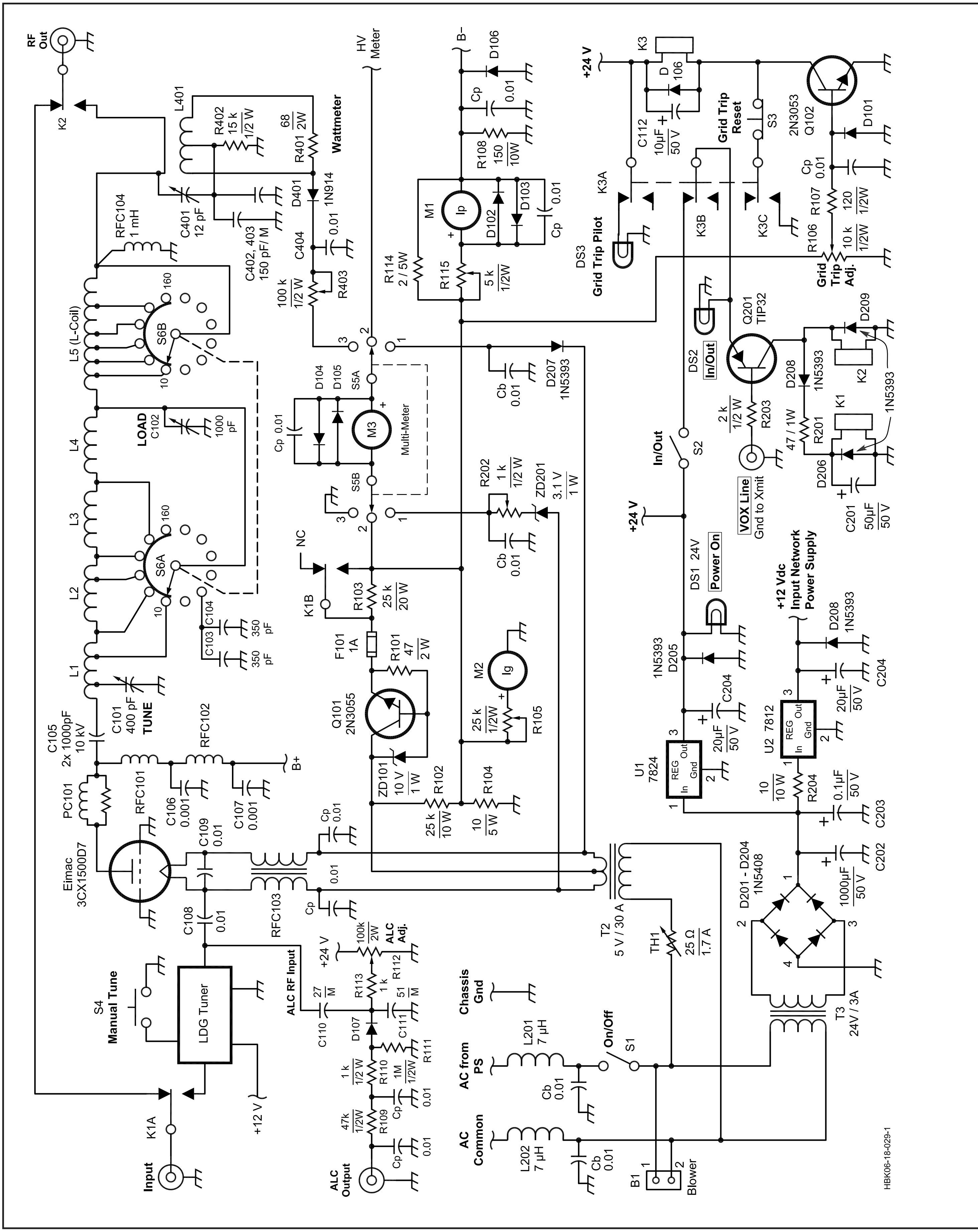

RF Out
K2
L401
R402 15 k 1/2 W
R401 68 2W
Wattmeter
D401 1N914
C401 12 pF
C402, 403 150 pF/M
C404 0.01
R403 100 k 1/2 W
RFC104 1 mH
L5 (L-Coil)
S6B
LOAD C102 1000 pF
L4
L3
L2
L1
S6A
C103 350 pF
C104 350 pF
C101 400 pF TUNE
C105 2x 1000pF 10 kV
RFC102
B+
RFC101
PC101
C106 0.001
C107 0.001
C109 0.01
Eimac 3CX1500D7
C108 0.01
RFC103
LDG Tuner
S4 Manual Tune
+12 V
K1A
Input
HV Meter
B–
D106
R108 150 10W
M1 Ip
D102
D103
R114 2 / 5W
R115 5 k 1/2W
M3 Multi-Meter
D104
D105
S5A
S5B
D207 1N5393
NC
K1B
R103 25 k 20 W
F101 1A
R101 47 2 W
Q101 2N3055
ZD101 10 V 1 W
R102 25 k 10 W
R104 10 5 W
M2 Ig
R105 25 k 1/2W
R202 1 k 1/2 W
ZD201 3.1 V 1 W
ALC RF Input
ALC Adj.
R112 100k 2W
R113 1 k
C110 27 M
C111 51 M
D107
R110 1 k 1/2 W
R111 1M 1/2W
R109 47k 1/2W
ALC Output
Chassis Gnd
AC from PS
L201 7 µH
AC Common
L202 7 µH
On/Off S1
B1 Blower
T2 5 V / 30 A
TH1 25 Ω 1.7 A
+24 V
K3
D106
C112 10µF 50 V
Grid Trip Reset
S3
2N3053 Q102
D101
R107 120 1/2W
R106 10 k 1/2W
Grid Trip Adj.
K3A
K3B
K3C
DS3 Grid Trip Pilot
DS2 In/Out
Q201 TIP32
D209
D208 1N5393
K2
R203 2 k 1/2 W
R201 47 / 1W
K1
1N5393
D206
C201 50µF 50 V
VOX Line Gnd to Xmit
In/Out S2
DS1 24V Power On
D205 1N5393
U1 7824
C204 20µF 50 V
U2 7812
+12 Vdc Input Network Power Supply
R204 10 10 W
C203 0.1µF 50 V
C202 1000µF 50 V
D201 - D204 1N5408
T3 24V / 3A
HBK06-18-029-1

Fig 18.29—disc ceramic.
B1—Dayton 4C763 squirrel-cage blower.
Cb, Cp—0.01 mF, 1 kV Jennings vacuum variable, UCSL-400.
C101—400 pF, 10 kV Schematic of the RF deck and control circuitry.
C102—1000 pF, 5 kV Jennings vacuum variable, UCSL-1000.
C103, C104—350 pF, 5 kV ceramic doorknob.
C105—two parallel 1000 pF, 10 kV ceramic doorknob capacitors (Ukrainian mfg).
C106, C107—0.001 µF, 7.5 kV disc ceramic.
C108, C109—0.01 µF, 3 kV transmitting mica (1 kV disc ceramics can be used).
C401—12 pF piston trimmer.
