NPL Polarized Source Group Technical Note #89-1

Bakeout and Stalk Heater Temperature Controllers

by

Nick Sereno

January 1989

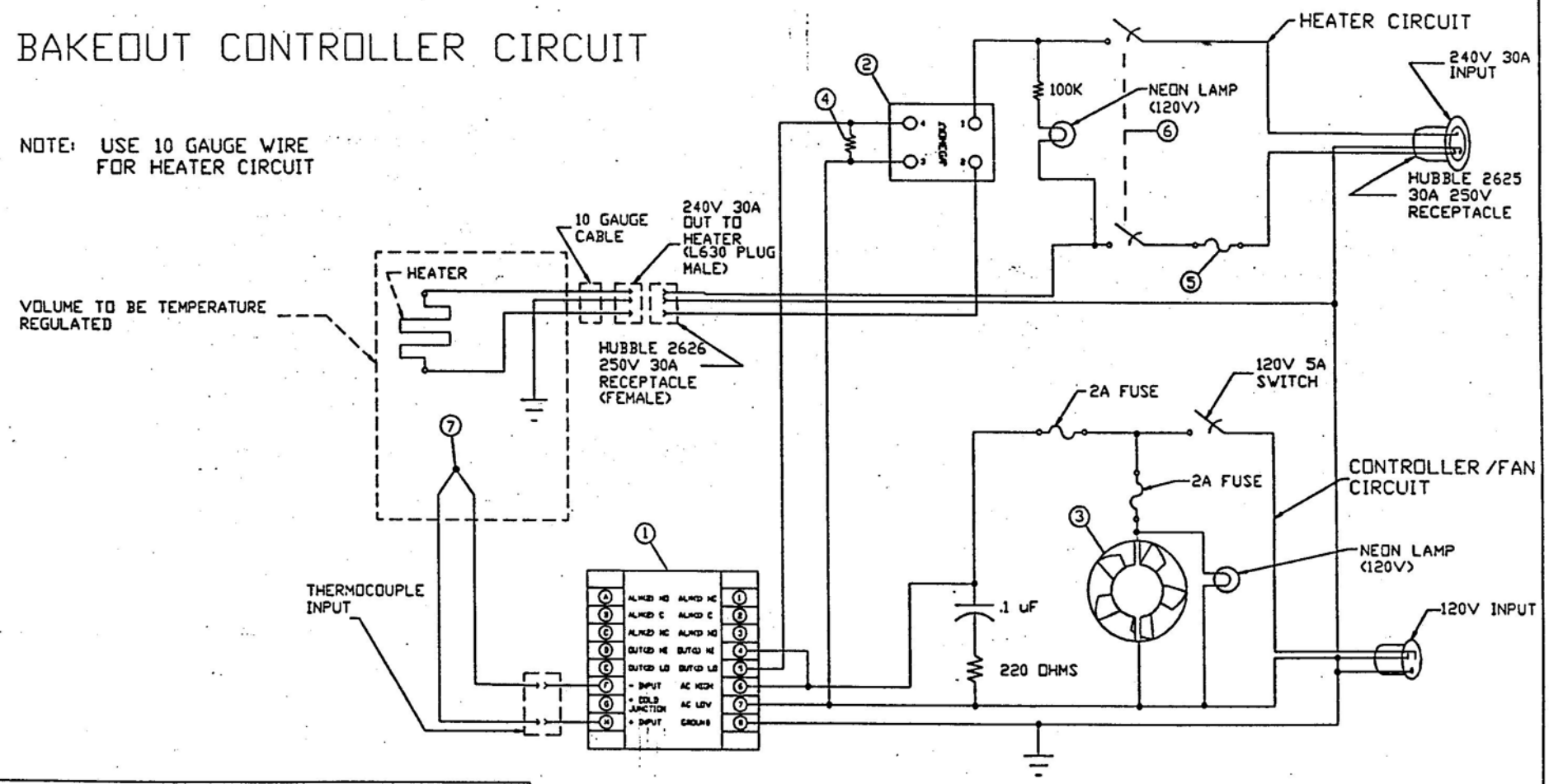
This note describes the bakeout and stalk temperature controller chassis used in preparing the polarized source for operation. The bakeout controller is used to regulate the temperature of the bakeout of the gun. The stalk controller is used to regulate the stalk temperature during bakeout, and to control the stalk temperature during photocathode activation. The following notes describe both controllers together because they are nearly identical in function and design.

