MLA2500B/4CX800A Conversion

(prepared 18 April 1996, by Robert Schetgen, KU7G)

Refer to: Issue of May 1996 QST page 45 ‘New Life for Dentron MLA2500s’
By Daughters, George T., AB6YL

Text refere to: **Tube Cooling Chimney (Figure F)**
A 2.80-inch-diameter hole was bored through the Teflon to provide a loose slip fit on the anode cooler (cooling-fin assembly) of the 4CX800A. A smaller diameter would be too tight to allow for some thermal expansion, or not fit at all; any larger might allow too much air to escape around the anode cooler, rather than going through the cooling fins. The diameter on the socket end of the chimney can be anywhere between 2.9 and 3.0 inches. A smaller diameter would not clear the extensions for the socket mounting tabs; a larger hole would be too close to screw holes for satisfactory socket mounting.

The height of the 3-degree tapered section should be about 1.5 inches, to match the distance between the bottom of the anode cooler and the socket. The length of the overlap of the chimney and anode cooling structure is not critical. My chimney has a rectangular external shape, which provides room to drill and tap two #8-32 holes. Mount the chimney on the inside of the back panel with two #8-32 screws to hold it in place.

If you choose to mount the tube vertically (as were the original 8875s), gravity will adequately hold the chimney in position, and a thin-walled (about 0.1 inch) circular chimney would be fine. In this configuration, however, the cooling scheme would have to be different from that presented in the article.

Text refere to: **Screen-Supply Capabilities (Figure K)**
The voltage/current characteristics of the regulator are shown in Figure K. The circuit can supply a maximum of about 13 W to the screen grid. (An hyperbola representing a screen dissipation value 15 W is shown on the figure at the upper right.) The "knee" in the curve depends upon a combination of Q2's beta and the value of R11 in Figure 1 of the article. Choose a value for R11 that places the "knee" at about 35 mA (try values between 10 and 18 ohms.) In any case, make sure the voltage is essentially constant from 0 to 30 mA, and that no combination of output voltage and current is above the 15-W line.

Text refere to: **Lab Test Results**
Figures L through R are spurious-emissions plots from ARRL Lab tests of the converted MLA2500B. Figure S is a plot typical of the IMD test. Regretfully, plots for the 30-m and
15-m bands are not available. The amplifier was tested on those bands, and the worst-case spurious emissions were -42 dBc for a 10.125-MHz test and -50 dBc for a 21.225-MHz test.

Text refere to: **Figures**
All photos and line drawings are stored in .JPG (pronounced J-PEG) format; Lab plots are stored in .PCX format, as used by PC Paintbrush, which is distributed with Microsoft's Windows operating system. These formats were selected to conserve space. Both formats are supported by many graphics viewers, such as Paint Shop Pro, version 3.11.

All of these graphics have been produced and displayed on a Gateway 2000 4DX-33 system with 8Mb RAM, running Windows for Workgroups Version 3.11. If you have trouble viewing these files, contact the ARRL Technical Secretary* and request the printed version of these files. Ask for the MLA2500/4CX800A Conversion package from May 1996 _QST_. If you are an ARRL member, send $5 (nonmembers, $7.50) to cover shipping and handling. (This does not constitute a recommendation of any software, format or product by ARRL.)

* ARRL contact information appears in the current issue of QST magazine, which is available at most public libraries.

Figure Captions

Fig. A. Grid-current indicator

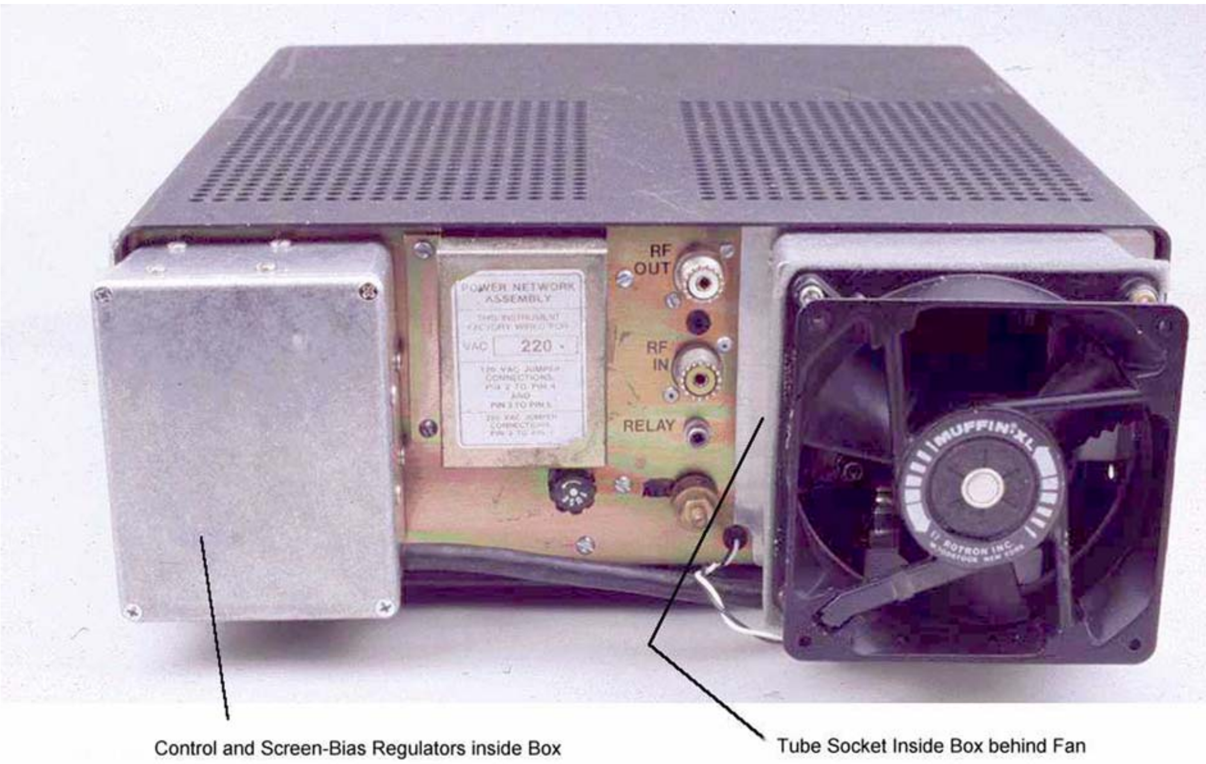

Fig. B. Rear View - Muffin fan, socket box, screen-and control-grid bias box

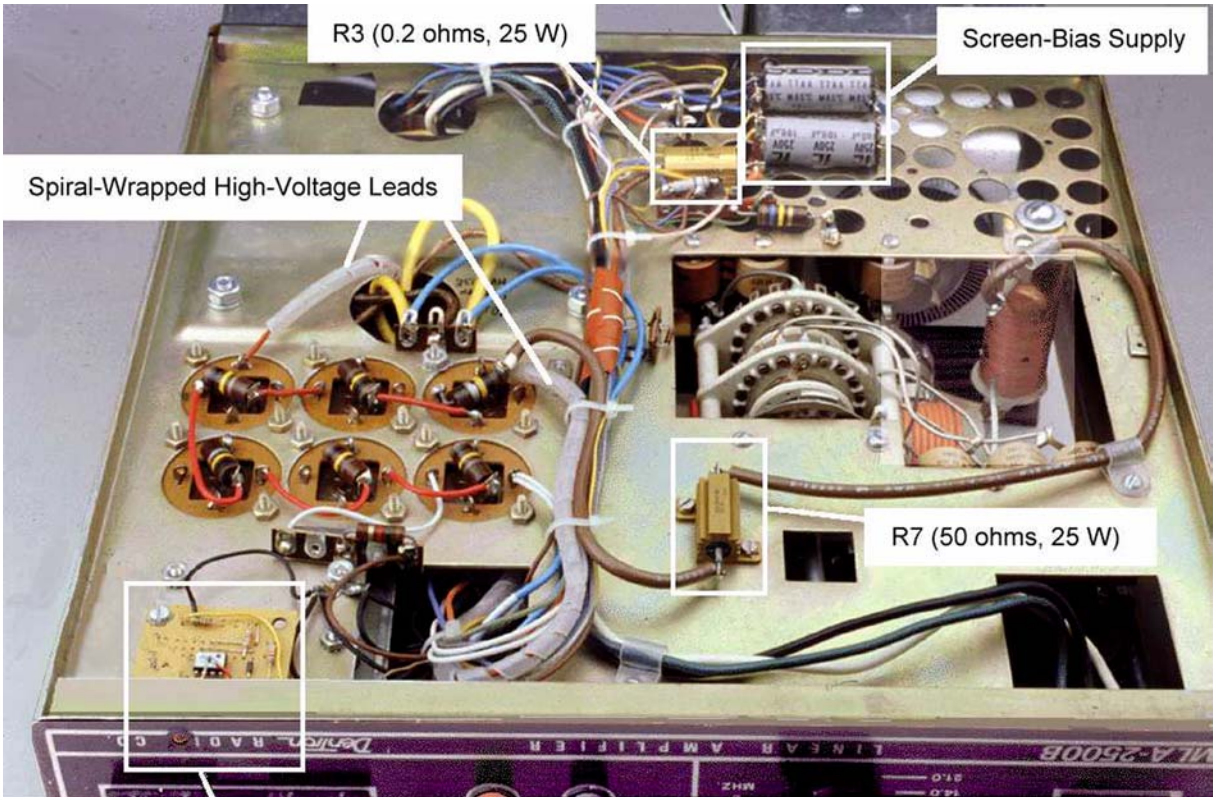

Fig. C. Chassis - Bottom View, Grid-current detector, indicator and PC board, R7,R3, spiral-wrapped HV lead, screen-bias supply (regulator in Figure I)