C403, C403—150 pF silver mica.
D101, D107, D205-D209—1N5393 (200 V, 1.5 A).
D102-D106, D201-D204—1N5408 (1 kV, 3 A).
K1—4PDT, 24 V dc KHP style (gold contacts).
K2—SPST vacuum relay, Kilovac H8/S4.
K3—4PDT, 24 V dc KHP style (gold contacts).
L1-L5—See Table 1.
L201, L202—Line chokes, 7 µH.
L401—24 t #22 enamel wire, center tapped on T50-6 core.
M1-M3—Simpson Designer Series, Model 523, 1 mA movement.
PC101—2 t 3/4-inch diameter × 2-inch long, 1/2-inch brass strap with two 150 Ω, 2 W non-inductive carbon resistors in parallel.
Q101—2N3055 TO-220 case on heat sink.
Q102—2N3053 TO-18 case.
R103—25 kΩ, 25 W wire-wound.
R104—10 Ω, 5 W.
R108—150 Ω, 10 W wire-wound.
R112—100 kΩ, 2 W potentiometer
R403—100 kΩ, 0.5 W trim pot.
RFC101—90 µH, 3 A Plate Choke, Peter W. Dahl p/n CKRF000100, www.pwdahl.com.
RFC102—14 t #18 enamel wire wound on 100 Ω, 2 W resistor.
RFC103—Bifilar 30 A filament choke, Peter W. Dahl p/n CKRF000080, www.pwdahl.com.
RFC104—1 mH, 300 mA RF choke.
S1-S2—Alco 164TL5 DPDT switch (only SPST contacts are used), www.alliedelec.com/.
S3-S4—Alco 164TL2 momentary DPDT (only SPST contacts are used; S3 wired as normally closed, S4 as normally open), www.alliedelec.com/.
S5—2 pole, 3 position rotary switch.
S6—RadioSwitch model 86, double-pole 12-position (30° indexing) with 6-finger wiper on each deck, p/n R862R1130001, www.multi-tech-industries.com.
T2—5 V, 30 A center-tapped transformer, Peter W. Dahl EI-150 × 1.5 core, primary 115/230 V ac, www.pwdahl.com.
TH1—Thermistor, Thermometrics CL-200 (Mouser 527-CL200).
ZD101—10 V, 1 W Zener 1N4740A.
ZD201—3.1 V, 1 W Zener.
Other parts:
Cabinet—Buckeye Shapeform DSC-1054-16 (10×17×16-inch H×W×D), www.buckeyeshapeform.com.
Chimney (Teflon)—A. Howell, KB8JCY, PO Box 5842, Youngstown, OH 44504.
LDG Tuner—AT-100AMP autotuner, available only online, www.ldgelectronics.com.
Tube socket—Eimac SK-410.

