FREI Raymond @ iphe.unil.ch.

Hybrid Layout.

- Depends of the choice of FE chip:
  SCTA or BEETLE.
- GOAL : - Keep the lines to a minimum.
  - minimum comp. on the hybrid.

* * *

Common specs.

- 16 FE / Hybrid.
- Power supply :
  - Digital : positive + 2 sense lines
    negative + 2 sense lines
  - Analogue : positive + 2 sense lines
    negative + 2 sense lines.
- silicon bias voltage (HV). + monitoring
- Temperatures probes (Rad hard).
- Decoupling capacitors
- Line terminating resistor.
- Analogue output : 4 / FE → 64 diff. out
- Digital signals : LVDS.

- NO LINE DRIVER ON THE HYBRID
- ANALOG GROUND, DIGITAL GROUND, HV GROUND
  SIGNAL GROUND will meet on the hybrid

SCTA's HYBRID ½ module.

- 16 SCTAs on hybrid.

		nbr. line
• Digital PS :	+4VD ; DGND ; -4VD	3
	2 positive sense	2
	~~2 negative sense~~	~~2~~
• Analog PS :	+4VA ; AGND ; -4VA	3
	2 positive sense	2
	2 negative sense	2
• Analog outputs :	4 diff. output / chip	128
Clock input :	LVDS	
Q: can we have one CLK LVDS line for 16 chips?		min 2
• Command input :	LVDS	
Q: - same as for Clock ? - do we want [illegible] control lines ?		min 2
• Temperature probe :	→ rad hard.	
Q : how many :	min 1	min 2
Silicon Bias voltage :	min 1	min 2
• V ref :	- on hybrid or not ?	
	- common to each FE	
	- external	min 2
• Ground lines :	digital	min 1
	analog.	min 1

total min lines : 154.

FEEDTHROUGHS NEEDED : 4

BEETLE's HYBRID 1/2 Module

		nb. lines
• 16 BEETLE. on hybrid.		
• Digital PS :	+ VD ; DGND ; - VD	3
	2 positive sense lines	2
	2 negative sense lines	2.
• Analog PS :	+ VA ; AGND ; - VA	3
	2 positive sense lines	2
	2 negative sense lines	2.
• Analog outputs :	4 diff out / chip	128
• Clock input : LVDS		min 2
• other command line, Trigger, reset ; ?		min 4
• Temperature probe : rad hard		
@ : How many !	min 1	max 2
• Silicon Bias Voltage	min 1	max 2
• other ?		?
• Ground line : digital		min 2
analog.		min 2.
total min lines		156
FEED THROUGHTS NEEDED :		4

• Consumption ?

• How information received.

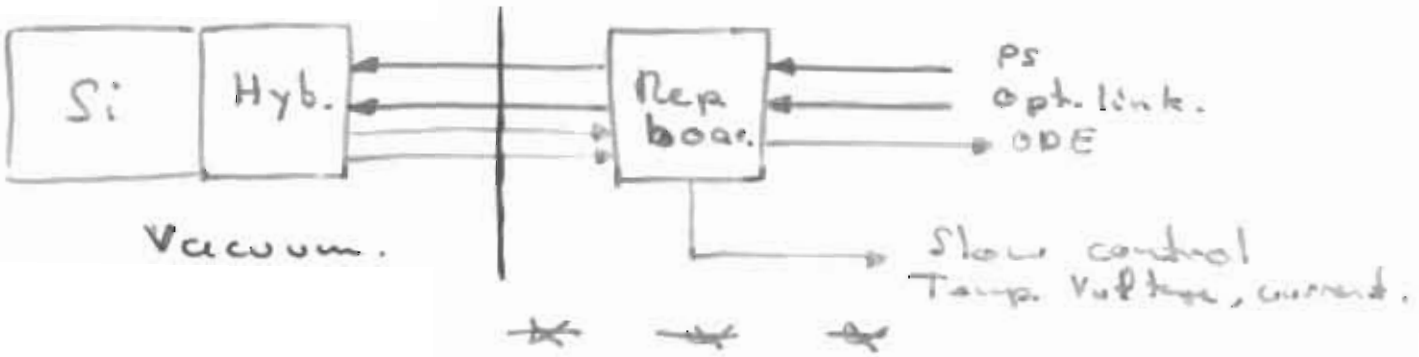
CABLES Hybrid → Feedthrought.

