

Power PWA Circuit Description.

1. Scope.

This document specifies the Mercury Power PWA.

2. Applicability.

This circuit description applies to the following documents:

- 03-925085-00 - Schematic Rev. 3 and later.
- 03-925082-00 - Assembly Rev. 3 and later.
- Power PWA Electronic Engineering Product Specification.

3. Terminology.

4. Description of the circuit.

(Refer to the Schematic.)

Line voltage circuit.

The main power source for the instrument is connected to the inlet side of the instrument power switch & circuit breaker. The power switch & circuit breaker is a single phase 20Amp device for 120VAC, 25Amps for 101VAC instruments, and a dual phase 10Amp device for 230VAC instruments.

The switched side of the power switch is connected to J49 of the Power PWA.

Contactor K1 switches line voltage to triacs Q1,Q3 - Q8 as well as optically coupled triac driver IC's U1,U3 - U8.

Column Oven Fan.

The column oven fan triac, Q2 and its driver I.C., U2 are connected to "TRANAUTO", which is a primary winding tap from the transformer. "TRANAUTO" provides 120VAC for the U.S. and Japanese versions and 230VAC for the European version. C1 and R17 form a snubber circuit for the inductive loading of the column oven fan.

Fuses.

F1 (6.3A TypeT) protects the general +24 VDC buss. (+24VGEN)

F2 (6.3A TypeT) protects the power supply +24 VDC buss. (+24VPWR)

F3 (10A TypeF) protects all of the heater zones except for the column oven heater.

(The column oven heater is protected via the main circuit breaker.)

F4 (6.3A TypeT) protects the two autosampler supplies at J45 and J46.

A trace fuse is located in series with C5 and protects against damage in the event of a short circuit on the -24 VDC supply. If a short does occur a fuse holder can be installed in XF5 and XF6. If a replacement fuse is installed it should be a 1 amp fast blow type fuse.

Triac Drive Circuit.

U10 is a serial input parallel output shift register with latched outputs. The outputs of U10 are connected to U9 which is an octal darlington transistor array. The darlington transistor array is used to switch the input of U1 - U8 which are optically isolated Triac drivers with built in zero crossing turn on circuitry. The Triac drivers are used to switch the power Triacs Q1 - Q8.

+24VDC Supply.

CR1 rectifies the secondary voltage from the instrument transformer which is then filtered by C2,C3 and C4, to produce a nominal +24 VDC supply. R31 is a bleed resistor intended to reduce

the bleed down time of the filter capacitors at turn off. The +24VDC supply is divided into two separate supplies. The General Buss, (+24VGEN) and the Power Supply Buss, (+24VPWR).

-24VDC Supply.

One half of the transformer secondary is used to create a -24VDC supply using C5,C6,CR2 and CR3. As the anode of C5 goes positive with respect to GND1, C5 charges up to the peak voltage, approximately 24 Volts. During the negative transition of the ac waveform the anode of C5 swings through a 48 volt transition to -24 Volts the charge on C5 is divided between C5 and C6 in such a way that the cathode of C6 charges to -24 Volts, less diode drops. In this manner a -24VDC supply is generated.

Over temperature diagnostic. (~ OVERTEMP)

RT1 is a negative temperature coefficient thermistor that is designed to have a resistance of 1.21K at a temperature of about 85C. The thermistor is located close to the bridge rectifier CR1 and is intended to sense an over temperature condition in the event of a gross overload or if the instrument cooling fan fails. At a temperature of approximately 85C the output of AR1 switches low and signals to the cpu that an over temperature condition has occurred.

R28 provides a small amount of hysteresis in the comparator circuit.

Line Cycle Interrupt. (~ PZXI)

R22,R24 and two inverters from U11 form a circuit that generates a zero crossing signal at each line cycle of the ac waveform. U11 is a 74HC14 inverter which has clamp diodes to VCC and Ground on it's inputs. The diodes are rated at 20ma clamping the input to no greater than or less than 1 diode drop above or below the supply to U11.

24VDC Drivers.

U14 and U15 are serial input shift registers that are used to present latched data at their output to the four peripheral driver I.C's U16 - U19. Serial data from the main board is inverted by U11-11,12 so that a logic high from the main board turns off the associated driver. This data inversion effects all of the 24VDC drivers driven from U14 and U15, but does not effect the temperature zones driven from U10. The ULN2068B is a quad high current darlington driver I.C. capable of sinking up to 1amp on two drivers at a time. The return ground pins 4,5,12 and 13 are connected together and connected to a 0.25 ohm current sense resistor formed by R35 and R36 in parallel. If the total current in R35 and R36 exceeds 4 amps pin 1 of AR2 will go low and via the logic formed by U20 will reset both serial shift register outputs to zero. This action will turn off all of the drivers in U16 - U19. When AR2 pin 1 goes low Q10 turns off allowing the reference input pin 3 of AR2 to float up at a time constant set by R40 and C22. When pin 3 of AR2 is equal to the voltage on pin 2 the comparator resets itself. The result is a strobe output from AR2 pin 1, this signal is called /EVFAULT. /EVFAULT is an interrupt signal to the cpu that an overload has occurred. The signal /EVSENSE occurs when the current through R35 and R36 exceeds 20 milliamps, and is a signal to the cpu that current is flowing.

J42 and J43 are provided for the customer to connect up external event solenoid valves.

J44 and part of J47 are used for connecting up the temperature zone Cryo valves. Cryo 1 - 3 can be connected up either using J44 or J47. Cryo 4 (J47-7) is dedicated for the column oven and can only be connected to J47. J47 is located inside the high voltage area of instrument, and is not intended for normal customer access. J42-J44 are accessible at the top of the power board and are intended for routine customer access.

EMI filtering.

When the contactor K1 is activated or de-activated a transient condition may occur that generates EMI which interferes with the action of the 24VDC driver circuit. To overcome this problem there are several filter components in the circuit. These components are: C24 to C29 and R49 to R54.

C30 is a 1.0uf capacitor that is intended to reduce conducted emi. This capacitor was added in order to eliminate emissions at the 150khz range, which are primarily caused by triac crossover distortion.

Interlock Circuit & Contactor K1.

The drive to the contactor coil of K1 is connected via a circuit called "INTERLK". This circuit loops through connectors J41 and J51 in such a way that the circuit will be broken if either of the connectors is not plugged in. With the circuit is broken the contactor will be turned off removing power from all of the heater zones. R19,R20,C7 and U11-3,4 form a circuit that generates the signal /INTERLOK. /INTERLOK is low when power is present in the "INTERLK" circuit. The contactor driver is located on the main board, and is brought to the power board via pin 15 of J40.

5. Revision Log and File Identification.

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<u>Revision:</u>	<u>Date:</u>	<u>Summary of Changes:</u>
Rev.1	9/19/95	Initial release
Rev.1.1	9/26/95	Add Revision Log
		Minor corrections & additions to text.
Rev.1.2	1/9/96	Change text to reflect changes to the circuit for PR1 of 03-925085
Rev.1.3	3/22/96	Add statement regarding EMI filters in 4.0 "24VDC Drivers."
		Roll Revision to C1.
Rev 2.0	10/3/96	Update for Rev 2 power pwa.
Rev 3.0	1/10/97	Change wording in section 2. to support rev 3.0.