Table 18.7
Pi-L Component Values

Frequency (MHz)	*C1 (pF)*	*C2 pF*	*L1 µH*	*L2 µH*	*Q*
1.850	211	1262	44.3	9.6	12
3.700	105	631	22.2	4.8	12
7.150	65	364	9.7	2.5	14
14.150	33	184	4.9	1.26	14
18.100	45	208	2.23	0.98	23
21.200	33	159	2.21	0.84	20
24.900	36	161	1.48	0.71	25
28.250	29	133	1.43	0.63	23

Tank Circuit Coils

Coil	*Band*	*Inductance*	*Construction*
L1	10/12-15/17 m	2.3 µH	7 1/2 t, 1/4-in. copper tube, 2-in. ID silver-plated 10/12-m tap @ 3 1/2 t 15/17-m tap @ 7 1/2 t
L2	20-40 m	7.4 µH	19 t, 3/16-in. copper tube, 2-in. ID silver plated 20 tap @ 8 t 40 tap @ 19 t
L3	80 m	12.4 µH	17 t on 3×T225-2 cores, #10 Teflon silver wire
L4	160 m	22.0 µH	23 t on 3×T300-2 cores, #10 Teflon silver wire
L5	L-Coil	9.6 µH	19 t on 2×T225-2 cores, #12 tinned wire w/Teflon sleeve 10/12-m tap @ 2 t 15/17-m tap @ 4 t 20-m tap @ 5 t 40-m tap @ 7 t 80-m tap @ 12 t 160-m tap @ 19 t

has a 5-V/30-A filament and a maximum plate dissipation of 1500W, compared to the 1000-W dissipation for a pair of 3-500Zs. The 3CX1500D7 uses the popular Eimac SK510 socket and requires forced air through the anode for cooling. The amplifier uses a conventional grounded-grid design with an adjustable grid-trip protection circuit. See the RF Deck schematic in **Fig 18.29**.

Output impedance matching is accomplished using a pi-L tank circuit for good harmonic suppression. The 10 to 40-meter coils are hand wound from copper tubing, and they are silver plated for efficiency. Toroids are used for the 80- and 160-meter coils for compactness. The amplifier incorporates a heavy-duty shorting-type bandswitch. Vacuum variable capacitors are used for pi-L tuning and loading.