+ connectors.

* MUST BE RAD HARD.

- Material (cables).
  - Kapton polymide and PEEK (poly ether ether ketone) are known for high radiation resistance. (tested total dose 130 MGy).
  - other material are suitable: Noryl - PEEK, Arnitel Radox (less resistant)
  - Thin insulation layers are to be prefered. (flexibility).
  - Composition of the cable must be known. → "out gassing".
  - Do not use cables with halogen polymer. → halogen gasses with irradiations.
  - Same for "connectors" ex: No teflon.
  - Esoteric material must be tested on irradiation hardness + out gassing.

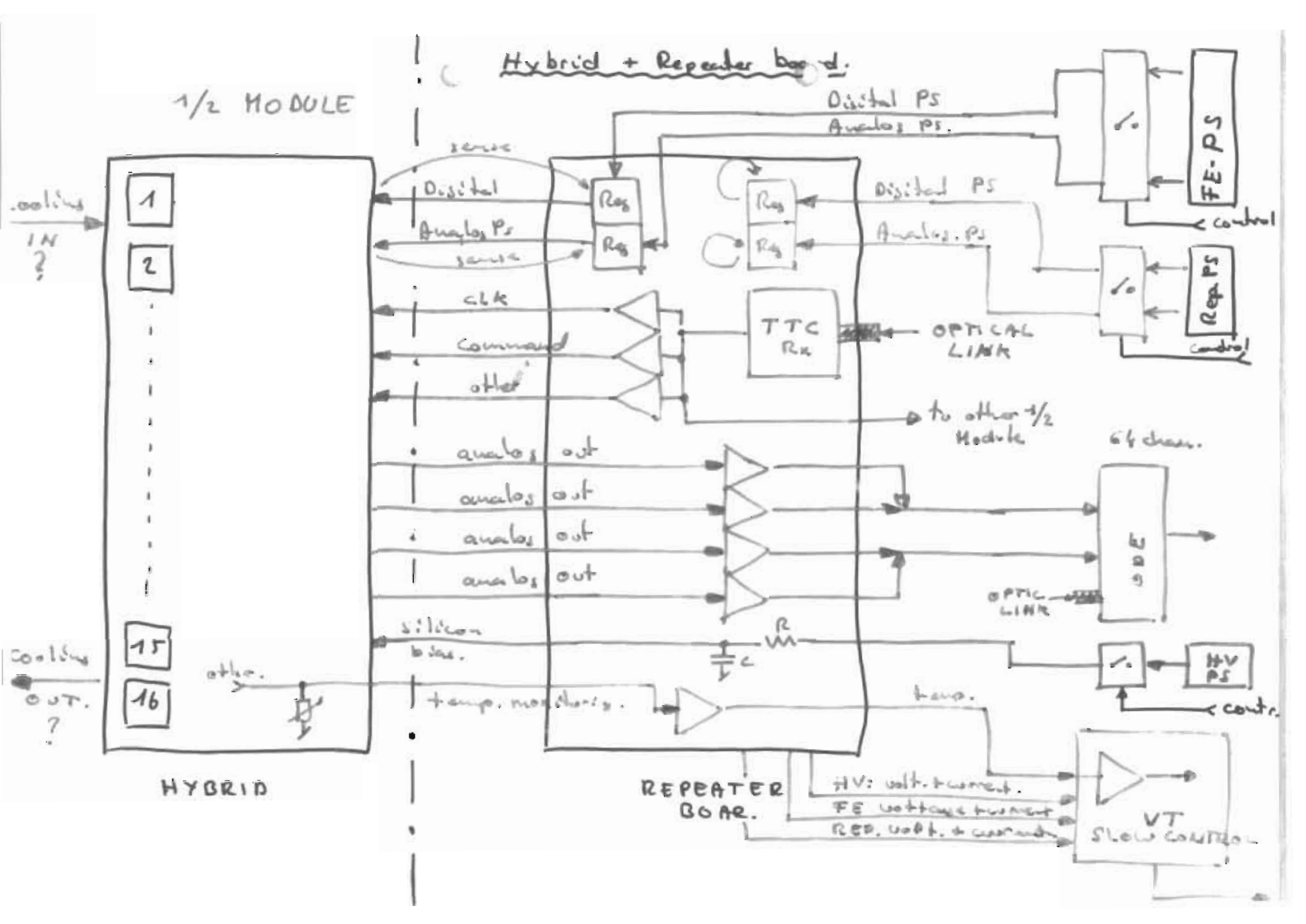
Repeater Board. 1/2 Module.



