



Orbitrap Exploris 480 Electronics

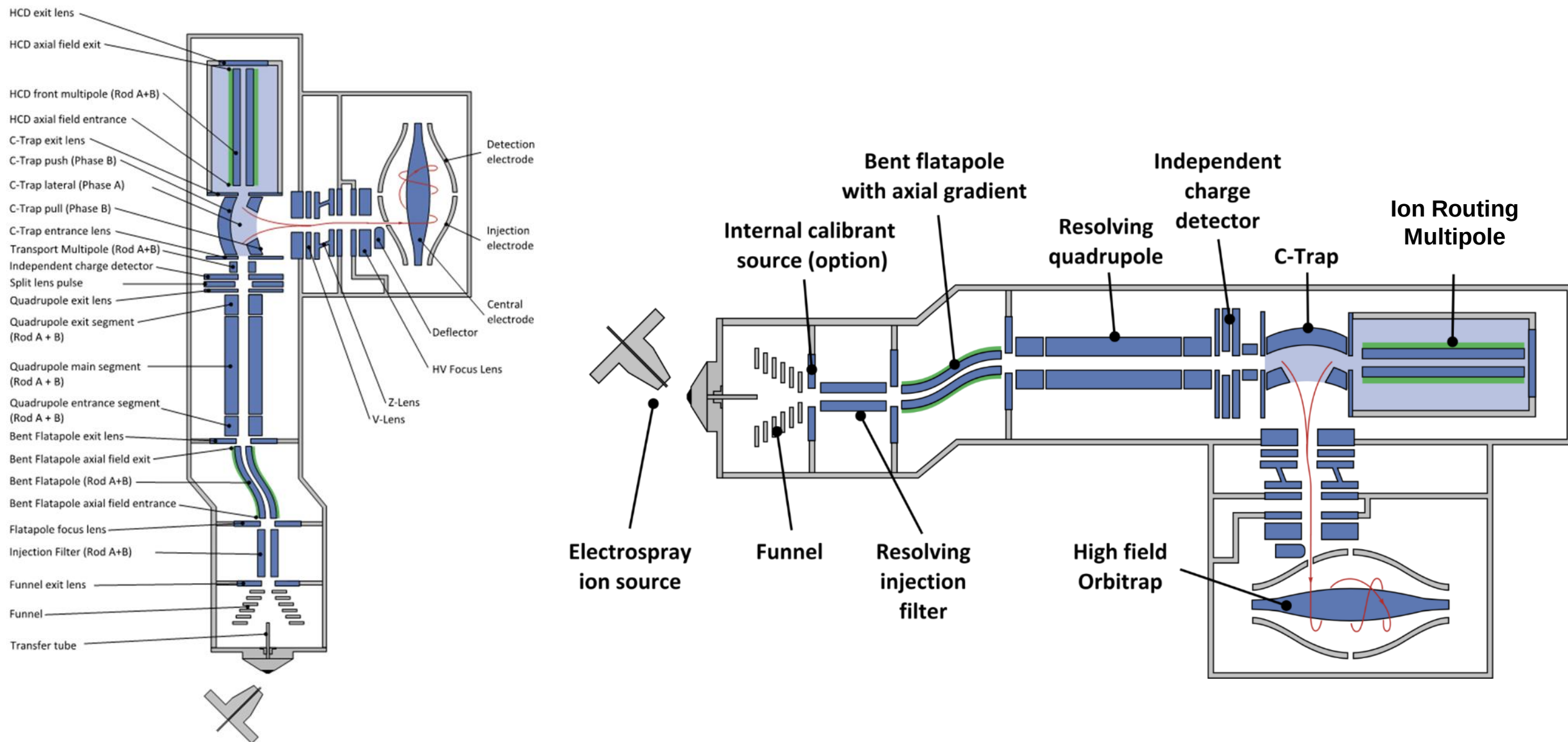
Revision 00 – June 2019

- Overview of the board locations
- Individual Boards
 - Source Board
 - Ion Optics Supply
 - Quadrupole Supply (QS)
 - C-Trap Supply (CTS)
 - Orbitrap Control (OTC)
 - Instrument Control (ICB)
 - DAQ Board
 - Embedded PC Unit
 - Base Plane
- Interconnection

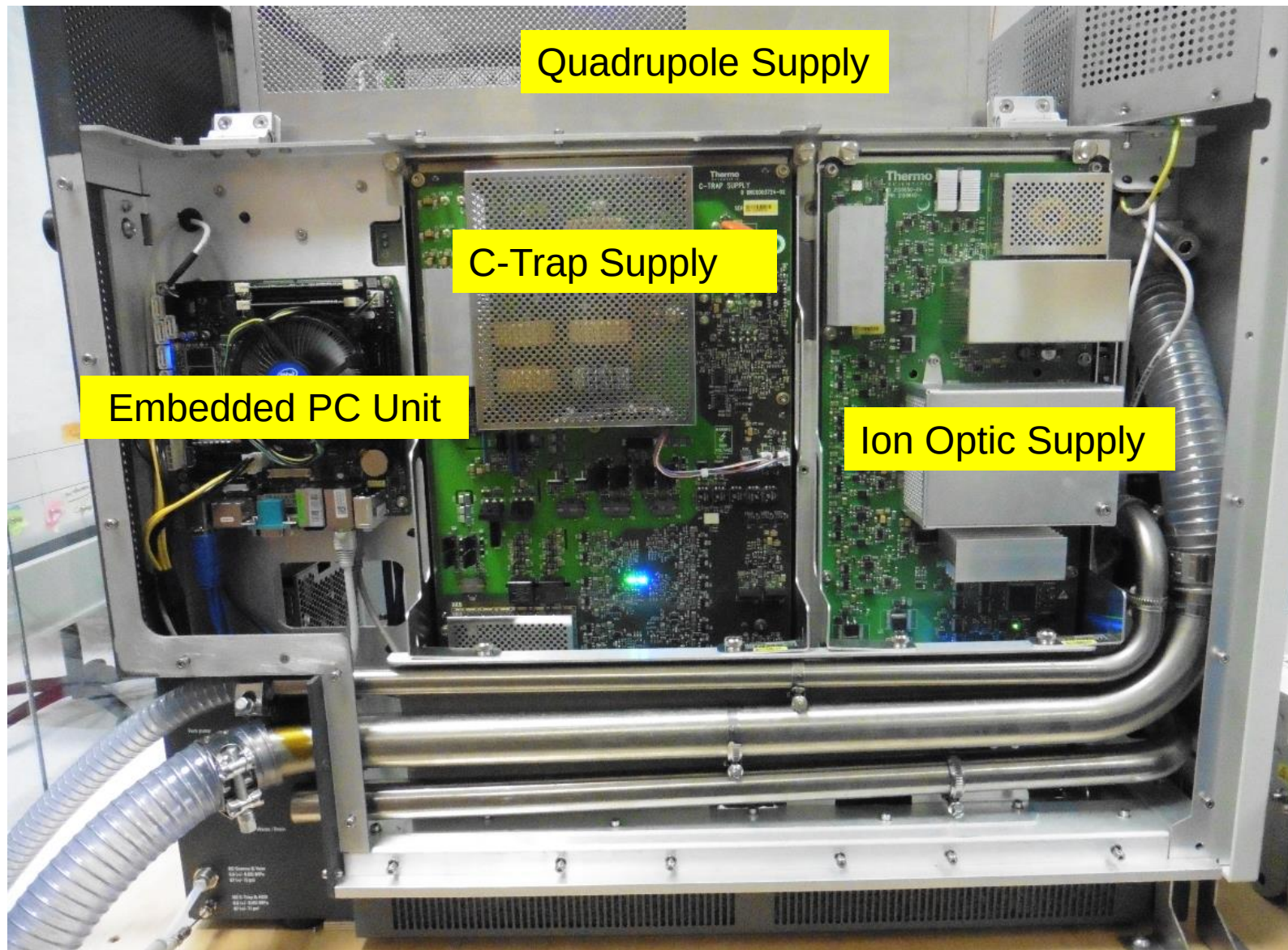
Analogies from Exactive Series to Orbitrap Exploris 480

Boards in Exactive Series	Corresponding board on Orbitrap Exploris 480
Source Board	Source Board, Instrument Control Board
Ion Optics DC and RF	Ion Optics Supply
Quadrupole Electronics	Quadrupole Supply
C-Trap RF (with inputs from CEHV)	C-Trap Supply
CEHV + Pulser	Orbitrap Control
FT adapter + Vacuum Control	Instrument Control
DAQ Board	DAQ Board
Preamplifier	Preamplifier

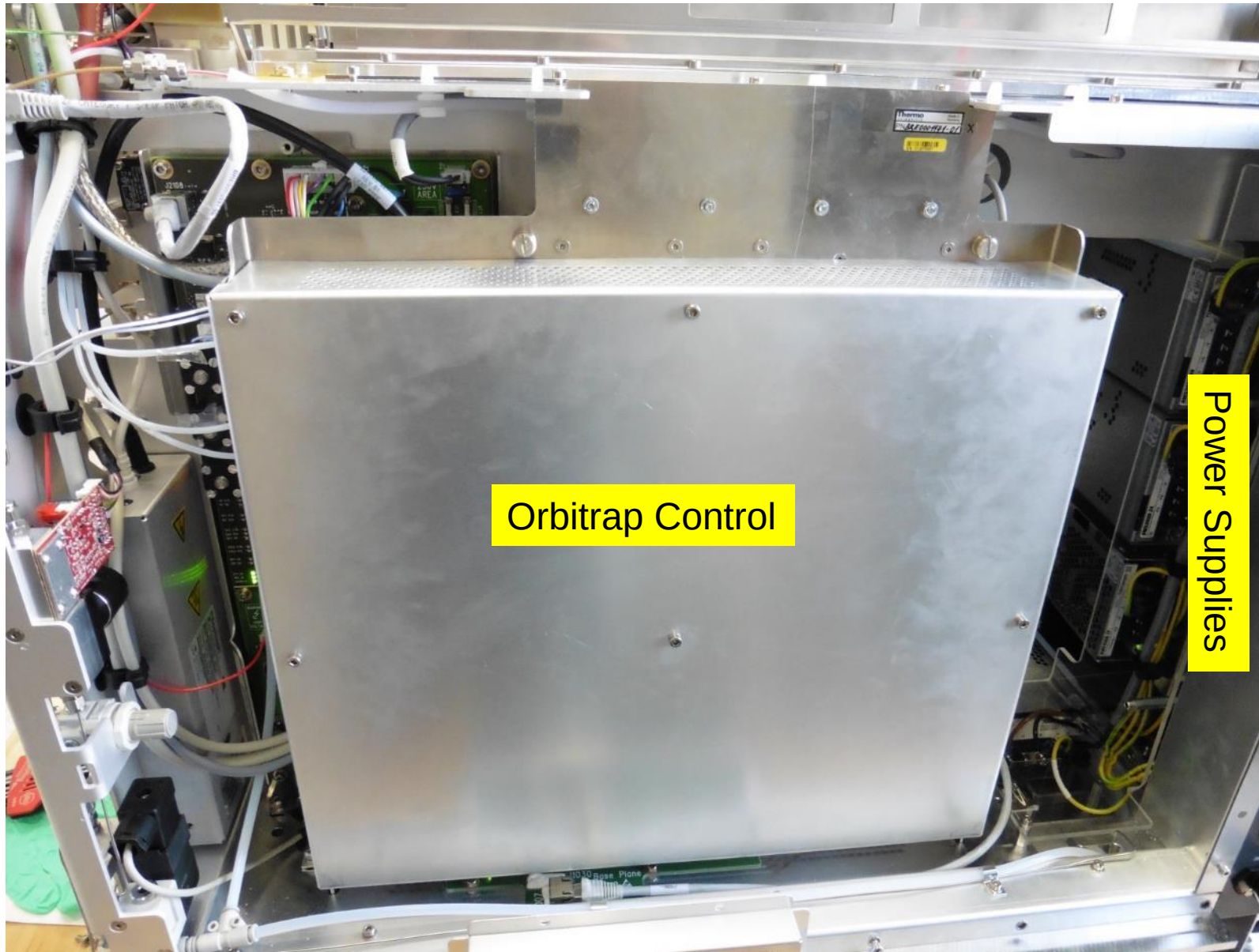
Name Conventions – Orbitrap Exploris 480



