Power and Ground

(Ueli Straumann, 3.9.04)

Purpose of this discussion: Check design w.r.t.

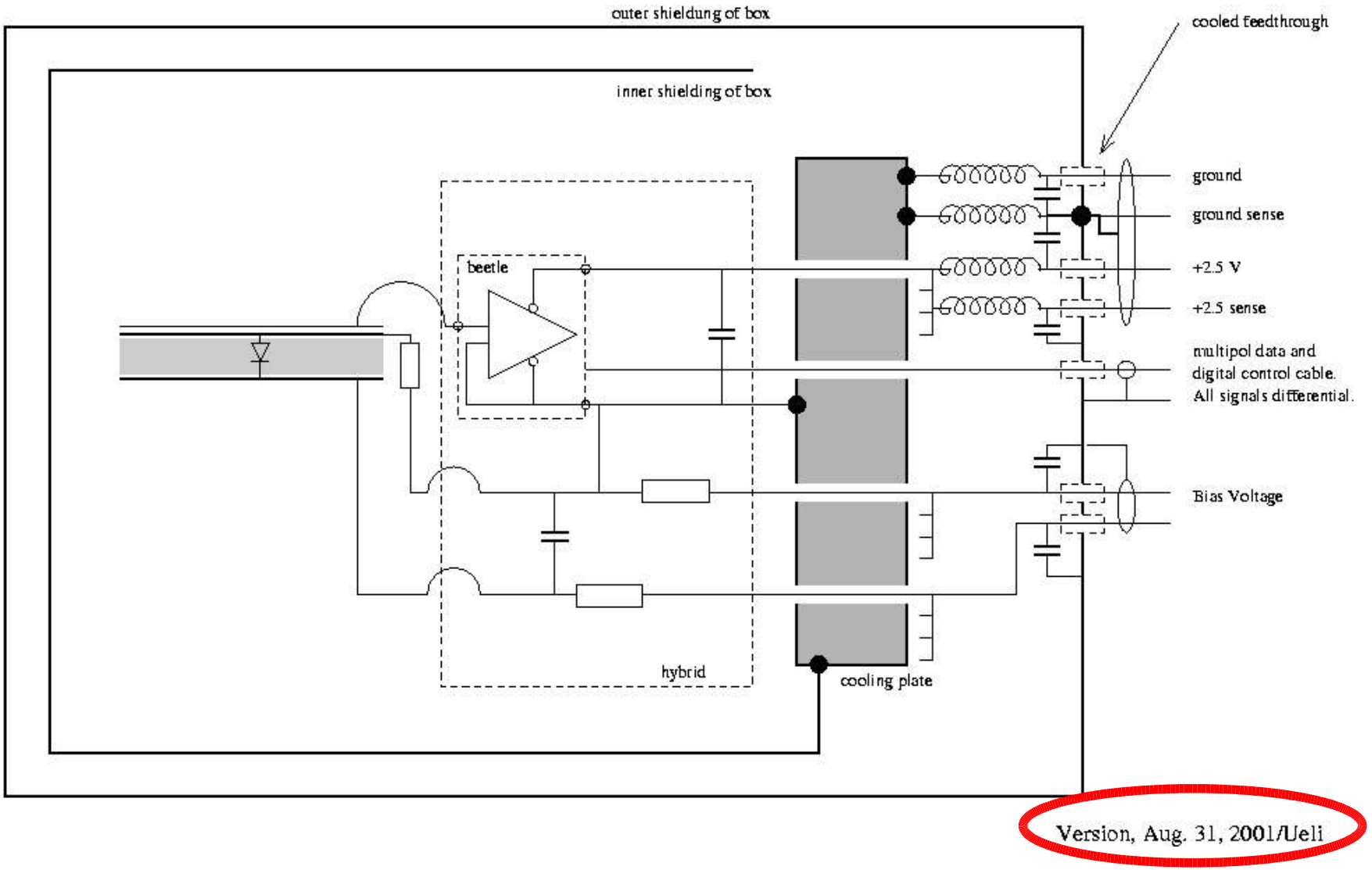
- Minimize inductive noise from external fields
- Avoid noise currents in the input signal path
- Filter noise, which might be brought in by power supply
- Avoid generation of noise currents due to big ground loops
- Safety ground

