

DTR-2000L

LINEAR AMPLIFIER

Denton RADIO CO

Introduction

The DenTron DTR-2000L Linear Amplifier is a conservatively designed 2000 Watt PEP 160-15 meter amplifier of unique design. Through years of designing linear amplifiers, DenTron Radio has greatly simplified the circuitry of the DTR-2000L, building in years of reliability based on the experience of our world-famous MLA-2500 series. The incorporation of a single 8877 (a tube till now used almost exclusively in broadcasting applications) makes the DTR-2000L a no-compromise unit featuring the most powerful final tube rating allowed under current FCC regulations . . . 1500 Watts plate dissipation!

The DTR-2000L has been fully tested at the maximum legal Amateur power limit on all modes; SSB, CW, SSTV, RTTY, as well as under contest conditions. The unit covers all the Amateur Bands from 1.8 to 21.450 MHz, along with most MARS operating frequencies, without modifications. With factory modifications, the DTR-2000L will operate on any frequency from 1.8 to 35 MHz, strictly for commercial applications.

A single 8877 external anode ceramic metal triode is used in the DTR-2000L, operating in grounded grid. A built-in continuous duty power supply completes the unit, capable of either 117V or 234V operation, although 234V line voltage is recommended. Cooling of the unit is accomplished through an EIMAC specified pressurized chamber and chimney. A vacuum impregnated power transformer, hi-lo power switching, dual meters for monitoring plate voltage and current, and modular construction complete the DTR-2000L package.

Please be certain to completely read this manual before operating your new DTR-2000L.

U. S. Amateur regulations limit the use of high powered amplifiers such as the DTR-2000L to licensees of General Class or higher.

Theory of Operation

After the DTR-2000L is hooked up to an AC power source and turned on, power is applied to the power transformer. This applies power to the Amperite tube which keeps the unit from being keyed for 3 minutes. Also, power is supplied to the B+ and 12 volt sections of the unit. The B+ section is a standard voltage doubler, the only difference being that the transformer has a tap for SSB which is highest voltage and CW which is about 30% less. These two voltages are selected from relay K2. Relay K2 also selects the appropriate zener diode for SSB or CW operation.

Plate current is measured across B- to ground through R18, voltage is measured through R6, R7, R8, and R9 to ground. SSB is about 2700V DC and CW is about 1800V DC.

After the ready lamp is lit, control of the unit is accomplished through the standby switch on the front panel. A path to ground is required for keying the amplifier.

Signal is applied to J2 and passes to J1 through K1, if the unit is in standby. If the unit is out of standby, signal goes from J2 through FL-1 (matching device) to J5 on the tube box. Now, the signal goes through two .01 disc ceramic capacitors (C6 & C7) to cathode of the 8877 tube. Cathode bias is controlled by R1 in standby, or D2 or D3 depending whether you're operating SSB or CW. CW is 24 volt zener, SSB is 8.9 volt zener. This is done through K1 and K2 relays.

The grids of the 8877 tube are grounded directly through clips mounted inside the tube box. Output of the 8877 tube passes through a parasitic choke to C15. B+ is applied to tube through a two stage plate choke circuit (RFC2, RFC3, C13, and C14). Amplified signal goes to a highly efficient pi-network tank circuit consisting of C18, L1, L2, and C21. There is only added capacitance on the tune and load controls for 160 meter operation.

ALC is obtained from the cathode of the 8877 tube through C8 and C9. The polarity of the ALC circuit is set by D1. As shown in the schematic, ALC is negative going in the DTR-2000L. If positive ALC is required, reverse diode D1.

Warning

IF ANY PROBLEMS OCCUR THAT ARE NOT EASILY REPAIRED IN THE FIELD, PLEASE CONTACT DENTRON RADIO COMPANY FOR TECHNICAL ASSISTANCE.

Specifications

Frequency Ranges:

| | |
|----------------|-------------------|
| 160 Meter Band | 1.8 - 2.5 MHz |
| 80 Meter Band | 3.45 - 4.6 MHz |
| 40 Meter Band | 6.00 - 9.0 MHz |
| 20 Meter Band | 11.00 - 16.00 MHz |
| 15 Meter Band | 20.95 - 23.50 MHz |

The DTR-2000L will cover most MARS frequencies just outside the Amateur Bands. (With proper FL1 and band switch modification, the unit will also cover the 10 meter amateur band.)

Modes: USB, LSB, CW, RTTY, SSTV

Power Requirements: 234/117 VAC 50/60 Hz

RF Drive Power: 125 Watts maximum, and 65 Watts RMS minimum for 1 KW DC input.

DC Plate Voltage: SSB (Idle + 2500V approximate)

CW (Idle + 1800V approximate)

Duty Cycle: 100% SSB, CW, RTTY, SSTV

Input Impedance: 50 Ohms nominal

Input VSWR: 1.5 to 1 average

Output Impedance: 50 Ohms nominal

Antenna load VSWR: 3 to 1 maximum

ALC: negative going, adjustable from rear panel.

Spurious Emissions: IMD - greater than 30 db down

Harmonics - greater than 40 db down

FCC Type Accepted

Size: H 7¼" x W 14½" x D 14½"

Weight: (including 8877) 54 pounds

Warning

TO TAKE FULL ADVANTAGE OF THE DTR-2000L COOLING SYSTEM, IT IS HIGHLY RECOMMENDED THAT THE UNIT BE RAISED UP WITH THE PROVIDED BAIL UNDER NORMAL OPERATING CONDITIONS.

