culminates in a grey block about 3/4×1×4 inches in size, with four leads coming out of it. One lead is RF in, one is for power output control, one carries +13.8 V, and the last is RF output.

I removed the module from its chassis heat sink after unsoldering its four leads. Noticing that the module looked like it could be pried open at some small tabs, I decided to break open the module and look inside. The cover came off with ease.

Inside, I saw nine transistors connected in parallel to act as a driver stage, and more for the output stage. (The amplifiers are on a ceramic base that's about 1/16 inch thick, and this can break if you pry off the module's cover carelessly, so take it easy.) Using a VOM as a continuity checker, I found that a printed-circuit RF choke in the driver stage had opened. I couldn't see a break in the choke foil, but I found it easily by running one VOM probe along the trace until continuity occurred.

My needle-point soldering pen couldn't heat the trace enough for soldering, so I used a 150-W soldering gun to do the job. This required considerable care because the circuit traces are thin, and a large iron can easily create solder bridges.

With the trace break repaired, I reinstalled the module after replacing its cover. The radio has been working fine now for six months. If the transceiver's UHF module goes down, I'm ready to do some prying!—*John Gruenwald, KØBF, Sterling, Colorado*

WJ1Z: In the early 1970s, I experienced a similar problem: My homemade 160-meter transmitter mysteriously cut out every time I slowed down my Morse sending enough to try working California from Chicago with an inefficient antenna. Thermal stress was the culprit: My final amplifier's cathode resistor had invisibly heat-cycled itself in half, and its sections stayed in contact only as long as I didn't heat up their junction too much with slow sending. Mentioning this to one of our 1995 *ARRL Handbook* authors brought confirmation of John Gruenwald's happy finding that you needn't just take a dead VHF/UHF rig lying down. Note once again, however, the significance of the phrase "out of warranty"; there's no sense attempting such radical surgery yourself if your radio's warranty will cover the work.

◊ Your 160-metre transmitter problem is bang up to date! The power output modules in current imported VHF/UHF mobile rigs are generally not heat-sunk well enough for ragchewing. Alumina [the ceramic substrate mentioned by John Gruenwald] bonded to copper that's bolted to a die casting (zinc alloy) is better than the average bimetallic strip: When it gets hot, things bend. Things that can bend do not include alumina! *Chink*! So the rig now works when cold, but as it warms, the metal tracks on the alumina substrate are moved apart by the expansion, resulting in no output! Let it cool, and they touch again—voilà! Normal service is (temporarily) resumed.

You can take the top off a module and carefully solder jumpers across the rift. Stress-relieved, it may be more reliable than new, but won't look as nice. I've fixed several transceivers in this way, but sometimes I need to take a hacksaw to an output module to open it. This approach is not recommended for the squeamish—but it's amazing how brave we tend to become in the face of costly, out-of-warranty repair bills!—*David Stockton, GM4ZNX, Crossford, Dunfermline, Fife, Scotland*

CONSTANT-CARRIER AM FOR THE DRAKE TWINS

◊ With the resurgence of interest in vintage gear and especially the AM mode of transmission, I set out to modify my Drake 4B-line to produce a constant AM carrier in transmit.

Straight from the factory R. L. Drake 4-line equipment included *controlled-carrier AM* to protect its sweep-tube final amplifiers, and the tubes in outboard power amplifiers, from thermal overload during AM operation. This holds the unmodulated carrier to only a few watts (in my case, 1 or 2 W). Under modulation, my T-4XB transmitter's carrier level increased along with the audio, but never in direct proportion to the audio, and never in an amount sufficient to enable an AM receiver to really detect and "latch on" to the signal. On-the-air reports revealed that my signal sounded like SSB with small amount of added carrier, and that it was very difficult to copy using vintage AM receivers.

Although I truly love vintage equipment (translation: boatanchors), I nonetheless wanted the capability to occasionally communicate with my "high-level AM" buddies while using some of my sideband equipment. Since I work modes other than AM, and have been a fan of Drake equipment for over 30 years, I was determined to improve the sound of my 4-line's AM transmission.

Modification Details

After talking to a number of fellow hams who've modified their Drake twins for AM operation, especially my friend Clint Lunsford, WA4WRJ, I began a series of experiments. I settled on the following modifications as best suiting my needs:

1. I converted V11, the T4XB's 6AU6A pentode amplitude modulator, to a triode by connecting together pins 6, 2 and 5 (the screen, suppressor and plate, respectively). *Be absolutely sure that you remove the screen connection (pin 6) from B+, and that you remove the suppressor connection (pin 2) from ground!* Once you've disconnected these pins from B+ and ground, respectively, simply run a jumper from pins 2 and 6 to the plate (pin 5). Figure 2 shows the 6AU6A stage before and after modification.

2. Couple the audio from the plate of the converter 6AU6A to the screen of the T-4XB's 12BY7A driver tube through 0.1-µF capacitor. (Refer to Figure 2 for wiring details.) I used a Radio Shack metallized film capacitor rated at 200 V dc (catalog no. 272-1053). You now have a triode audio amplifier screen-modulating a pentode.