The bakeout and stalk controllers consist of two main circuits separated by a solid state relay (see drawings 2 and 4). The high voltage circuit (240V 1 phase) powers the heater. The heater circuit consists of a high capacity DPST 25A 250V switch, 120V neon lamp power indicator with current limiting 100K resistor, 30A fuse and fuse holder, OMEGA Solid State Relay (SSR), and special 10 gauge cables (for the bakeout controller), or 14 gauge cables (for the stalk controller) with L6-30 (250V 30A) Plugs to get the power to the relay and out again to the heater (see drawings 1 and 3). The cables plug into special Hubble 2625 and 2626 30A 250V recepticals as shown in drawings 1,2,3 and 4. Simply turning the DPST switch off disables the heater circuit. The SSR acts as a switch controlled by the controller thus turning the heater on and off as needed to regulate temperature.

The controller circuit operates on common 120V service which is fed through the back panel as is the 240V service (see drawings 1 and 3). The controller circuit consists of a fan, 120V 5A switch, 120V neon lamp power indicator, two 2A fuses for the fan and controller, (one 3A fuse in the stalk--see drawing 4) and a snubber network consisting of a .1uF capacitor and 220 ohm resistor connected across the power terminals to the controller (see drawings 2 and 4). The temperature input to the controller is through an OMEGA K type thermocouple. When the controller is running it continually cycles the SSR on and off as needed to regulate temperature. When the controller is not running the SSR is in the off state and the heater circuit is disabled. The DPST switch is an added feature to manually disable the heater circuit and must be on when the controller is running. The complete instruction manuals for the controllers and SSR's are included after the drawings.

BAKEOUT CONTROLLER CIRCUIT

NOTE: USE 10 GAUGE WIRE FOR HEATER CIRCUIT



MAJOR PARTS LIST	
ITEM	DESCRIPTION
1	OMEGA CONTROLLER #CN2011K-D5
2	OMEGA SSR240A45 AND OMEGA HEAT SINK
3	PAMOTOR #8506D
4	2K 8W (HERE 2 4K 10W //)
5	30A 250V FUSE AND HOLDER
6	25A 250V DPST SWITCH (ALLIED ELECTRONICS #41-10494-2MRY)
7	O' K TYPE THERMOCOUPLE