- WHAT WILL BE ON THE REPEATER BOARD.??
- Voltage regulators with sense line (Rad ha
  - Digital Positive + Negative for FE
  - Analog Positive + Negative for FE.
  - Digital Positive + Negative for Repeater Card
  - Analog positive + Negative for Repeater Ca
- Analog line drivers. (Rad hard). 128.
- TTC rx chip.
- Digital level adaptators +
- Temp. monitoring : " signal conditionning.
- Filters. For Silicon bias Voltage.
- Current + Voltage monitoring.
- OTHER ____

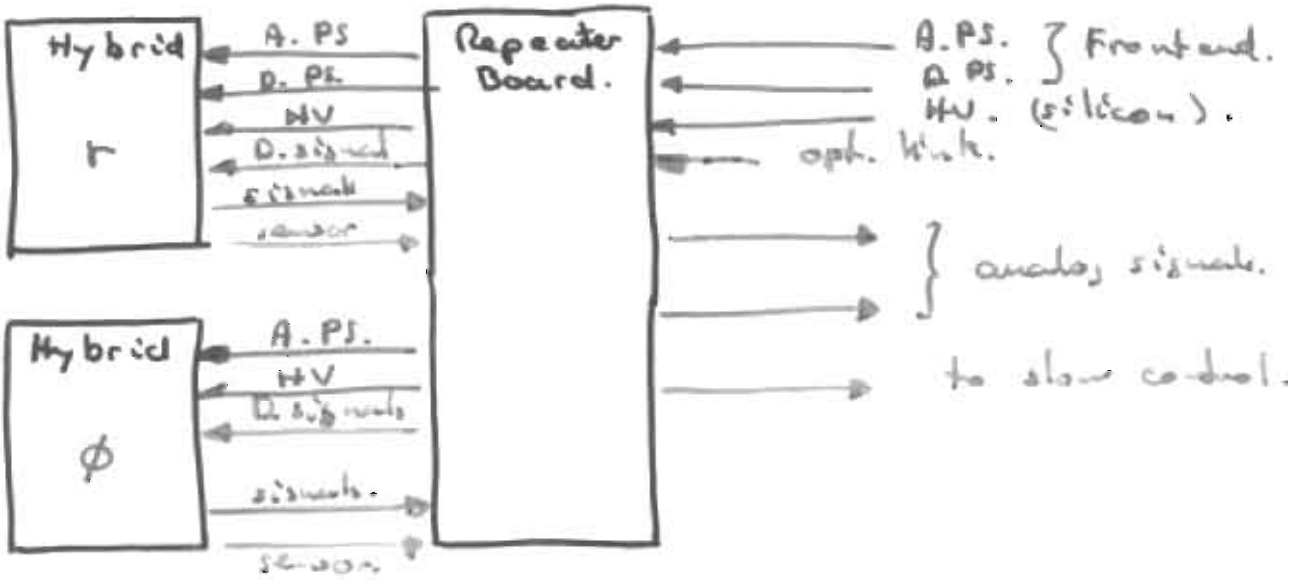
- LOCATION ?

  outside of the Vacuum tank. As close as possible to the feed throughts.


Hybrid + Repeater board
1/2 MODULE
Digital PS
Analog PS.
FE-PS
control
Digital
Analog PS
sense
Reg
Reg
Reg
Reg
Digital PS
Analog. PS
Rep. PS
control
clk
command
other
TTC Rx
OPTICAL LINK
to other 1/2 Module
64 chan.
analog out
analog out
analog out
analog out
GDEC
OPTIC LINK
silicon bias.
R
C
HV PS
cont.
cooling IN ?
cooling OUT ?
other.
temp. monitoring.
temp.
HV: volt. + current.
FE voltage + current
REP. volt. + current
VT
Slow control
HYBRID
REPEATER BOAR.