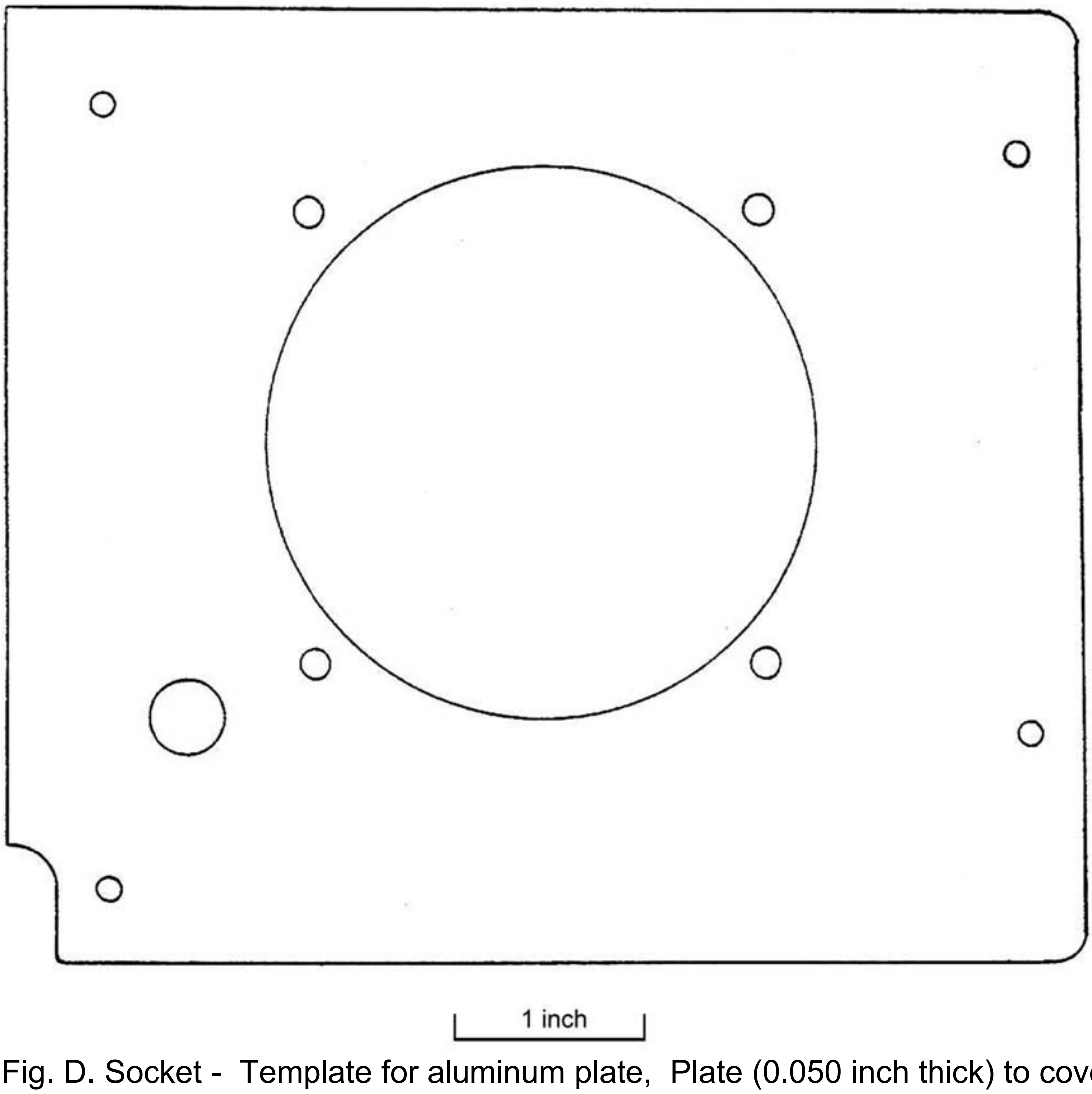

Fig. D. Socket - Template for aluminum plate, Plate (0.050 inch thick) to cover Template original fan cutout on back panel. This template is full-size when printed so that cutouts are round and 1-inch scale on drawing measures 1 inch on print.

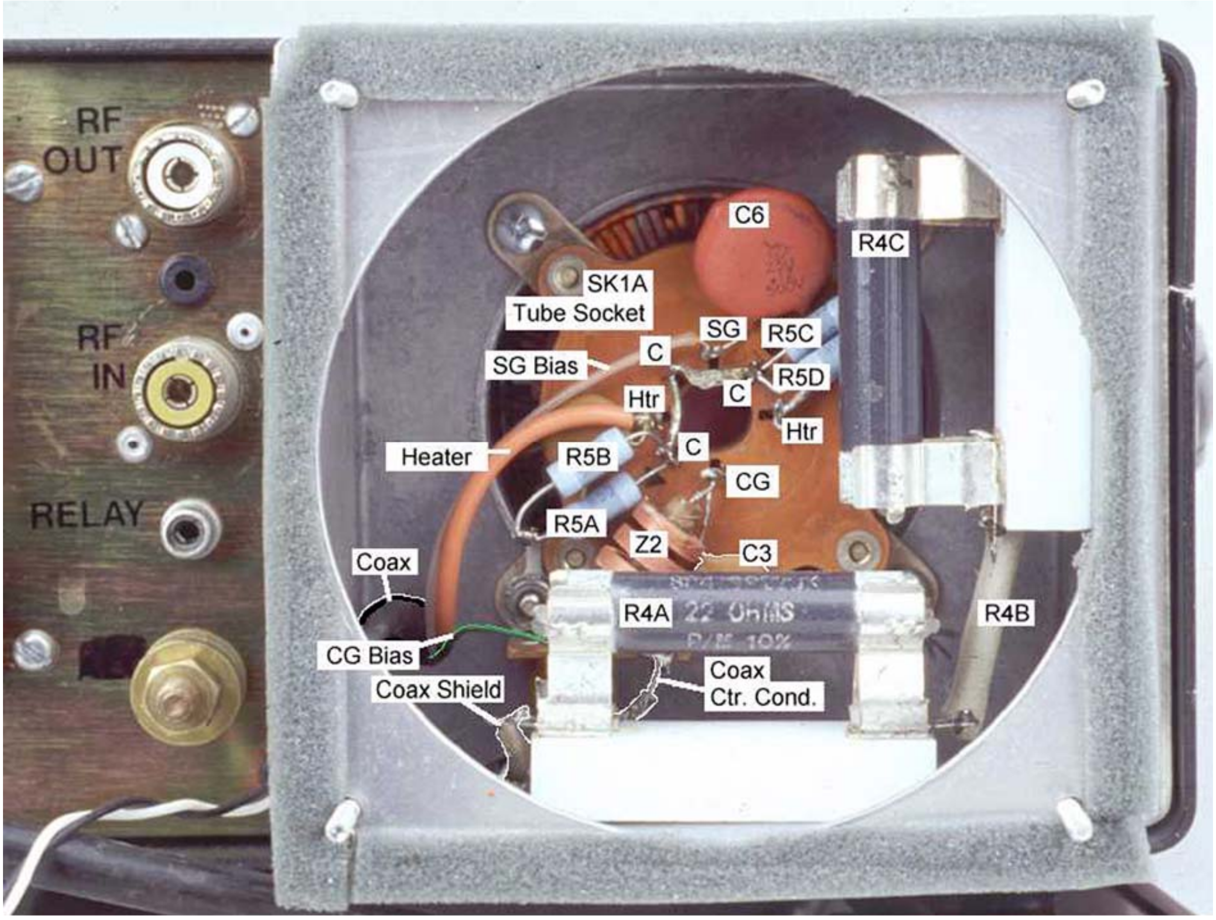

Fig. E. Socket - Socket pins and functions, R4 (A Assembly through C), RFC (Z2), coax grid lead connections, heater lead, screen-bias lead, R5 (A through D), C3 and C6

