Amplifier Cool-Down Circuits

Pamper your expensive transmitting tubes with one of these weekend projects.

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Large transmitting tubes are expensive, and there are no signs that their prices are coming down! Many builders feel that for longest tube life, cooling airflow should be continued for a few minutes after voltage is removed from the amplifier-tube filaments or heaters. This is especially important immediately after a prolonged transmitting period. Here are three circuits that provide a tube cool-down period. The first is a simple manual circuit I've used in several amplifiers over the last 20 years. The other two are automatic circuits I've used to replace the manual one, just for fun; they've been operating well for over a year. The automatic circuits shut off the blowers just as I'm going out the shack door.

The manual cool-down circuit is shown in Fig 1A. When S1 is set to OPERATE, both the filaments/heaters and blower are on. When the switch is set to COOL, only the blower runs. Although the circuit looks simple, it's really the most sophisticated of the three circuits. Its essential element is a human brain (not shown in the diagram), which must remember to switch S1 to COOL, and then to OFF a few minutes later. After so many years, I got tired of this approach. It's especially inconvenient if, as I do, you like to chat right to the last millisecond before dashing off to work.

The second circuit is shown in Fig 1B. It uses a thermostatically operated vacuum-delay relay that I got at a flea market. I designed the circuit according to the following specification: The circuit should be entirely add-on, and not require breaking the supply current path for the blower in normal operation (that would reduce the reliability of the cooling-air supply). This requires that relay contacts must not carry blower-motor current, except during the cool-down period. This way, a bad relay, bad contacts or any other cool-down circuit failure will not prevent normal blower operation. In addition, the circuit draws no current after the cool-down period is completed.

The circuit shown in Fig 1B operates as follows: When the switch is in the OPERATE position, the filament/heater transformer and blower each receive line current

