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Title: Using the SB-220 Amplifier with Solid-State Transceivers
Author: James Hebert, K8SS

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Hints and Kinks

Conducted By David Newkirk, AK7M
Assistant Technical Editor

USING THE SB-220 AMPLIFIER WITH SOLID-STATE TRANSCEIVERS

☐ The Heathkit SB-220 is one of the most popular amplifiers ever sold. It was designed in an era when most amateur equipment was based on vacuum-tube technology. Because of this, special care is needed if the SB-220 is to be used with a solid-state transceiver.

The SB-220 goes into the transmit mode when the hot contact of its rear-panel ANT RLY jack (J1 in Fig 1A) is shorted to ground, actuating K1, the SB-220 antenna relay. The open-circuit dc voltage at this jack is 125; the short-circuit current is 25 mA. Vacuum-tube-based exciters usually have no trouble switching power at this level. Solid-state rigs are a different story.

My ICOM IC-740 transceiver can't switch 125 V at 25 mA because the maximum ratings for its amplifier-control relay contacts are 24 V/1 A dc. Other solid-state transceivers likely use relays or open-collector transistors of similar ratings for amplifier control. The switching problem is complicated by the fact that the SB-220 antenna-relay solenoid is not shunted by a spike-suppression diode. The transient voltage developed by a solenoid's collapsing magnetic field can exceed the supply voltage. (If you've ever gotten a poke from relay-solenoid back EMF, you know that this voltage is not just theoretical!) With the 24-V rating of the IC-740's control contacts in mind, a direct amplifier-control connection between the SB-220 and the IC-740 seemed to invite trouble.

