# Magnet Rack & Cryo Rack

ORC Update – 3/4/2021

# Outline

- Magnet Rack
- Cryo-Rack

# Magnet Rack: Remaining issue

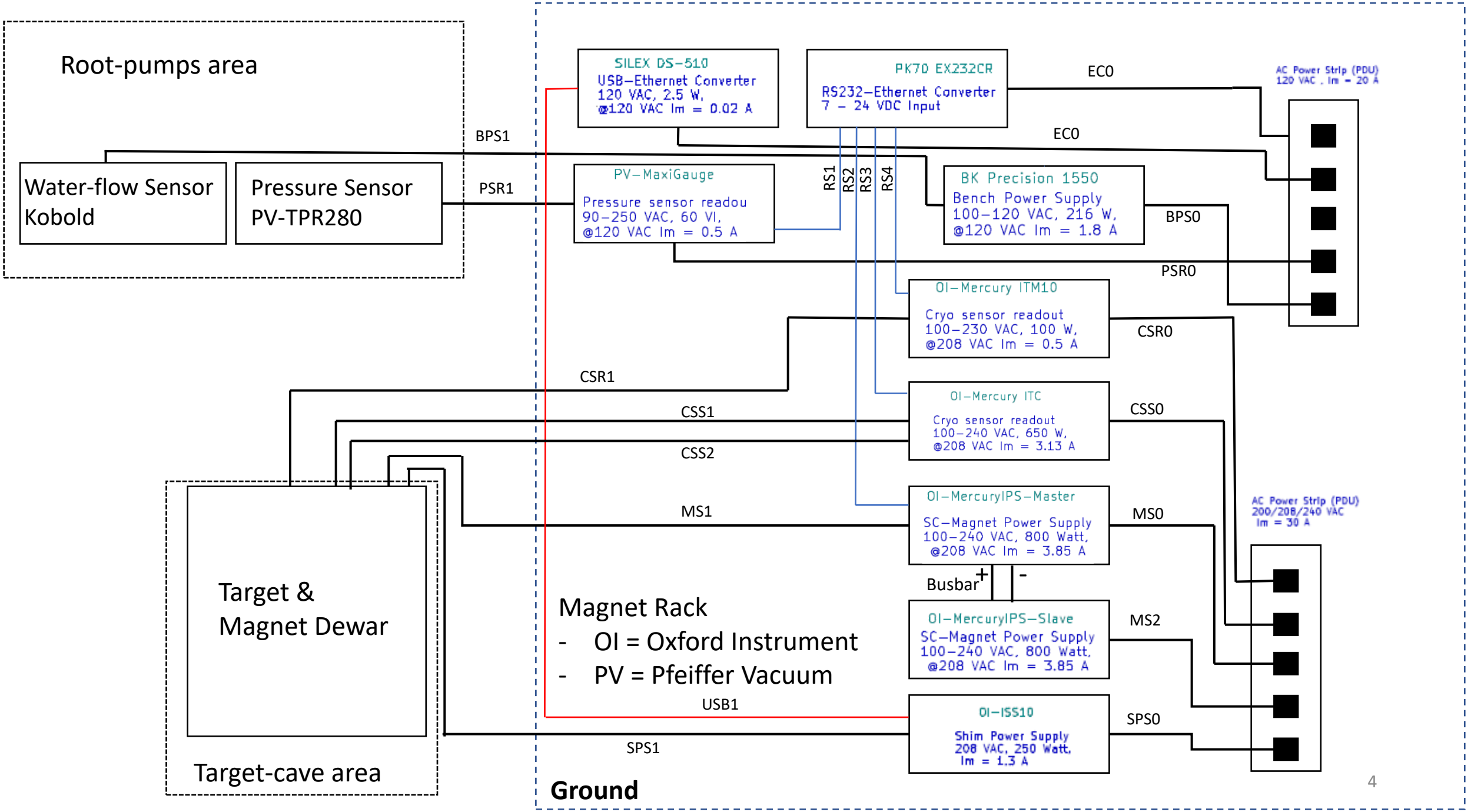
Cable list: Most cable has been specified. But the **ITM10 & Shim-PS** cables have not been specified since they are covered by the shielding. See the following couple of slides for the new setup dan cable list

Possible solution:
1. See/guess the type of the shielding
2. Open the connector to see how many gauge wire inside
3. Measure the diameter (AWG size)

Terminal issue from Rick: The 208V 3 phase distribution in Figure 3 does not have sufficient detail. Looking at the terminal block where the distribution occurs, the diagram is wrong (not enough wires on the output side going to the power strips). Also, I think this construction will not pass because the 208V looks to be a 10AWG wire and the wires going into the power strips look to be 18 AWG (this is asking to start a fire without fusing).

Solution: Waqar, could you please draw a new terminal-block diagram? Thank you

Next step: Could you please show the new terminal-block diagram (after Waqar finish the drawing) along with the cable list and schematics shown in the following slides to Rick?