A unique feature of this amplifier is the use of a commercial computer-controlled input network module from LDG Electronics (**www.ldgelectronics.com**). This greatly simplifies the amplifier design by eliminating the need for complex ganged switches and sometimes frustrating setup adjustments. The computer-controlled input network is reasonably priced and basically plug-and-play.

An adjustable ALC circuit is also included to control excess drive power. The amplifier metering circuits allow simultaneous monitoring of plate current, grid current, and a choice of RF output, plate voltage or filament voltage.

The blower was sized to allow full 1500-watt plate dissipation (65 cfm at 0.45 inches H_2O hydrostatic backpressure). The design provides for blower mounting on the rear of the RF deck or optionally in a remote location to reduce ambient blower noise in the shack.

The power supply is built in a separate cabinet with casters and is connected to the RF deck using a 6-conductor control cable, with a separate high voltage (HV) cable. The power transformer has multiple primary taps (220/230/240 V ac) and multiple secondary taps (2300/2700/3100 V ac). No-load HV ranges can be selected from 3200 to 4600 V dc using different primary-secondary combinations. The amplifier is designed to run at 4000 V dc under load to maintain a reasonable plate resistance and component size. A step-start circuit is included to protect against current surge at turn on that can damage the diode bank. The power supply schematic is shown in **Fig 18.30** and a photo of the inside of the power supply is shown in **Fig 18.31**.

Both +12-V and +24-V regulated power supplies are included in the power supply. The +12 V is required for the computer-con-

