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Title: Tips for the Heath SB-200 Amplifier
Author: Chris Hays, WB0LPV

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Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

THREE-PHASE, HIGH-VOLTAGE POWER SUPPLY FOR MOBILE AMPLIFIERS

[A photo of W2DDN's single-band, mobile linear amplifier appears in the July Up Front in QST column (p 12). Credit for the photo goes to Bob Wilgus, KZ2A, not K2BLA. Of particular interest is the high-voltage power supply for the amplifier, which uses three-phase power supplied by the automobile alternator.—Ed.]

☐ Back in the early days of SSB, during the 1950s, mobile operation on the 20-meter band was quite popular. Most hams built their own transmitters and receivers for long-distance mobile QSOs. High voltage was usually supplied by dynamotors. Leece Neville three-phase alternators were a little too expensive for use then, and I limited myself to a popular SSB phasing exciter built by Anthony C. Vitale, W2EWL, a neighbor of mine. I enjoyed many QSOs with that system over a 10-year period.

I recently read some 1950 *GE Ham Tips*, and the old magazines renewed my interest in mobile SSB operation. Several articles written by Al Prescott, W8DLD, and Bill Louden, W8WFH, inspired me to build a three-phase mobile power supply, now that alternators are standard equipment on automobiles. So, when I ordered my new pickup truck, I included a 120-A alternator.

My first amplifier used a pair of EIMAC® 4-65s, in a grounded-grid circuit, driven by a Swan HF700. This system worked very well. I then replaced the 4-65s with a pair of 813s. My first three-phase power supply was built after some conversation with Bill Louden. It produced about 2500 V, and the 813s performed well. I decided that the 813s could use some more voltage, and a second supply produced 3600 V at 500 mA. This yielded over 1 kW with the 813s. I have worked VKs, ZLs, and many European and South American stations with this setup and a shortened Hustler® antenna. My latest mobile station uses a 3CX800A7 amplifier driven by a Yaesu FT-77 transceiver.[1]

The three-phase high-voltage power supply is simple to construct. (A schematic appears in Fig 1.) My supply is enclosed in a standard chassis with dimensions of 10 × 14 × 3 inches. It is located under the hood of my pickup truck. Three-phase power is taken from the alternator (with no. 10 wire) at the input of the diode junction for each phase. The transformer uses the delta-wye (△-Y) configuration, and was custom built with a 12-V primary and an 800-V, 500-mA secondary.[2] The frequency-response limits are from 100 to 1000 Hz. Relay K1 and another relay in the amplifier are both controlled by the exciter PTT line.

I hope that this project generates some interest in high-power mobile operation. It is a wonderful project and simple to build. Again, thanks to EIMAC for producing a wonderful tube; Jerry Pittenger, K8RA; Bob Wilgus, KZ2X; Al Helfrick, K2BLA. Many thanks also to Al Prescott, W8DLD, and Bill Louden, W8WFH, who stirred me up.—*S. Pavone, W2DDN, Boonton, New Jersey*