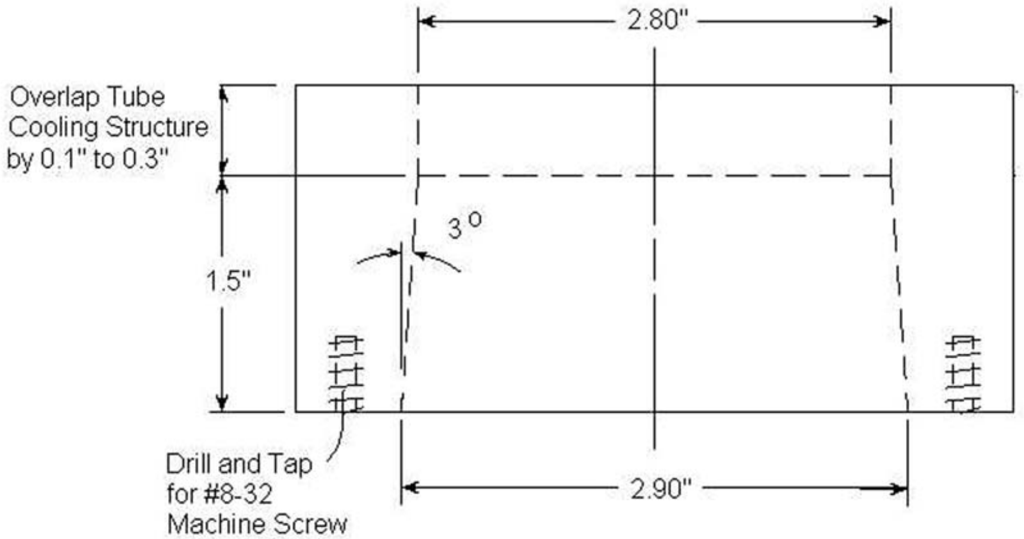

Figure F - Tube Chimney

Fig. F. - Tube Chimney, Elevation view of cooling chimney for 4CX800A tetrode. Make the chimney out of Teflon, Delrin, or nylon. Dimensions are in inches. Only those dimensions that are important for fit to the 4CX800A tube and the SK1A socket are given; choose other dimensions to suit.

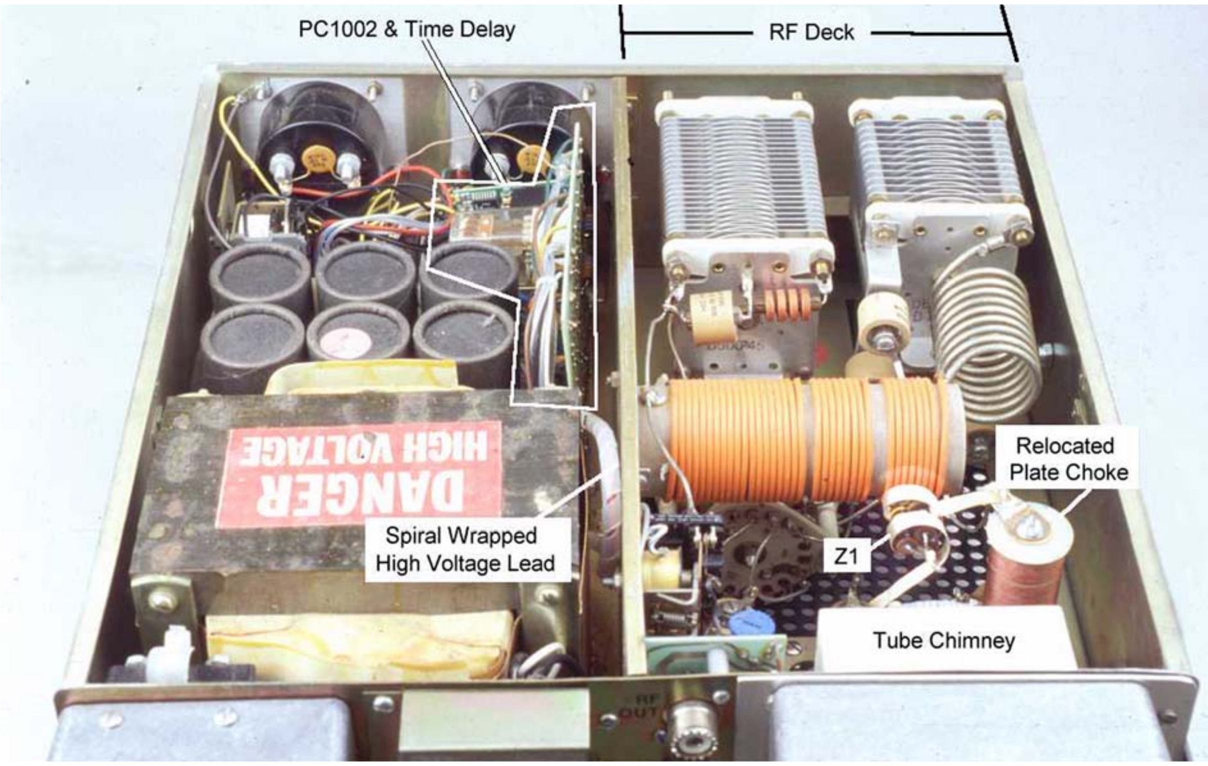

Fig. G. - Top Rear, RF deck with relocated plate choke, View tube chimney and parasitic suppressor, high-voltage and metering deck with spiral-wrapped HV lead, PC1002 and time delay.