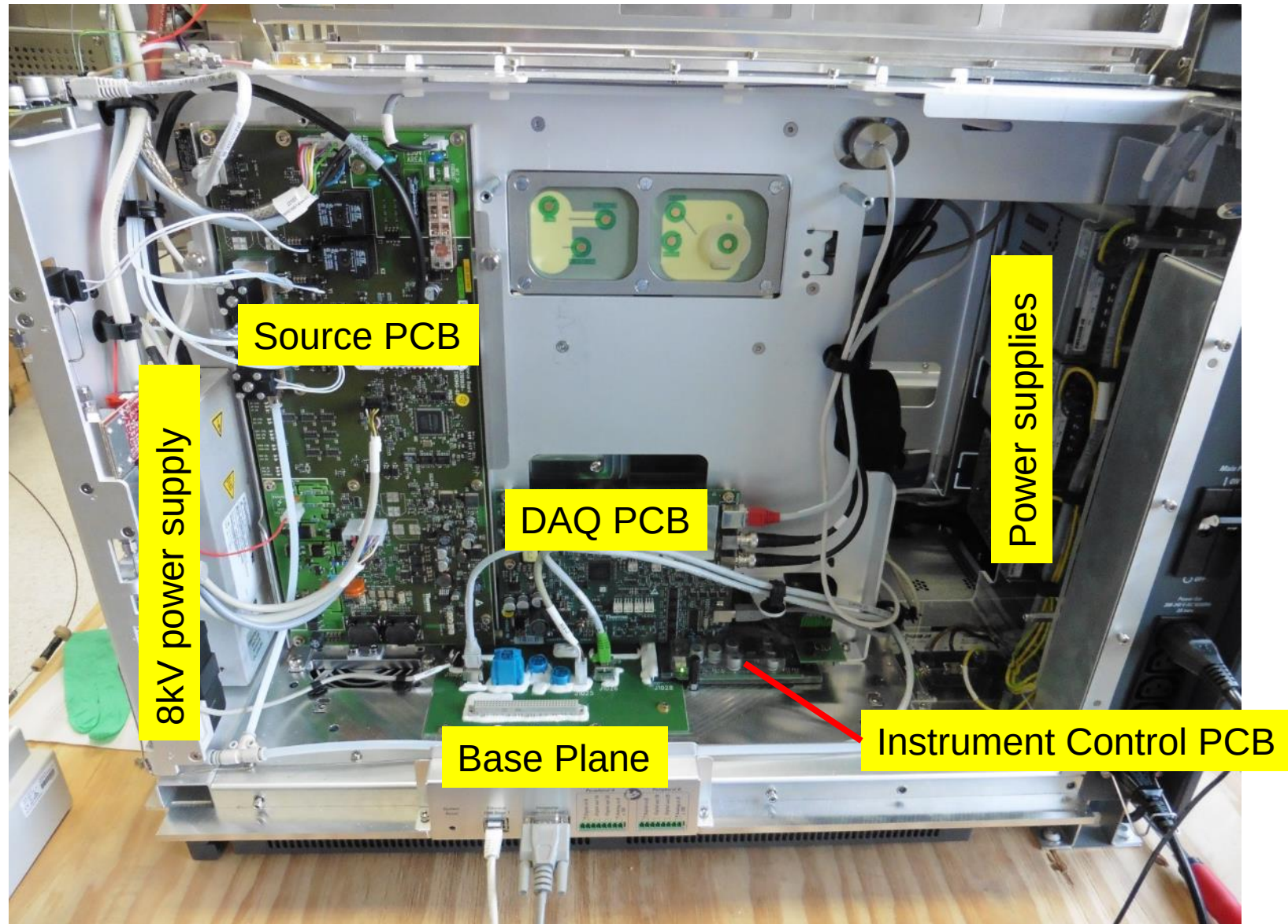
Overview left-hand side



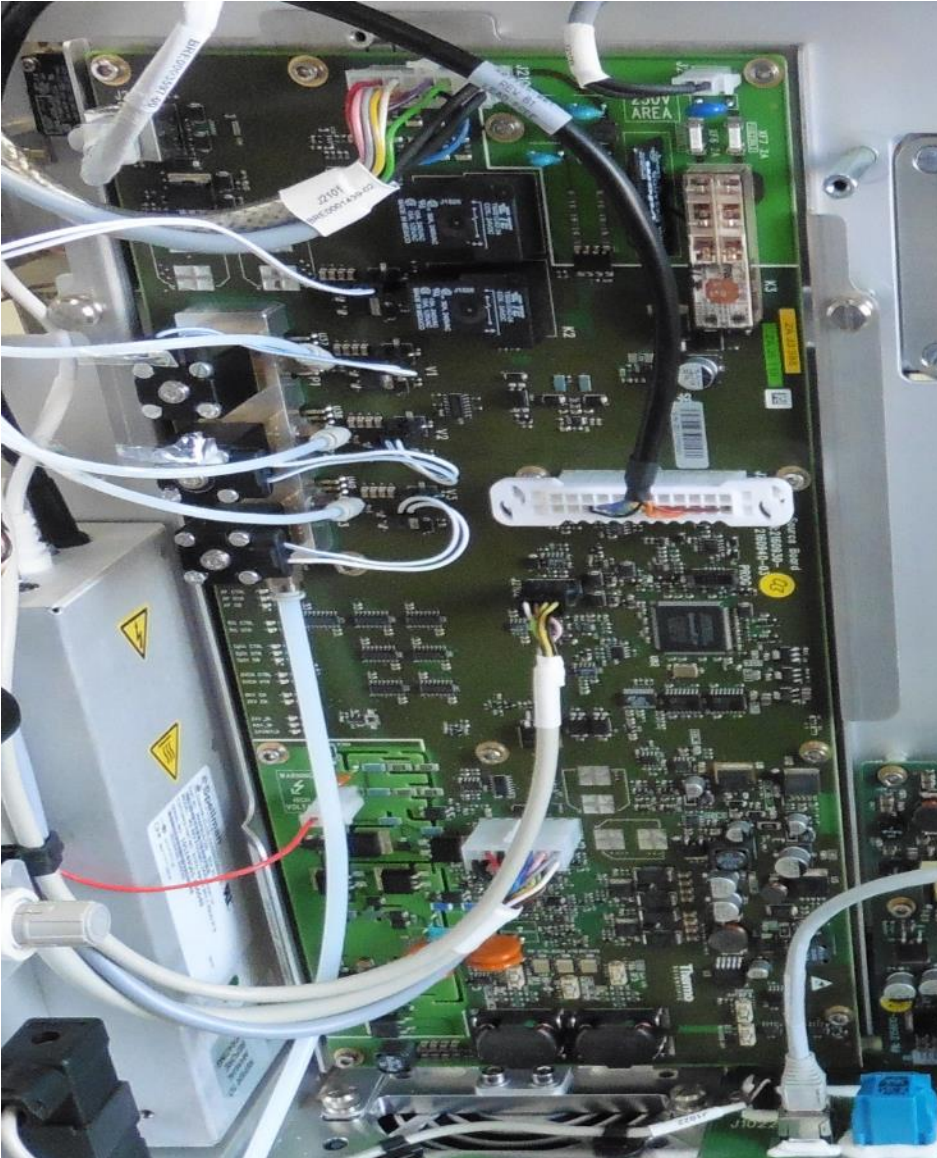
Overview right-hand side



Overview right-hand side, Orbitrap Supply removed



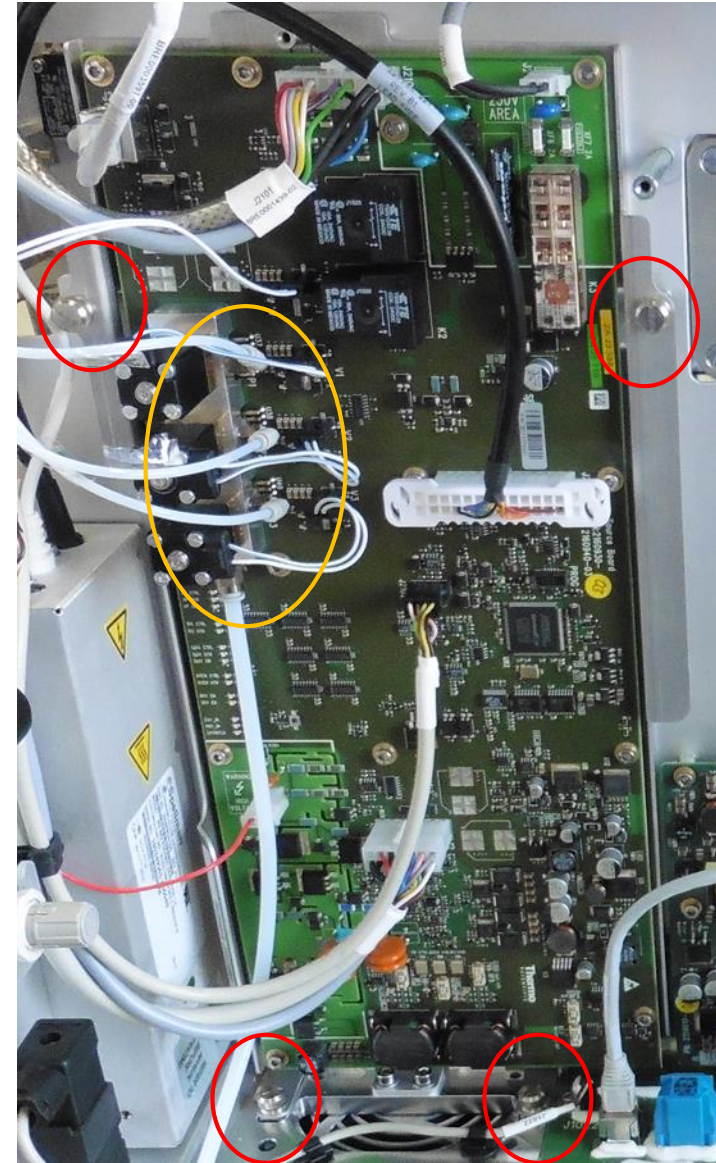
Source Board (SB) - BRE0013902



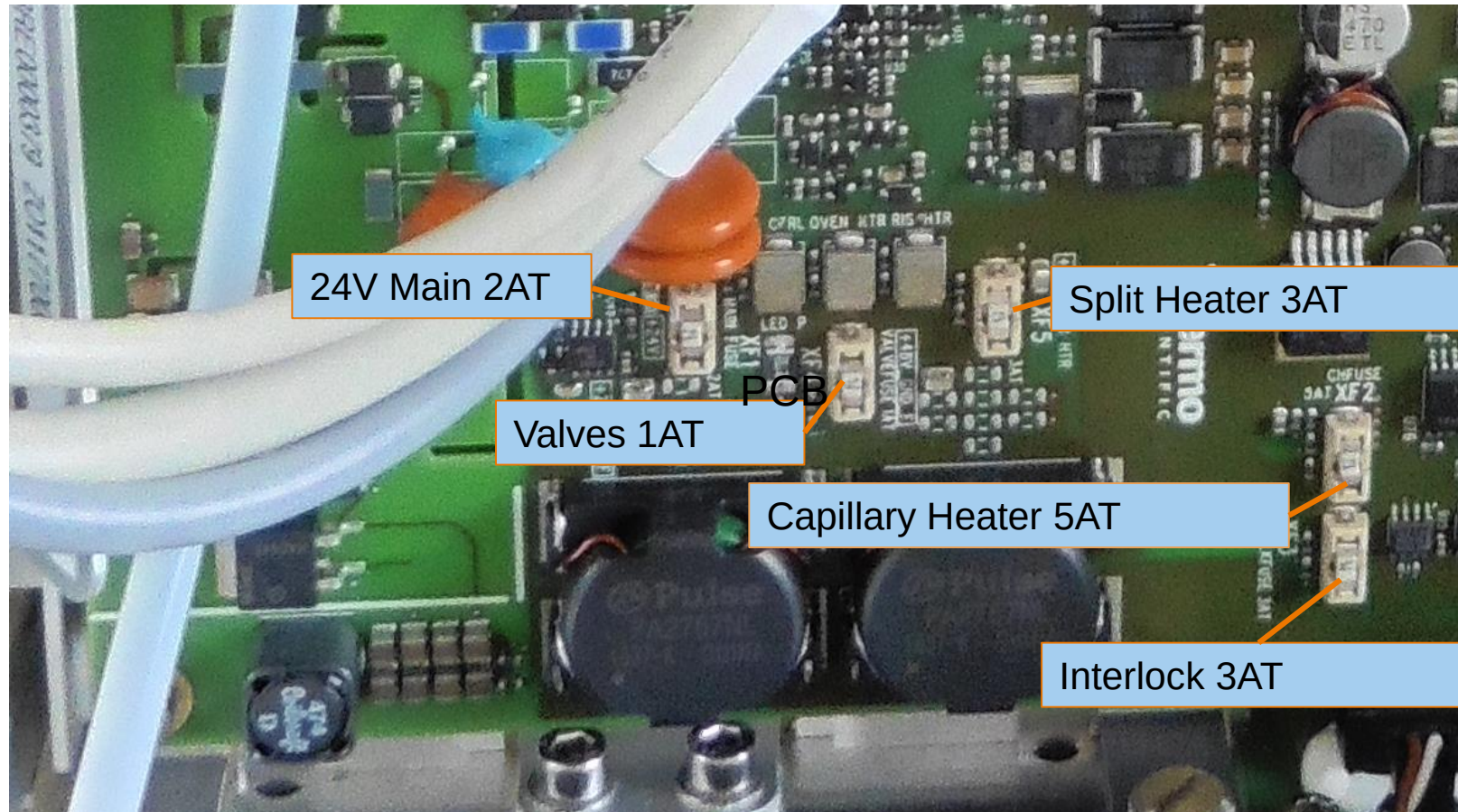
- Controls:
 - APCI Heater
 - Capillary Heater
 - Source Interlocks
 - Internal Calibration Unit Heaters and high voltage
 - Source gases
 - Cover light sensor (right side)
 - 8kV supply
 - LED Panel
 - Source ID
 - N2 flow regulation

Source Board - Exchange instructions

- Required Tools
 - Pliers or similar to push quick fit release (gas tubing)
 - Slot screwdriver
- Steps for disassembly
 - Disconnect all cables
 - Turn off nitrogen supply
 - Disconnect gas tubings (check if labelled prior to removal)
 - Loosen 4 screws
 - Tilt and pull out

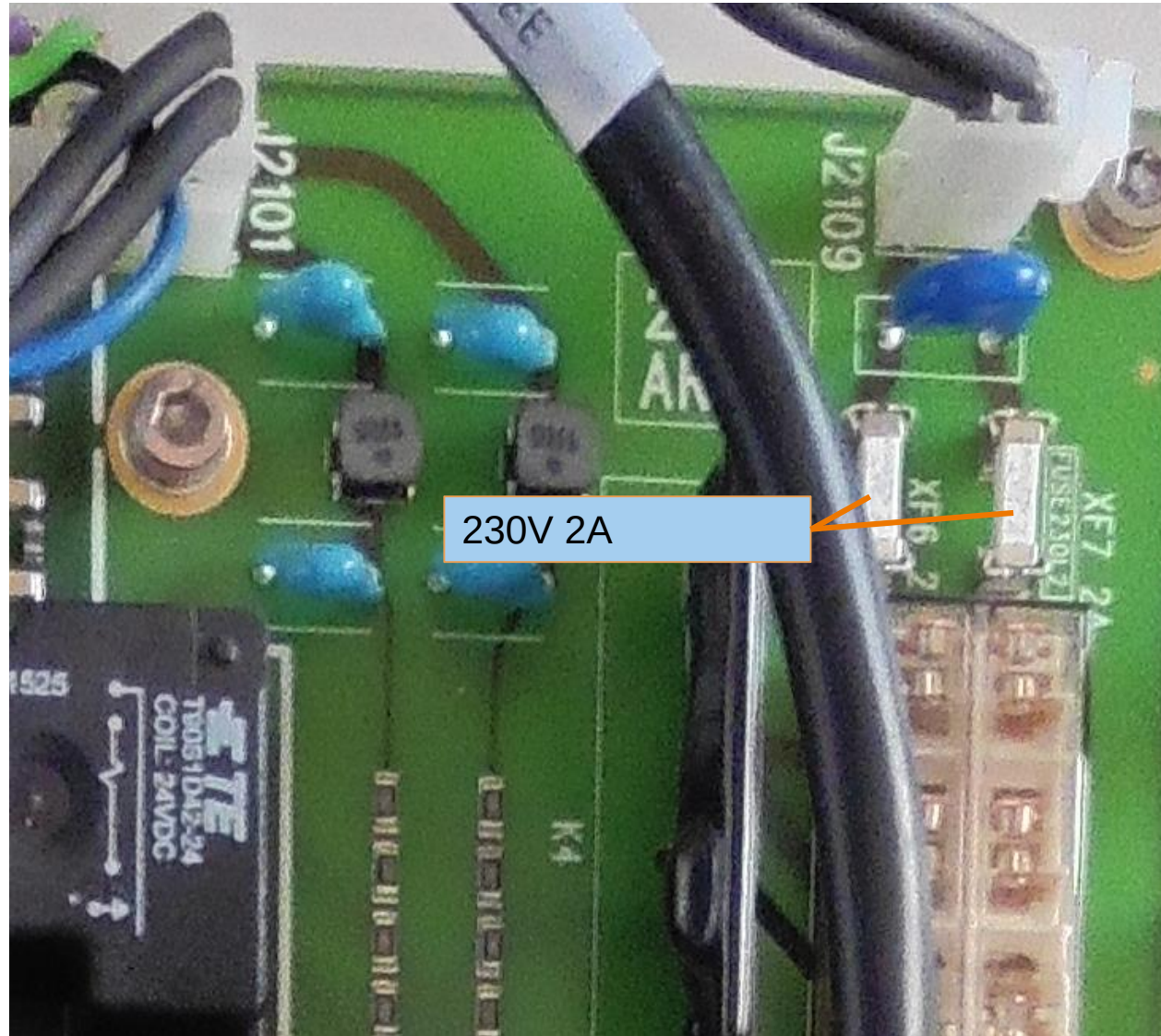


Source Board – Fuses



Fuse Kit PN BRE0020166

Source Board – Fuses cont.



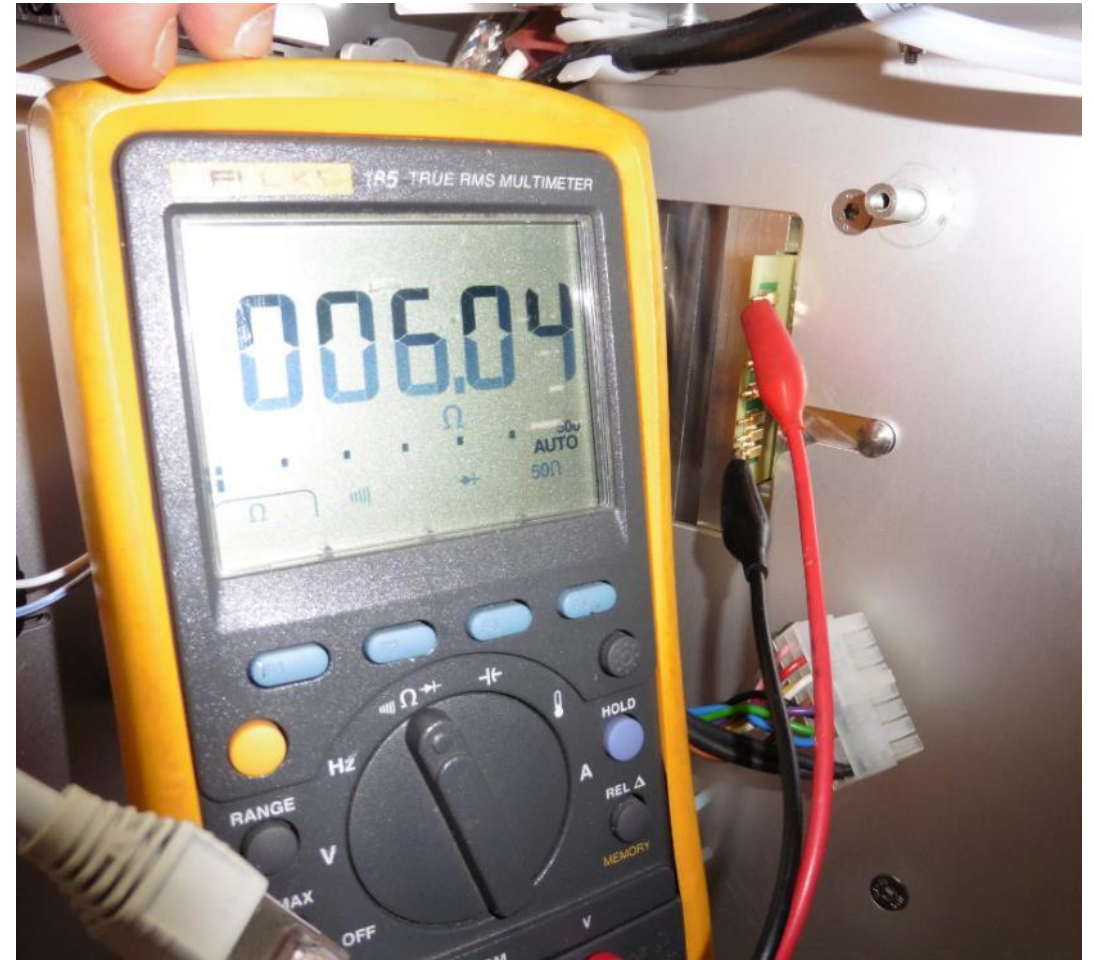
Source Board spring loaded pin connections