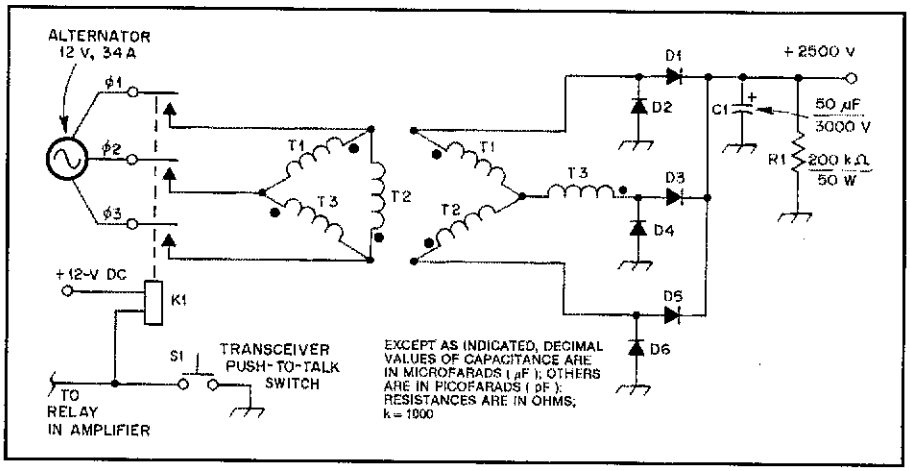

Fig 1—A schematic of W2DDN's mobile high-voltage supply. Use 1-A, 14-kV diodes. The relay has a 12-V coil and 30-A contacts. [The relay contacts are slightly underrated, but the author has experienced no problems.—Ed.] T1 through T3 each have a 12-V primary and a 800-V, 500-mA secondary.

QSK AMPLIFIER KEYING

☐ ETO amplifiers, such as the Alpha 78, are exceptional when operated QSK with a transceiver like the Ten-Tec Omni D. Normally, the electronic keyer triggers the amplifier directly, while the exciter is keyed via a separate line from the amplifier keying relay. This is often necessary because RF output may precede TR switching by milliseconds in many solid-state exciters. Protective circuitry in the amplifier senses RF from the exciter and prevents the amplifier TR relay from changing state when RF is present.

When the exciter is connected to a QSK amplifier via the normal TR scheme, a noticeable pause in amplifier keying results.

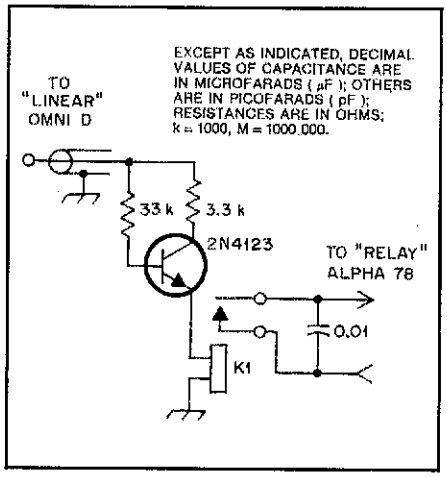

Fig 2—KN2M's QSK keying circuit that uses the transceiver transmit-control line to key an external amplifier. K1 is a 5-V dc reed relay. Parts shown are for the Ten-Tec Omni-D transceiver.

This pause may omit the first portion of each CW character or delete whole words during VOX operation. My simple method allows all amplifier switching to be done from the exciter without pauses or lost code elements.

Solid-state transceivers generally have some transmit-control voltage available, immediately, whenever the transmitter is keyed. Furthermore, this voltage is often conveniently available externally. In the Omni D, this "T" voltage is present at the output of the multi-pin connector labeled LINEAR. After installing the common-emitter circuit shown in Fig 2, the Omni switches the amplifier QSK relays with no noticeable delay. Similar techniques can be employed with any exciter/amplifier combination.—*David J. Rodman, MD, KN2M, Buffalo, New York*

TIPS FOR THE HEATH SB-220 AMPLIFIER

☐ After purchasing a used SB-220 amplifier, I was upset to find a rash of problems with my new purchase. There was arcing across the main tuning capacitor whenever the amplifier was keyed in either the low-power/tune or high-power modes. Also, the high-voltage reading seemed low.

First, I replaced all of the high-voltage metering resistors (old resistors of 100 kΩ or greater tend to drift in value as high voltage/current is passed through them). Even though a resistance measurement may show adequate resistance, the value varies under loaded conditions. With the new resistors in place, the displayed high voltage is acceptable.

Second, I replaced the main tuning capacitor with a Heath replacement having a slightly wider plate spacing. The arcing persisted, however. I cleaned the relay, and that seemed to help, but only for a short while. Next, I removed the antenna relay and examined the contacts. They were severely pitted, probably because RF was applied to the amplifier with no antenna connected. The relays were apparently switching the exciter RF to the amplifier before the antenna-relay transition was complete. A spike of power was arriving

[1]The amplifier design is very straightforward. Anyone wanting details should contact the author directly at RD 4, Box 105A, Boonton, NJ 07005.
[2]The transformer was made by Transformers Inc, 1920 Murrell Rd, Rockledge, FL 32955, tel 305-632-7370.