NUCLEAR PHYSICS LABORATORY

BAKEOUT CONTROLLER

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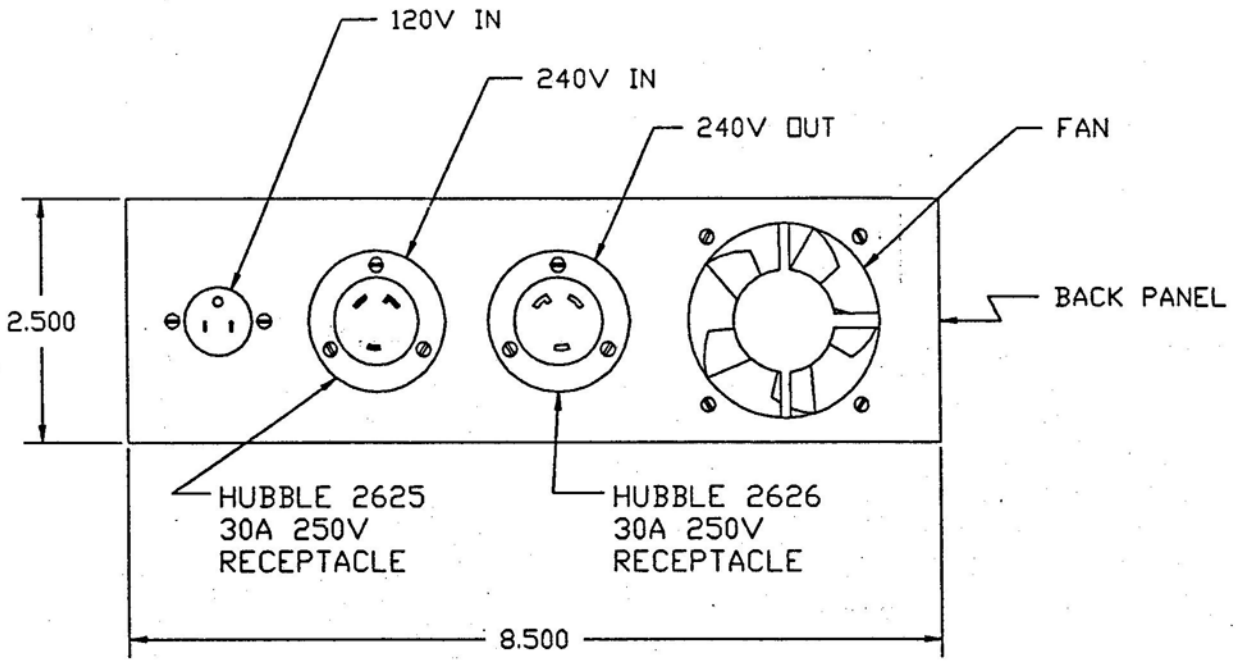
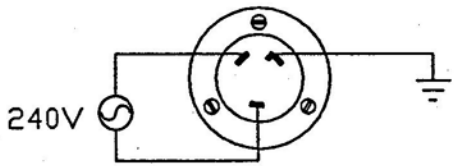
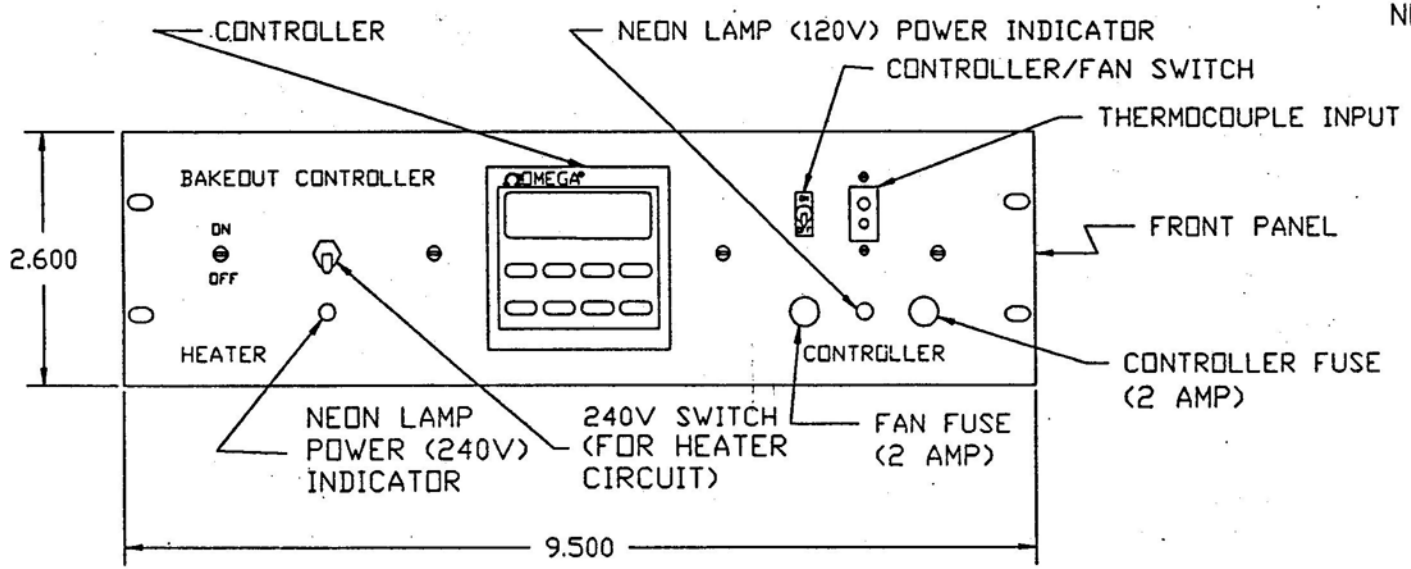
REV.	DATE	DESCRIPTION	BY	APP'D



POWER DIAGRAM FOR 1 PHASE
240V RECEPTICALS.