Sturcture of this talk:

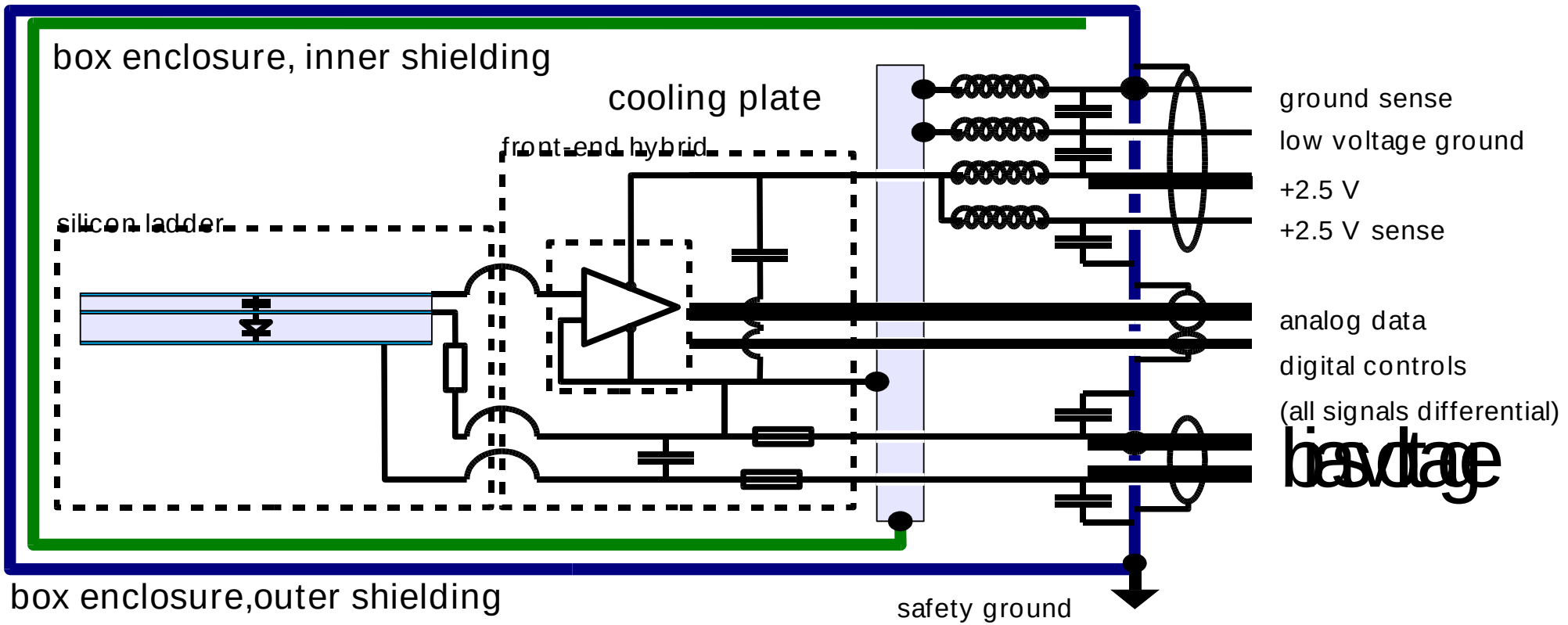
1. History
2. Shielding
3. Input signal current path
4. Power currents, grounding, shielding: loop?
5. Conclusions

History (I)

Here is my original drawing:

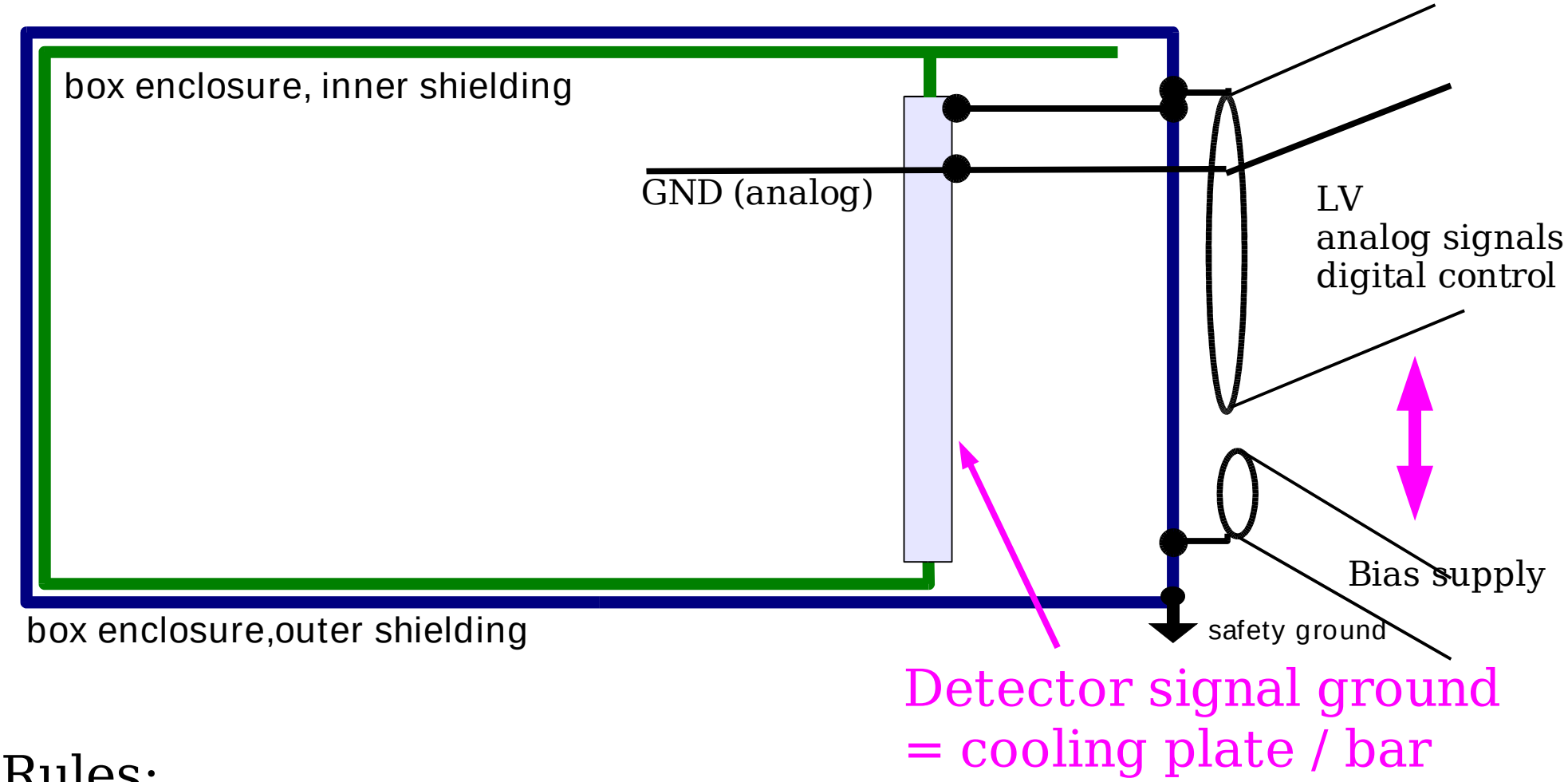


History (II): Version of TDR:



At that time we had a 1 to 1 cable between service box and detector.