Repeater board configuration

1 Repeater board for 1 module.



- Less power supplies.
- more connections on repeater board.
- ---

REPEATER BOARD GROUNDING.

- All grounds will meet on the hybrid.

⇒ ALL PS ARE FLOATTING.

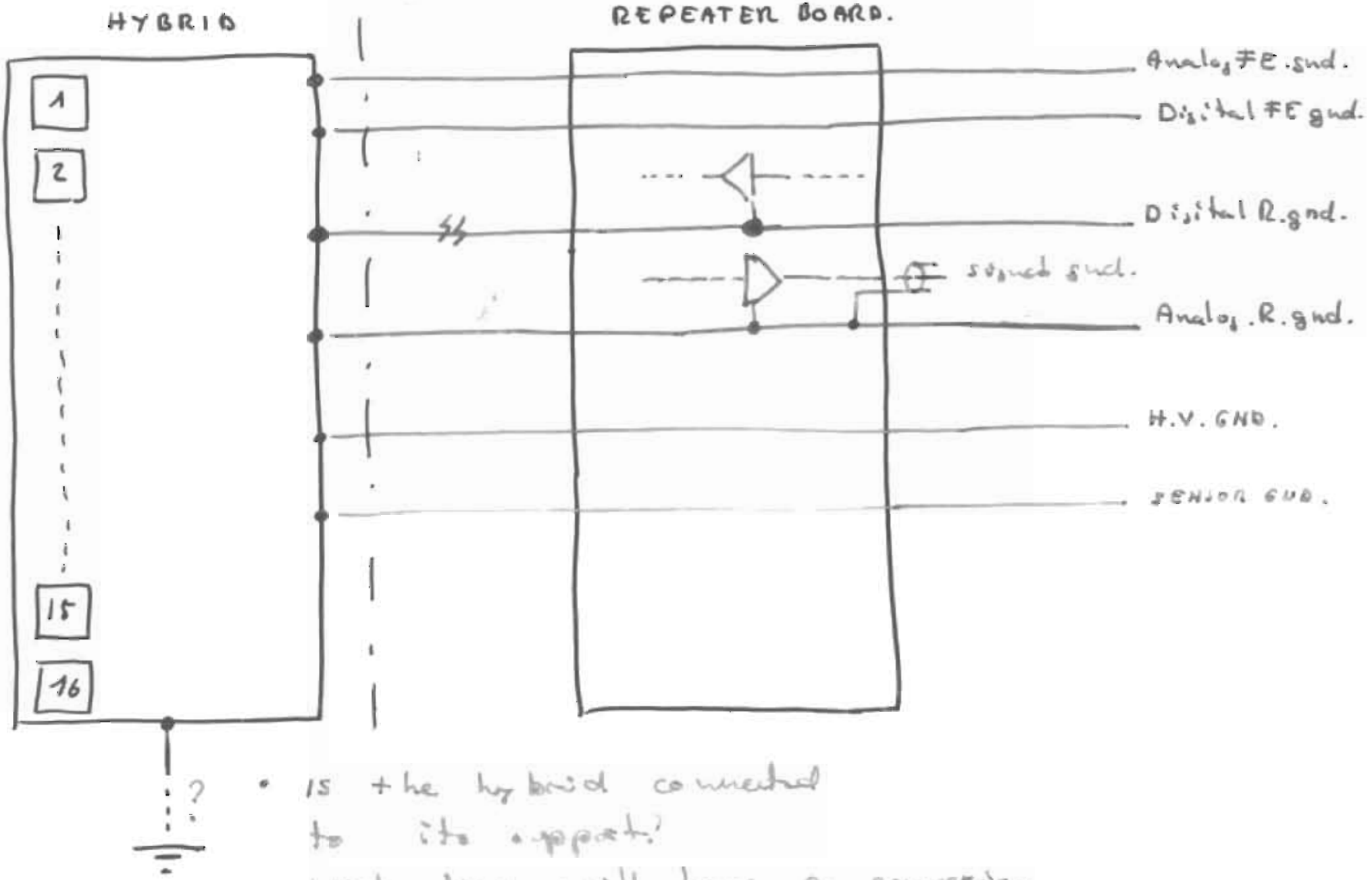
RULE : !! NO GROUND LOOP. !!

BUT ALL PIECES MUST BE CONNECTED TO EARTH FOR SAFETY REASONS.