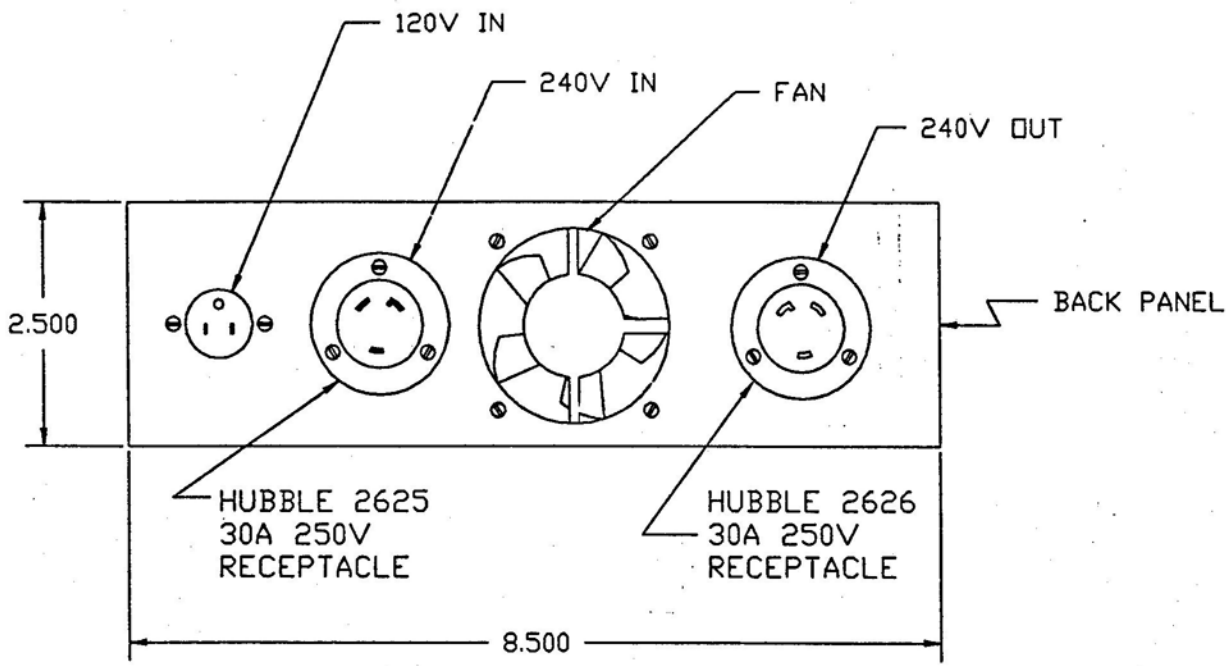


NOTE: USE ONLY 10
GAUGE CABLES
FOR 240V POWER

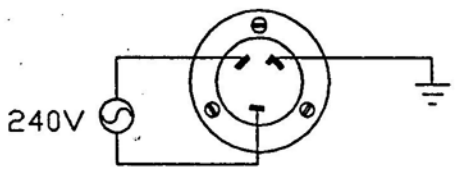


DRAWN BY	NUCLEAR PHYSICS LABORATORY UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN	BAKEOUT CONTROLLER		
CHECKED BY	UNLESS OTHERWISE SPECIFIED	PART NO.	SCALE 1:2	FILE
APPROVED BY	DIMENSIONS IN INCHES 2 PLACE DEC. ± .01 BREAK SHARP CORNERS 3 PLACES DEC. ± .005 FRACTIONAL ± 1/32" ANGULAR ± 0°30'	NO. REQ'D.		
		CHASSIS NO. OR MATERIAL 4575	DATE	DWG. NO. 1