2. Shielding ... and where to connect it to.

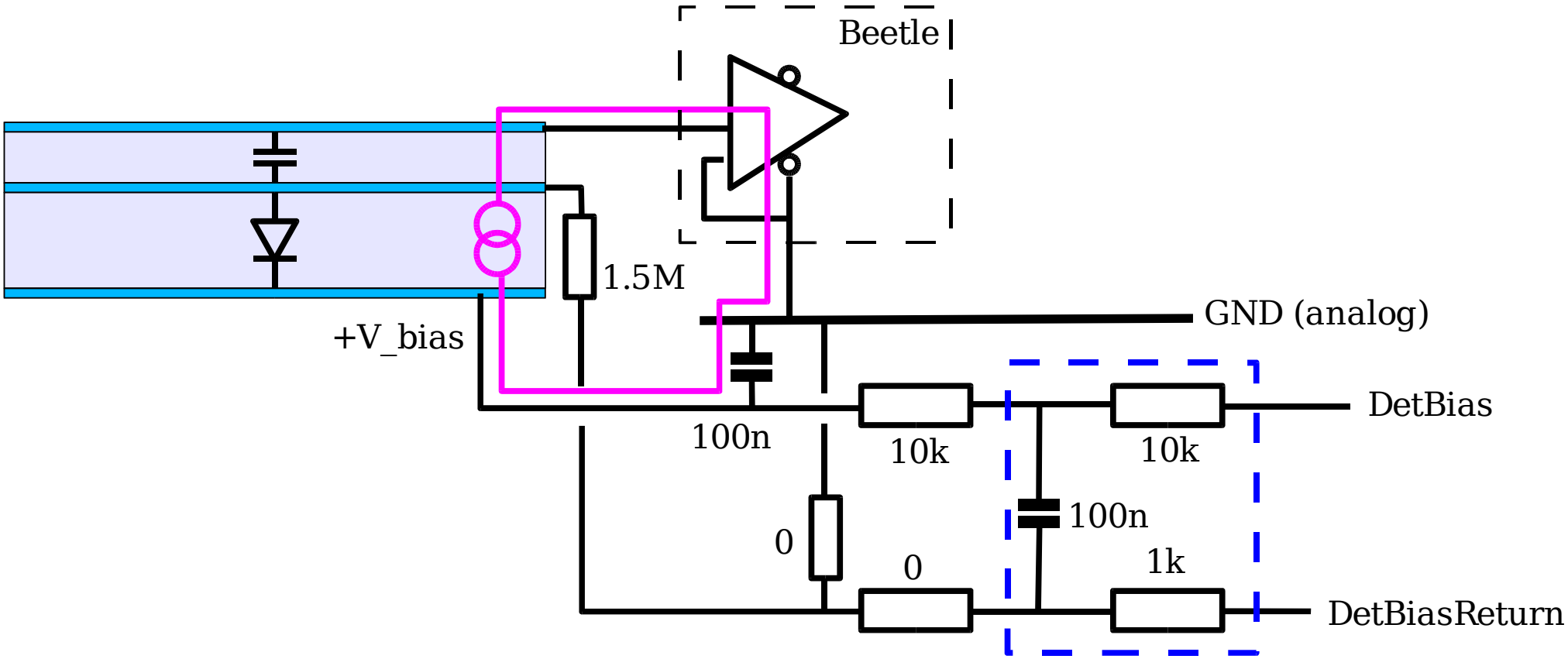


Rules:

1. all shielding must be connected on both ends of the cable
2. shielding of detector should be “water tight”