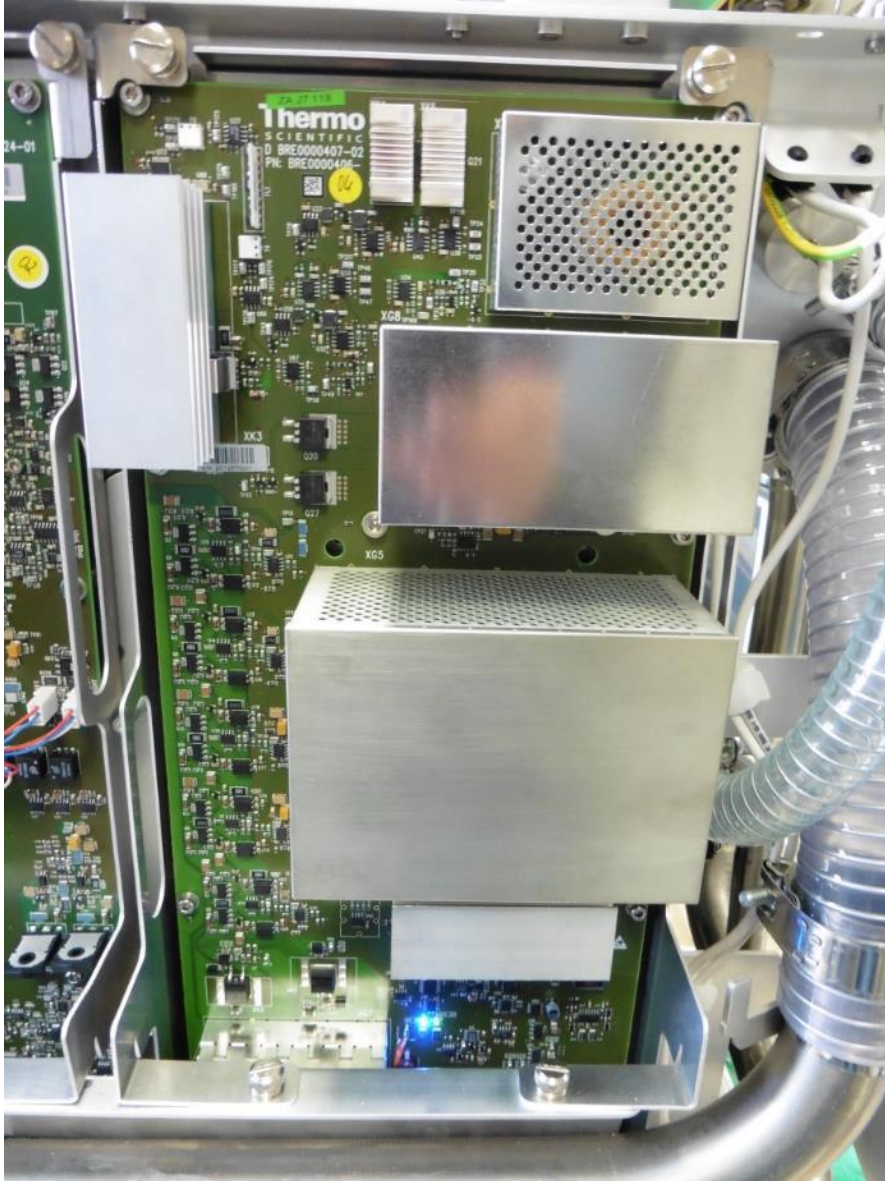


- PT 100 resistance



- Capillary heater resistance





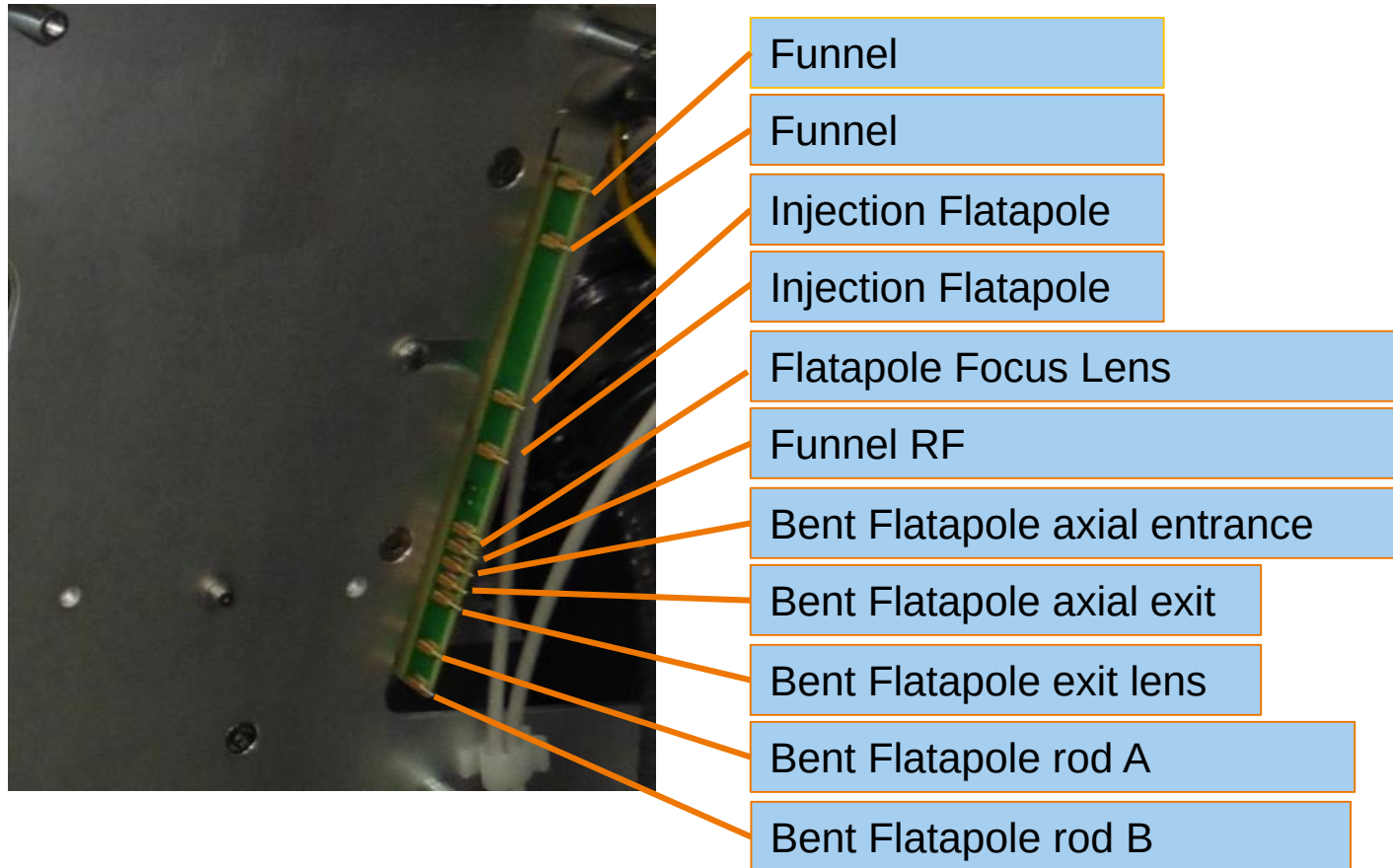
- Supplies:
 - Source DC offset
 - Funnel RF (RF1), Funnel DC offset
 - Injection Filter DCs and RF (RF2)
 - Flatapole Focus Lens DC (DC2)
 - Bent Flatapole RF and DC (RF3)
 - Bent Flatapole Axial Field (DC3)
 - Bent Flatapole Exit Lens (DC4)

Ion Optic Supply Exchange

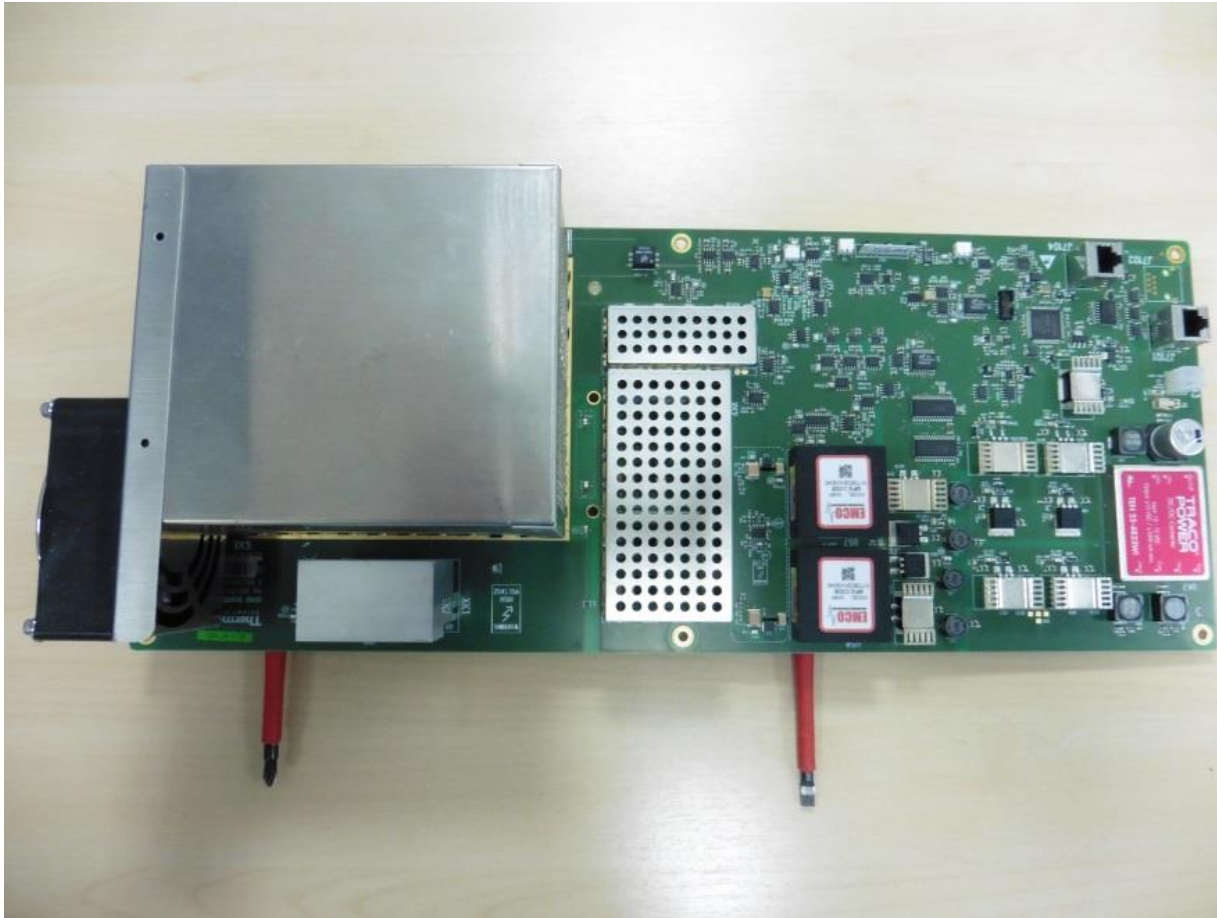
- Required Tools:
 - Slot Screwdriver
- Steps for disassembly
 - Loosen 4 screws
 - Tilt board
 - Remove PCB



- Voltages are supplied through spring loaded contacts (pogo pins)
- Check pins before installing the board.



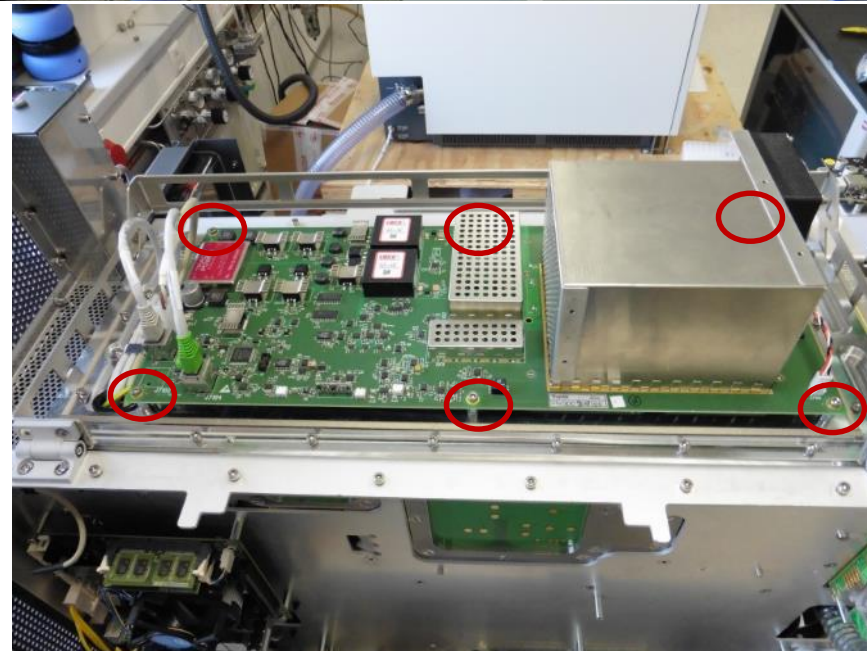
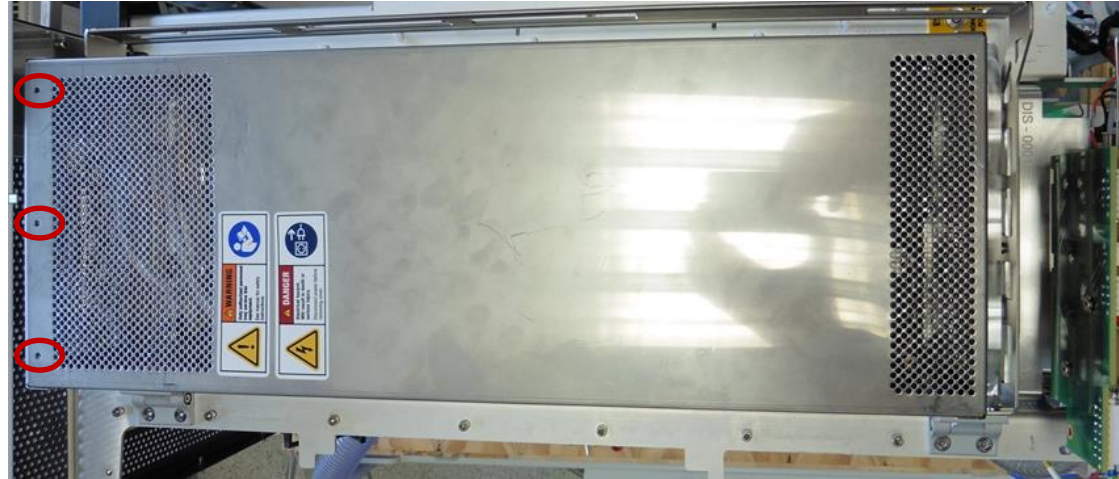
Quadrupole Supply (QS) – BRE0013916



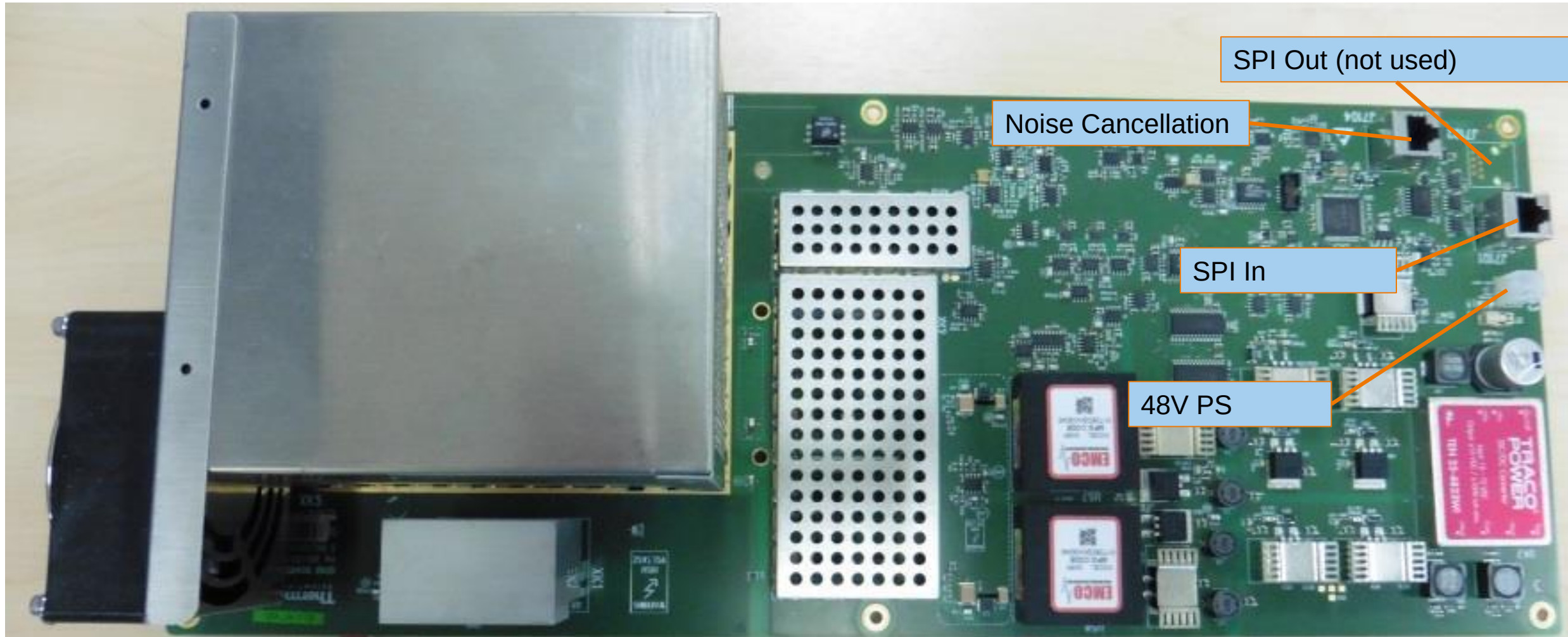
- Supplies:
 - Quad end segment DC offset
 - Quad main segment DCs
 - Quad RF