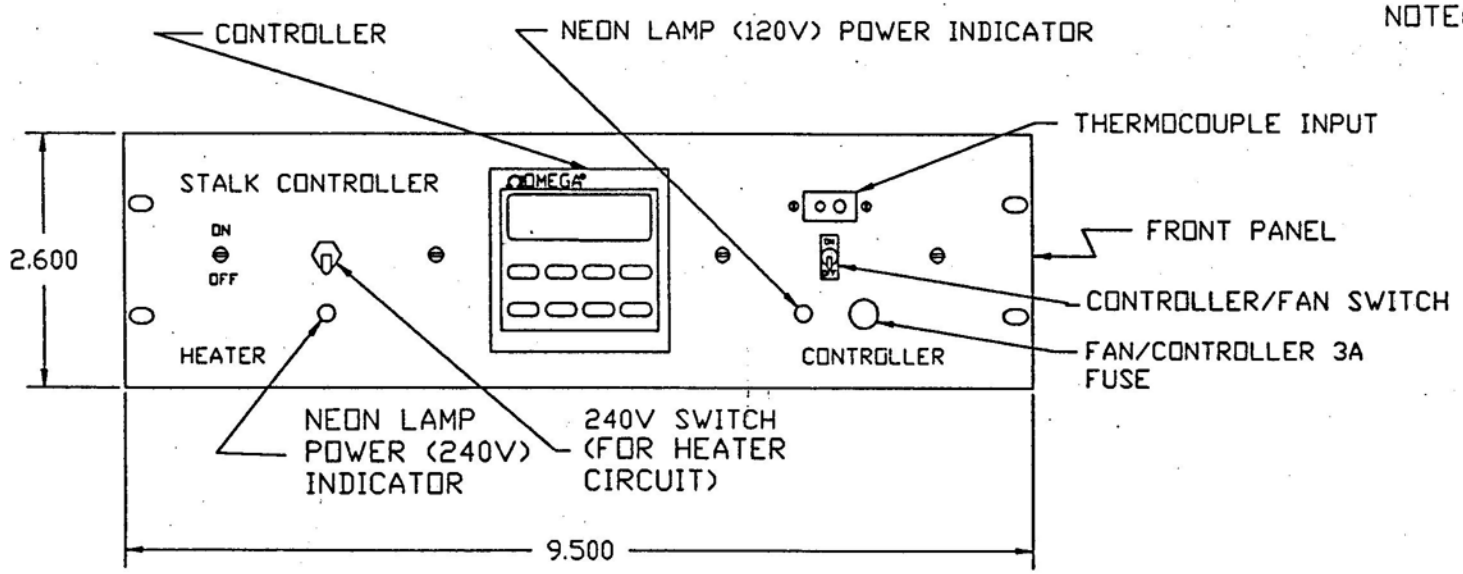
REV.	DATE	DESCRIPTION	BY	APP'D



POWER DIAGRAM FOR 1 PHASE