3. Input signal current path

essential elements,
taken from Christian's schematics

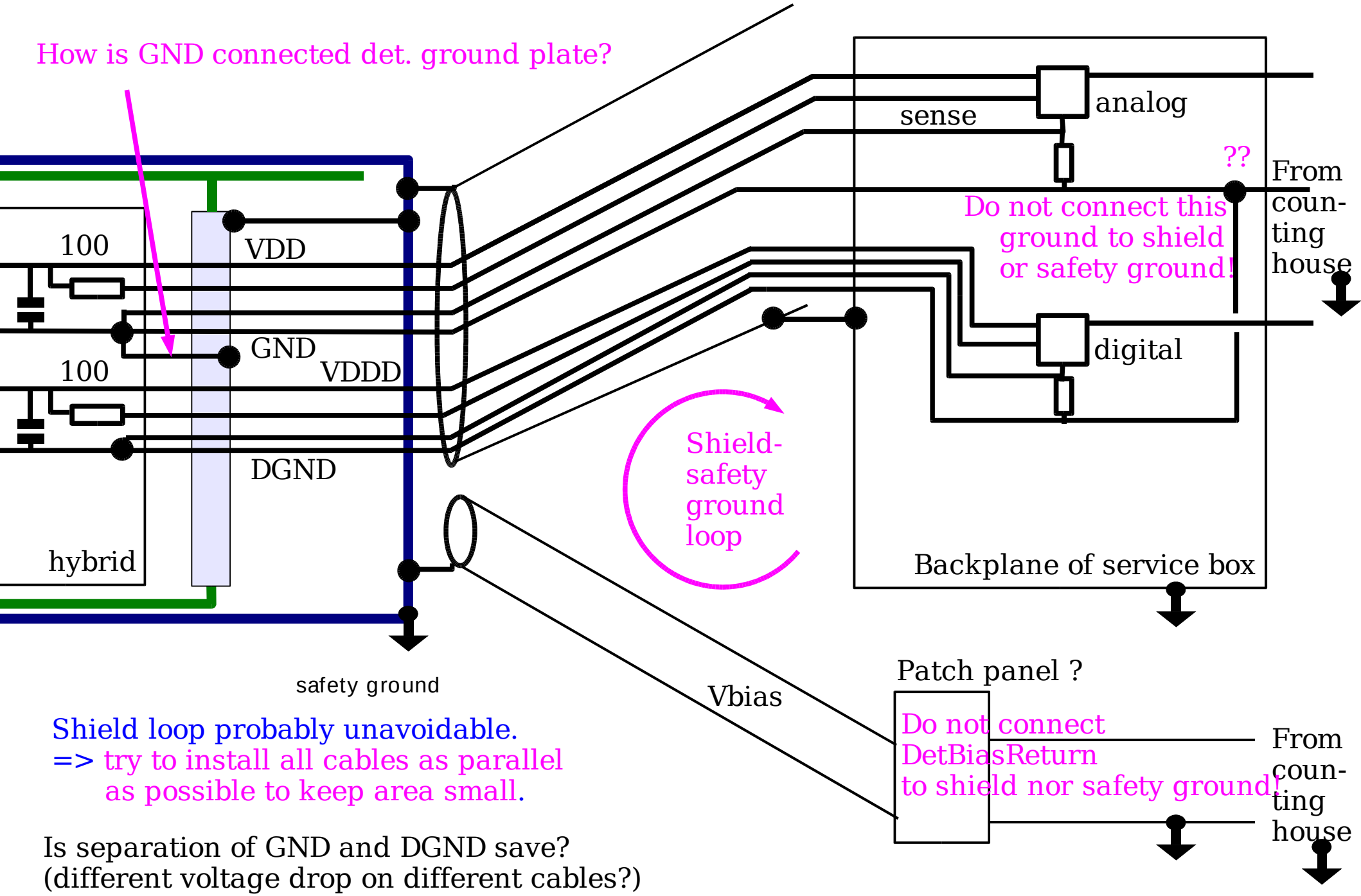


Signal path and power filtering now decoupled.
No obvious source for noise in signal path

V_bias connection shoud be straight and as short as possible

A total of (10+1+10+3)kOhm in bias circuit woul give 24 Volts drop at 1 mA bias current

4.Power currents, grounding, shielding: loops?



Shield loop probably unavoidable.
=> try to install all cables as parallel as possible to keep area small.

Is separation of GND and DGND save?
(different voltage drop on different cables?)

5. Conclusions and questions

1. Input signal circuit and detector grounding is very good.
2. All analog and digital signals are differential and symmetric, fine.
3. Is the separation of analog and digital ground save?
4. Details of safety ground connections?
5. V_bias patch panel?
6. Shield ground loop unavoidable => install cables closely together