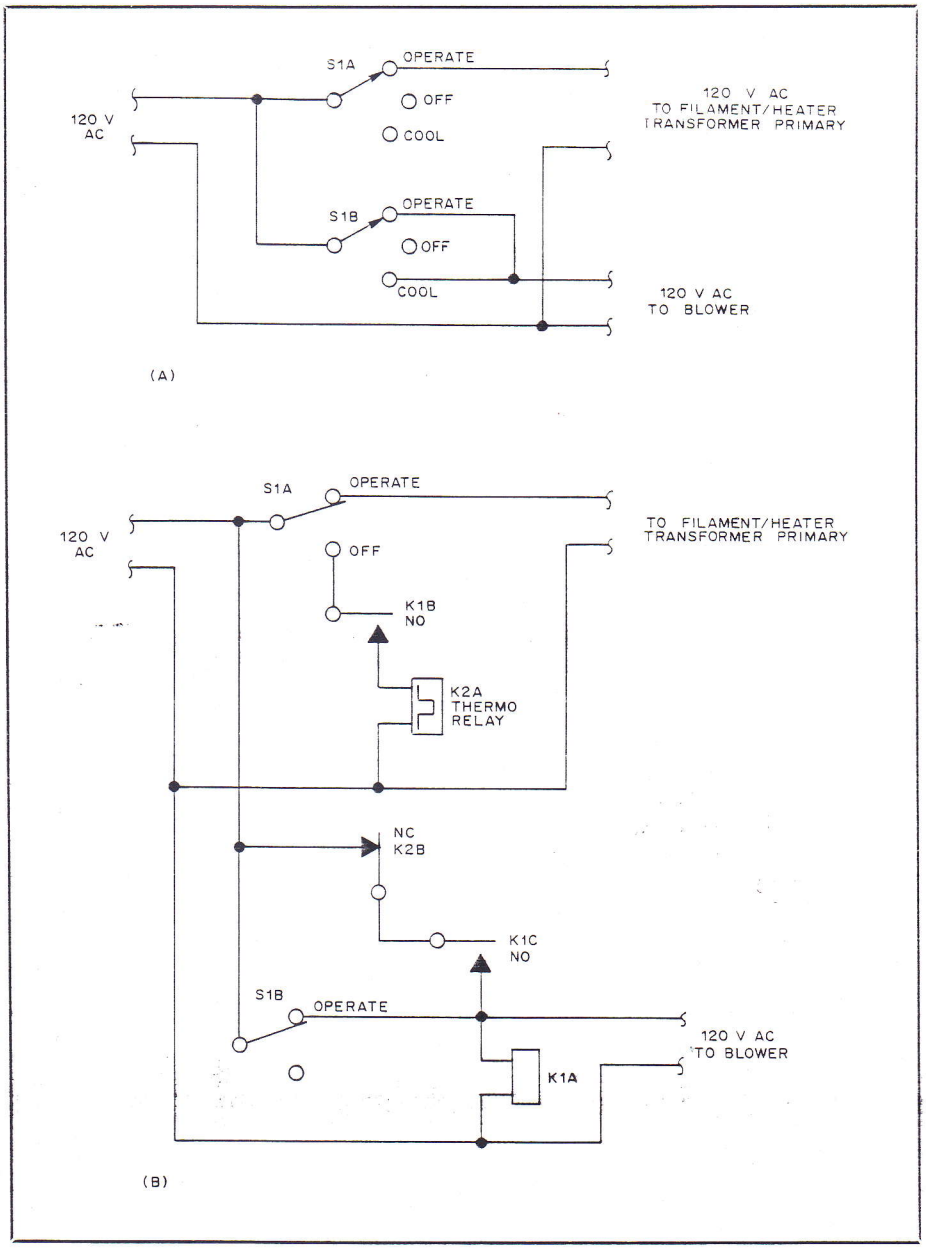

Fig 1—At A, a circuit for manually delaying the removal of blower airflow from an amplifier after filament/heater voltage has been removed. At B, a delay relay regulates the cool-down period and shuts off the blower after a fixed delay.

K1—DPST relay, 120-V ac coil.
K2—Delay relay (Amperite type 115C120; normally closed, 120-second delay). Allied Electronics stock number 711-1613.
S1—DPDT switch.

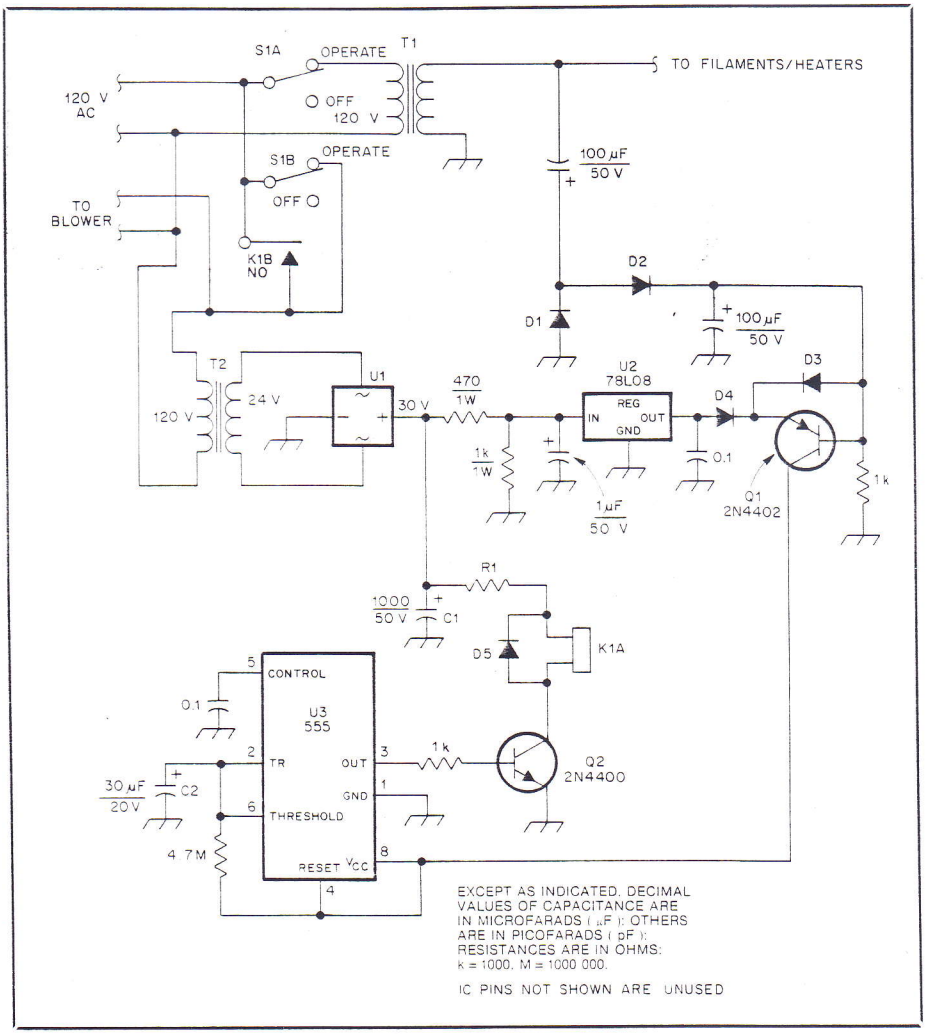

Fig 2—IC-timer cool-down-delay circuit.