Quadrupole Supply – Exchange

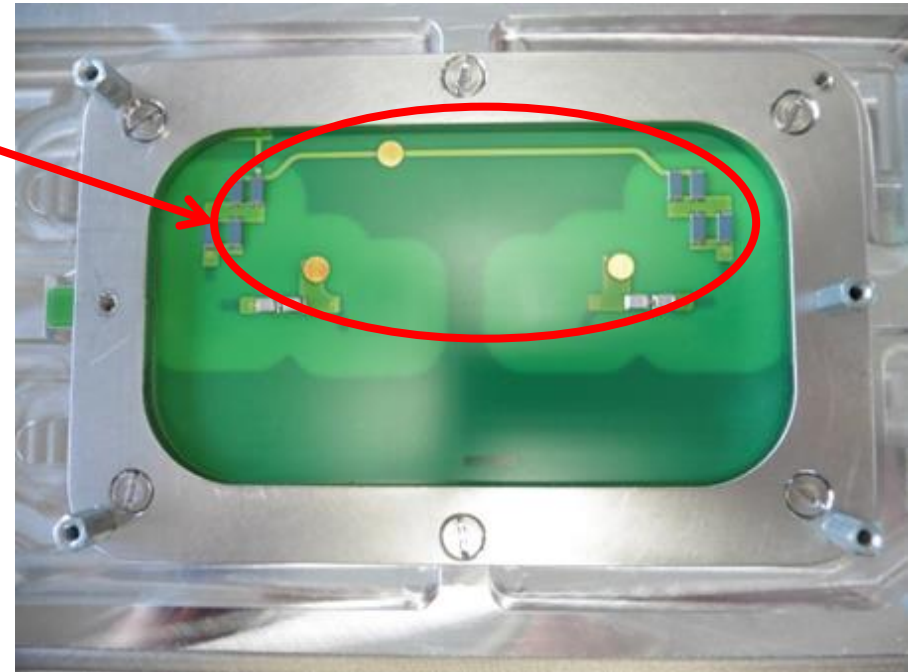
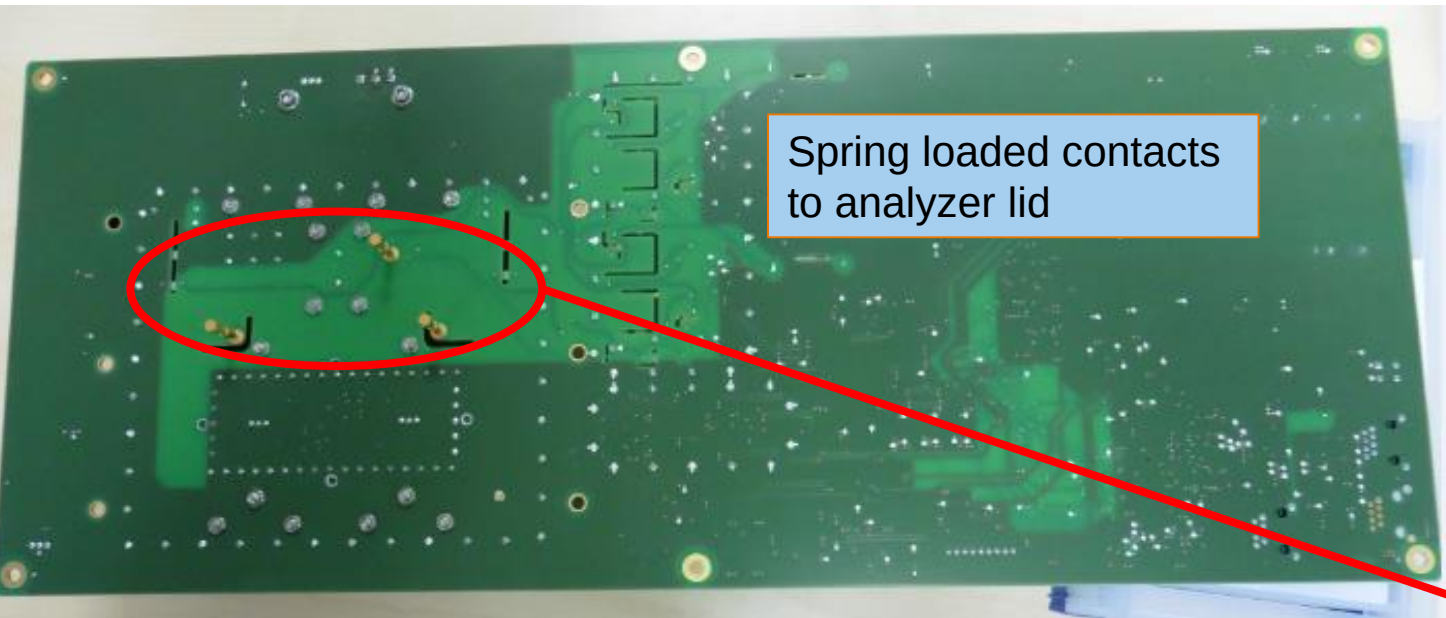
- Required Tools:
 - 3 mm hex
- Steps for disassembly
 - Loosen 3 screws hidden under cover
 - Loosen 17 screws outside cover
 - Remove cover
 - Disconnect cables
 - Loosen screws below cover
 - Remove PCB



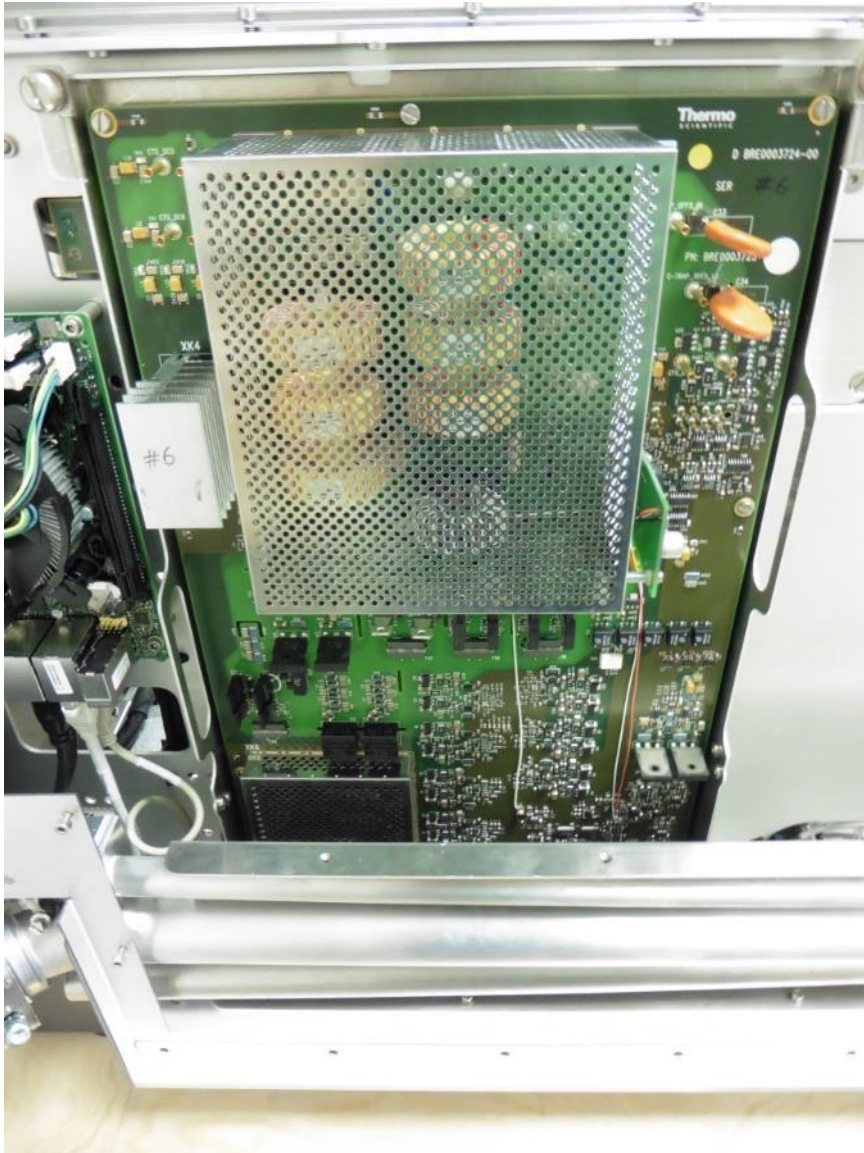
Quadrupole Supply - Connections



Quadrupole Supply – Connections cont.



C-Trap Supply (CTS) - BRE0013900

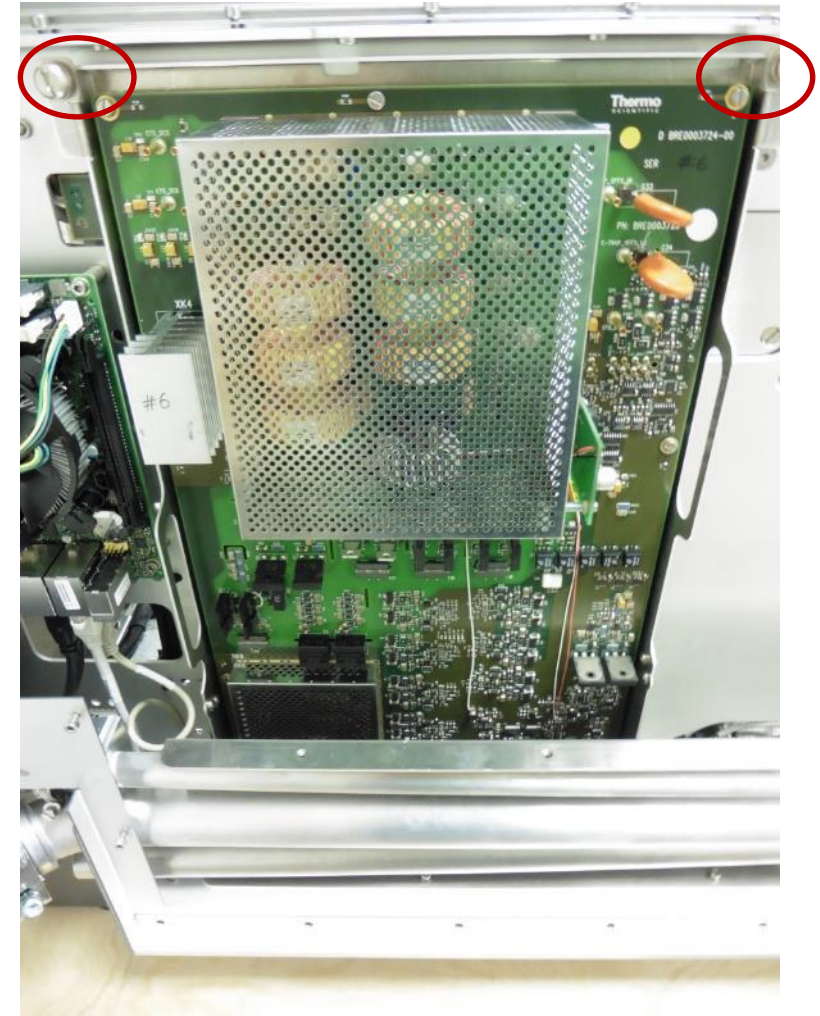
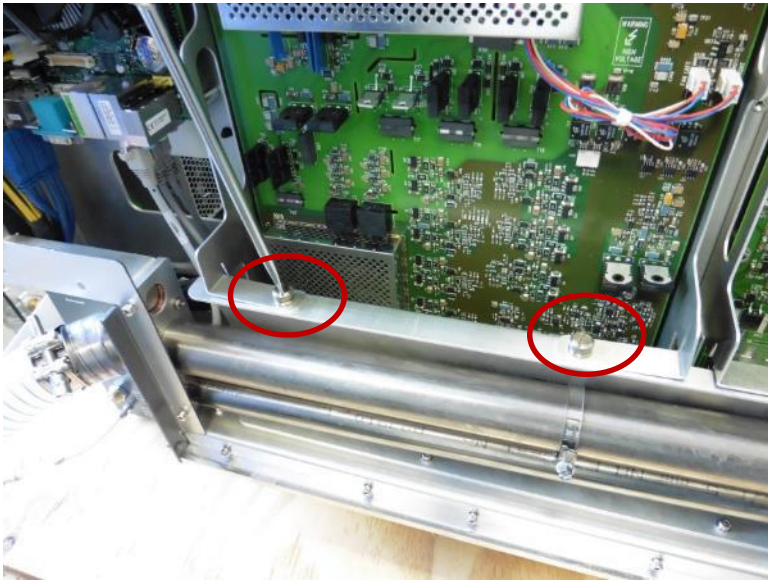


- Supplies:
 - Independent Charge Detector
 - Quad Exit Lens
 - Split Lens
 - C-Trap Entrance Lens
 - C-Trap Exit Lens
 - C-Trap Push and HV offset pulser
 - Z-Lens
 - Transport Multipole DC
 - HCD Axial Field Entrance
 - HCD Axial Field Exit
 - HCD Exit Lens
 - C-Trap RF
 - HCD RF
 - Transport Multipole RF

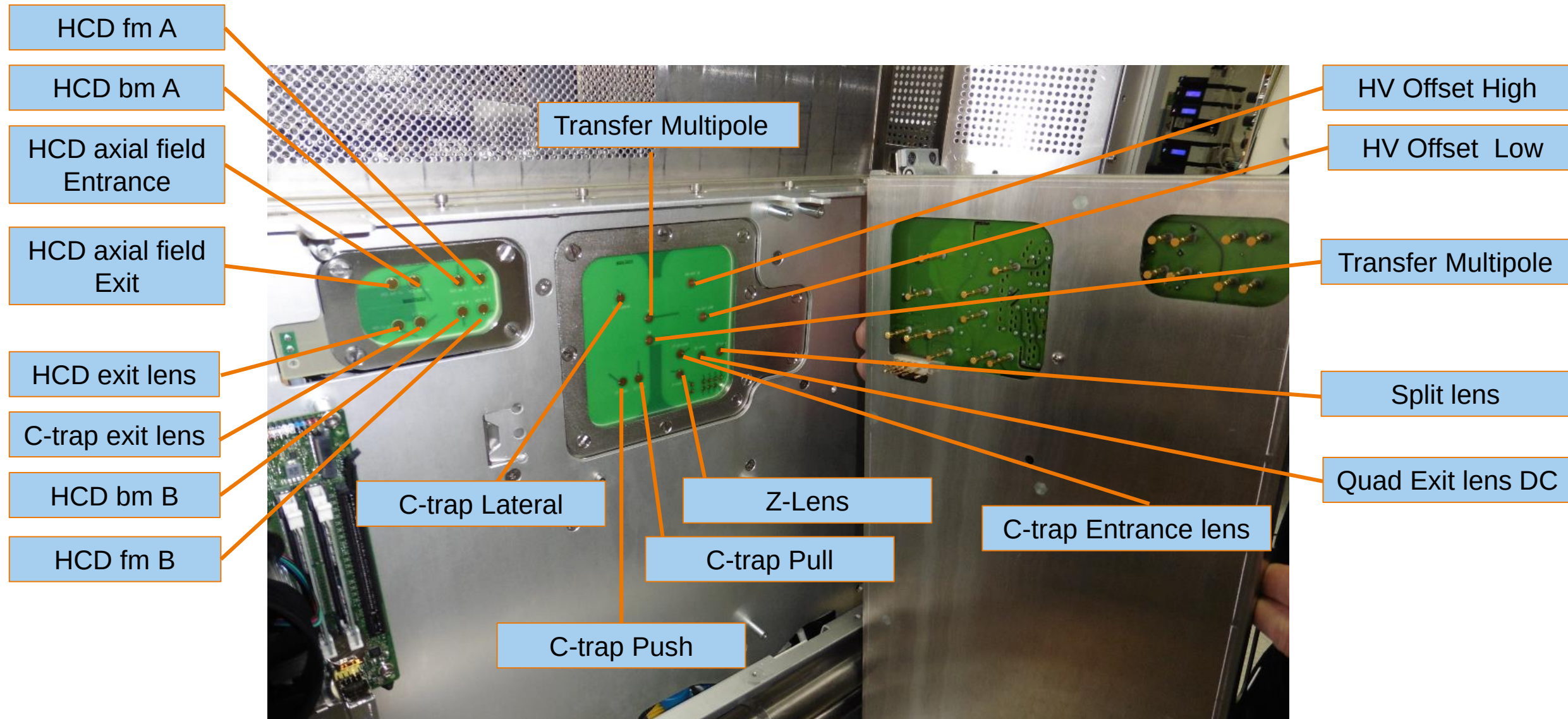
These come from one coil, i.e. only one setpoint