Root-pumps area
Water-flow Sensor
Kobold
Pressure Sensor
PV-TPR280
BPS1
PSR1
SILEX DS-510
USB-Ethernet Converter
120 VAC, 2.5 W,
@120 VAC Im = 0.02 A
PK7D EX232CR
RS232-Ethernet Converter
7 - 24 VDC Input
EC0
EC0
AC Power Strip (PDU)
120 VAC , Im = 20 A
PV-MaxiGauge
Pressure sensor readou
90-250 VAC, 60 VI,
@120 VAC Im = 0.5 A
RS1
RS2
RS3
RS4
BK Precision 1550
Bench Power Supply
100-120 VAC, 216 W,
@120 VAC Im = 1.8 A
BPS0
PSR0
OI-Mercury ITM10
Cryo sensor readout
100-230 VAC, 100 W,
@208 VAC Im = 0.5 A
CSR0
CSR1
OI-Mercury ITC
Cryo sensor readout
100-240 VAC, 650 W,
@208 VAC Im = 3.13 A
CSS0
CSS1
CSS2
OI-MercuryIPS-Master
SC-Magnet Power Supply
100-240 VAC, 800 Watt,
@208 VAC Im = 3.85 A
MS0
MS1
AC Power Strip (PDU)
200/208/240 VAC
Im = 30 A
Busbar
+
-
OI-MercuryIPS-Slave
SC-Magnet Power Supply
100-240 VAC, 800 Watt,
@208 VAC Im = 3.85 A
MS2
OI-ISS10
Shim Power Supply
208 VAC, 250 Watt,
Im = 1.3 A
SPS0
SPS1
USB1
Target &
Magnet Dewar
Target-cave area
Magnet Rack
- OI = Oxford Instrument
- PV = Pfeiffer Vacuum
Ground

| Cable | Description |
|---|---|
| EC0 | AC power cord |
| EC0 | AC power cord |
| PSR0 | AC power cord |
| PSR1 | Factory made sensor cable (Pfeiffer Vacuum, catalog number PT448252- T) |
| BPS0 | AC power cord |
| BPS1 | AWG 18-gauge wire |
| SPS0 | AC power cord |
| CSR0 | AC power cord |
| CSS0 | AC power cord |
| MS0 | AC power cord |
| MS1 | Factory-made power cable (Eland cable: BS 638:PART 4 H.O.F.R  85 DEG.C 25 MM2 ELAND) |
| MS2 | AC power cord |
| SPS1 | ? |
| CSR1 | ? |
| CSS1 | Helium probe sensor cable (Oxford Inst. : 7-2-4C P46339 CNC6700 HE ) with extension of AWM 2464 cable |
| CSS2 | Nitrogen probe sensor cable (Oxford Inst. : 7-2-4C IEC60332.1 CNC6600 N2 ) with extension of AWM 2464 cable |

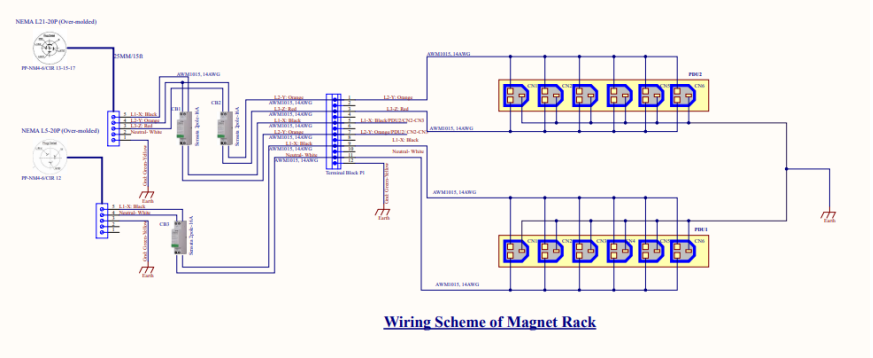
| Cable | Description |
| --- | --- |
| USB1 | USB cable |
| RS1 | RS232 cable |
| RS2 | RS232 cable |
| RS3 | RS232 cable |
| RS4 | RS232 cable |

# Cryo Rack: Power distribution

In the following slides, I make summaries of:

1. Power consumption, maximum current, 120/240 VAC requirement, Neutral requirement for each subsystem that will sit on the Cryo rack: Cryo control, lifter control, Microwave system, slow control & other system.
2. Total power consumption and current
3. Power consumption & current for devices that require 120 VAC, single-phase, and require Neutral
4. Power consumption & current for devices that require 240 VAC, single-phase, and NO neutral
5. Power consumption & current for devices that could work both with 120 & 240 VAC, single-phase, and require Neutral