My 1963 ARRL *Radio Amateur's Handbook* states that "screen modulation is probably the simplest form of grid modulation and is the least critical of adjustment." It also states, however, that "pentode-type tubes do not, in general, modulate well when the modulating voltage is applied to the screen grid." I considered suppressor modulation of the 12BY7A, but a little more research indicated that I would have to apply a negative bias to its suppressor. Besides, the screen-modulation approach I've just described passed the "smoke test," and my audio reports are most favorable. I therefore didn't even experiment with modulating the suppressor, even though it may prove to be an interesting and worthwhile project.

3. I obtained the carrier level I desired by experimenting with the value of R in Figure 2, which determines the voltage applied to the driver screen. In my case, a 470-kΩ, 2-W carbon resistor did the trick. (I recommend using a 2-W resistor because the resistor dissipates some power in dropping the 250-V B+ to the value needed.)

Assuming that you'll be using the modified T-4Xx to drive a linear, be sure you

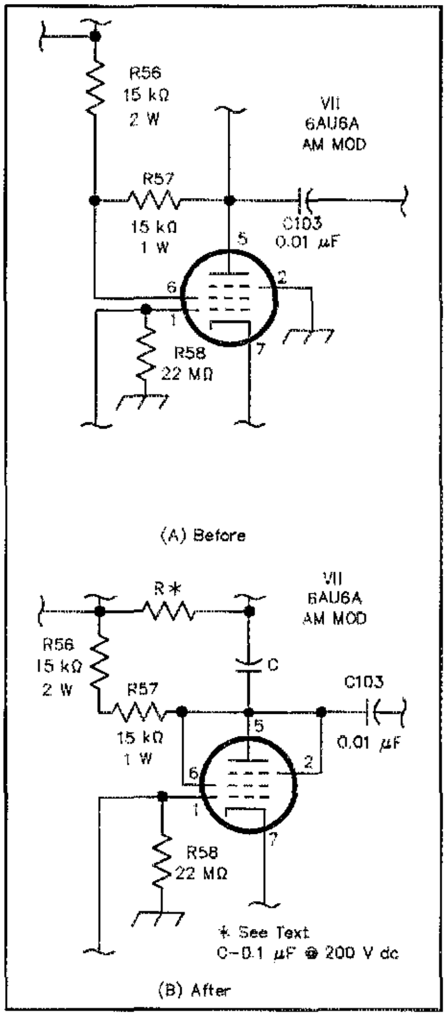

Figure 2—How Steve Thomason modified his Drake T-4XB's amplitude modulator (A) for better AM operation (B).

leave enough headroom for your sideband energy, and be sure that your resting carrier level is well within the dissipation limits of both your T-4X*x* finals and the tubes in your linear.

Operating Results

The modifications described result in a constant carrier of approximately 9 to 10 W from my T-4XB, and about 40 to 50 W on audio peaks. This is well within the 35-W plate dissipation rating for a pair of 6JB6s. That level of output driving my L-4B amplifier in the SSB mode (2.7 kV dc on its 3-500Z's plates versus 1.9 kV in the CW/tune mode) results in a 140-W carrier and about 550 W on audio peaks. Operating the L-4B on the lower voltage tap produces a carrier of about 115 W, and audio peaks of around 450 W. Although the power level is considerably less than the legal limit, it nonetheless produces a respectable AM signal compared to the power level afforded by a Johnson Viking II or Valiant. (When conditions warrant, I put one of my Johnson 500s into service.)

I find being able to instantly switch between SSB and acceptable quality AM to be extremely convenient. I'm sure there are other methods and modifications that can accomplish the same goal, but the one I've described is quite easy to do, and appears to produce excellent results.—*Steve Thomason, WB4IJN, Summerville, South Carolina*

WRIST REST FOR KEYBOARD OPERATORS

◊ Moving from a typewriter to a word processor required a great change in my keyboard approach. The word processor required such a light touch that I often misstruck keys, and my wrists became numb from holding my hands carefully above the keys. Then I saw an advertisement for a "wrist rest" said to relieve this problem, but none were available in my local stores.