They were severely pitted, probably because RF was applied to the amplifier with no antenna connected. The relays were apparently switching the exciter RF to the amplifier before the antenna-relay transition was complete. A spike of power was arriving at the final-tank circuit of the amplifier while there was no antenna load and was discharging through the main tuning capacitor. Once the arc was struck, it held until the key was released. Anyone experiencing this problem should thoroughly check the relays and then clean or replace them if they appear badly pitted. Also, exercise extreme caution when working on amplifiers. In high-voltage circuits, there are no slight shocks, only lethal ones!—*Chris Hays, WBØLPV, Florissant, Missouri*

A BALANCED GRID CIRCUIT FOR THE HEATH SB-200 AMPLIFIER

☐ I have found that my SB-200, which uses two 572-B tubes, has a serious problem. The grids are unbalanced, and overdrive will destroy the same tube of the pair each time. To improve the balance, remove C29 and install an 8- to 50-pF capacitor, rated at 500 V, from the junction of R21 and R22 to C17. Fig 3 shows the modification and an X where the wiring to C29 was cut. Guy, W5VGK, designed this fix, and I installed a 20-pF capacitor in an SB-200 for NM5T after a tube failed in his.—*Mark Tyler, K5GQ, Katy, Texas*

AN AUTOMOBILE VOLTMETER

☐ I have had a problem with my last four cars in that the "idiot" light did not come on when the alternator malfunctioned. As a result, I built the expanded-scale voltmeter shown in Fig 4.

A relay disconnects power from the mobile rig and voltmeter when the ignition switch is off. The voltmeter, however, draws only about 5 mA and could be left connected if so desired. A voltage regulator supplies +10 V to the negative terminal of the meter so that the meter actually reads the difference between the system voltage and the regulator output. System voltage, then, is that shown on the meter plus 10 V. I set the 5-kΩ potentiometer so that the meter reads 2.5 (12.5 V) normally and 4.0 (14.0 V) when charging. Now I need not depend on my "idiot" light.—*Vern Rush, W9FDS, Lafayette, Indiana*

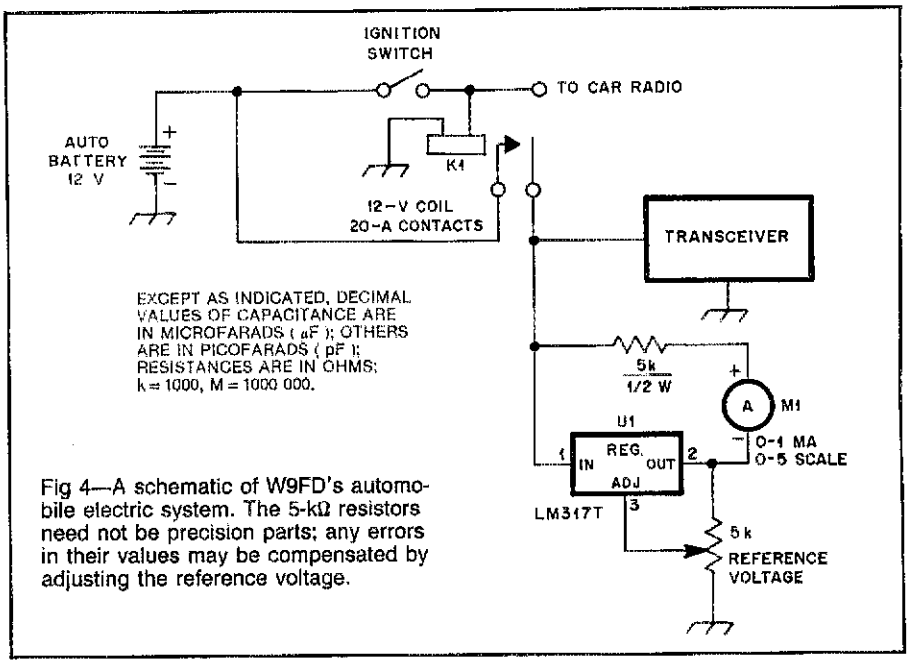

Fig 4—A schematic of W9FD's automobile electric system. The 5-kΩ resistors need not be precision parts; any errors in their values may be compensated by adjusting the reference voltage.