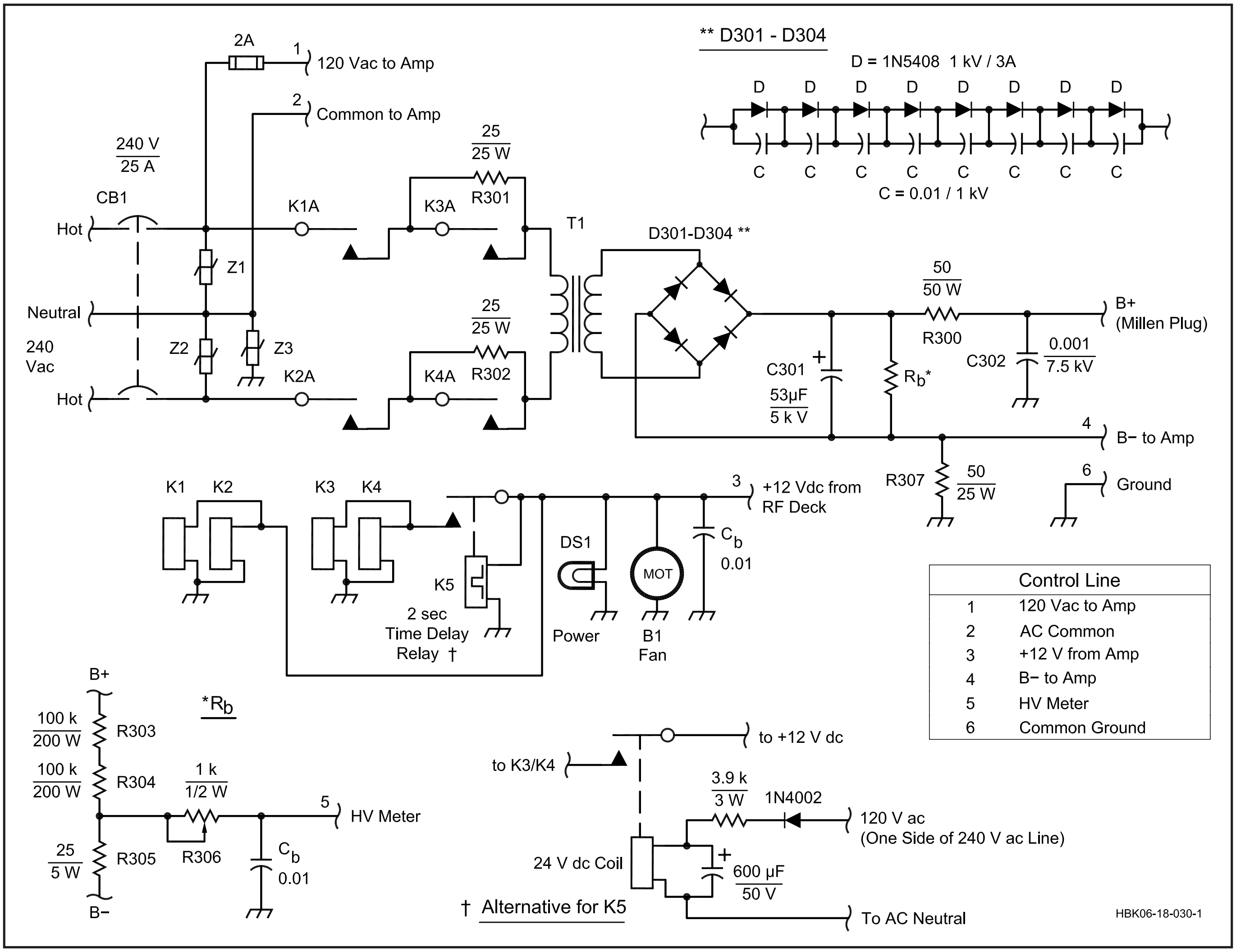

Fig 18.30—Schematic for power supply for 3CX1500D7 amplifier. For Peter W. Dahl parts, see www.pwdahl.com.

B1—12 V dc brushless fan, 2-1/4 inch (Mouser 432-31432).
DS1—12 V dc pilot lamp (Alco 164-TZ).
Cb—0.01 µF, 1 kV disc ceramic bypass capacitor.
C301—53 µF, 5 kV oil-filled (Peter W. Dahl p/n CDCF007100).
CB1—2 pole 25 A, 240 V circuit breaker.
K1-K4—SPST solid-state relay 240 V ac, 25 A line voltage with 12 V dc input (the author used surplus Crydom relays but a readily available substitute is the Tyco/P&B SSR-240D25R).
K5—2 second trimpot time delay relay (surplus Bourns 3900H-1-125 or equiv; or FTD-12N03 3 second glass timer relay from Surplus Sales of Nebraska). Note: This part may be difficult to find. You can build the equivalent from a 24 V dc SPST relay, diode, resistor and capacitor as shown in the drawing inset. This technique is borrowed from the K6GT HV supply shown later in this chapter (Fig 18.35).
R303, R304—100 kΩ, 200 W wirewound resistor (Peter W. Dahl p/n RP002000).
T1—Plate transformer, primary 220/230/240 V; secondary 2300/2700/3100 V at 1.5 A CCS (Peter W. Dahl Co).
Z1-Z3—130 V MOV.
Cabinet—Buckeye Shapeform DSC-1204-16 (12×18×16 inches HWD), www.buckeyeshapeform.com.

trolled input network and +24 V is needed for the output vacuum relay. The input and output relays are time sequenced to avoid amplifier drive without a 50-Ω load. Relay actuation from the exciter uses a low-voltage/low-current circuit to accommodate the amplifier switching constraints imposed by many new solid-state radios.

Much thought was put into the physical appearance of the amplifier. The goal was to obtain a unit that looks commercial and that would look good sitting on the operating table. To accomplish the desired look, commercial cabinets were used. Not only does this help obtain a professional look but it eliminates a large amount of the metal work required in construction. Careful attention was taken making custom meter scales and cabinet labeling. The results are evident in the pictures provided.

GENERAL CONSTRUCTION NOTES

The amplifier was constructed using basic shop tools and does not require access to a sophisticated metal shop or electronics test bench. Basic tools included a band saw, a jig saw capable of cutting thin aluminum sheet, a drill press and common hand tools. Some skill in using tools is needed to obtain good results and insure safety, but most people can accomplish this project with careful planning and diligence.

Metal work can be a laborious activity. Building cabinets is an art within itself. This part of the project can be greatly simplified by using commercial cabinets. However, commercial cabinets are expensive (~$250 each) and could be a place where some dollars could be saved.

The amplifier is built in modules. This breaks the project into logical steps and facilitates testing the circuits along the way. For example, modules include the HV power supply, LV power supply, input network, control circuits, tank circuit and wattmeter.