- ON repeater board, there will be no connexion between grounds.

- Each Power supply must have it's own return path.

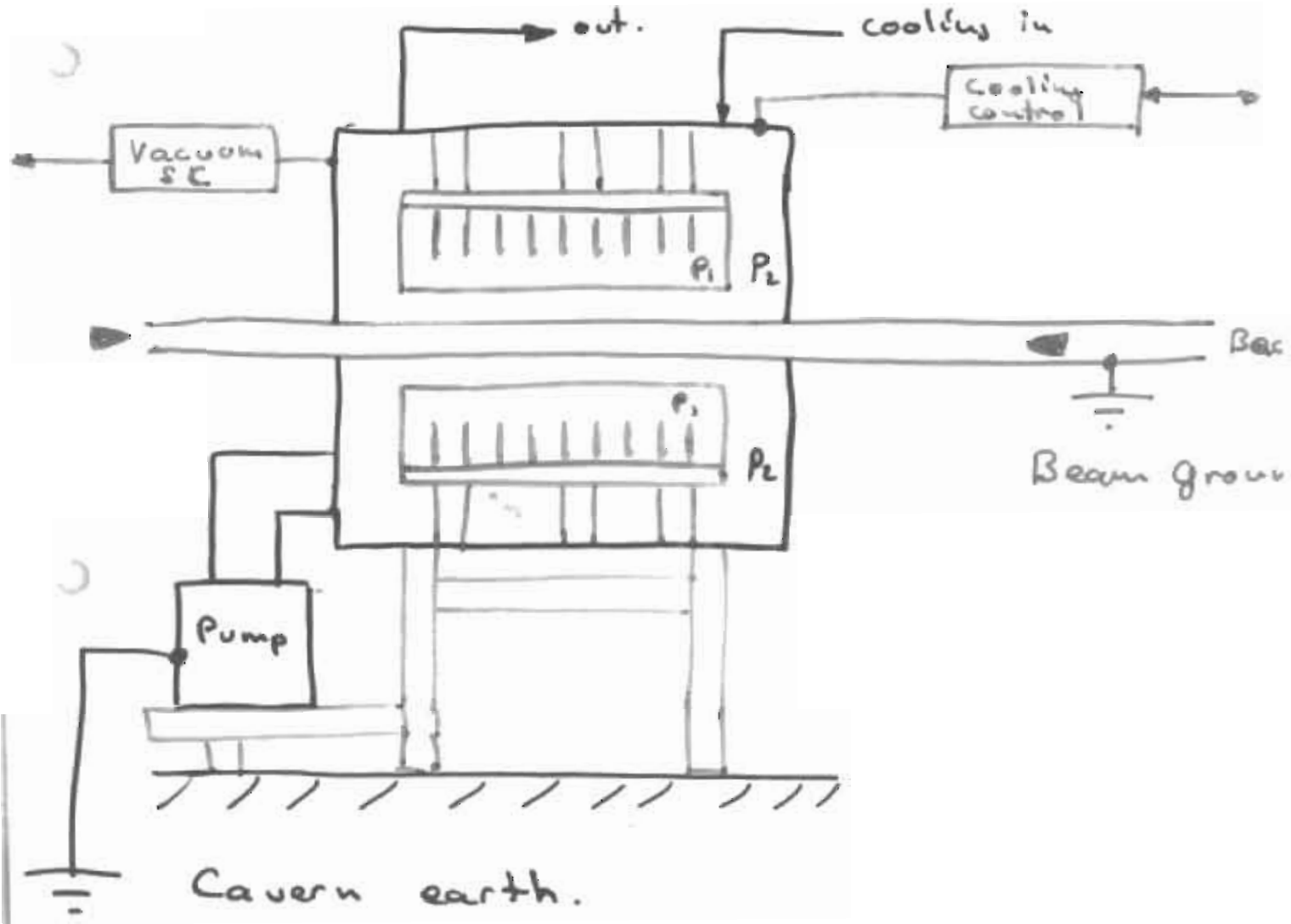
REPEATER BOARD GROUNDING.