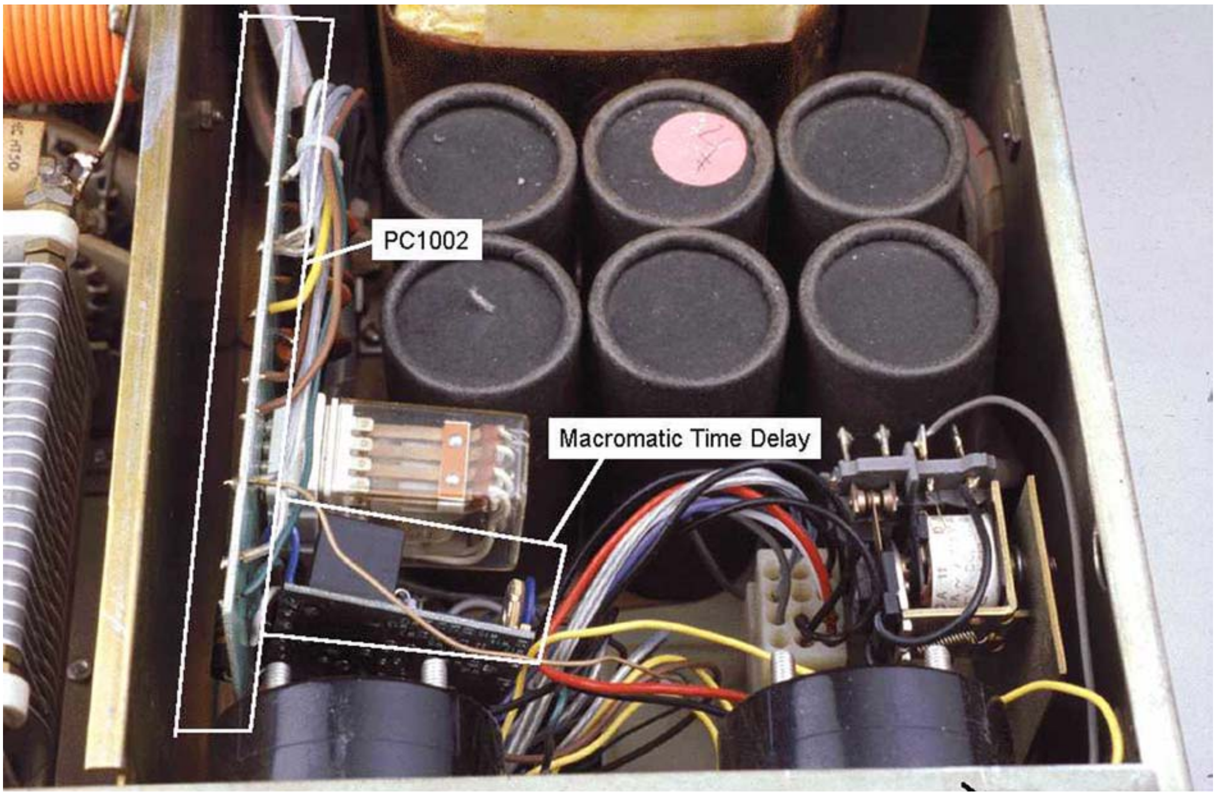

Fig. H. - Time Delay Macromatic time delay on PC1002 and PC1002

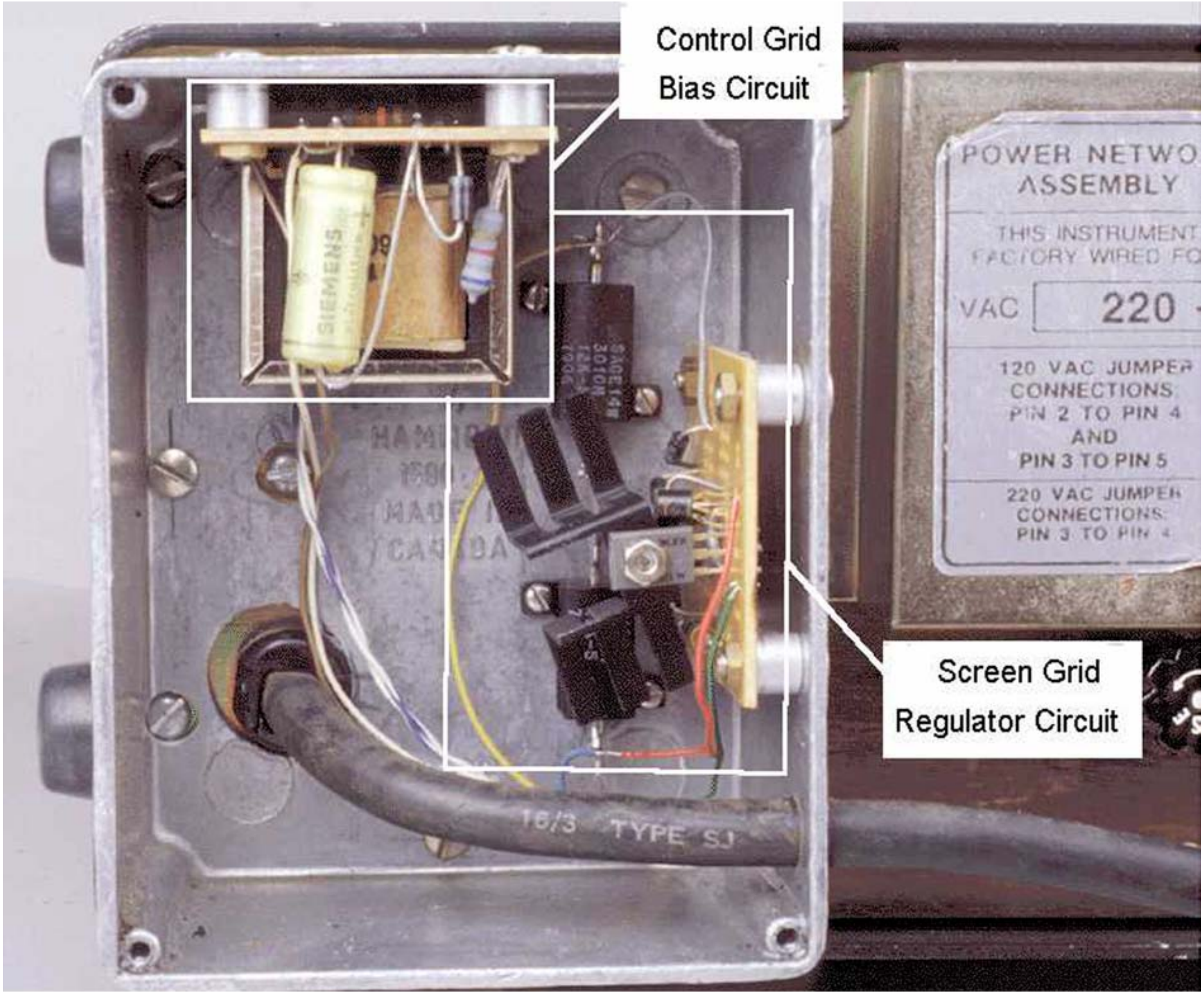

Fig. I. - Grid Bias Box, Control-grid bias circuit, screen-grid bias regulator circuit

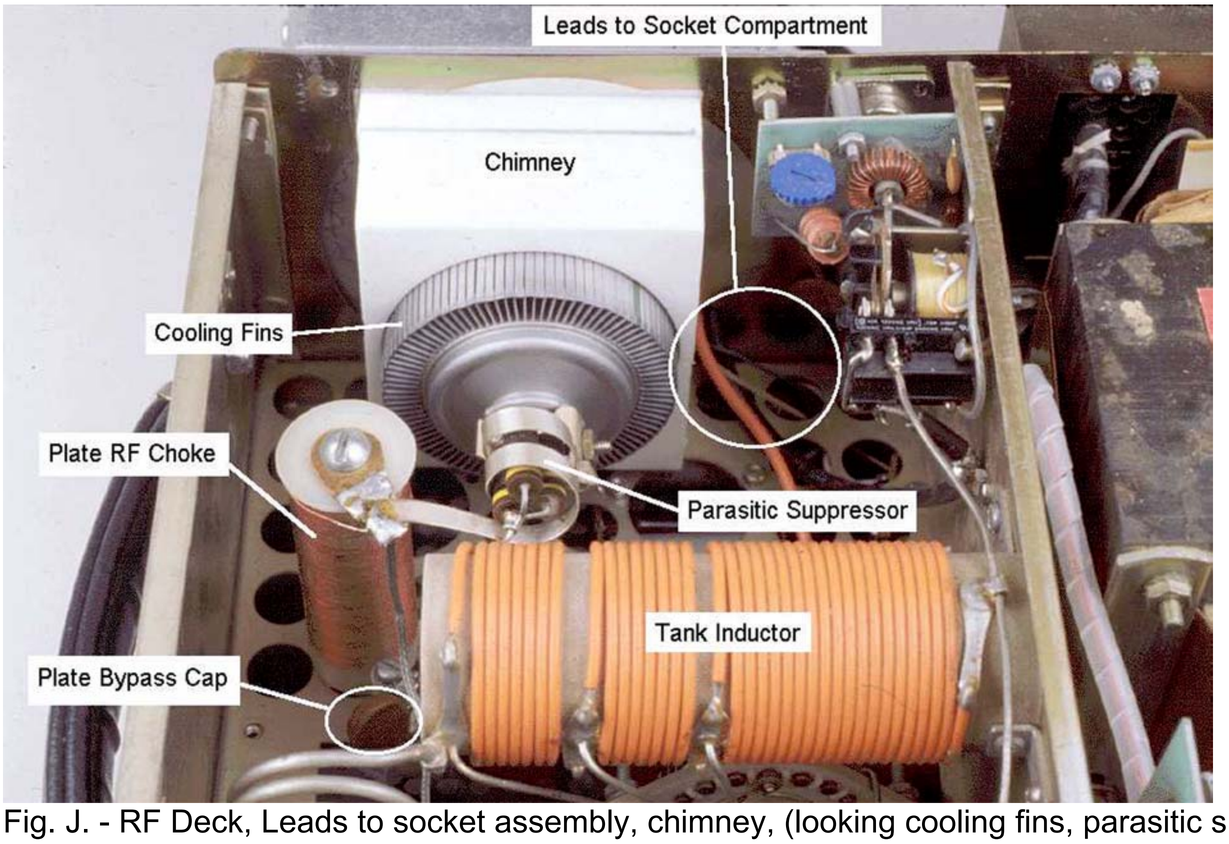

Fig. J. - RF Deck, Leads to socket assembly, chimney, (looking cooling fins, parasitic suppressor, rearward) relocated plate RF choke, plate bypass cap, tank inductor.

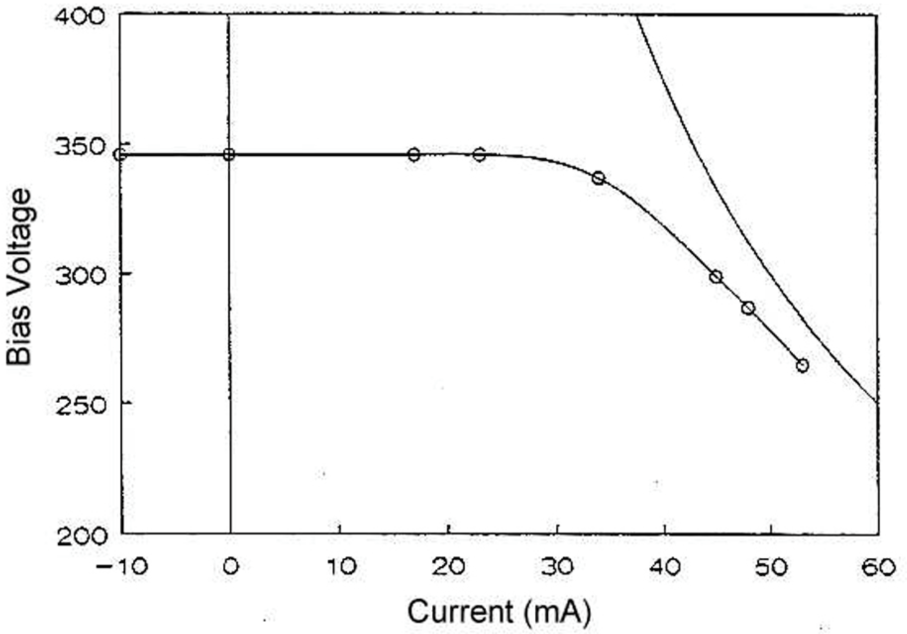

Fig. K. Screen-Grid, Plot of voltage-versus-current, Bias characteristics of the screen Character-supply. The hyperbola represents a caracteristics screen-grid dissipation of 15W, the maximum value allowable for the 4CX800A.