240V RECEPTICALS.



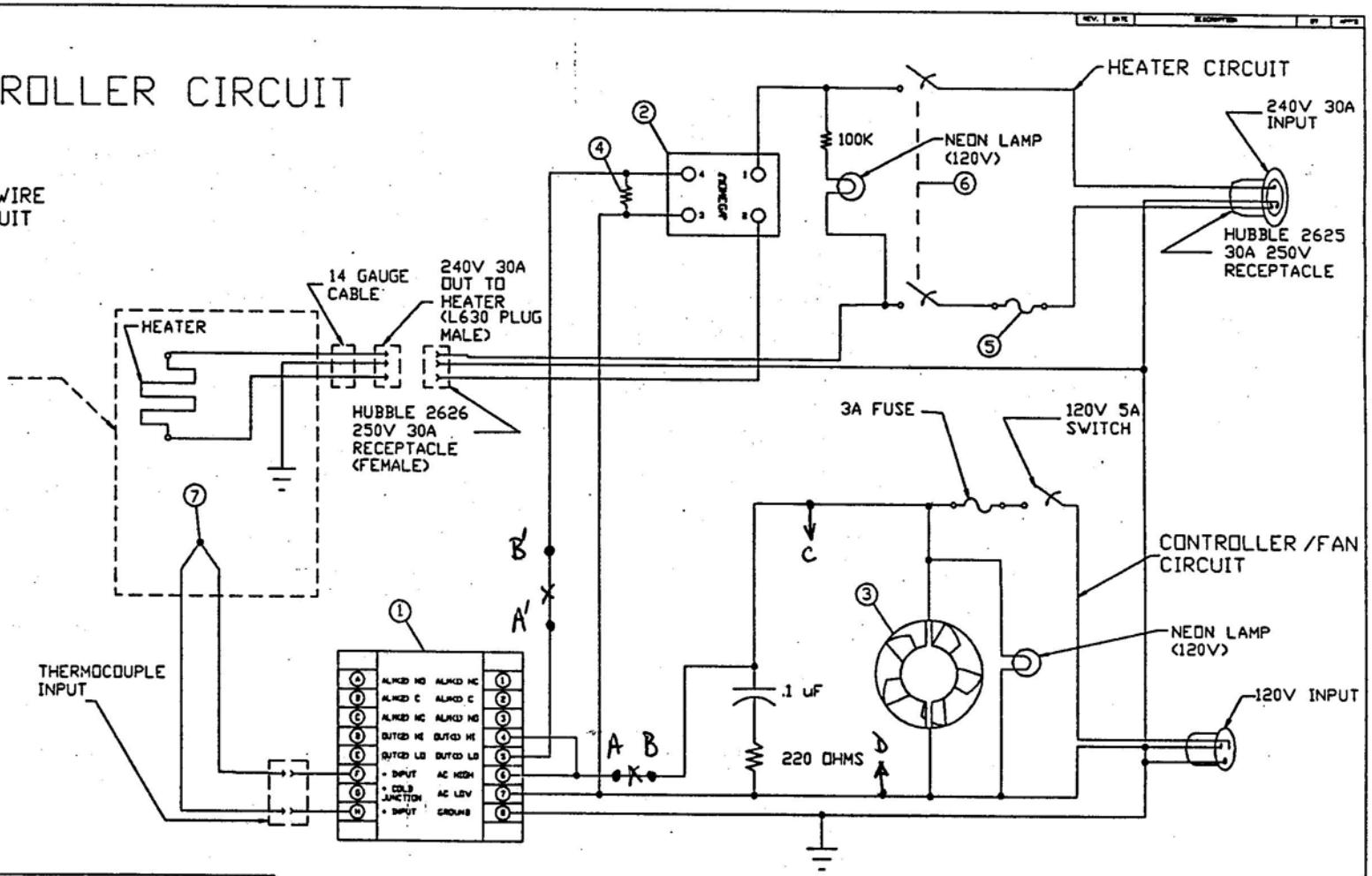
NOTE: USE 14 GAUGE CABLES FOR 240V POWER



