19 Thermostatic Bath

☐ Maintaining a volume of solution at constant temperature is easy if you do it electronically. Photographic processing is the obvious application for a thermostatic bath, but if you etch your own printed circuits, you can also use it to keep your etchant hot. Thermistor RT1 comes packaged as a small glass probe. Waterproof it with several coats of epoxy, and mount it below the surface of the fluid in your tank. The heating element, HTR1, must also be submerged—preferably close to the bottom of the tank and away from RT1. (CAUTION: Do not operate an immersion heater in open air.) Heater wattage depends upon the volume of solution you wish to heat. A 500-watt heater will raise two gallons of water from 70° to 120°F. in half an hour or so. Conventional brass or stainless steel heaters are perfect for a simple water bath, but if you plan to heat an etchant like ferric chloride, get a quartz immersion heater. Pot R2 sets the bath temperature at any point between 70° and 160°F. A temperature of 115° gives safe and fast etching with ferric chloride. Do not use this bath with flammable liquids, and always wear goggles.

PARTS LIST FOR THERMOSTATIC BATH

C1, C2—10-uF, 10-VCD tantalum capacitor
C3—0.1-uF ceramic disc capacitor
D1—1N914 diode
HTR1—200 to 500-Watt immersion heater (see text)
IC1—LM311 comparator
K1—6-VDC, 500-ohm relay
Q1—200-VDC, 10-A triac
R1—6,800-ohm ½-watt resistor (all resistors 5% unless otherwise noted.)
R2—10,000-ohm linear-taper potentiometer
R3—6,200-ohm, ½-watt resistor
R4—1,000-ohm, ½-watt resistor
R5—4,700-ohm, ½-watt resistor
R6—33,000-ohm, ½-watt resistor
R7—6,800,000-ohm, ½-watt resistor
R8—1,000-ohm, 1-watt resistor
RT1—10,000-ohm, @ 25° Thermistor (Fenwal 6B41P12 or equivalent)