C-Trap Supply - Exchange

- Required Tools
 - Slot screwdriver
- Steps for disassembly
 - Loosen 4 screws
 - Tilt
 - Remove PCB



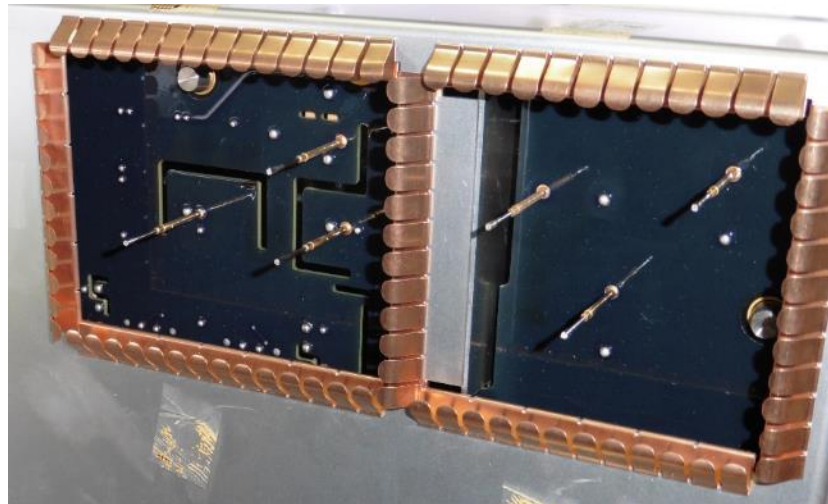
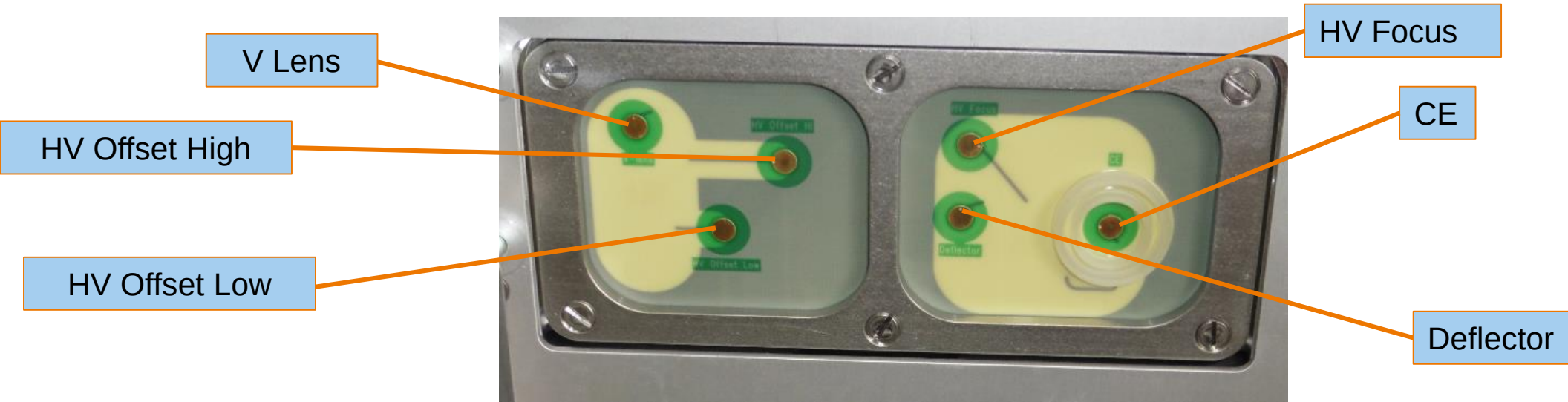
Spring loaded pins at C-trap supply





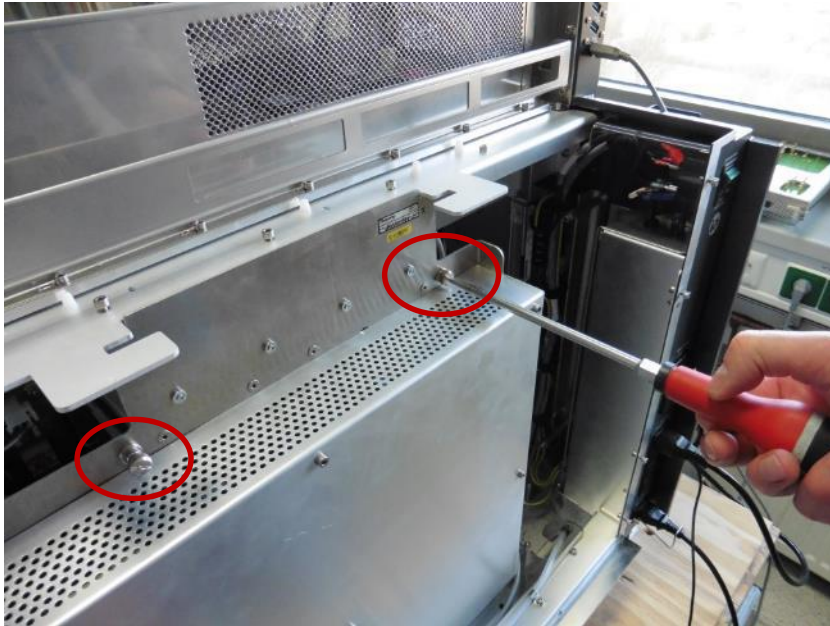
- Consists of Orbitrap Supply and Orbitrap Pulser
- Supplies:
 - C-Trap Inject (HV offset high and low)
 - HV Focus Lens
 - V Lens
 - Deflector Inject
 - Deflector Measure
 - Central Electrode Inject
 - Central Electrode Measure

Spring loaded pins and contact surfaces at OTS



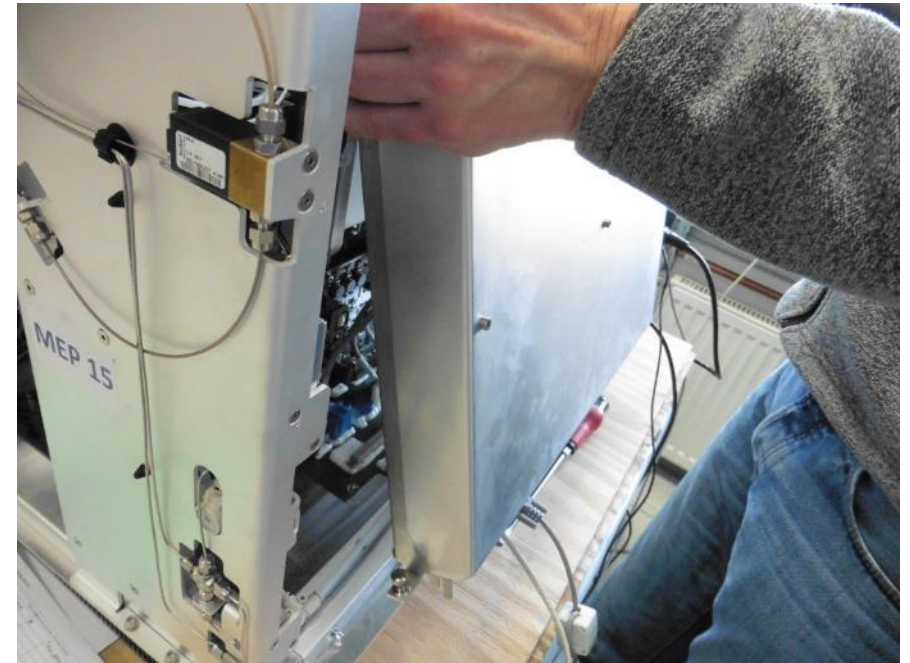
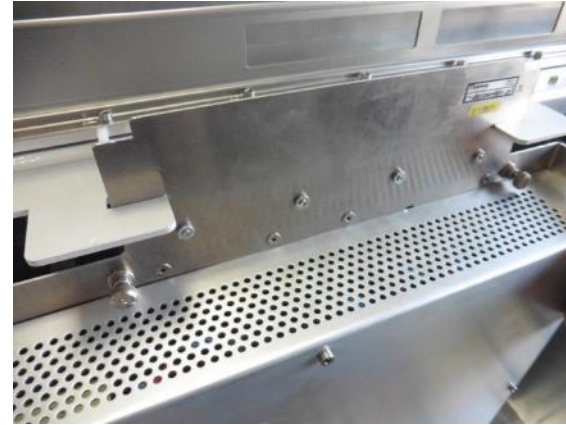
Orbitrap Control (OTC) - Exchange

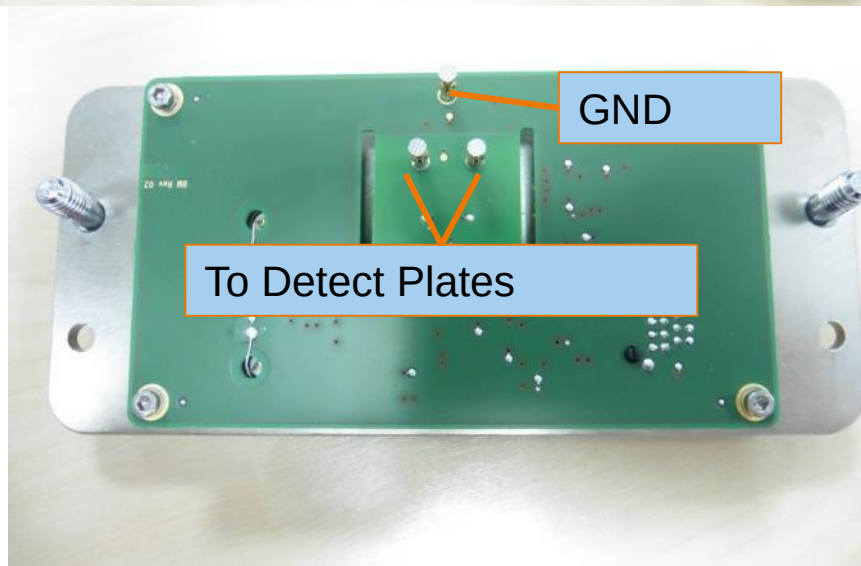
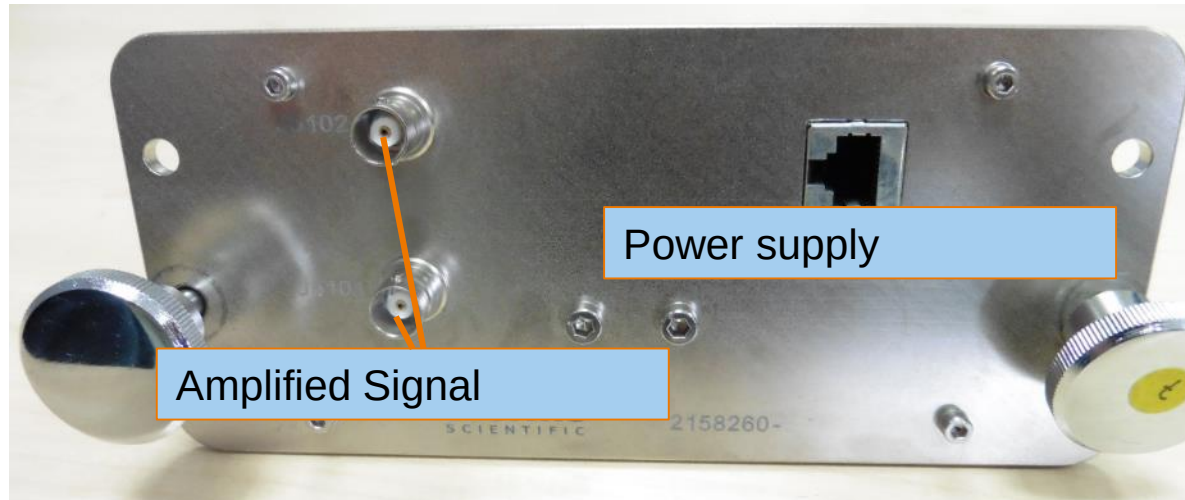
- Required Tools
 - Slot Screwdriver
- Steps for disassembly
 - **Loosen all 4 bolts**
 - Tilt about 10 deg
 - Pull up and out



Orbitrap Control (OTC) - Exchange

- Required Tools
 - Slot Screwdriver
- Steps for disassembly
 - Loosen all 4 bolts
 - **Tilt about 10 deg**
 - **Pull up and out**





- Amplification of the Orbitrap Signal
- To remove:
 - Disconnect BNC and RJ45 cables
 - Loosen 2 fingertight screws.
 - Pull away from analyzer

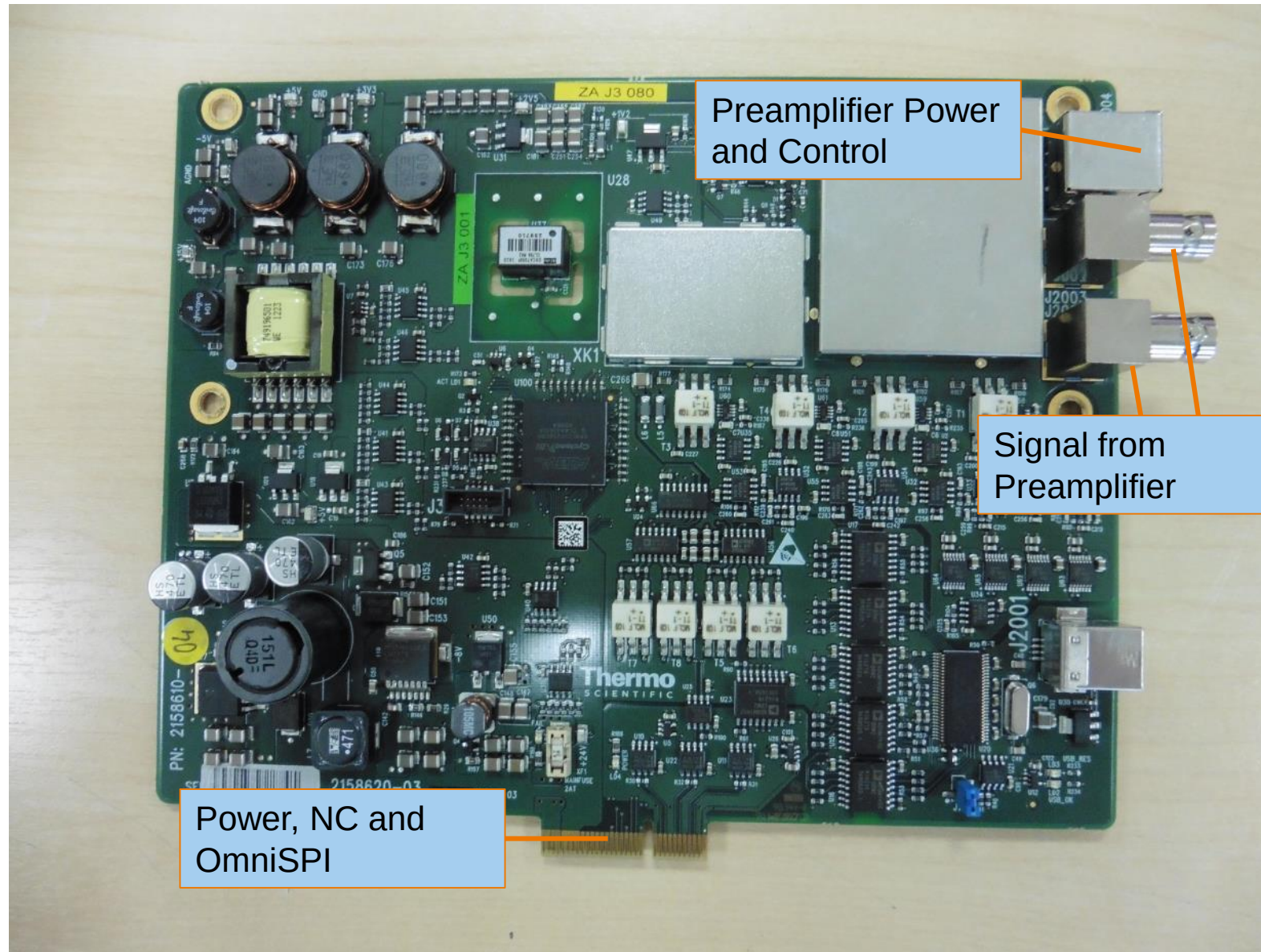


DAQ Board (BRE0013896)