DRAWN BY	NUCLEAR PHYSICS LABORATORY UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN	STALK CONTROLLER
CHECKED BY	UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES 2 PLACE DEC. ±.01 BREAK SHARP CORNERS 3 PLACES DEC. ±.005 FRACTIONAL ±1/32" ANGULAR ±0°30'	PART NO. NO. REQ'D. CHASSIS NO. OR MATERIAL 4576 SCALE 1/2 FILE DWG. NO. 3
APPROVED BY		

STALK CONTROLLER CIRCUIT

NOTE: USE 14 GAUGE WIRE IN HEATER CIRCUIT



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	NUCLEAR PHYSICS LABORATORY UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN	STALK CONTROLLER
		4576

Charlie:

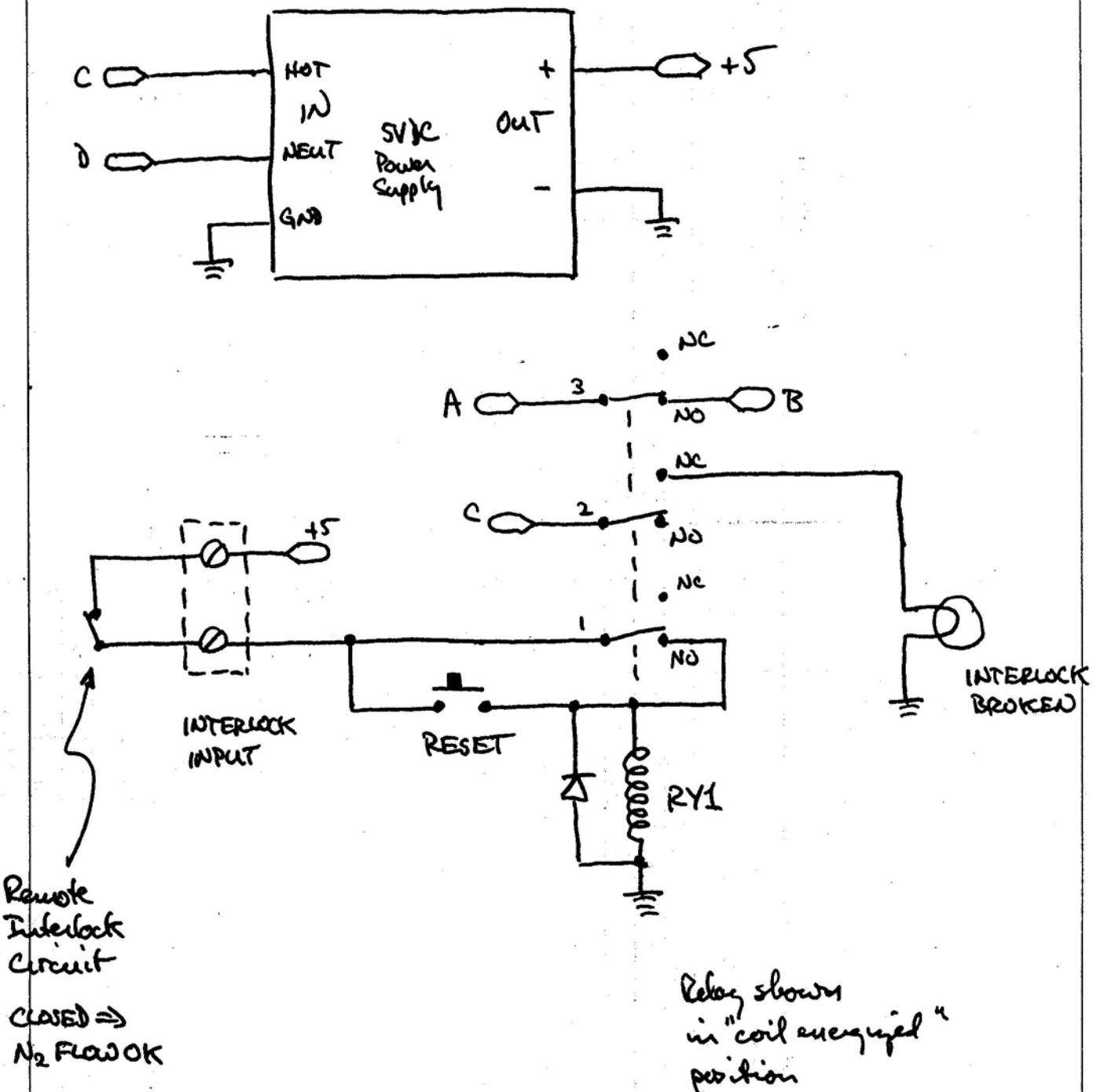
Sorry to be so long about getting this to you, but I just kept putting it off and putting it off - partly because I was hoping we would locate the drawing files for the schematics and chassis layouts so I could update them and send you something tidy. Instead you get the following, which I suspect will be satisfactory. If you (or your tech) have questions, give me a call or drop a note via bitnet.

We originally built a single temperature controller design as described in Nick Sereno's technical note 89-1 attached. Although the power requirements of the stalk and bakeout heater are somewhat different, I felt it was desirable to have the controllers interchangable so we only needed to build one spare instead of two. The cost difference for different power-handling capabilities doesn't really amount to much.

As described in the tech note, the controllers are based on the Omega CN2011K-D5 temperature controller and a SSR240A45 Solid State Relay to boost the power capability. It provides programable heat and soak cycles, and has proven to be quite satisfactory. As for inputs, the the stalk thermometer we use is called out in the 2709-series drawings, and the bakeout thermometer is similar, but in the style that has a "loop" on the end that you can put under a machine screw rather than a probe. We use the proper thermocouple wire extention cords as required.

