ION GETTER PUMP CONTROLLER PINOUT SCHEMATIC & INTERFACE SPECIFICATION

GAMMA VACUUM DIGITEL (SPCe/QPC/MPCq) & AGILENT (IPCMini/4UHV) ELECTRICAL INTERFACE REFERENCE

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Author / Created By:	**Kadeem Manning**, Tier II Facility Technician	**System Hardware:**	DIGITEL SPCe/QPC/MPCq & Agilent 4UHV/IPCMini
Connectors Covered:	10kV SHV, DB-9 (RS-232/485), DB-15 I/O Relay	**Electrical Standard:**	IEC 61010-1 / CE / Low Voltage Directive

1. High-Voltage Connector & Safety Interlock Architecture

1.1 High-Voltage Power Connection (10kV SHV / SAFE-CONN): Ion pump controllers deliver high DC potential (+3.0 kV to +7.0 kV DC for Diode CV / Differential DI elements; -7.0 kV DC for Triode TR elements) via co-axial 10kV SHV (Safe High Voltage) or SAFE-CONN receptacle assemblies. The connector outer braid provides a low-impedance ground return to the controller chassis. Disconnection automatically trips the internal high-voltage interlock loop.

Terminal / Pin Name	Connector Type	Electrical Specification	Functional Signal Description	Safety Interlock Standard
HV Output (+ / -)	10kV SHV Receptacle	+3.0 to +7.0 kV DC (Diode) -7.0 kV DC (Triode)	Anode/Cathode High Voltage DC Bias supply.	Auto HV shutdown if unlatched
Outer Braid Ground	SHV Outer Bayonet	Chassis Ground (< 0.1 Ω)	Low-impedance safety return & RF noise shield.	Mandatory safety bond
Safety Interlock Loop	2-Pin Phoenix Terminal	24V DC / 10 mA Optocoupled	External vacuum interlock / roughing valve contact.	Closed circuit required for HV ON

2. DB-9 Female Serial Communications Interface (RS-232 / RS-485)

Pin No.	Signal Designation	RS-232 / RS-485 Mode	I/O Direction	Signal Specification & Logic Protocol
Pin 1	**RS-485 Data- (D- / A)**	RS-485 Differential	In / Out	Inverted RS-485 differential data line.
Pin 2	**RXD (Receive Data)**	RS-232 Serial	Input	Asynchronous serial data input from host PC.
Pin 3	**TXD (Transmit Data)**	RS-232 Serial	Output	Asynchronous serial data output to host PC.
Pin 4	**DTR (Data Terminal Ready)**	RS-232 Control	Input	Handshake line from host controller.
Pin 5	**GND (Signal Ground)**	Common Ground	Reference	Isolated signal ground reference point.
Pin 6	**DSR (Data Set Ready)**	RS-232 Control	Output	Handshake signal indicating controller ready.
Pin 7	**RTS (Request To Send)**	RS-232 Control	Input	Hardware flow control request input.
Pin 8	**CTS (Clear To Send)**	RS-232 Control	Output	Hardware flow control clear output.
Pin 9	**RS-485 Data+ (D+ / B)**	RS-485 Differential	In / Out	Non-inverted RS-485 differential data line.

3. DB-15 Female Remote Analog, Relay Setpoint & EPO Interface

Pin No.	Terminal Name	Signal Function & Type	Electrical Range / Rating	Application & Interlock Behavior
Pin 1 & 2	**Relay 1 NO / COM**	Dry Contact Relay Output	24V DC / 1.0 A Max	Setpoint 1 process interlock trigger.
Pin 3 & 4	**Relay 2 NO / COM**	Dry Contact Relay Output	24V DC / 1.0 A Max	Setpoint 2 UHV threshold indicator.

Pin 5 & 6	**Remote HV Enable**	Optocoupled Input	12–24V DC / 15 mA	External PLC closure turns HV ON.
Pin 7 & 8	**Analog Out 1 (Pressure)**	Logarithmic Analog Out	0.0 to 10.0 V DC (1V/dec)	Vout = 1.0V/decade log pressure output.
Pin 9 & 10	**Analog Out 2 (Current)**	Linear Current Monitor	0.0 to 10.0 V DC	Proportional to measured ion current.
Pin 11	**Chassis Ground**	Shield Ground Reference	0.0 V Reference	Cable shield ground tie point.
Pin 12 & 13	**External EPO Input**	Emergency Power Off Loop	Dry Contact Loop Closure	Opening loop immediately disables HV.
Pin 14 & 15	**Auxiliary 24V DC Out**	DC Power Supply Output	+24V DC ± 5% / 250 mA	Power supply for external optocouplers.

4. Wiring Harness Verification & Technician Certification

Wiring Harness Verification Notes: Interfacing wiring harness assembled for Gamma Vacuum DIGITEL SPCe quad controller in Bay 2 UHV testing station. Cable DB-15 pinout continuity verified using DMM. Logarithmic analog output 1 calibrated across 0–10 V DC range (1.00V = 1×10^{-9} mbar; 10.00V = 1×10^{0} mbar). High-voltage interlock loop closed through chamber vacuum pressure switch. All pinouts and grounds verified by Kadeem Manning.

Inspecting Technician:	Kadeem Manning	**Role / Title:**	Tier II Facility Technician
Technician Signature:	*Kadeem Manning*	**Verification Date:**	December 18, 2021
Metrology Authorization:	Dr. Marcus Vance	**Harness Status:**	**[X] APPROVED FOR SERVICE**