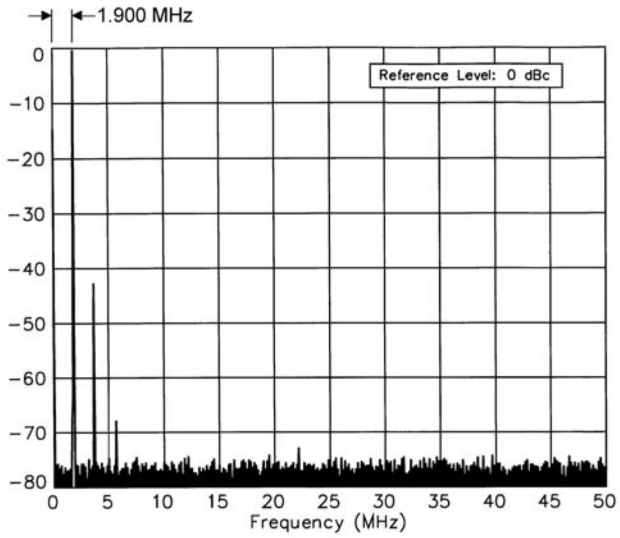

Figure L - 160 m Band Spurious Emissions

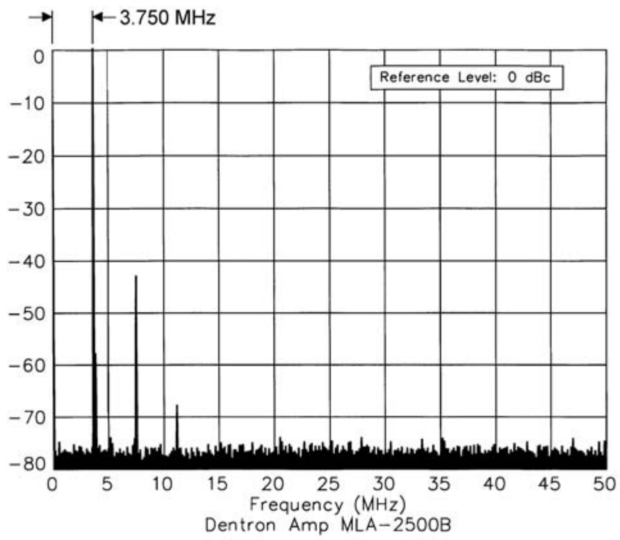

Figure M - 80 m Band Spurious Emissions

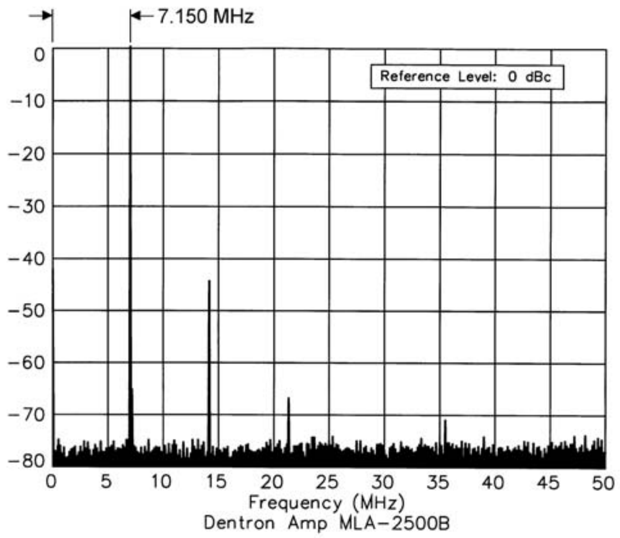

Figure N - 40 m Band Spurious Emissions

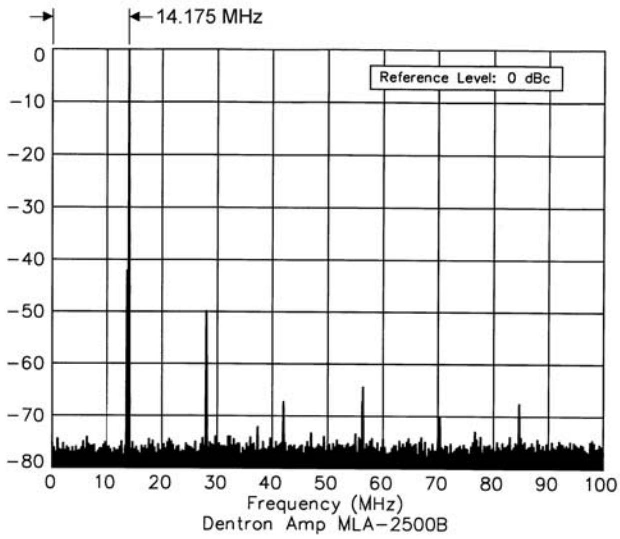

Figure O - 20 m Band Spurious Emissions

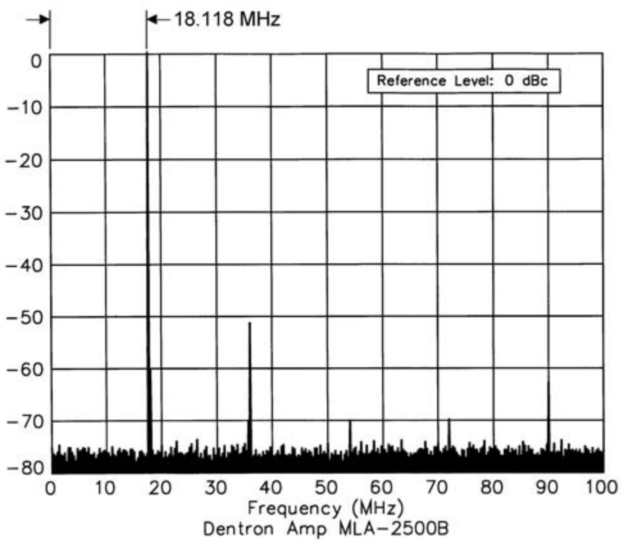

Figure P - 17 m Band Spurious Emissions

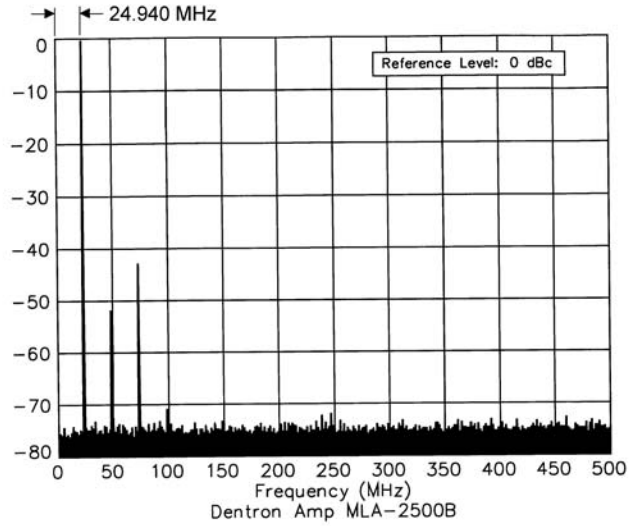

Figure Q - 12 m Band Spurious Emissions

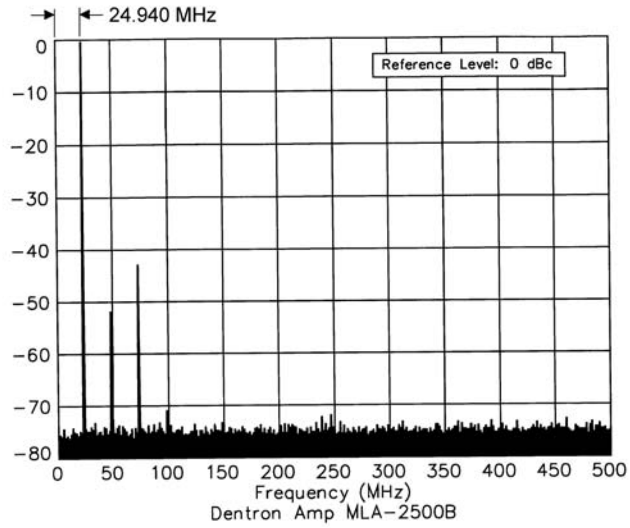

Figure Q - 12 m Band Spurious Emissions

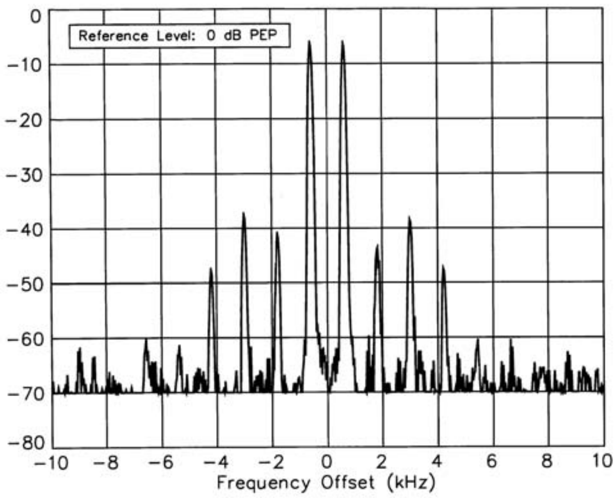

Figure S - Typical IMD Performance

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By George T. Daughters, AB6YL

New Life for Dentron MLA2500s

AB6YL uses a single, inexpensive Russian 4CX800A *tetrode* to replace a *pair* of 8875 triodes in these popular medium-power amplifiers.