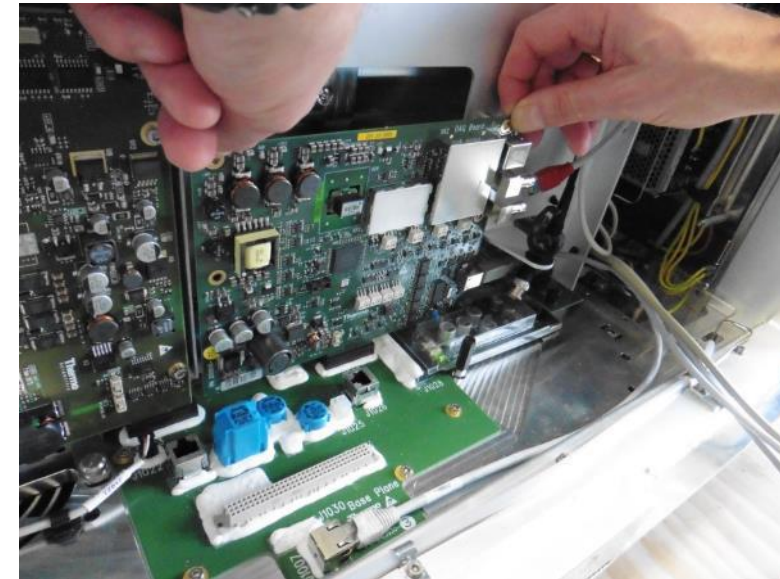
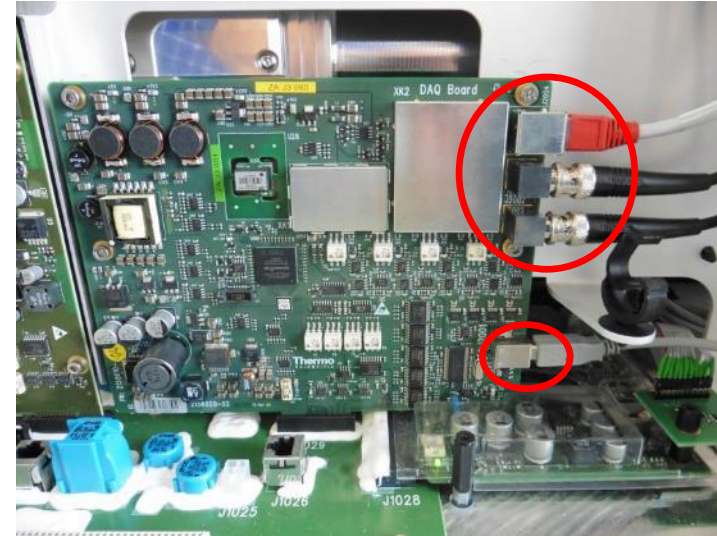
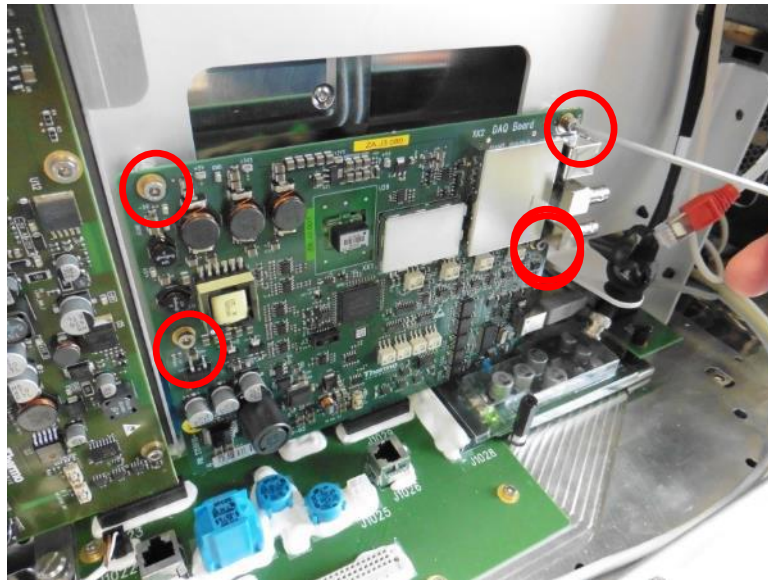
- Analog to digital conversion of Preamplifier signal (BNC cable)
- Data transmitted via USB to embedded PC.
- Provides power for Preamplifier (red cable)
- Performs active noise cancellation.

DAQ Board - Connections



DAQ Board - Exchange

- Required Tools
 - 3 mm hex
- Steps for disassembly
 - Unplug cables
 - Remove 4 screws.
 - Remove PCB

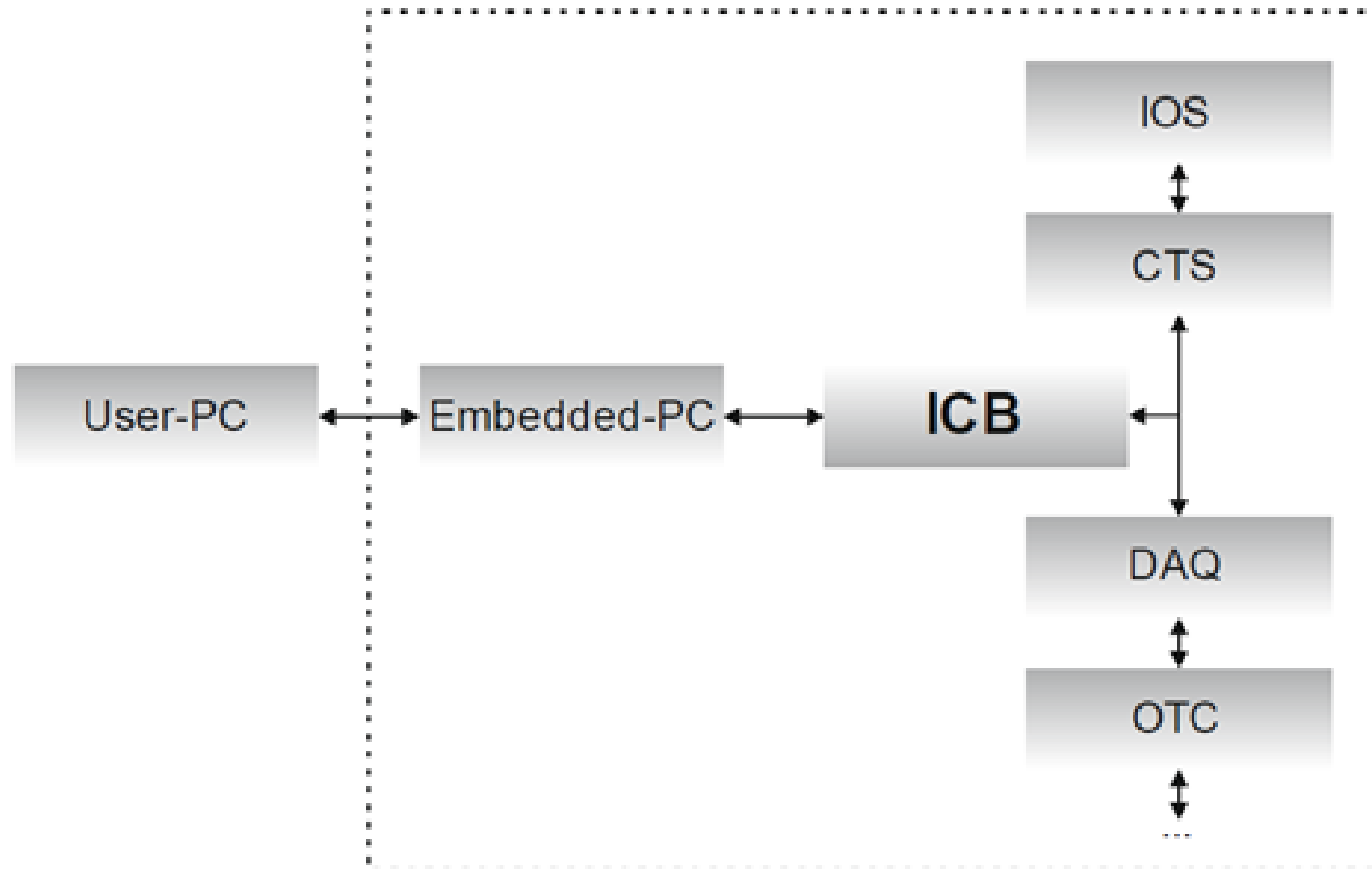


Instrument Control PCB (BRE0013897)



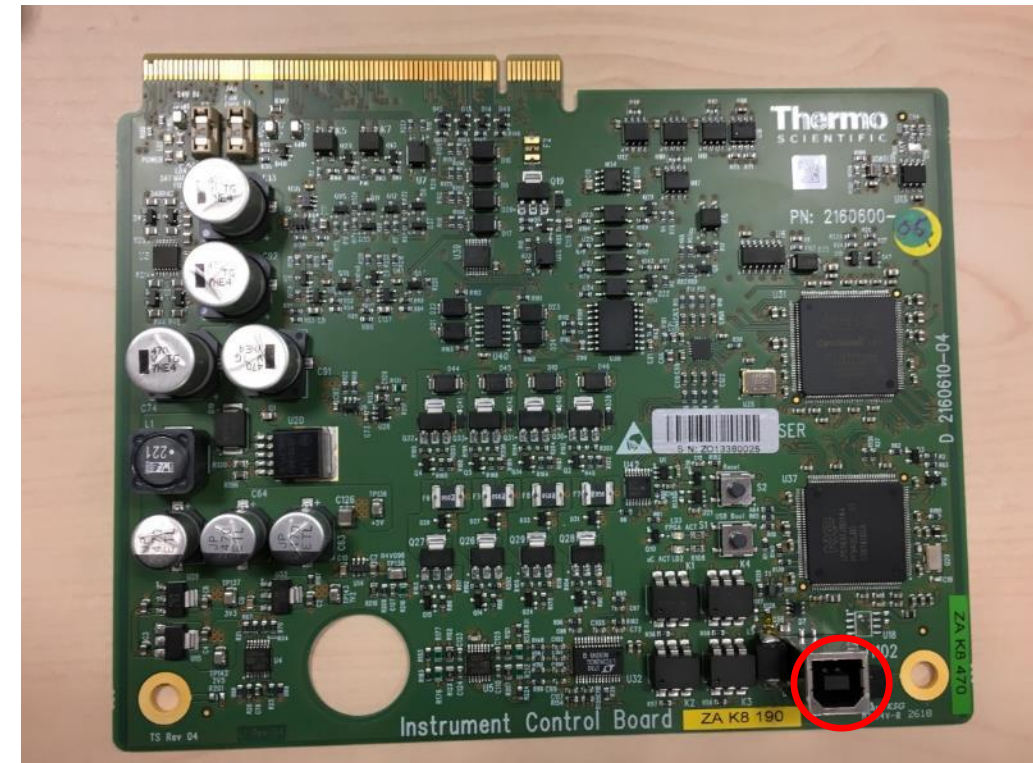
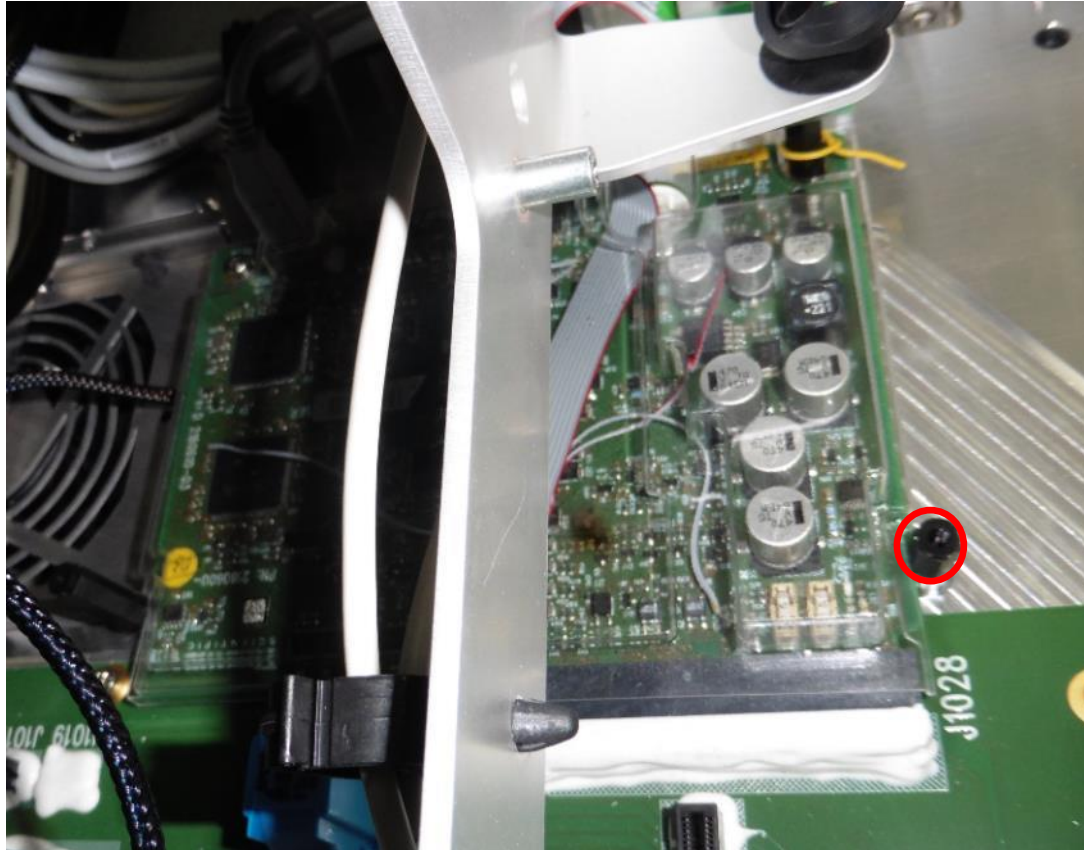
- Controls:
 - OmniSPI
 - Turbo Pump
 - Vent valve
 - Forepump
 - Embedded PC reset
 - Vacuum Gauges
 - Temperature and Humidity Sensor
 - Bakeout
 - Fans
 - Digital and Analog In/Out IO Panel

Instrument Control Board, ICB (BRE0013897)



Instrument Control PCB Exchange

- Required Tools
 - 3 mm hex
- Steps for disassembly
 - Disconnect USB
 - Loosen 1 screw
 - Slide out



Embedded PC (BRE0013920)



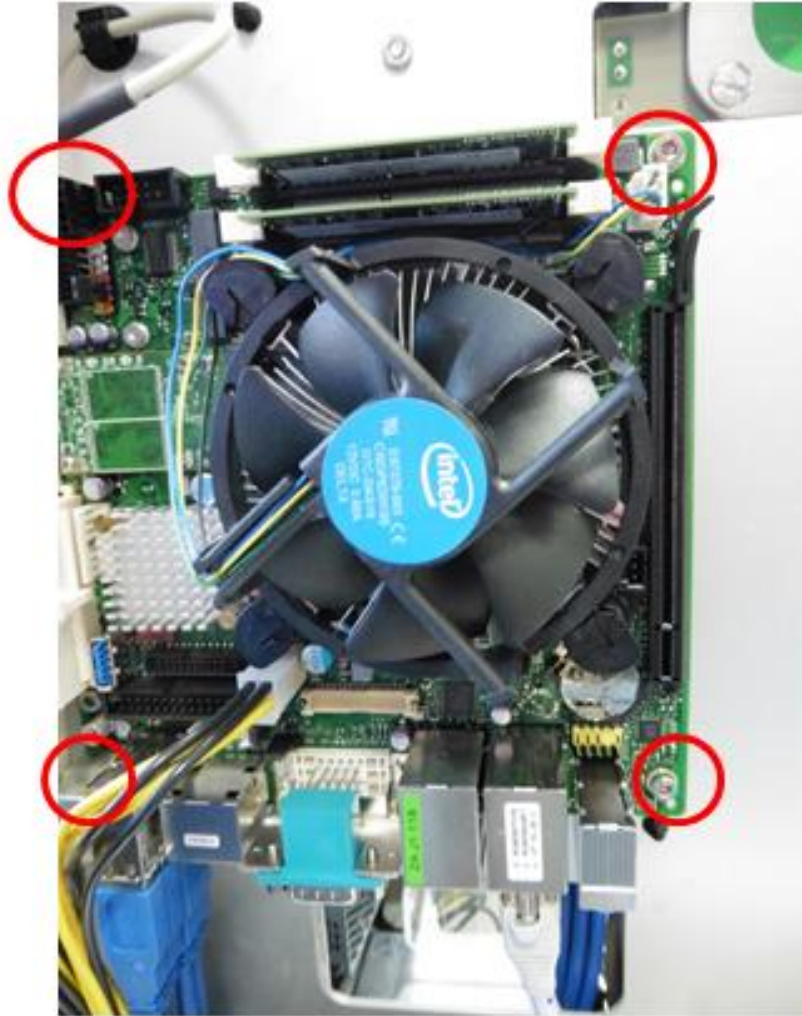
- Intel core i5, 4th generation
- SSD for booting (no USB bootstick anymore)



- USB 2.0, 4GB RAM, 8GB SSD Memory
- Power from main power supplies
- Responsible for FFT and calculation of mass spectra

Embedded PC Exchange

- Required Tools
 - 3 mm hex
- Steps for disassembly
 - Disconnect all cables
 - Remove 4 screws.
 - Remove PCB



Power Supplies



- Turbo pump
24V/25A



- Top
48V/6.3A
- Middle
24V/12.5A
- Bottom
12V/13A

Power Supplies

- 48V/6.3A (P/N BRE0000346): Quad PCB, C-trap Supply PCB
- 24V/12.5A (P/N BRE0000348): Source Board, Ion Optic Supply, Orbitrap Supply, Preamplifier, DAQ
- 12V/13A (P/N BRE0000350): Embedded PC
- 24V/25A (P/N BRE0000349): Turbopump, Instrument Control Board, Bake out heaters, Ion Gauge, Pirani gauges, Vent Valve