D1-D4—1N4003.
D5—1N4148.
K1—24-V-dc coil relay (All Electronics no. 4PRLY-24N, socket no. PRLY-SC).
R1—Select to obtain proper coil voltage.
S1—DPST toggle.
T1—Amplifier filament/heater transformer.
T2—120-V primary, 24-V, 0.5-A secondary.
U1—Bridge rectifier, 1 A, 200 V.
U2—78L08 regulator (Digi-Key stock number AN78L08).
U3—555 timer.

through S1, and K1 is energized. When the amplifier is turned off, ac is removed from the filament/heater transformer, but K1 remains energized through delay relay K2's contacts (K2B) and K1C. The blower is powered through the same circuit. When S1 is switched to the OFF position, K2's heater is energized through S1A and K1B. When K2 has completed its delay period, its contacts open, K1 drops out, the blower stops and ac is removed from K2. I had to place a small resistance in series with the delay relay heater to bring the warm-up time up to the rated two minutes. (Maybe that's why I got it for only a dime at the flea market!)

Because I had only one delay relay, and because new delay relays cost hundreds of dimes, I used an IC timer in the cool-down delay circuit shown in Fig 2. This circuit is a bit more complicated, but was fun to build. The circuit has the same add-on safety feature as the one in Fig 1B. An additional feature is that the relay is not energized during normal operation—only during cool-down periods.

The circuit in Fig 2 functions as follows: The 555 timer (U3) is used in a variation of the monostable mode, which provides one positive pulse immediately after IC turn-on.[1] When the amplifier's filament/heater circuit is turned on, the 30-V dc power supply comes on also. The presence of filament/heater voltage keeps supply voltage from reaching U3. When power is removed from the filaments/heaters, the supply voltage is applied to U3, and the timing period begins.

The supply voltage for U3 is switched by Q1. When S1 is in the OPERATE position, current derived from a rectifier doubler on the filament/heater line biases Q1 off. As S1 is set to the OFF position, there is actually a split second when ac is removed from the blower and T2. During this time, C1 supplies plenty of current to turn on the timer chip, Q2 and K1. This energizes the blower and T2, so the relay is held in. After timing capacitor C2 charges to the threshold level, the timer output goes low, and the relay opens. Power is then removed from the blower and T2. I chose C2 to yield a two-minute cool-down period. C2 should be a low-leakage tantalum or electrolytic unit.

Parts for these circuits are available from the suppliers listed in Table 1. In lieu of the handy little 78L08 regulator, a 78M08, 7808 or an adjustable regulator configured for an 8-V output may be used.

Maybe you'll start with the manual (Fig 1A) circuit to cool down your amplifier, but I hope it doesn't take you 20 years before you try the others! QST

[1]H. Berlin, *The 555 Timer Applications Sourcebook* (Indianapolis: Howard Sams Co, 1976), p 20, Fig 2-7 (A).

Table 1

Component Suppliers

Allied Electronics
401 E 8th St
Fort Worth, TX 76102
tel 800-433-5700

All Electronics
Box 567
Van Nuys, CA 91408
tel 800-256-5432; in California, 800-258-6666

Circuit Specialists
Box 3047
Scottsdale, AZ 85257
tel 800-966-0764

Digi-Key Corp
Box 677
Thief River Falls, MN 56701
tel 800-344-4539

Strays

I would like to get in touch with...

☐ anyone who has conversion data for a TBX-6 WWII receiver/transmitter built by General Electric for the Navy. Steve Kiraly, WA2O, 51 Ramon Blvd, Freehold, NJ 07728, tel 201-462-2705.

☐ anyone with a schematic for a Dumont model 304-A oscilloscope. Paul Kemp, 3104 N Delaware, Independence, MO 64050-1111.