

Electrical System

Cryopump System:

Regeneration Controller:

The Regeneration Controller is the main unit of the entire cryopumping system, an 8085-based IO- and Relay controller that controls the Helium Compressor,

Enumerated from left to right:

J1: Valve Control • 6: Valve V1 (NO) • 5: Valve V2 (NO) • 4: Valve V3 (NO) • 3: Valve V4 (NO) • 2: Hi Vac • 1: AC Common All valve control outputs close to 230V AC output.	J2: Heater • 1: • 2: • 3: Sieve Power	J3: Remote Valve Control • 6: Valve V1 (NO) • 5: Valve V2 (NO) • 4: Valve V3 (NO) • 3: Valve V4 (NO) • 2: Hi Vac • 1: Switched AC Common External OR'ed control of J1 outputs. Switches	J4: Compressor • 1: NC • 2: Compressor Remote Start • 3: Compressor Cooling Interlock A simple Relay port, pins 2 & 3 get closed to engage the compressor.	J5: Sensor /Remote • 1: TC Sig/ Ext. Set 1 • 2: Room Temp (NO) • 3: Regen start (NO) • 4: TC Return • 5: TC Heater/ Ext. Set 2 • 6: GND Minimum operating pressure sensing. Either drives a TC Gauge or can be externally controlled by shorting pins 1 & 5 when setpoint is met. Shorting pin 2 to 6 (GND) tells controller room temp has been met. Shorting pin 3 to 6 for >5s starts a regeneration cycle.	J6: Test • 1: ? • 2: ? • 3: ? • 4: ? • 5: ? • 6: ? • 7: ? • 8: ? • 9: ?	AC Power • 230V 1Ph
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Temperature Monitor:

The Temperature Monitor reads room and cryopump cold head temperature, compares with setpoints and controls 3 relay outputs from these.

Enumerated from left to right:

J1: Room Temp. • 3: NC • 2: GND • 1: Room Temp. (NO) Relay output, closure signaling cryopump has reached room temperature.	J2: Low Set. • 3: NC • 2: Common • 1: Low Temp. (NO) Relay output, closure signaling cryopump low setpoint has been met.	J3: High Set. • 3: NC • 2: Common • 1: HighTemp. (NO) Relay output, closure signaling regeneration heating temperature has been met.	J4: Digital Out • 1: NC • 2: Compressor Remote Start • 3: Compressor Cooling Switch A simple Relay port, pins 2 & 3 get closed to engage the compressor.	J5: Sensor • 1: ? • 2: ? • 3: ? • 4: ? Cryopump cold head temperature sensor. Possibly diode/RTD /Hybrid based.	AC Power • 230V 1Ph
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Helium Compressor Module & Cable Harness:

The cooling system itself, a 2-stage Gifford-McMahon cooler ([Wikipedia Article](#)). The helium cooler is a high pressure, low-leakage scroll pump compressing helium between 12.5 Bar and 28 Bar, creating a overpressure in the exit line and vacuum in the return line. It also powers the motor for the 2-stage GM-expansion responsible for the cooling.

Enumerated from left to right:

Circular Connector: Compressor Module - A: ~Lr (AC 3Phase) - B: ~Ln (AC 3Phase) - C: GND (PE) - D: Compressor Cooling Interlock - E: Compressor Remote Common - F: Compressor Remote Start - G: NC Relay output, closure signaling cryopump has reached room temperature. While E has a Common-function, it is not used in the rack. Interlock and rack are connected in series	Compressor Remote Start - A: Compressor Remote Common - B: NC - C: Compressor Remote Start Relay Input, shorting pins 3 & 1 turns compressor on.	Valve Control - A: Compressor Cooling Interlock - B: NC - C: Compressor Remote Common - D: NC Interlock membrane pressure switch, won't turn on unless water pressure and flow rate are at acceptable rates. Connected in series with rack for compressor remote start.
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