The Dentron MLA2500 series of linear amplifiers has a checkered history. These compact amplifiers were much-modified, but unquestionably represented a cost-effective means of getting a stronger signal on the air. The economic advantage seems to have disappeared, however, based on the very high cost of replacement tubes. A pair of new Eimac 8875s can set you back $800! Because of this, the amplifiers are sometimes available at bargain-basement prices.

I obtained a B-model amplifier that had fallen from a significant height onto its rear panel, at the corner where the fan is mounted. This destroyed the fan and severely bent the rear panel. The shock dislodged the tubes from their sockets—destroying one of the sockets in the process. The owner epoxied the socket back in position, reinstalled the tubes, turned on the rig and blew out the plate RF choke. (I guess he had a penny behind the fuse!) Ohmmeter tests didn't disclose any shorts when the tubes were cold, but the impact of the fall had apparently deformed the tube elements enough to cause internal shorts when they were hot. At this point, the owner offered me the amplifier at a price I couldn't refuse.

After all, the output tank, power supply, control and metering circuits could be reused—even if I changed to another tube at the same power level—so I deemed it reasonable to attempt a resurrection.

Choosing the Tube

It was clear to me that my Dentron's new life would not include 8875s. Although replacement with a triode appeared convenient, a recently advertised price of $340 for the 3CX800A makes it a bit too dear. Furthermore, I have long admired tetrodes, having built many transmitters with them. The recent availability of a Russian-made ceramic/metal 4CX800A for $180 makes that tube very attractive. Its astonishing warranty—two years from the time placed into service—makes it an extremely good buy, indeed! The socket (Svetlana SK1A, at $35) and anode connector (AC2, $3) for this tube are also reasonably priced.

A single 4CX800A can replace the pair of 8875s, but it requires a screen-grid supply. Furthermore, the 4CX800A requires 12.6 V at 3.6 A for the heater, whereas the Dentron has a big 6.3-V winding for the parallel-connected pair of 8875 heaters (6.3 V at 3 A, each). Also, the heater of the 4CX800A must be on for a minimum of 2.5 minutes before applying any drive or significant operating voltages. (The original Dentron MLA 2500 delay is only 1.25 minutes.) Finally, the 4CX800A cooling-fin structure is very different from that of the 8875. Full-power plate dissipation requires a blower that can deliver cooling air at 20 cubic feet per minute (cfm) *with a back pressure of 0.5 inches of water.* Although the original fan needed replacement in any case, a simple muffin fan wouldn't be adequate for the 4CX800A—or so I thought (more on this later).

The 4CX800A can be used in a passive, grid-driven mode, where the input power is dissipated in a 50-Ω resistor between the grid and ground. In fact, the passive grid-driven mode is the *ideal* configuration for a project such as this.

In the MLA2500, the 8875 cathodes are driven directly, without tuned input circuits for each band. Such tuned circuits are necessary, however, to ensure good linearity. Any technically responsible retrofit of a cathode-driven triode in this amplifier should include such tuned circuits. Each circuit must be separately adjustable and bandswitched. Such a conversion is a difficult task for nine HF bands.

The passive grid-driven mode alleviates the need for tuned input circuits entirely and easily provides true all-band capabilities. In addition, the low-impedance grid circuit helps to avoid instabilities and parasitics, and it provides the driver with a stable, low-SWR resistive load. Finally, a very popular commercially available 1500-W-output amateur rig made by a prominent manufacturer uses a *pair* of 4CX800As in this configuration; it's not exactly an untried circuit!

The data sheet[1] for the 4CX800A lists typical operation in the passive, grid-driven mode as requiring about 60 W of drive (all dissipated in the grid resistor) to produce 750 W of output with a modest plate dissipation of 450 W. The zero-signal plate dissipation can be reduced to about 350 W by adding a noninductive resistor (30 Ω maximum, R5) to the cathode lead. This resistor provides some negative feedback, or *degeneration,* that improves the linearity somewhat, reducing the fifth-order products by about 3 dB, according to the data sheet.

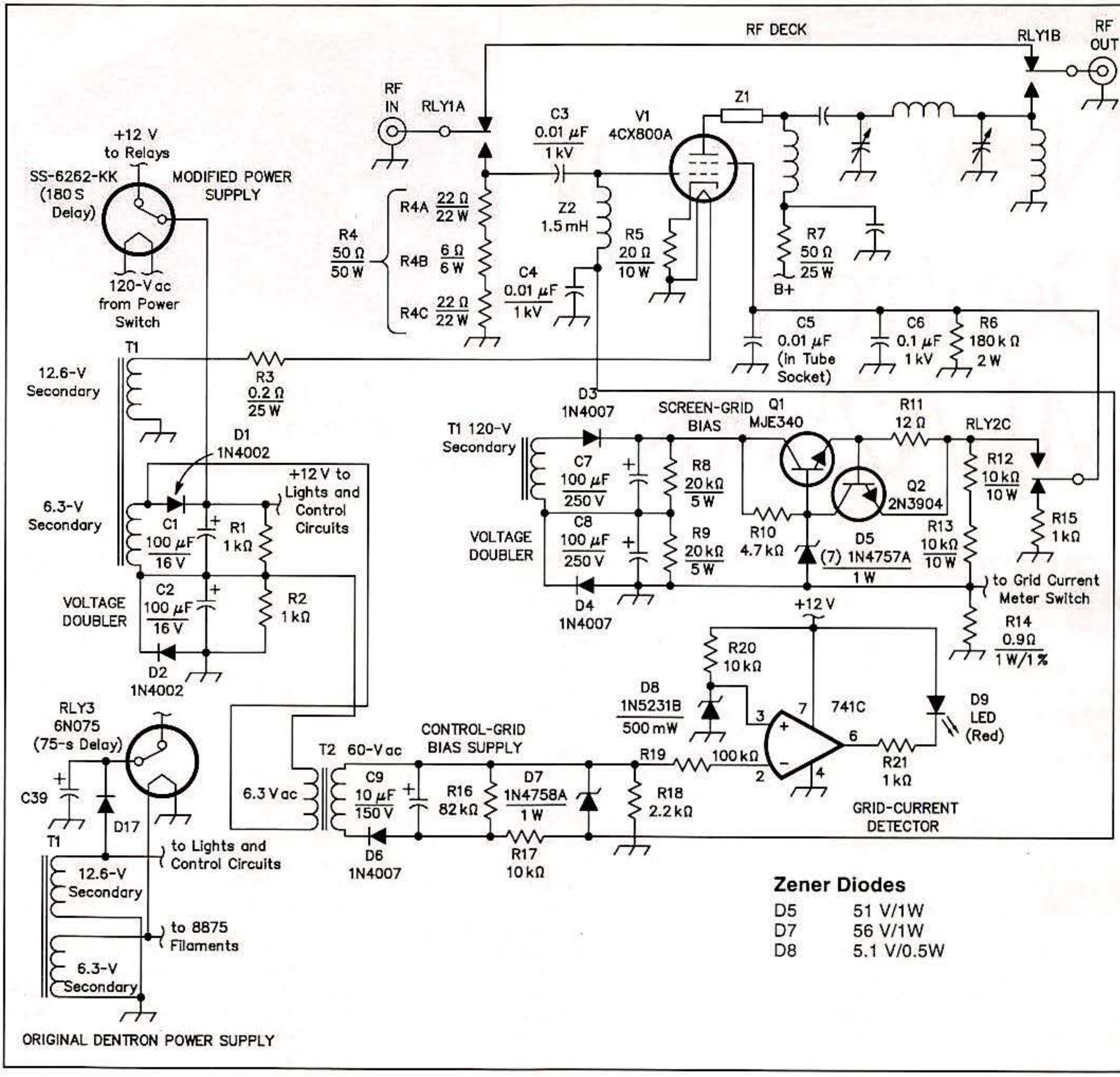
Although this project represents quite a list of modifications, none of them are difficult. If this project sounds attractive to you, write for photograph printouts and additional details that are necessary for the project.[2] (They'll help you avoid my mistakes!)

