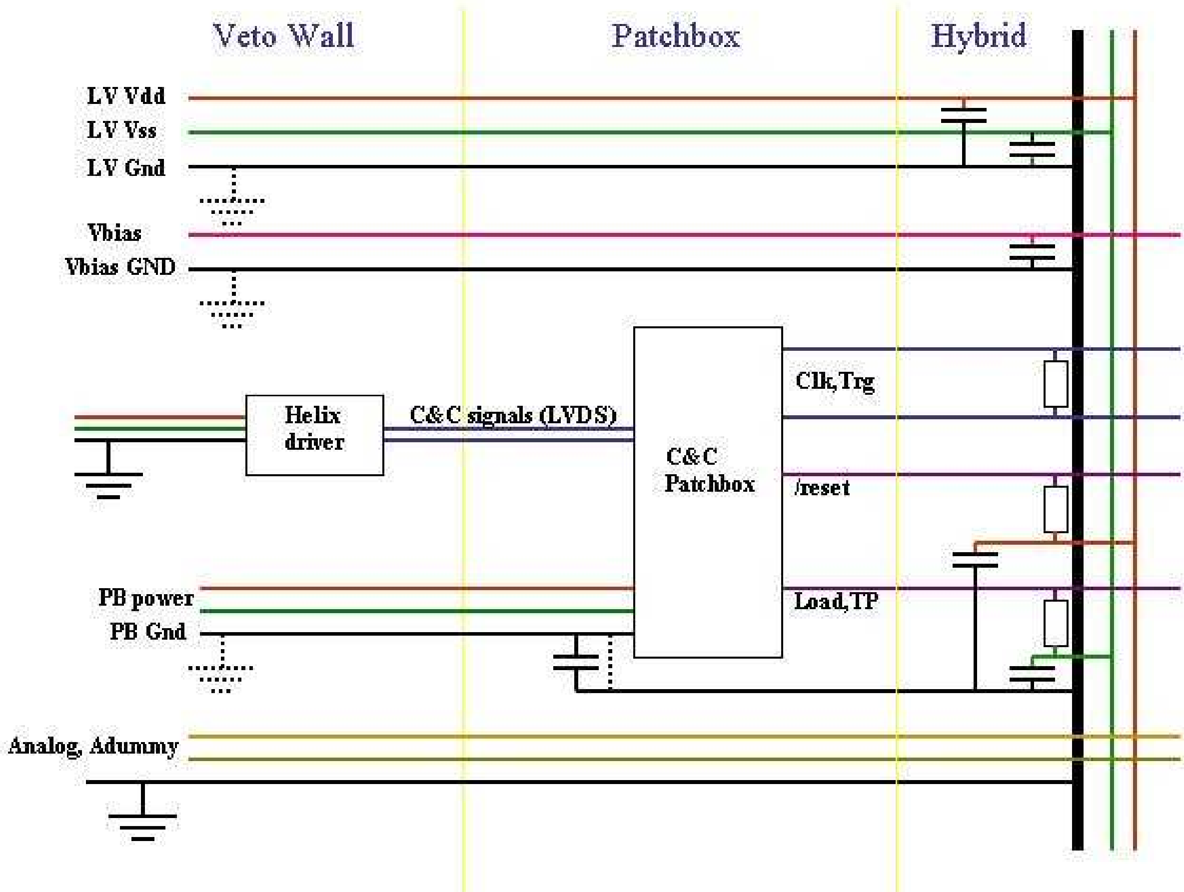
Little note on the MVD grounding
R.C. 16 Nov 2000

After the first, successful operation of the prototype ladder, Uli and I tried to check the grounding of the MVD, to understand if it is as it was designed, and if the design is satisfactory. The reason is that, as you know, the S/N ratio is worse than expected, at least worse than what we measured at the test beam. At the moment, we get 11.5 as S/N ratio, which is better than 10 as measured at the Hall 1 (where the grounding was quite messy) but far from the 14 or 15 measured at the beam.

I did not sketch the external shielding, which is difficult to implement properly but quite clear conceptually: all the shields are connected to ground (=> protective earth) at the VW end, all the cables are surrounded by shield (either zipper tubes or the braid of the cable).



I'm a little more confused on the real grounding. I will try to summarise the situation as I see it:

1. The power supply of HELIX (Low Voltage Vdd,Vss,Gnd) is completely floating. The ground goes to the ground layer at the hybrid side. It would be possible with a little modification to connect the ground to the chassis (I have drawn an etched ground connection in the picture).
2. The same is true for the HV (Vbias, Vbias Gnd). The power lines are not individually floating, they have a common ground in the crate, but this ground is anyway floating. On the hybrid side, the Vbias Gnd goes to the common hybrid ground. Also here it would be easy to connect the ground also at the VW side.
3. The analog link is not floating. On the hybrid side the shield of the STP cable (which provide the return path to the signals) is connected to the common ground. On the VW side the shield of the cable goes to the chassis ground. At the moment, this connection fixes the potential of the hybrid to that of the protective earth.
4. The C&C is more complicated, because we have active electronics (receivers and drivers) in the patch-boxes. At the moment, the shield of the signal cables on the combo (LVDS and CMOS) is connected to the ground at the hybrid side, but there is no DC connection at the patch-box side (there is clearly an AC connection on the CMOS signals, I think no connection for the LVDS). So, there is no direct return path for the DC component of the CMOS signals, and for the non zero common mode current of the LVDS. For this reason, I had to connect the ground of the power supply of the patch-box to the chassis ground (hatched in the picture), otherwise the common mode levels of the LVDS signals tended to drift away. The signals from the helix drivers in the VW to the patch-box are all LVDS, and there is no ground connection between the helix driver and the patch-box (a shielded TP flat cable is used, where the shield is part of the external shield). Clearly, the helix drivers are in a VME module and I presume their ground is the chassis ground. So, if we do not connect the patch-box ground to the VW ground, we may have a problem of levels also there.

This is the situation as it is. It is not at all clear to me that it is the best. We can still try to experiment a little, but not for much long.