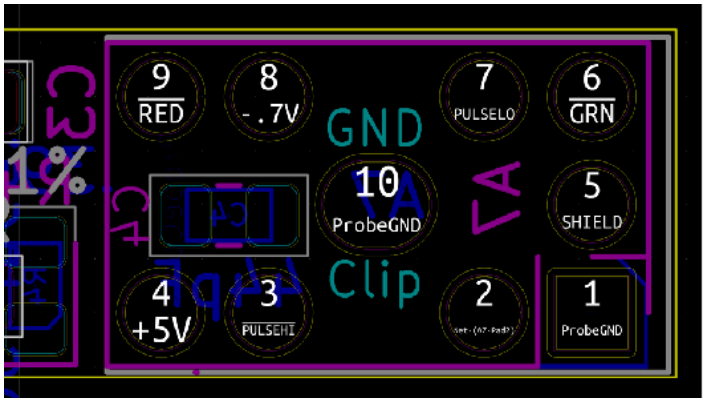
For the probe’s tip I just used a long nail which was sanded down to get rid of its finish and then glued in using epoxy.
I’m sure there are better options, but this seems to work well as it adds stability to the assembly.

The Schematics









PCB from Top, Tip is left

Some explanations:

PIN „10“ on the probe connector is actually the ground clip (whose connector on the original was fixed to the board). In order to preserve the original physical layout of the probe as much as possible it had to be placed on the footprint of the connector)

R5/R6 are the current- limiting resistors for the LEDs. I suggest something between 200-330R, depending of the LED’s you choose / the brightness you like.

Cap C4 is a solution to the „pulse high- glitch“ discussed below and can be omitted if said glitch does not manifest.

The BOM

Fluke 9010a Probe

Designator	Designation	Qty	Package	Dig-Key Part Number
CR2,CR1	1N4448	2	D_1806_4516Metric	LS4448GS08GICT-ND
C1	33 pF 100V	1	C_0805_2012Metric_Pad1.15x1.40mm_HandSolder	**478-10393-1-ND**
C2,C3	.39uF 50V	2	C_0805_2012Metric_Pad1.15x1.40mm_HandSolder	**399-13291-1-ND**
D1(Green)	GRN	1	LED_D3.0mm	
D2(Red)	RED	1	LED_D3.0mm	
Q1	MMBT3906	1	SOT-23_Handsoldering	MMBT3906-FDICT-ND
Q2	MMBT3904	1	SOT-23_Handsoldering	MMBT3904-FDICT-ND
R1	205K 1%	1	D_0805_2012Metric_Pad1.15x1.40mm_HandSolder	**311-205KCRCT-ND**
R2	220R	1	D_0805_2012Metric_Pad1.15x1.40mm_HandSolder	**A130130CT-ND**
R3	100K 1%	1	D_0805_2012Metric_Pad1.15x1.40mm_HandSolder	**RMCF0805FT100KCT-ND**
R4	68K 1/8W	1	D_0805_2012Metric_Pad1.15x1.40mm_HandSolder	**P123871CT-ND**
R5,R6	330R	2	D_0805_2012Metric_Pad1.15x1.40mm_HandSolder	200R - 330R

Other Stuff: (Digi-Key Part Numbers)

- DB 9 connector: A-DS 09 LL/Z
- Slide Lock: 160-009-002R031
- Cable: 30-01528

The „Pulse High“ Glitch

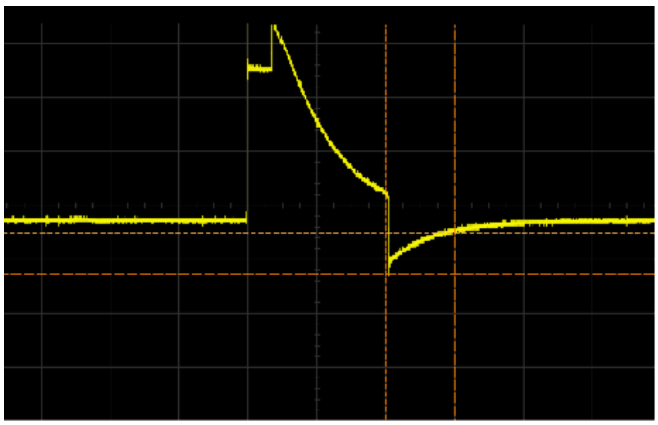
When pulsing high only, the low LED does blink too which of course it shouldn’t.

The issue seems to be caused by „crosstalk/interference“ with the PULSELO signal. Not sure yet if it is because of the boards layout or missing shielding / type of the cable (the problem was much less prominent when I used a different cable).

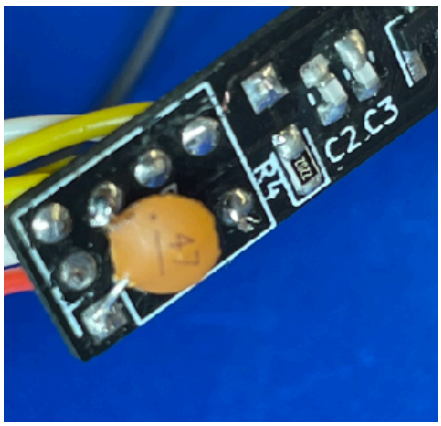
It can however be dealt with by adding a ‚decoupling’ cap (47isch pF) between pins 7 (PULSELO) and 1 (GND). It is referenced as C4 in the schematics above.
(The board shown below was the first prototype, so might look different than the final version).

However, the glitch might not really affect the probes general function as the ‚low‘ part of the high pulse is marginal.

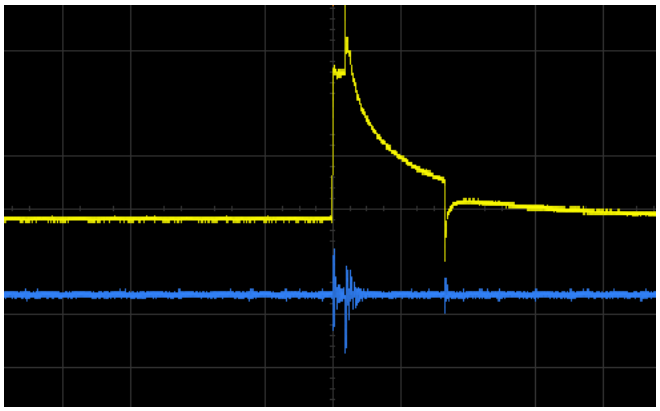
Mabe I’ll add the filter cap as an option to the next version of the board, however there’s little space left.

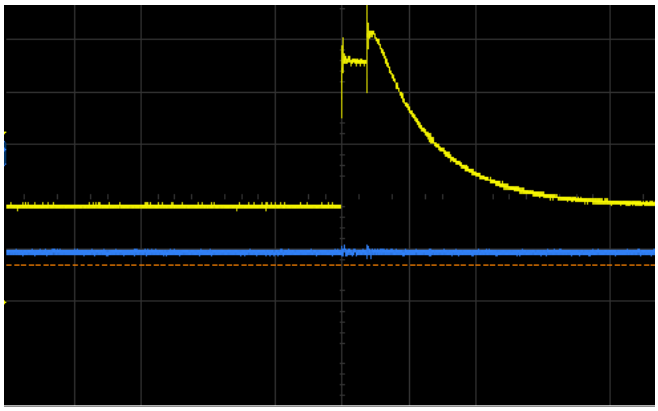


The Glitch



The Solution





Yellow trace is probe tip
Blue trace is PULSELO

Updates:

V1.3: Added C4 (see „high puls glitch“ above) as a SMD component to the layout. May be omitted if problem is not apparent.