4CX800A Mounting and Cooling

First, I removed the original 8875 circuitry, both above and below the chassis deck, including the ALC PC board, PC1004. I stripped out the plate circuit: the plate connectors, the RF choke, all the way back to where the helically wrapped high-voltage line connects to the positive side of the power-supply capacitor chain. This helps to minimize the possibility of contact with *lethal* voltages during tests of the new power supplies.

There is little clearance inside the original plate compartment to mount the 4CX800A vertically, and the hole-riddled chassis deck would make cooling difficult. Therefore, I decided to mount the tube horizontally, with the socket through the back panel. (According to the specification sheet,

[1]Notes appear on page 48.



Zener Diodes

D5	51 V/1W
D7	56 V/1W
D8	5.1 V/0.5W

Figure 1—At lower left, the original Dentron heater and auxiliary power supplies. The main schematic shows the completed modifications to the Dentron MLA2500. D6 and C9 are from the original cutoff bias/ALC supply on PC1002. Unlabeled components are the original Dentron parts. Use ½-W, carbon-composition resistors unless otherwise noted.

C5—0.01-µF screen-bypass capacitor (part of the tube socket)
D5—Seven series-connected 1N4757As to total approximately +350 V
R4—50-Ω, 50-W noninductive resistor, made from three series-connected resistors: two 22-Ω, 22-W, noninductive and one 6-Ω, 6-W wirewound, see text.
R5—20-Ω, 10-W noninductive. The author used a combination of four parallel-connected 80-Ω units.
R7—50-Ω, 25-W, aluminum-body (breakdown exceeds 2500 V, available from Allied Electronics, see Note 3)
T1—Main power transformer of MLA2500.
T2—Miniature 120-V primary, 12.6-V secondary power transformer; connect 12.6-V winding to T1's 6.3-V output. T2's output should be about 60 V ac.
Z1—Parasitic suppressor: 3 t (about 0.625 inch in diameter) of 0.032×0.187-inch tinned copper strap, in parallel with three 100-Ω, 2-W composition resistors.
Z2—1.5-mH RF choke taken from Dentron PC1004 board

the tube can operate in any orientation.)

I covered the original rear-panel fan cutout with a piece of 0.050-inch aluminum sheet. (See Note 2.) A die-cast aluminum box (4.75×4.75×2 inches, Hammond 1590U or equivalent, available from Allied Electronics[3]), mounts on this cover plate. The SK1A socket mounts in a 2.9-inch-diameter hole cut in the plate and box. This box also contains the input (passive-grid) resistor and other socket-mounted components. I fitted the box lid for a 2.5-inch vacuum-cleaner hose that leads to a Dayton 4C42 squirrel-cage blower (110 cfm at 0.5 inch of water back pressure). Airflow through this box cools the grid and cathode resistors. The intake opening has no screen because the impedance (and RF voltage) is quite low inside this compartment.

I made an anode cooling chimney from a piece of PTFE (Teflon) that I picked up at a local surplus store. (Delrin and nylon are probably okay, too.) Chimney details are part of the information package listed in Note 2.

Because the lid for the cast-aluminum box is tantalizingly similar in size to the original muffin fan, and because I had obtained an exact-replacement fan (Rotron MX2A3, from Allied), I decided to mount the fan—to an adapter plate on the box—and measure the airflow through the chimney. I didn't measure the pressure difference, but because total volume through the anode cooling fins and chimney was easy to measure—by timing the inflation of a large plastic bag at the output of the chimney—I could obtain a good estimate of the fan's cooling capacity.

I was surprised and delighted to measure 15 cfm! According to the 4CX800A data sheet, this airflow is adequate for an anode dissipation of almost 600 W. Although this does not allow operation of the tube at its maximum capability, it is *plenty* for the conservative "typical operation" cited by the manufacturer! If you want to push the tube to its maximum, go with the external squirrel-cage blower. Remember, heat is the single biggest enemy of power tubes.

The main ac-power switch controls the fan. Whenever the amplifier is on, the fan runs at full speed.

Heater Voltage and Time Delay

I tried a voltage-doubler circuit to provide dc heater voltage from the 6.3-V winding, but it produced only about 11 V across the heater. (See Figure 1.) However, the DenTron power transformer (T1 in Figure 1) also has a 12-V, 4-A winding that originally provided +12 V for relays and indicator lamps—a very good match for the 4CX800A heater! In fact, it provided *more than* 12.6 V when attached to the 4CX800A heater. A trip to the local surplus electronics emporium yielded a 0.2-Ω, 25-W resistor (R3, providing a *large* safety factor), which reduces the voltage at the heater pins on the tube socket to exactly 12.6 V with the tube installed.

The original thermal time-delay relay (RLY3; an Amperite 6NO75) was activated by the appearance of 6.3 V—which accompanied the application of heater voltage to the 8875s—on the rectifier and control circuit board, PC-1002. Because it does not provide the required time delay for the 4CX800A, I removed RLY3, its 9-pin socket and associated components from PC1002. I then routed a circuit from the main 120 V ac-line switch to PC1002 and used it to activate a 120 V ac 3-minute time delay (Macromatic SS-6262-KK; from Allied Electronics, see Note 3) to switch the +12 V relay line. I removed the SS-6262 circuit from its plastic, octal-plug enclosure and mounted the circuit board directly on PC1002, where the socket for the 6NO75 had been. Modifications to this section of the original circuitry of the MLA2500 appear as the Modified Power Supply in Figure 1. I had easily solved the heater problem, and an appropriate time delay for the 4CX800A was in place, but there was a new problem. Now there was no +12 V for the control relays and indicator and meter lights!

Relay Voltage

The "missing" voltage comes from a full-wave voltage doubler. Although the 6.3-V winding didn't have enough power for the tube heater, lifting the winding's formerly grounded end from the chassis and adding a few components provides plenty of output for the relays and indicator lights. With no load, the doubler output is about +18 V. With all relays closed and lights on, the voltage is about +11.8 V. An electronic regulator could eliminate this variation, but I didn't add one because the relays and lights operate well from this supply. I mounted the voltage-doubler components on PC 1002, near the half-wave supply they replaced. Now, power for the relays and lights comes from the former heater winding, and the new heater gets power from the former relay winding. So far, so good!

Screen Power Supply

T1's 120-V winding and a half-wave rectifier provided about +180 V for cutoff bias and ALC. I lifted this winding from ground and used another full-wave voltage doubler to provide 365 V at well over 50 mA. This is adequate to supply 350 V (regulated) for the screen grid.[4] These doubler components are below the chassis, where they encounter the stream of cooling air. The regulator circuit is inside the die-cast "bias box" (a Hammond 1590C or equivalent from Allied Electronics) added to the rear of the original cabinet, on the side opposite the tube socket. Figure 1 shows the schematic for the Screen-Grid Bias regulator with over-current protection. (Remember when testing this circuit that *300+ V can be lethal!*) Details of the regulator voltage and current characteristics are in the information package mentioned in Note 2.

A spare set of contacts on RLY2 switches the screen between ground (through R15) and 350-V bias. The screen grid also returns to ground through R6, which ensures that the screen voltage doesn't soar while the relay is switching—or should the relay fail. This results in a screen voltage of zero except when the time-delay has closed and the amplifier is keyed and transmitting. The 0-V screen bias cuts off plate current, which minimizes dissipation when the amplifier is off the air.

Grid Bias Supply

The tube data sheet suggests a control-grid bias of approximately −56 V when the screen voltage is 350 V. The control-grid bias supply need not provide any significant power, because the grid current is zero under the desired operating conditions. In the Control-Grid Bias Supply, a small 120:12.6-V transformer, T2, is installed *backward*—with its secondary used as the primary—across the 6.3-V winding of T1 to produce about 60 V ac. The balance of the circuit regulates the bias at −56 V at about 3 mA. These components are inside the previously mentioned bias box that also houses the screen regulator.

Table 1
Dentron MLA2500-B/Svetlana 4CX800A Conversion Performance

Plate voltage	2200 V
Zero-signal plate current	170 mA
Single-tone plate current	550 mA
Single-tone screen current	25 mA
Zero-signal plate dissipation	370 W
Plate input power	1200 W
Plate output power	750 W

Grid Load Resistor

I obtained two 22-Ω, 22-W, noninductive resistors (R4A and R4C, from Surplus Sales of Nebraska[5]) for the passive grid load. Because of the large input capacitance of the 4CX800A (approximately 50 pF), some inductive compensation is a good idea, especially at higher frequencies. R4B, a 6-Ω, 6-W, wire-wound resistor provides this inductance and completes a 50-Ω, 50-W resistor, R4. (The wire-wound resistor is flat, with a "sandpaper" surface finish. Brown Devil resistors exhibit too much inductance.) According to my MFJ 259, the input SWR is less than 1.1:1 to beyond 35 MHz.

Metering

The original metering circuits still measure plate voltage, plate current and relative RF output. There is no need to monitor screen voltage after initial tests.