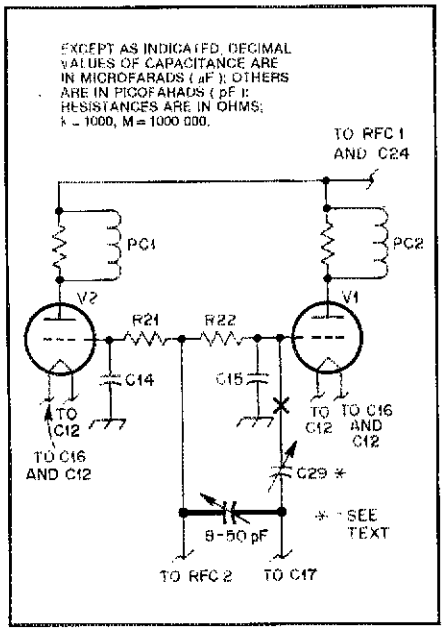

Fig 3—A partial schematic of the Heath SB-200 showing modifications to help balance the grid circuit. The changes are shown in heavy black lines.

PLASTIC FILM SPOOLS AS WIRE SPREADERS

☐ I have used a parallel-wire dipole on the 80- and 40-m bands for many years. Size "120" plastic film spools make excellent spreaders to hold the parallel wires apart. The spools are quite durable and seem to resist the effects of ultraviolet light. I had one antenna up for seven years in downtown Cleveland, and it survived vicious winds and industrial fumes. There was no sign of brittleness in the plastic spools.

Here is a trick to get the spools on the wire: First, estimate how many spools are needed and place them on the ends of the wires. Then, place both wires under tension, slide the spools into position and fasten them in place. This technique makes it easier to slide the spools in position without binding, as is common when the wires are not under tension. Simply twist the no. 20 wire around the antenna or feed-line wire (as shown in Fig 5) to hold the spools in place. My spools are spaced 12 inches apart. The spools are available for the asking in "eye-popping" quantities at virtually any professional photo lab.—*Timothy N. Colbert, WA8MLV, Burton, Ohio*

[Those who are less concerned with appearance can avoid the trouble of sliding the spools along the antenna or feed-line wire. Simply pass the no. 20 wire through the hole drilled in the spindle, lay the spindle against the antenna wire and wrap the no. 20 wire around the large wire.—Ed.]

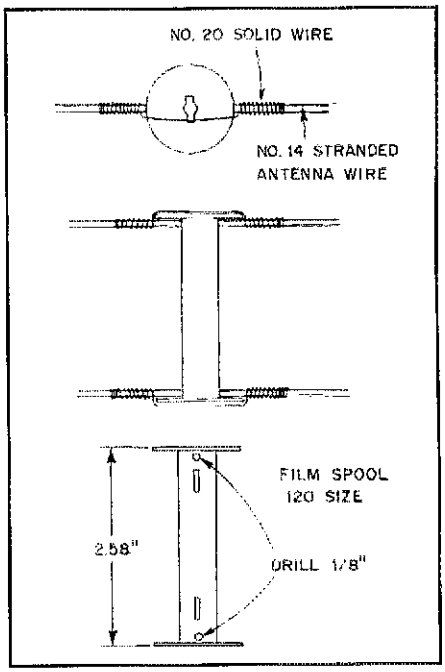

Fig 5—WA8MLV's technique for using plastic film spools as antenna spacers.

ANOTHER SOURCE OF SPACERS FOR OPEN-WIRE LINE

☐ Coat hangers made of 3/8-inch-diameter plastic are an excellent source of spacer material. These hangers are periodically on sale at a cost of $1 per dozen, and 15 two-inch spacers can be cut from each hanger.

Spacer fabrication is quick, clean and easy. Cut the hangers into the lengths you need, sand the ends, file a groove in each end to accept the conductors, and drill each end for the tie wires.

These spacers are inexpensive, easily available and light in weight. I use one every 12 inches or so in my system.—*John Jarnefeld, WØTOY, Hibbing, Minnesota*