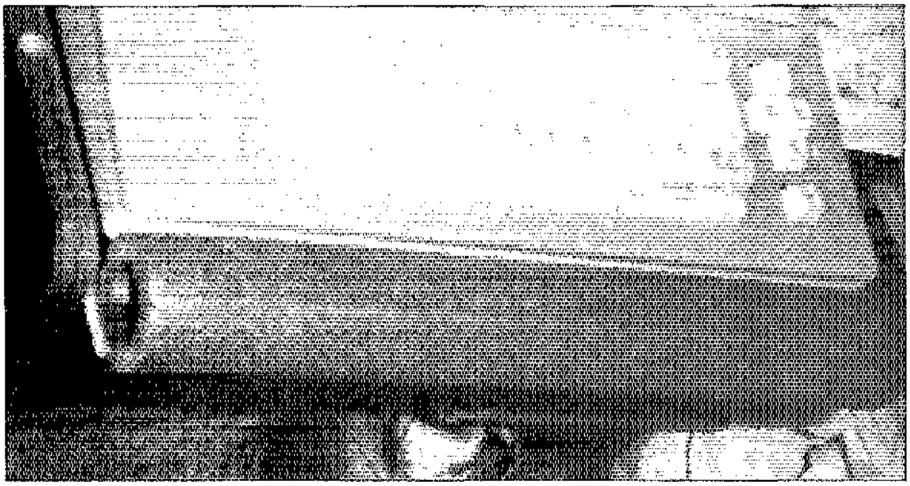

Figure 4—The Seaton wrist rest ready for action

The name *wrist rest* suggests some sort of bar upon which one rested one's wrists. Being a physicist, I went out to the barn to cut a piece of 3/8-inch plywood to fit under my keyboard, with an extra 2 inches sticking out in front, on which I tacked a batten of 3/4×1-inch fir to receive a length of 1/2-inch-wall Polytherm insulation (intended for 7/8-inch water pipe). The Polytherm is split lengthwise. I cut a piece about 16 inches long, opened up the split and snapped the Polytherm over the batten (Figure 3). Bravo! A nice, soft wrist rest (see Figure 4).

You may require a wrist rest sized differently than mine, or your personal touch may demand a higher or lower rest. No problem: cut your rest to fit, and adjust it to suit.

This wrist rest really works: Now my wrists feel much better, and I can type for longer periods.—*S. L. Seaton, K4OR, Hampton, Virginia*

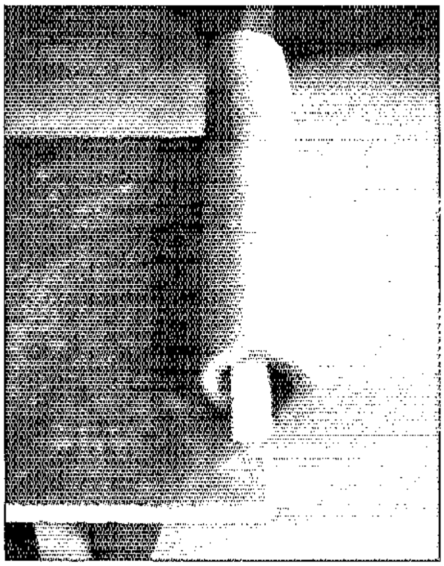

Figure 3—S. L. Seaton used wood and Polytherm pipe insulation to build a custom wrist rest for his keyboard. This view shows the wrist rest end-on.

CURING INTERMITTENT METER OPERATION IN THE TELEX TAILTWISTER T²X ROTATOR

◊ I've had a T²X in operation for almost six years. In this period, I had to take the rotator down and clean its position-sensing potentiometer three times because it sometimes operated intermittently. My station setup is a Kenwood TS-850S transceiver, an Ameritron AL-1200 amplifier running at 1.5 kW output, and a Mosley PRO 67A 10 to 40-meter Yagi at 70 feet.

I point the beam northeast more of the time, and most of the intermittent meter indications occurred when the beam was pointed in this direction, so I assumed that the intermittent indication came from dirt buildup in the sensing pot due to sweeping the beam to the northeast. Cleaning the pot would solve the problem, but intermittent meter indications would occur again after three or four months.

I've discovered that RF pickup, not dirt, causes the problem. When I run my amplifier at full power, RF pickup in the rotator control wiring causes burning and small carbon spots on the sensing pot's resistive track. To solve this, I installed ferrite beads (Palomar Engineers FB8-73) on the two wires at the pot in the rotator. (See Figure 8, the T²X schematic, on page 22 of the T²X manual; the leads involved are nos. 3 and 7.)

Since installing the beads 16 months ago, I've experienced *no* intermittent meter operation.—*Robert J. (Whitey) Doherty, K1VV, Lakeville, Massachusetts*

Telex has since advised Whitey that they'll be incorporating ferrite beads on the pot leads in all new production.—*Ed.*

A ONE-SWITCH COMPACT LOOP

◊ As I read Robert Capon's "You Can Build: A Compact Loop Antenna for 30 through 12 Meters" (page 33 of May 1994 *QST*), I realized that you only need one switch to control the capacitor motor, as shown in Figure 2.—*John H. King, NH6ZF, Chula Vista, California*

◊ Simultaneously pressing S1, **Forward**, and S2, **Reverse**, in Figure 5 of the Compact Loop article will short-circuit the system's motor battery (BT1). Figure 5 shows how to avoid this.—*Antoine F. Galindo, AC6G, Garden Grove, California*

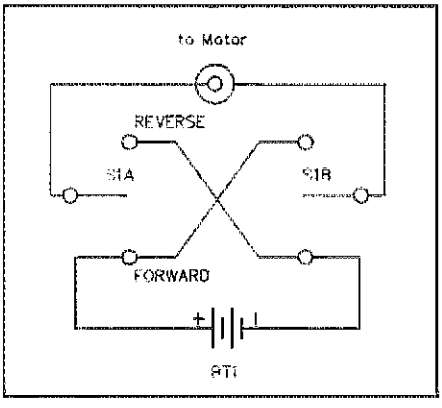

Figure 5—John King and Antoine Galindo suggest replacing S1 and S2 of May 1994 *QST*'s compact loop with a single momentary DPDT switch. QST