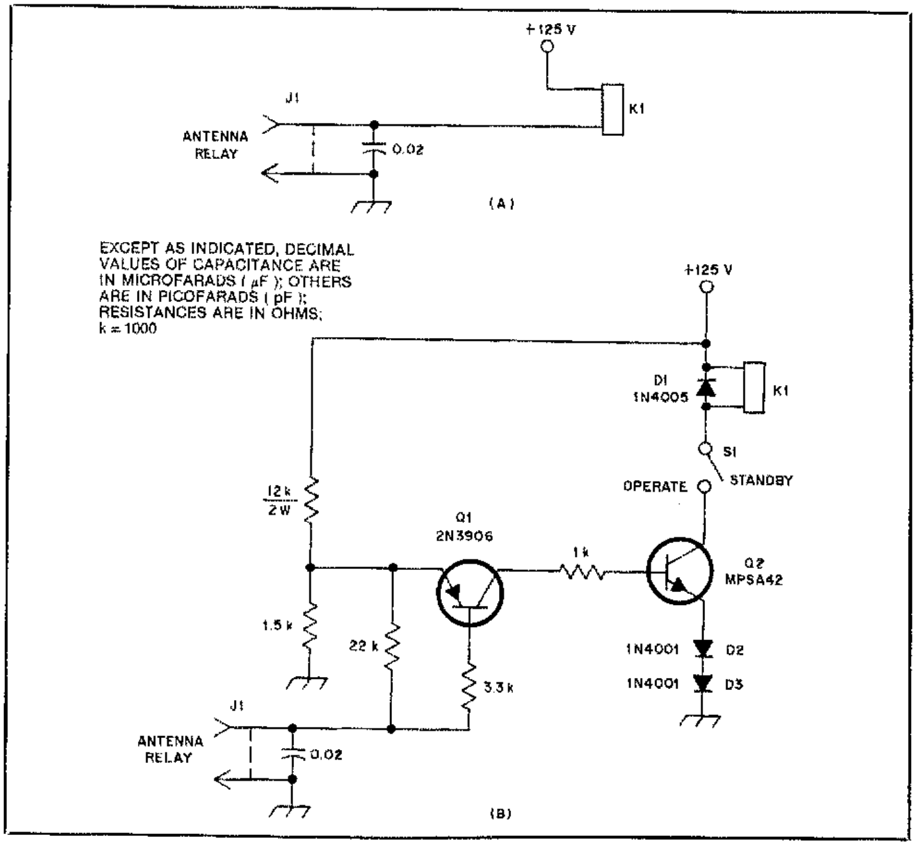

Fig 1—K8SS' SB-220 modification lowers the voltage at the ANT RLY jack, J1, from 125 at A to approximately 12 at B. Short-circuit current through J1 is reduced from 25 mA in the unmodified circuit to 2 mA in the circuit shown at B. J1, K1 and the 0.02-µF capacitor are SB-220 parts. Resistors are ¼-W, carbon-film units unless designated otherwise.

D1—1-A, 600-PIV diode.
D2, D3—1-A, 50-PIV diode.
Q1—General-purpose transistor.
Q2—High-voltage switching transistor, V_{CBO} = 300. ECG287 also suitable.
S1—SPST toggle.

Fig 1B shows my solution to this problem. With Q1 and Q2 handling the actuation of K1, voltage at J1 is reduced to approximately + 12. Short-circuit current through J1 is about 2 mA. Because the SB-220 must be opened to make this modification, now's a good time to install an OPERATE/STANDBY switch, S1, to save switching the SB-220's tube filaments on and off.

There's plenty of room under the SB-220 chassis for mounting the switching components; the entire circuit can be assembled on a tie strip and mounted to an available under-chassis screw. I installed my version of the Fig 1B circuit next to the SB-220's 125-V dc supply, just behind the SSB/CW rocker switch. (Take proper high-voltage safety precautions when you make this modification. Lethal voltages exist in the SB-220.) Dress the wiring for minimal coupling to RF circuits under the chassis and near the antenna relay. As installed in my SB-220, this circuit shows no susceptibility to RFI.—*James Hebert, K8SS, Livonia, Michigan*

QUICK REPLACEMENT FOR MULTIPIN CONNECTORS

☐ After I bought a Collins R-392 receiver at a summer swap meet, I discovered that I couldn't test it because I didn't have a mate for its power connector. Here's one solution to this problem. Obtain a package of solderless butt-splice connectors (wire size no. 22-18 in this example). Count out one for each of the pins you wish to access on the equipment plug. Crimp one end of each of the solderless connectors just enough for a snug, sliding fit on the equipment-plug pins. "Hard crimp" connecting wires to the other ends of the solderless connectors, and slide the connectors onto the appropriate pins of the equipment plug. (If you use uninsulated butt splices, slip a short piece of insulating tubing over each splice to avoid short circuits between the equipment pins.) I have successfully used this method to furnish speaker, mic and power connections to several pieces of equipment.—*Ken Kolthoff, K8AXH/6, Vandenberg AFB, California*

FLEXING DAMAGES COAXIAL CABLE

☐ If you've ever had trouble with fluctuating SWR and similar erratic behavior in a coax-fed RF system, my experience with three pieces of coax removed from 75-MHz IF amplifier modules may be of interest to you. The bandwidth, differential gain and phase response of the amplifiers would not stay put; the coax was the culprit.

Flexing of the coaxial cables had resulted in damage to the cable shield at several plugs. The IF-amplifier manufacturer had not provided access holes large enough for 90° coaxial adapters, necessitating that the coax be pulled away from chassis connectors at a 90° angle at several places. In this wide-band application, the integrity of the coax was critical in maintaining proper tuning of amplifier stages. Cable-shield damage resulted in signal leakage, circuit detuning and uncertain RF grounding. This was caused by 150 to 200 flexing cycles over a period of about 15 years. These cables were used indoors, by the way; wind flexing was not a problem.

Coaxial cable is particularly vulnerable to flexing damage at connectors and bulkheads. Protect it well, flex it minimally, keep bending radii as large as possible and take the action of weather into consideration. —*Kurt U. Grey, VE2UG, Sept Iles, Quebec, Canada*