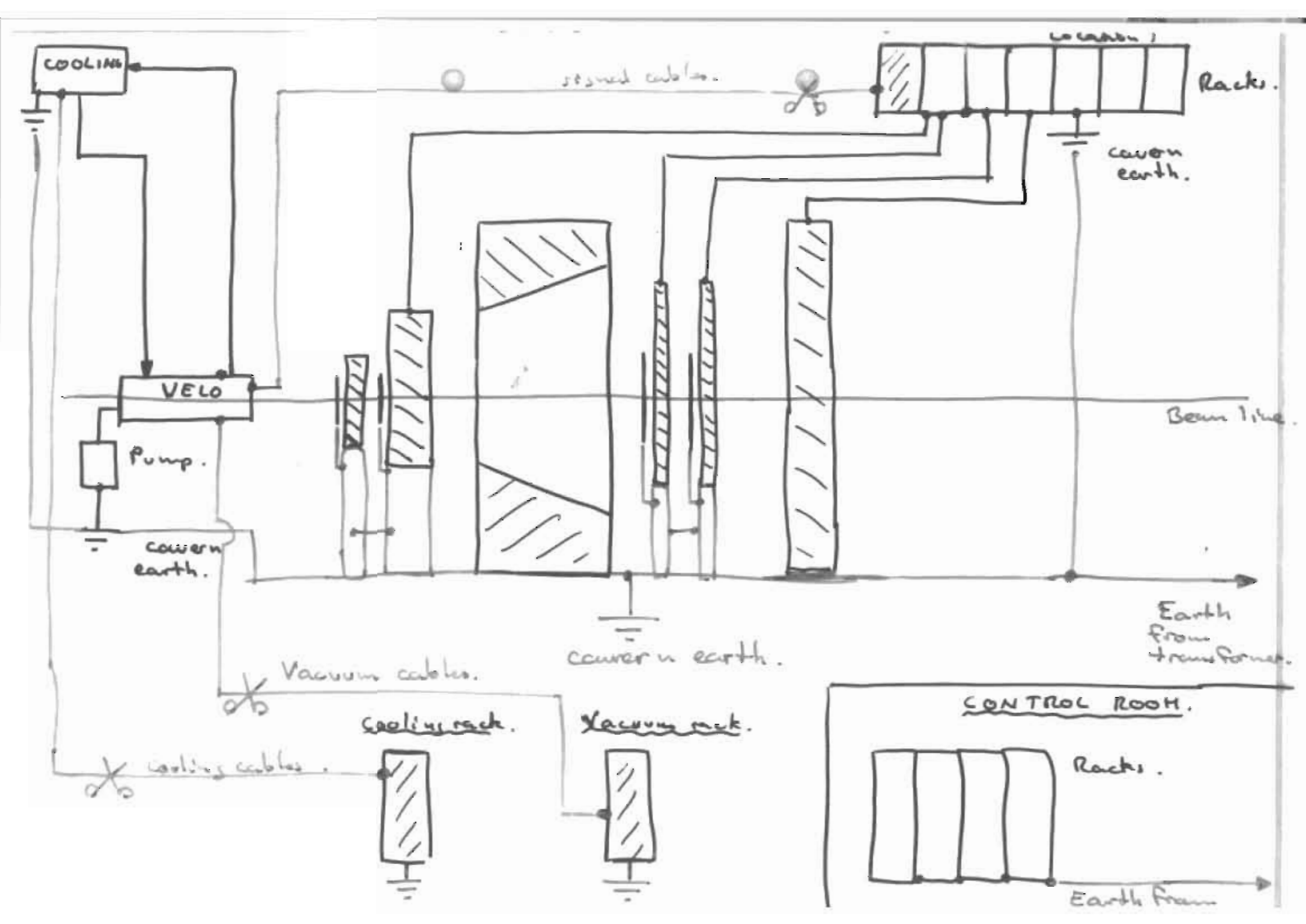
- Is the hybrid connected to its support?
- Each line will have a connector

DETECTOR GROUNDING.

- Is the hybrid connected to it' support?
- Is the tank connected to it 's support?
- Is the tank insulated from the beam pipe?
- How are the connexion between the primary vacuum and high vacuum.
- Connexion between cooling and hybrids.