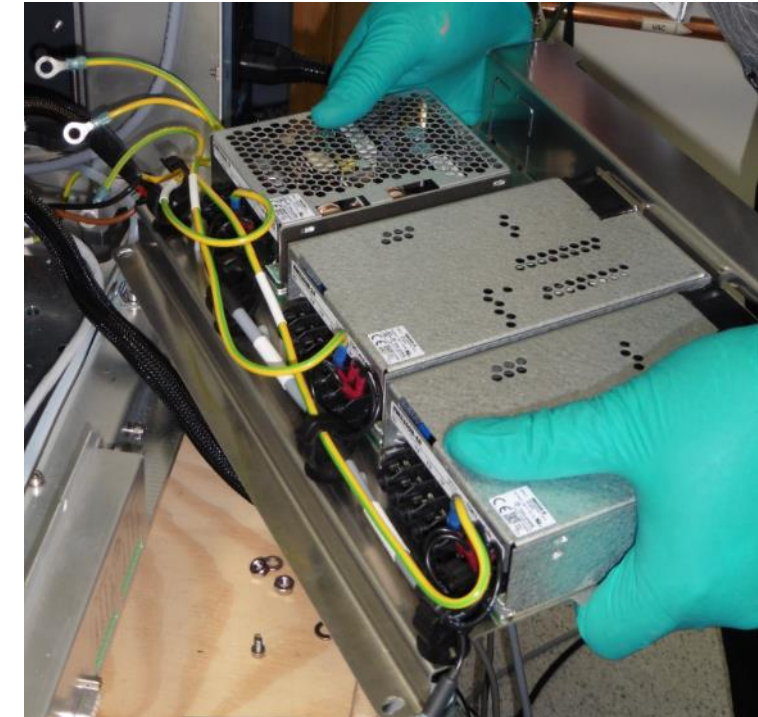
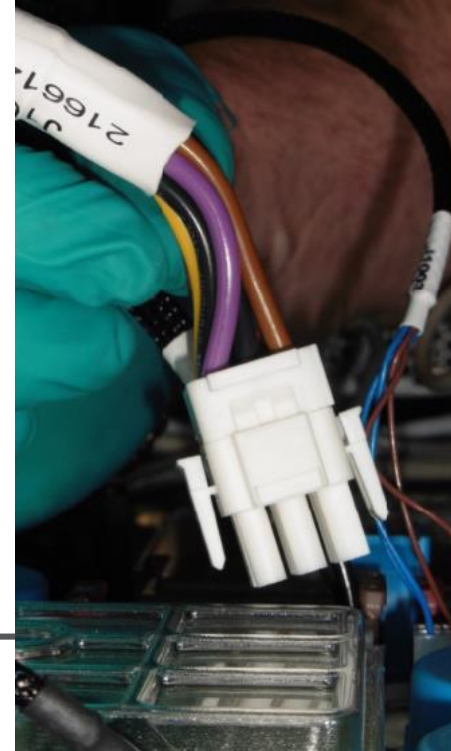
Power Supplies Removal (three at top)

- Required Tools

- PH1 or PH2 driver
- 3, 8 and 10 mm hex

- Steps for disassembly

- Loosen 3 hex screws (3 mm) to remove protective cover
- Remove the grounding wires from earth pin using 10 mm wrench
- Remove the 2 screws from the plate where all the power supplies are attached
- Then the plate can be removed from the instrument (careful to the wires, need to be taken off the secure clips)



Power Supply Removal (bottom)

- Required Tools

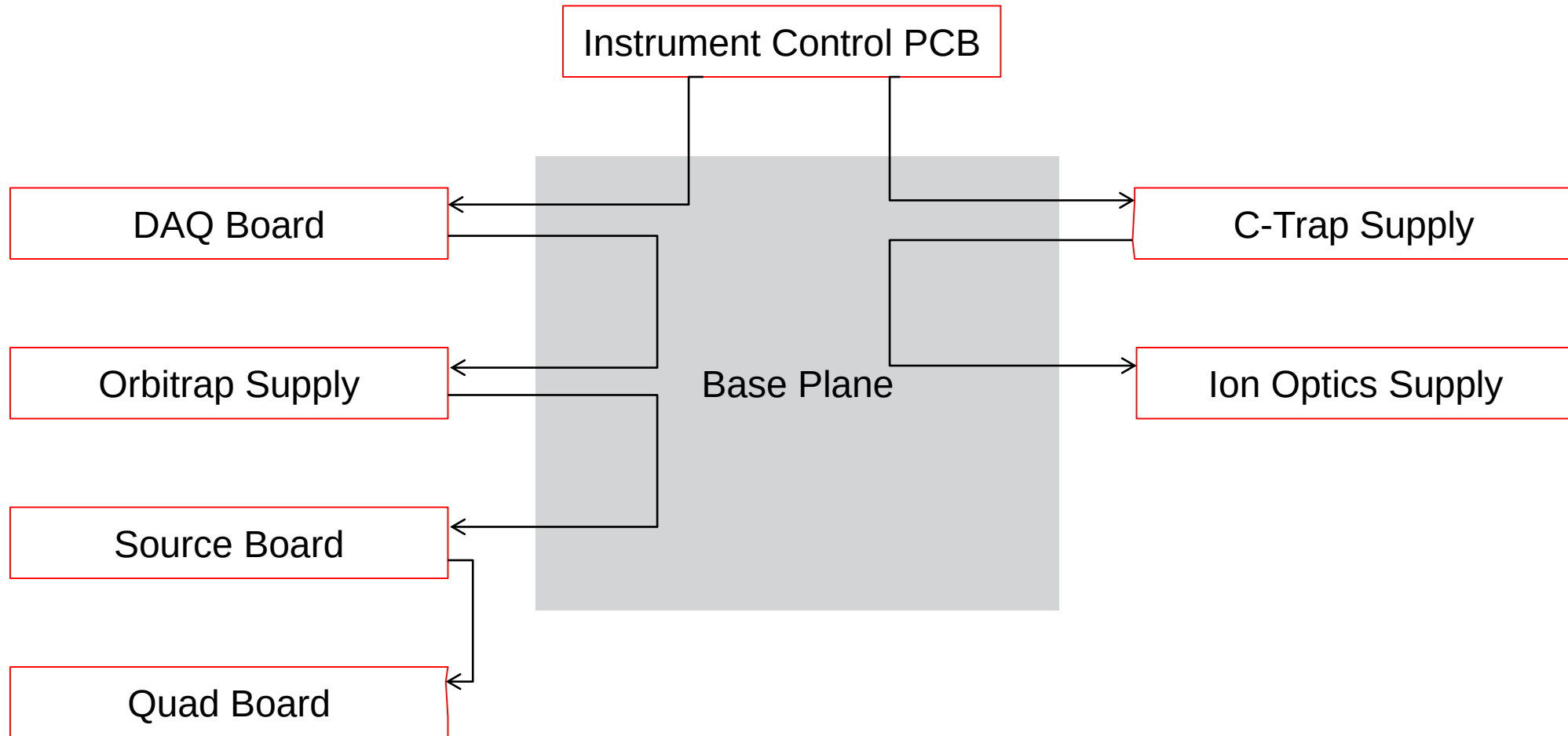
- PH1 or PH2 driver
- 3, 8 and 10 mm hex

- Steps for disassembly

- Loosen 3 hex screws (3 mm) to remove protective cover
- Remove the grounding wires from earth pin using 10 mm wrench
- Remove the 2 screws from the plate where all the power supplies are attached
- Then the plate can be removed from the instrument (careful to the wires, need to be taken off the secure clips)
- For the 24 V turbo power supply (located on the bottom of the instrument) use 8 mm wrench.

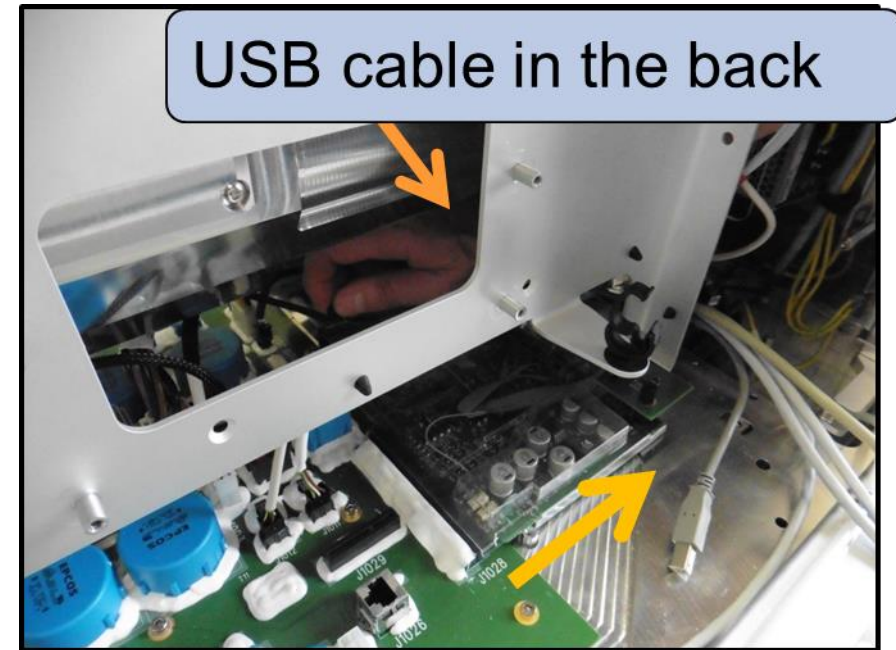


Interconnection – Omni SPI



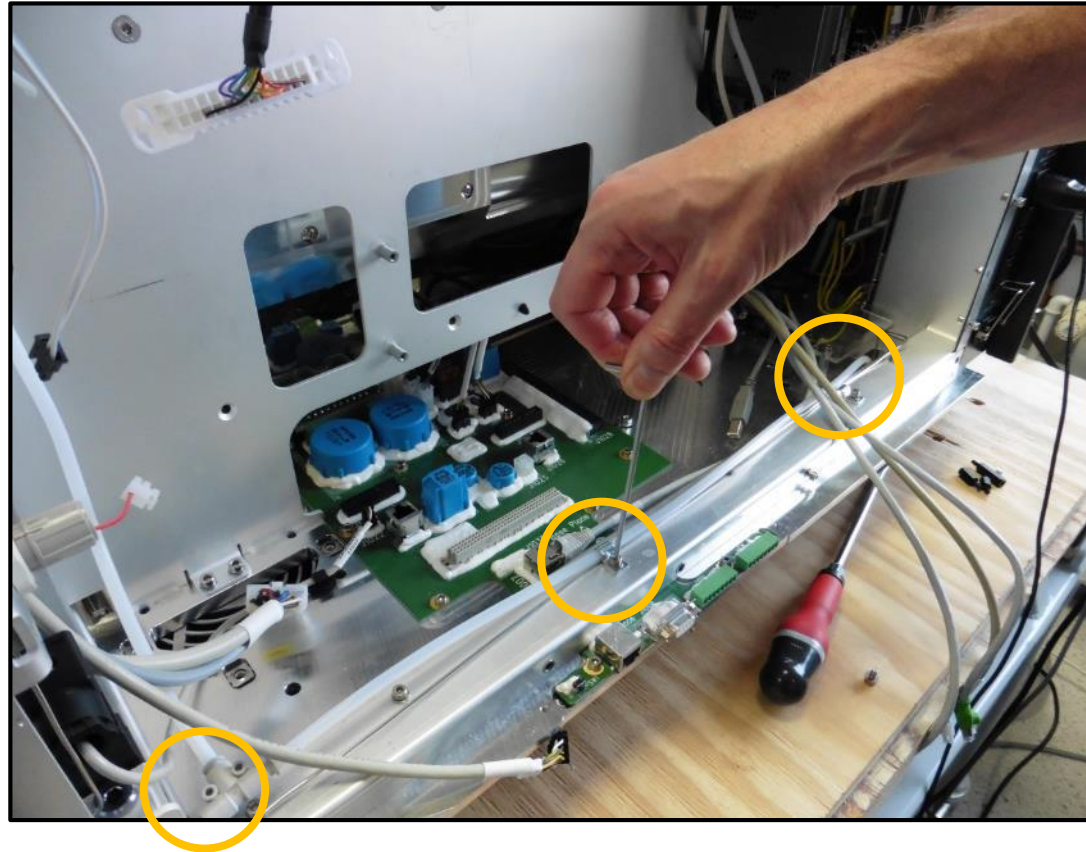
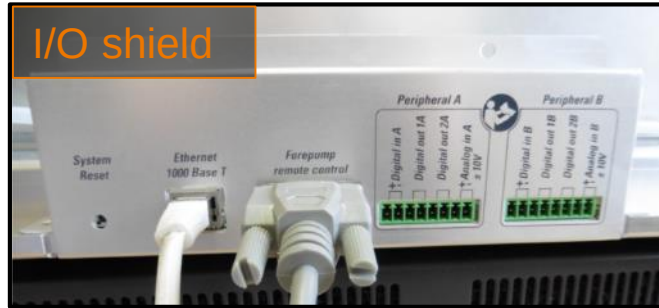
Baseplane Exchange (BRE0013901)

- Power down the instrument.
 - Follow the procedures to remove the following boards.
 - Orbi Supply board, source board, DAQ board on the right hand side of the instrument
 - Ion Optics Supply, Unit CLT Supply on the left hand side of the instrument.
-
- Now disconnect the USB cable on the Instrument Control PCB.
 - Undo the 4 screws 3 plastic studs & one 3 mm Allen
 - Carefully slide the Instrument Control PCB out to the back.
 - Disconnect all cables on the base plane board.



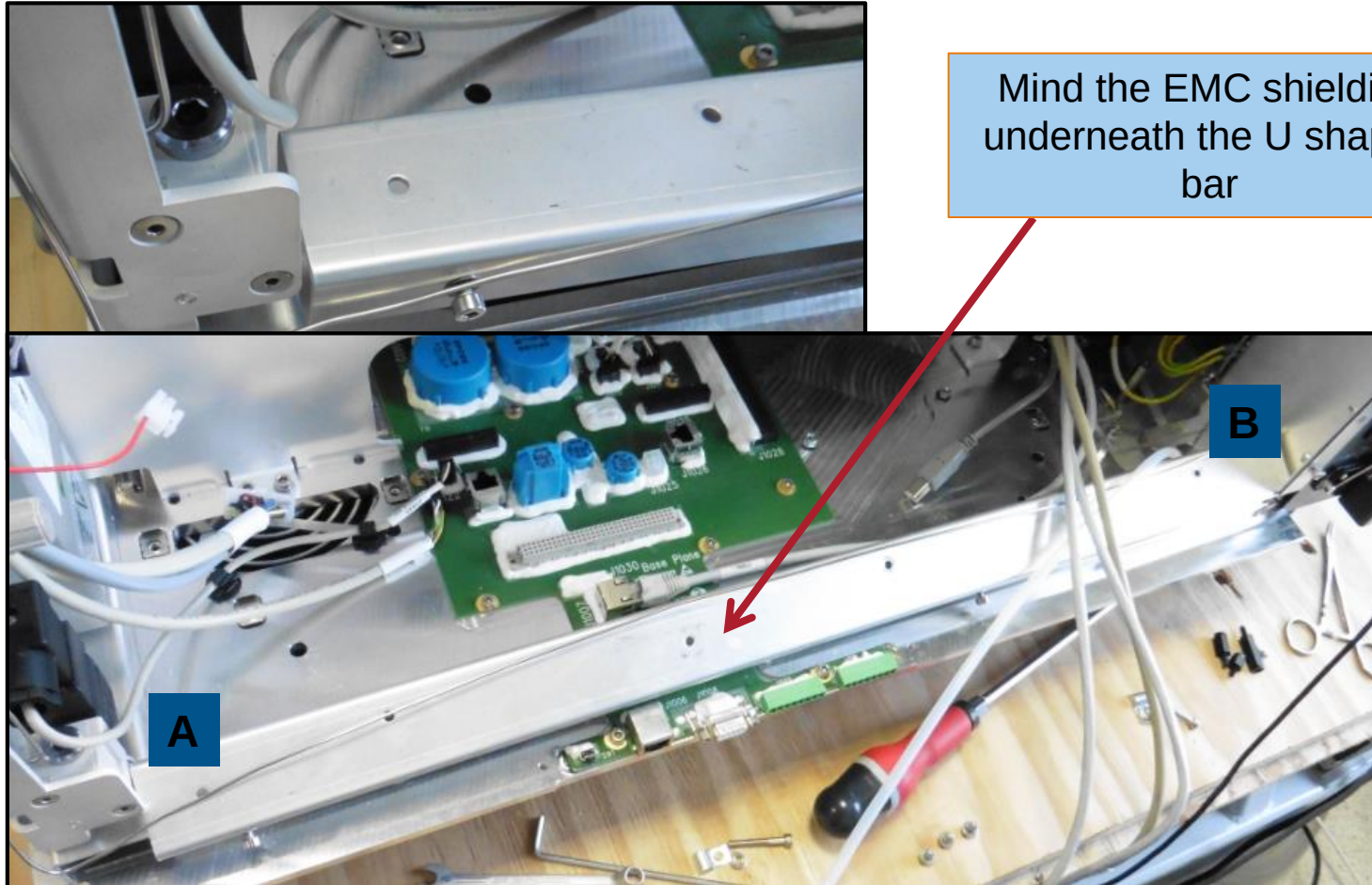
Baseplane Exchange (BRE0013901)