Next step: Waqar, based on these information (also following slides), could you please draw the terminal-block diagram like the diagram for the magnet rack below



| Cryo Control | Max Power (Watt) | Max Current (Amp) | Work with 120 VAC | Work with 240 VAC | Need Neutral? |
|---|---|---|---|---|---|
| MKS 670BD21 | 40 | 0.3 | YES | YES | YES |
| MKS 670BD21 | 40 | 0.3 | YES | YES | YES |
| MKS 670BD21 | 40 | 0.3 | YES | YES | YES |
| TPG 361 | 45 | 0.38 | YES | YES | YES |
| DCU 600 | 590 | 3.8 | YES | YES | YES |
| Lakeshore 218 | 18 | 0.15 | YES | YES | YES |
| Lakeshore 218 | 18 | 0.15 | YES | YES | YES |
| Lakeshore 218 | 18 | 0.15 | YES | YES | YES |
| Lakeshore 218 | 18 | 0.15 | YES | YES | YES |
| Keithley 2000 | 30 | 0.25 | YES | YES | YES |
| THCD 400 | 72 | 0.6 | YES | YES | YES |
| AMI 1700 | 264 | 2.2 | YES | YES | YES |
| | | | | | |
| TOTAL | 1193 | 8.73 | | | |

| Lifter Control | Max Power (Watt) | Max Current (Amp) | Work with 120 VAC | Work with 240 VAC | Need Neutral? |
|---|---|---|---|---|---|
| Motor Power Supply | 312 | 2.6 | YES | YES | YES |
| ADC | USB Powered | USB Powered | | | |
| Precision voltage | USB Powered | USB Powered | | | |
| | | | | | |
| TOTAL | 312 | 2.6 | | | |

| Microwave system | Max Power (Watt) | Max Current (Amp) | Work with 120 VAC | Work with 240 VAC | Need Neutral? |
|---|---|---|---|---|---|
| CPI Power Supply | 1650 | 8 | NO | YES | NO |
| Power measurement | 104 | 0.5 | YES | NO | YES |
| EIP freq. counter | 100 | 0.48 | YES | YES | YES |
| DC Power supply | 220 | 1.8 | YES | NO | YES |
| | | | | | |
| | | | | | |
| TOTAL | 2074 | 10.78 | | | |

| Slow Control | Max Power (Watt) | Max Current (Amp) | Work with 120 VAC | Work with 240 VAC | Need Neutral? |
|---|---|---|---|---|---|
| USB to Ethernet | 10 | 0.4 | YES | NO | YES |
| USB to Ethernet | 10 | 0.4 | YES | NO | YES |
| USB to Ethernet | 10 | 0.4 | YES | NO | YES |
| USB to Ethernet | 10 | 0.4 | YES | NO | YES |
| USB to Ethernet | 10 | 0.4 | YES | NO | YES |
| RS232 to Ethernet | 6.03 | 0.19 | YES | NO | YES |
| RS232 to Ethernet | 6.03 | 0.19 | YES | NO | YES |
| | | | | | |
| TOTAL | 62.06 | 2.38 | | | |

| Other system | Max Power (Watt) | Max Current (Amp) | Work with 120 VAC | Work with 240 VAC | Need Neutral? |
|---|---|---|---|---|---|
| Fridge valve | 55 | 0.46 | YES | NO | YES |
| Microwave interlock | | | | | |
| | | | | | |
| TOTAL | 55 | 0.46- | | | |

Notes: Carlos estimation

Total Consumption

| System | Max Power (Watt) | Max Current (Amp) |
|---|---|---|
| Cryo Control | 1193 | 8.73 |
| Lifter Control | 312 | 2.6 |
| Microwave system | 2074 | 10.78 |
| Slow Control | 62.06 | 2.38 |
| Other | 55 | 0.46 |
| | | |
| TOTAL | 3696.06 | 24.95 |

Devices that require 120 VAC, single phase and require neutral

| Devices | Max Power (Watt) | Max Current (Amp) |
|---|---|---|
| RF-Power measurement | 104 | 0.5 |
| DC Power supply | 220 | 1.8 |
| USB to Ethernet | 10 | 0.4 |
| USB to Ethernet | 10 | 0.4 |
| USB to Ethernet | 10 | 0.4 |
| USB to Ethernet | 10 | 0.4 |
| USB to Ethernet | 10 | 0.4 |
| RS232 to Ethernet | 6.03 | 0.19 |
| RS232 to Ethernet | 6.03 | 0.19 |
| | | |
| TOTAL | 386.06 | 4.68 |

Devices that require 240 VAC, single phase and NO neutral

| devices | Max Power (Watt) | Max Current (Amp) |
|---|---|---|
| CPI Power Supply | 1650 | 8 |

Devices that could work both on 120 VAV & 240 VAC, require 1-phase & Neutral

| Devices | Max Power (Watt) | Max Current (Amp) |
|---|---|---|
| MKS 670BD21 | 40 | 0.3 |
| MKS 670BD21 | 40 | 0.3 |
| MKS 670BD21 | 40 | 0.3 |
| TPG 361 | 45 | 0.38 |
| DCU 600 | 590 | 3.8 |
| Lakeshore 218 | 18 | 0.15 |
| Lakeshore 218 | 18 | 0.15 |
| Lakeshore 218 | 18 | 0.15 |
| Lakeshore 218 | 18 | 0.15 |
| Keithley 2000 | 30 | 0.25 |
| THCD 400 | 72 | 0.6 |
| AMI 1700 | 264 | 2.2 |
| Motor Power Supply | 312 | 2.6 |
| EIP freq. counter | 100 | 0.48 |
| | | |
| TOTAL | 1605 | 11.81 |