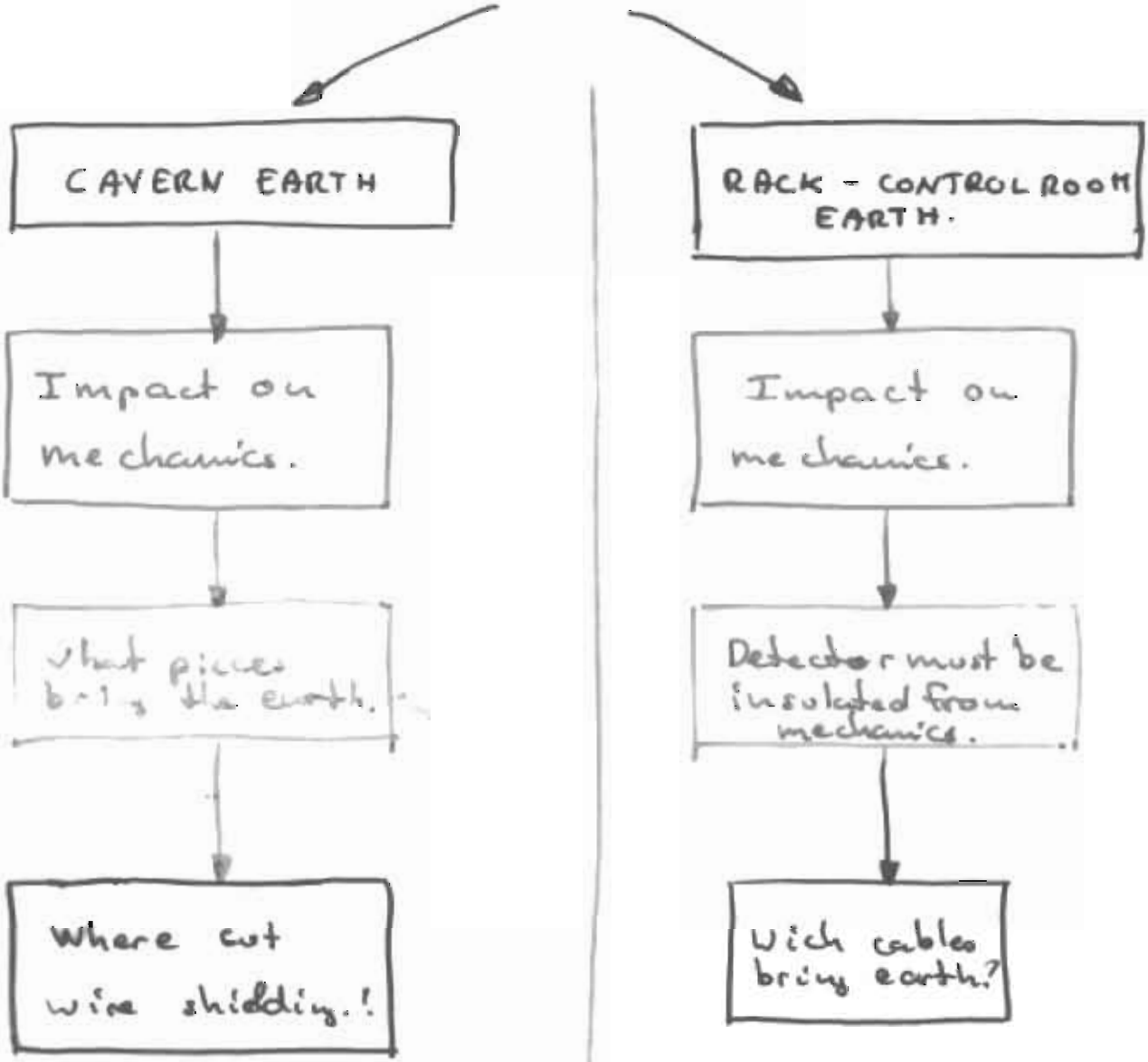


- Are the pump, cooling system, vacuum system. connected to tank? → earth.


COOLING
Racks.
cavern earth.
VELO
Pump.
Beam line.
cavern earth.
Earth from transformer.
Vacuum cables.
cavern earth.
cooling rack.
Vacuum rack.
cooling cables.
CONTROL ROOM.
Racks.
Earth from

Detector grounding. (ground loop).

- Must be defined for VELO:
  - What and Where will be the connection to EARTH.??



- same scenario must be established in Lhcb. collaboration.
  - Location of connectio to earth..
  - Same for everybody.