Screen-grid current is another matter, however. In tetrodes, screen current is a better indicator of resonance and tuning than is plate current, so I modified the **GRID CURRENT** switch on the front panel to select *screen*-grid current for display. When the **GRID CURRENT** switch is pressed, the meter movement is connected across R14, a 0.9-Ω, 1/2-W shunt resistor from the negative side of the screen supply to ground, and the meter indicates 0-60 mA of screen current. To read it, I just double the first two digits of the 0-3000 meter scale. Negative screen current is normal for tetrodes under some conditions, but when properly tuned, this amplifier's screen-current meter will indicate a positive value, about half-scale.

Any control-grid current quickly causes nonlinearities resulting in splatter. Therefore, an op-amp comparator and LED signal when grid current exceeds a couple of milliamperes, as detected by a voltage exceeding 5.1 V across R18, the grid-bias ground return. This circuit is the Grid-Current Detector in Figure 1. The comparator and LED take their power from the +12-V lamp supply. The comparator and LED are mounted below the chassis, with the LED extending through a hole drilled at the lower right of the front panel, at the letter O in RADIO.

Plate Tank Circuit

Now let's rewire the high-voltage circuits. First, mount R7 on the underside of the chassis deck, where it gets some cooling airflow. Then mount the plate RF choke about 1.5 inches toward the side wall from its original position, and hook up the plate circuit with the spiral-wrapped wire removed earlier. Don't forget to reinstall the bypass capacitor at the dc-supply end of the RF choke.

The caption of Figure 1 describes the plate parasitic supressor, Z1. Connect Z1 between the top of the plate RF choke and the anode connector.

Socket Circuitry

Wires to provide RF (control-grid) drive and heater, grid and screen voltages pass from other locations in the amplifier through a single rear-panel hole to the socket. The same piece of RG-58 coax used to drive the 8875 cathodes drives the 4CX800A grid.

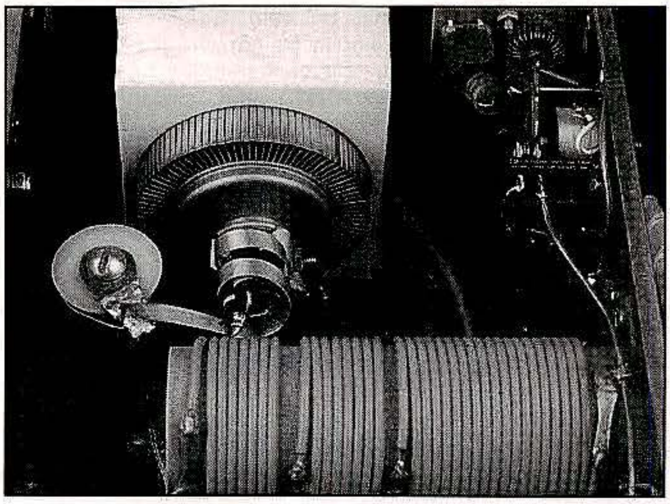
Testing, Tuning, and Operation

Attach an 800-W dummy antenna to the output and a 60-W driver to the input. Make sure the driver and amplifier are set to the same band, and set the drive to *zero*. Adjust the loading capacitor for heavy loading (*ie*, capacitor plates nearly unmeshed). With the amplifier switched on, with heater and plate voltages applied, but with the screen at 0 V and the control grid at –56 V, the plate, screen and grid currents should all be zero.

After three minutes, the time-delay relay trips. If there's no smoke yet, insert a shorted phone plug into the **RELAY** jack on the back panel to close the TR switch and activate RLY2. Plate current should be between 150 and 200 mA, screen current should indicate about –5 mA, that is, just off-scale to the left, and there should be no power output. On each band, slowly sweep a full rotation of the plate tuning knob to verify that the amplifier is, in fact, working as an amplifier with no drive (no output), not as an oscillator. If you've exercised reasonable care in assembly—*ie*, minimum lead lengths and cleanly dressed wire paths—the amplifier should require no neutralization.

When you've made it this far, things should be fine! Slowly increase the drive until you see the screen current change. (It will take 20 W or more, because you're driving that big 50-W resistor, not just the grid!) Now tune the plate to *resonance*, as indicated by a *peak in screen current*. In small increments, increase the drive, re-adjust loading and resonate the plate circuit—watching *screen* current to do this! If the screen current exceeds 30 mA at resonance, increase loading and/or reduce drive. When you get about 550 to 600 mA of plate current accompanied by about 25 mA of screen current, you're done! Record the settings, reset the amplifier (heavy loading) and driver controls and repeat the initial tuning procedure for each band.

Your born-again Dentron MLA2500 should now be set up for optimal performance. Remember, when tuning a tetrode, plate current increases with drive; the screen grid current peaks at resonance and decreases with loading. Note that you ***don't*** tune the amplifier for maximum power output. Rather, you're aiming for the set of published conditions, which gives optimum linearity. If you duplicate the conditions suggested in the data sheet, the amplifier should be very linear and need no ALC, as long as the control-grid draws no current.



Where it's at! The 4CX800A in its chimney. Z1 obscures the tube anode here. The plate choke is on the left and the tank inductor in front. The spiral-wrapped high-voltage lead shows between the interior bulkhead and T1 (right).

I've found that the amplifier's drive requirement lessens at higher frequencies. This probably happens because the cathode-to-heater capacitance begins to serve as a cathode bypass, reducing cathode degeneration. This should not be a problem, but remember it, to prevent overdriving the amplifier on 15 and 10 meters.

With about 60 W PEP of drive (heating the grid resistor!) you should have the performance summarized in Table 1, and the tube should last "forever" under these conditions! Before switching the amplifier off after use, leave it in standby condition for about three minutes. The fan cools the tube very nicely in that time.

Acknowledgments

I would like to thank George Badger, W6TC, and Bob Alper, W4OIW, for their support and encouragement.

Notes

[1]The 4CX800A, socket and anode connector are produced by Svetlana. The 4CX800A technical data sheet and list of stocking distributors is available from Svelana Electron Devices Inc, 3000 Alpine Rd, Portola Valley, CA 94028; tel 800-5-Svetlana or 415-233-0429, fax 415-233-0439. Web site: **http://www.svetlana.com/**

[2]Write to the Technical Secretary at ARRL Headquarters and ask for the MLA2500/4CX800A Conversion package from May 1996 *QST*. The package includes builder's details, ARRL Lab test data (spurious emissions and intermodulation distortion) for all nine HF bands and several photo printouts of the author's modified amplifier. ARRL members send $5 (nonmembers, $7.50) for this postpaid package of about 15 double-sided copies. You can download the package (about 1 MB of text and JPG images) from the ARRL "Hiram" BBS (tel 860-594-0306), or the ARRL Internet ftp site: **oak.oakland.edu** (in the **pub/hamradio/arrl/qst-binaries** directory). In either case, look for the file MLA2500B.ZIP.

[3]Allied Electronics, 7410 Pebble Dr, Fort Worth, TX 76118; tel 800-433-5700, 817-595-3500, fax 817-595-6444, e-mail: **ftw$manager@allied.avnet.com** Web site: **http://www.allied.avnet.com/**

[4]Although the Dentron schematic labels this winding "120 V" its output is about 140 V, which provides sufficient overhead for screen regulation.

[5]Surplus Sales of Nebraska, 1502 Jones St, Omaha, NE, 68102; tel 800-244-4567, fax 402-346-2939.

As a young teenager, George became interested in Amateur Radio, and while he was in the Air Force, Uncle Sam trained him as a radio operator. He was first licensed (General class) as K9KDE in 1957, upgraded to Advanced class (WB6AIG) soon after moving to California in 1961, and, to Extra Class in 1993. He holds BS and MS degrees in Physics, and has previously published articles in QST *and other Amateur Radio journals. He worked in the semiconductor industry in Silicon Valley in the early '60s and has done medical research on the dynamics of the heart for the past 30 years. You can write to George at 1560 Klamath Dr, Sunnyvale, CA 94087; or e-mail him at:* **g.daught@forsythe.stanford.edu**

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Feedback

◊ ARRL Technical Information Coordinator, Mike Tracy, KC1SX, has noted corrections for "An In-Room 80-Meter Transmitting Multiturn Loop Antenna" that appears on pages 43 to 46 of the February 1996 *QST*. With regard to C1, the text should read "The fixed plates are connected to the upper end of L1 . . ." In Figure 1, the words "Stator" and "Rotor" should be transposed.

Author Wally Erikson, WB0LPB, points out an error in Figure 3 of the February 1996 Hints & Kinks column. The PC board on the left side of the figure should be labeled "IF Unit in Rear Half of Case."

Bruce, AA6KX, has discovered an error in "Cure for the 'Missing First Dot Problem' . . ." on page 84 of the November, 1995 *QST*. Figure 3 shows incorrect pin numbers for the 4N35 optoisolator. Each pin labeled "6" in Figure 3 should be labeled "4". QST