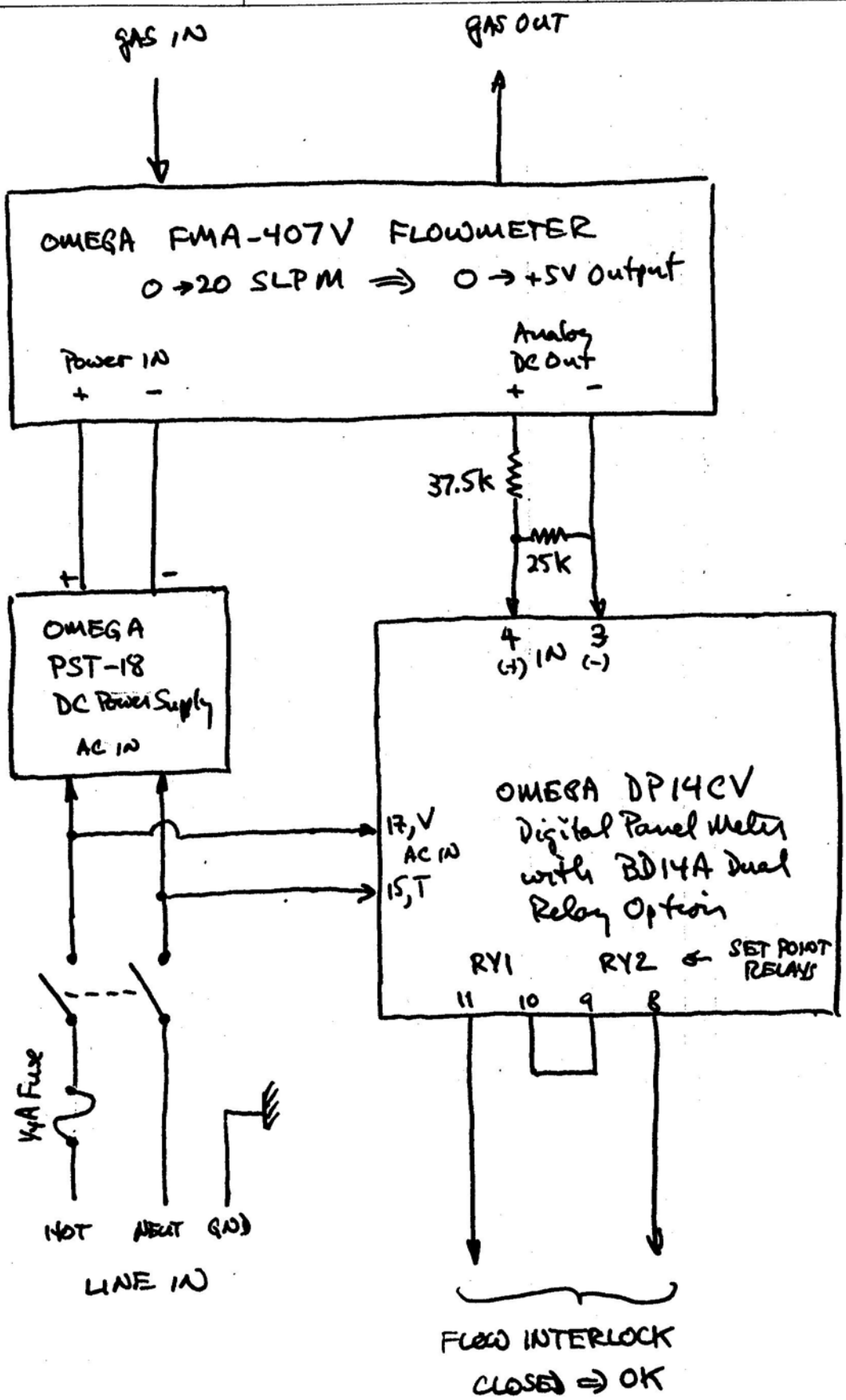
After our first stalk failure that resulted in the screw being "welded" into the stalk we decided to add a nitrogen flow interlock to the stalk heater circuit. On an attached sheet I show how this was added to the existing controller circuit. The new circuitry (which could certainly be incorporated as an iterlock in both controllers if you were starting fresh, so they would stay identical) consists of a small 5VDC power supply that drives a latching relay through an external interlock. We added the interlock wiring via a terminal block on the back of the chassis. The 5 volts is passed through the external circuit and to the coil of a triple-pole, double-throw, 5VDC relay (RY1). When the chassis is "powered up" the relay will be in the "NC" position, and interlock will act as if it were "broken" independent of the state of the external circuit. When you push the "reset" button (a momentary contact push button added to the front panel) the relay will pull in IF THE EXTERNAL INTERLOCK CIRCUIT IS CLOSED, and will latch via the first pair of contacts. This will cause contacts 2 and 3 to be connected to the "NO" contacts, closing the circuit between points A and B in the chassis and turning off the "INTERLOCK BROKEN" light. If the external interlock is broken the relay drops out, the "INTERLOCK BROKEN" switch is

Modify the Stalk Controller Internally to provide a N_2 flow interlock as follows:



Power Supply is POWERONE 1A5D (1A @ 5VDC)

RY1 is Potter Brumfield R10-E1-X2-V2P



FLOW SWITCH CIRCUIT