- Remove the metal i/o shield.
- Remove the 3 **long** 3 mm Allen key screws



Baseplane Exchange (BRE0013901)

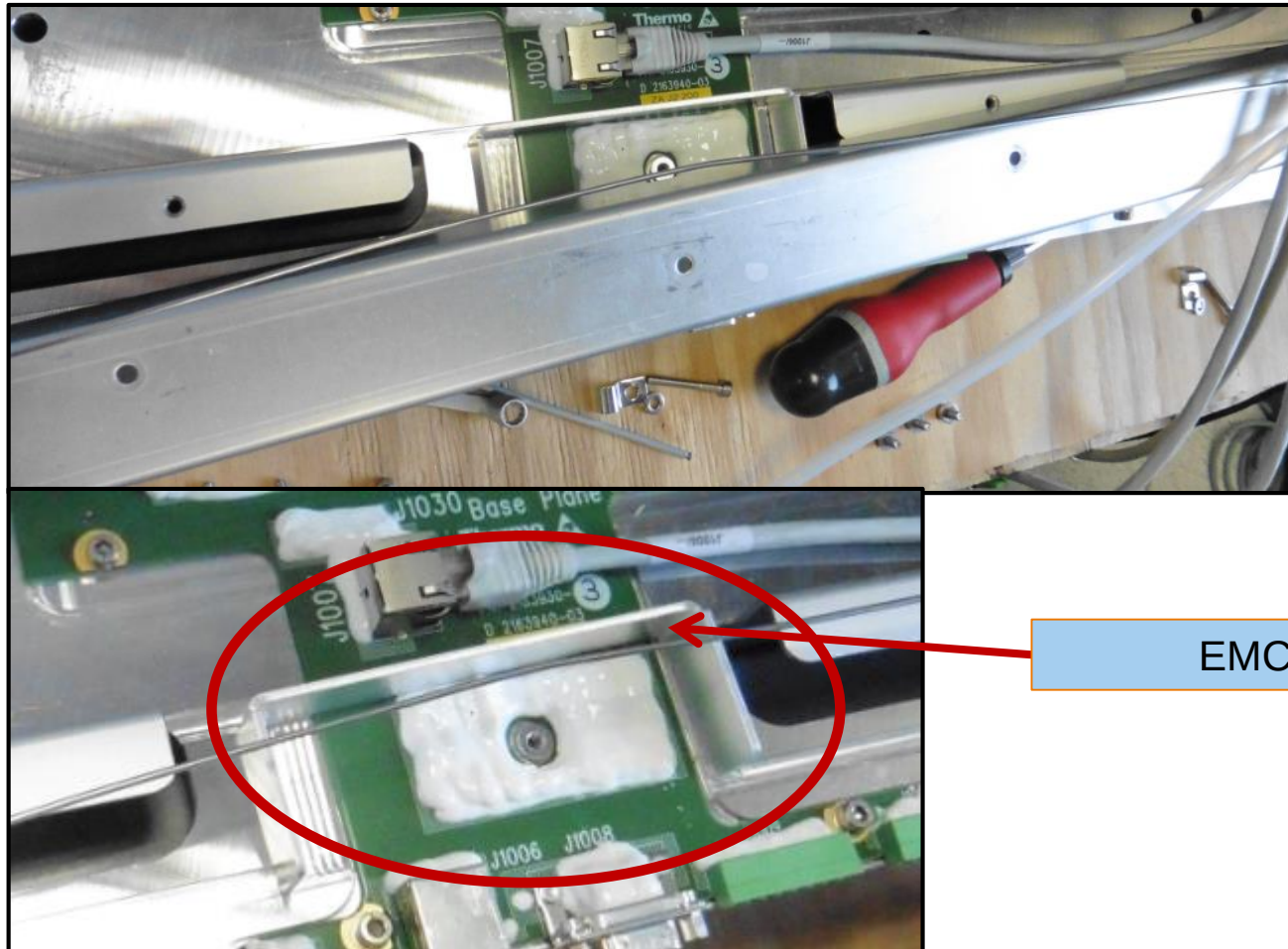
- Now lift the aluminum bar on the left hand side, indicated by letter A and rotate slowly on the right hand side indicated by the letter B.
- See pictures below, be carefully when lifting!



Mind the EMC shielding underneath the U shaped bar

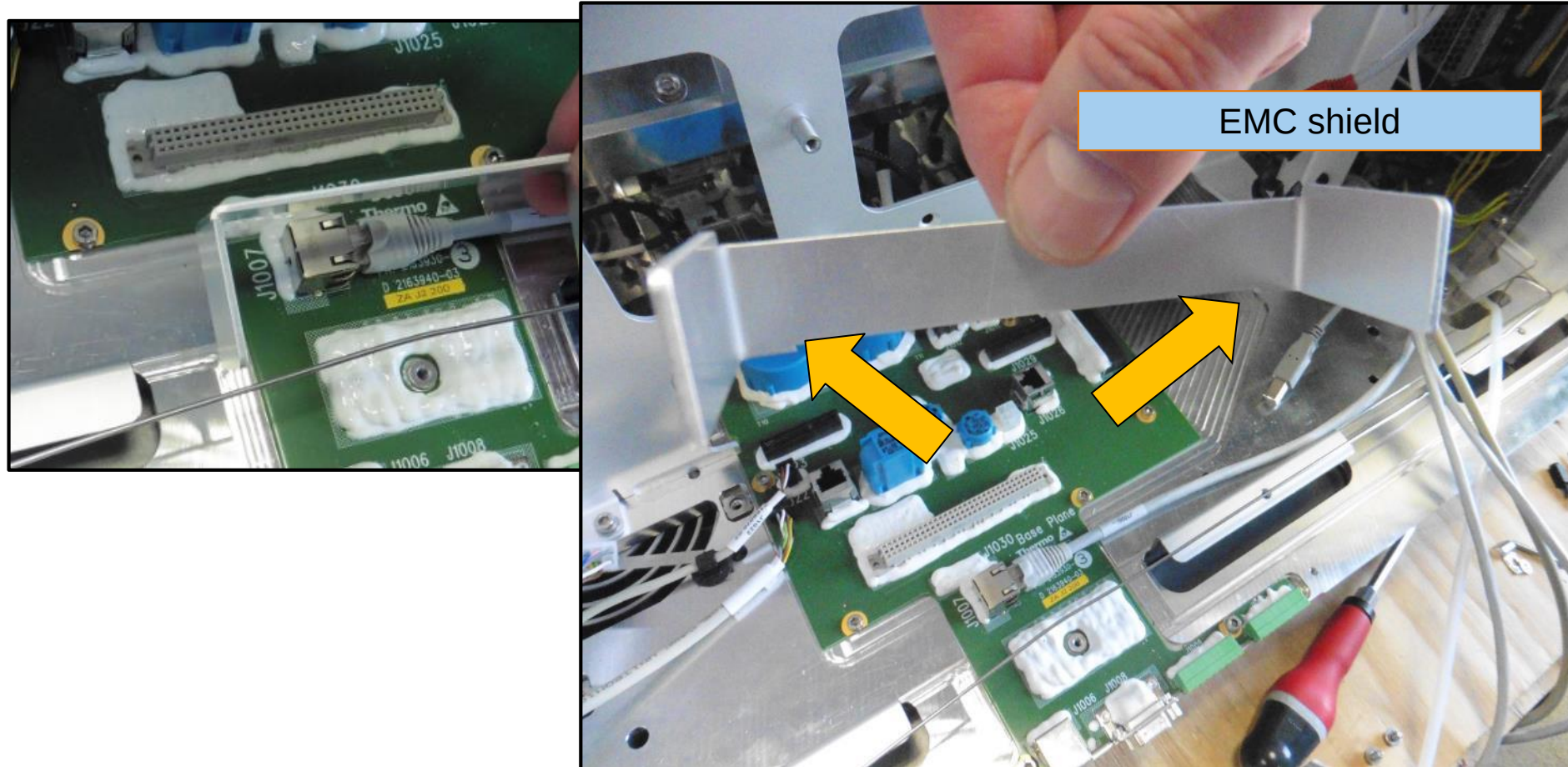
Baseplane Exchange (BRE0013901)

- You will find a bracket underneath the bar, sitting on the PCB, as pictured below.



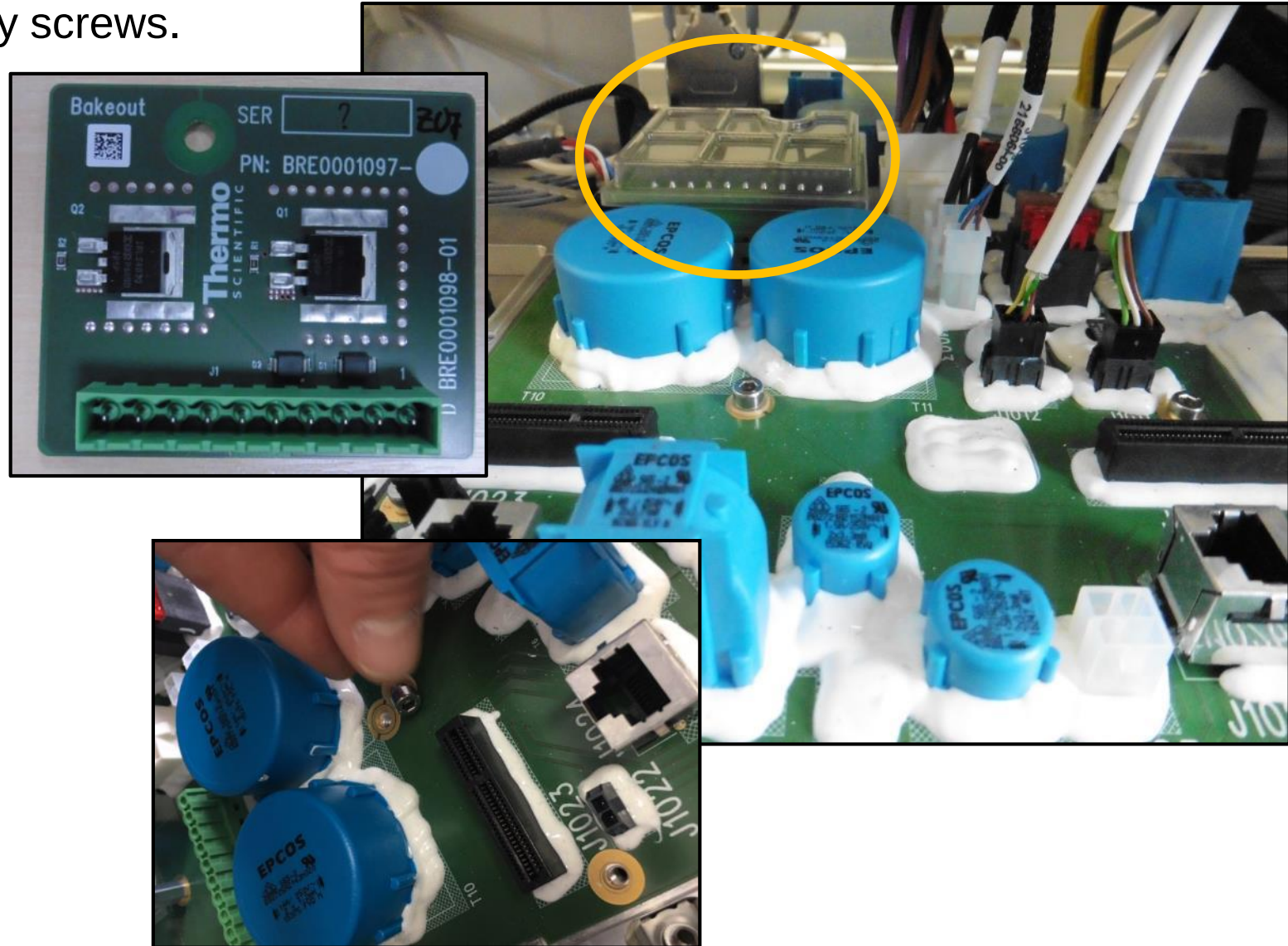
Baseplane Exchange (BRE0013901)

- Now lift the bracket away, it isn't tightened.
- See pictures below.
- Please note the bracket has a keyed position, **remember this for re-installation!!!**



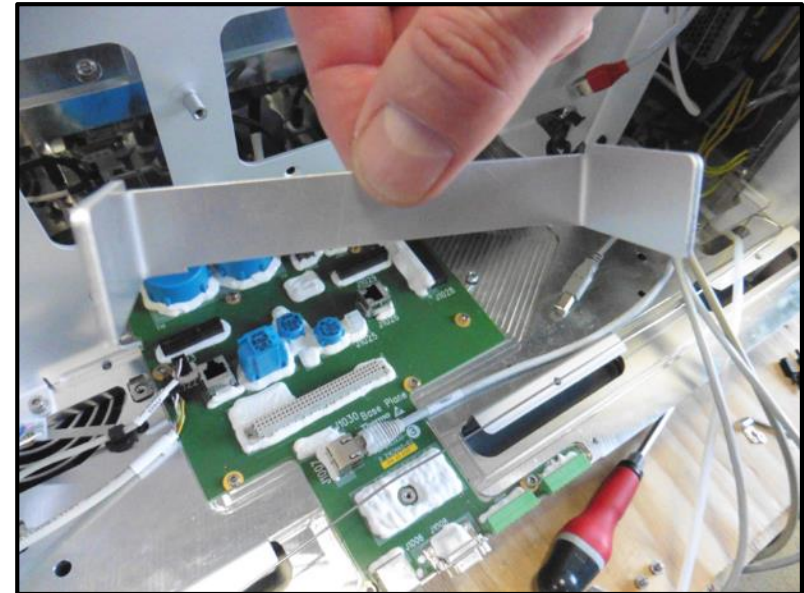
Baseplane Exchange (BRE0013901)

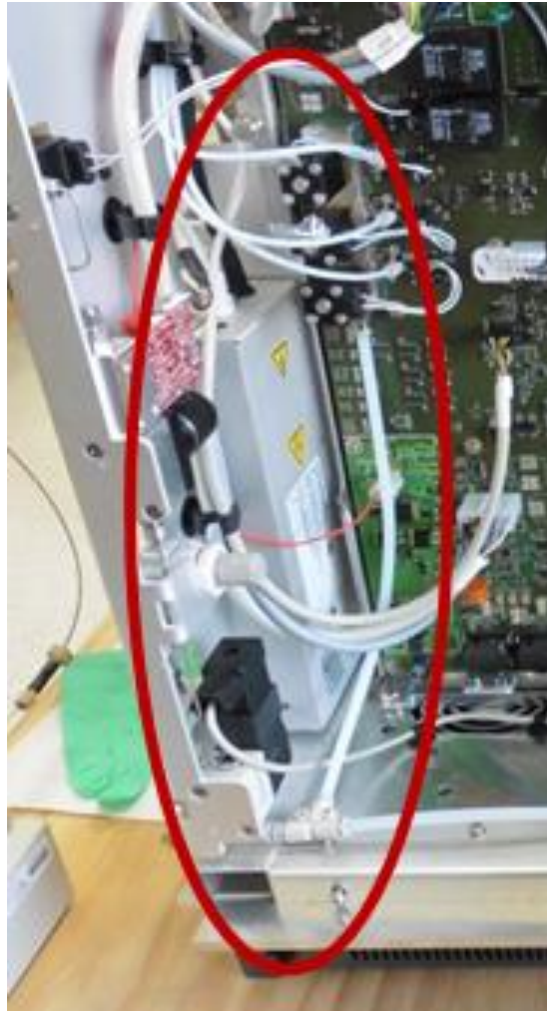
- Undo all the thirteen 3 mm Allen key screws.
- See pictures below.
- In the center area under the plastic cover we do have the upside down mounted PCB.
- Undo the screw, remove the PCB and undo the mounting stud.
- Now the base plane is free and can be moved out (carefully) to the right side while raising the PCB slightly.
- Different washer could occur



Baseplane Re-Installation (BRE0013901)

- Carefully move the base plane into position.
- Install all thirteen screws, leaving the screws slightly loose.
- Align the base plane on the right side position of the instrument.
- Tighten a few screws and check now the correct alignment of a few PCB's.
- For example CLT RF and Orbi Supply Board.
- When this is OK remove the above PCB's, tighten the rest of the screws.
- Follow the removal instruction's in reversed order.
- Make sure you do install the EMC shield correctly otherwise you will damage the new base plane board!
- EMC shield is required to guard against emissions of electromagnetic frequencies.





- Required Tools
 - 3/32 inch hex
- Steps for disassembly
 - Remove 4 hex screws
 - Disconnect nitrogen tubing and cables on Source PCB (to clear space)
 - Loosen and move Source PCB as far as possible
 - Pull out 8 kV supply