Cautions

1. Make no attempt to put the DTR-2000L in service outside of the cabinet. Contact with voltages in this Amplifier can be *fatal to the human body*.
2. Never attempt to operate the DTR-2000L with drive power of more than 125 Watts!
3. Never attempt to operate the DTR-2000L without first connecting it to an antenna with an SWR of less than 3:1, or a 50 Ohm dummy load of sufficient power handling capacity or serious damage may result to the amplifier.
4. Do not, under any circumstances, operate the DTR-2000L from a 117V lighting circuit because the circuit conductors are not large enough to safely carry this load.
5. Never run Amplifier from an extension cord.
6. Do not attempt to change jumper connections on back of the Amplifier without first removing power plug from the DTR-2000L.
7. Do not cover the top of the DTR-2000L with books, papers or other pieces of equipment or overheating may result.
8. Do not use different tuning procedures other than indicated in this manual.
9. When cleaning the DTR-2000L, never blow high pressure air directly into the fan blades. Spinning the fan at higher speeds than it was designed for can cause damage and freeze the rotor assembly of the fan. Use brush in cleaning fan assembly.

Warning

DO NOT SHIP YOUR UNIT WITH THE 8877 TUBE INSTALLED. BE CERTAIN TO PACK THE 8877 TUBE SEPARATELY.

Operating Features

1. Continuous monitoring of D.C. plate voltage and D.C. plate current via two front panel meters.
2. Standby/operate switch.
3. CW/SSB power switch to provide maximum operating efficiency at 1 KW and 2 KW PEP input to amplifier.
4. Mandatory 3 minute warmup for long tube life.
5. 8877 EIMAC triode rated at 1500 Watts dissipation, yields a comfortable safety margin and insures maximum tube life.

Unpacking Instructions

Carefully remove your DTR-2000L from its packing carton. Make sure there is no damage from shipping. If there is any evidence of damage, notify the delivering shipper, fully describing the damage.

Fill out the DenTron Registration Card included in the information package and return it to DenTron. Do not destroy the packing material since it will be usable later should you require factory service or wish to transport the amplifier for any other reason.

In general, the location of your DTR-2000L is not critical as long as you make sure that there is adequate air flow at the back, top and sides of the case. Fresh cool air enters from the back, through the fan, and exhaust through the top and sides of the cabinet.

Warning

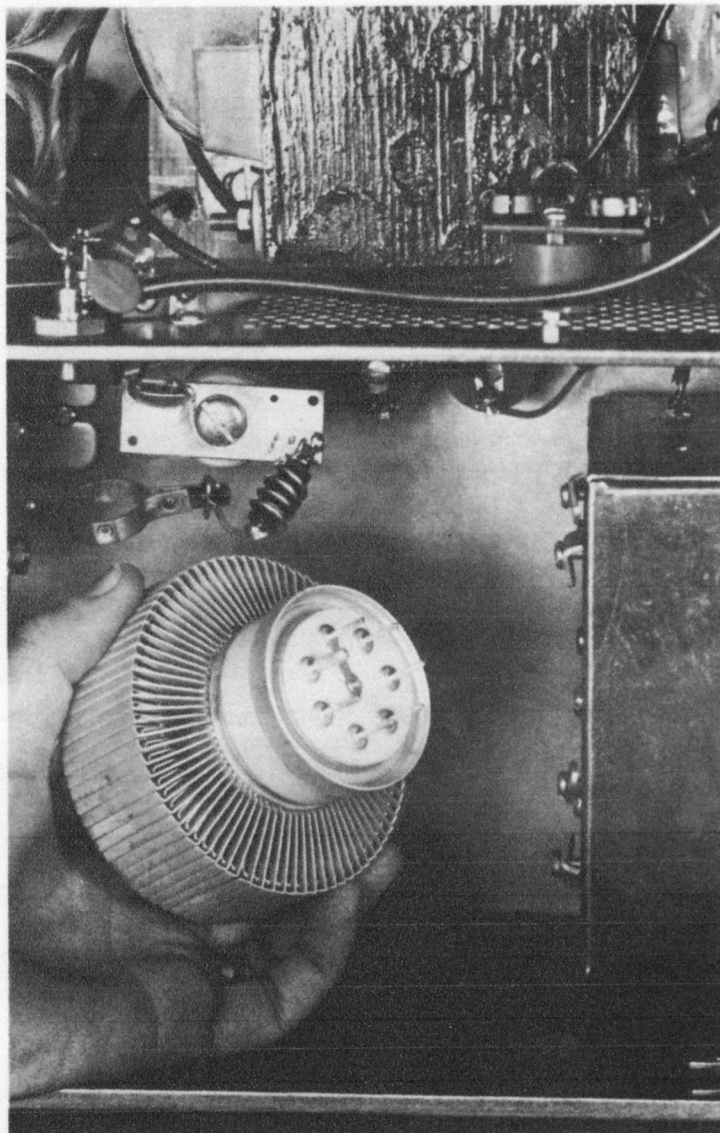
MAKE NO ATTEMPT TO PUT THE AMPLIFIER IN SERVICE OUTSIDE OF THE CABINET! CONTACT WITH VOLTAGES IN THIS AMPLIFIER CAN BE FATAL!

Tube Installation

Warning

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1. Make sure that the AC power cord is not plugged into an AC source before going on.
2. Remove the top cover of the DTR-2000L with three screws on both upper sides.
3. Unpack the 8877 tube and inspect it, making sure all pins are straight and there is no shipping damage.
4. Align the 8877 pins with the tube socket (with the large pin oriented nearly straight up) and carefully insert. If too much resistance is felt remove the tube and check for bent pins.
5. After mounting the 8877 in its socket, inspect the teflon chimney and mounts to make sure they are mounted solidly.
6. Install the plate cap connector and carefully tighten the clamp screw. (Caution: Do not overtighten).
7. Unpack and inspect the Amperite time delay relay.
8. Align the time delay tube pins with the socket and carefully insert.
9. Reinstall the DTR-2000L top cover and proceed to the next set of instructions.



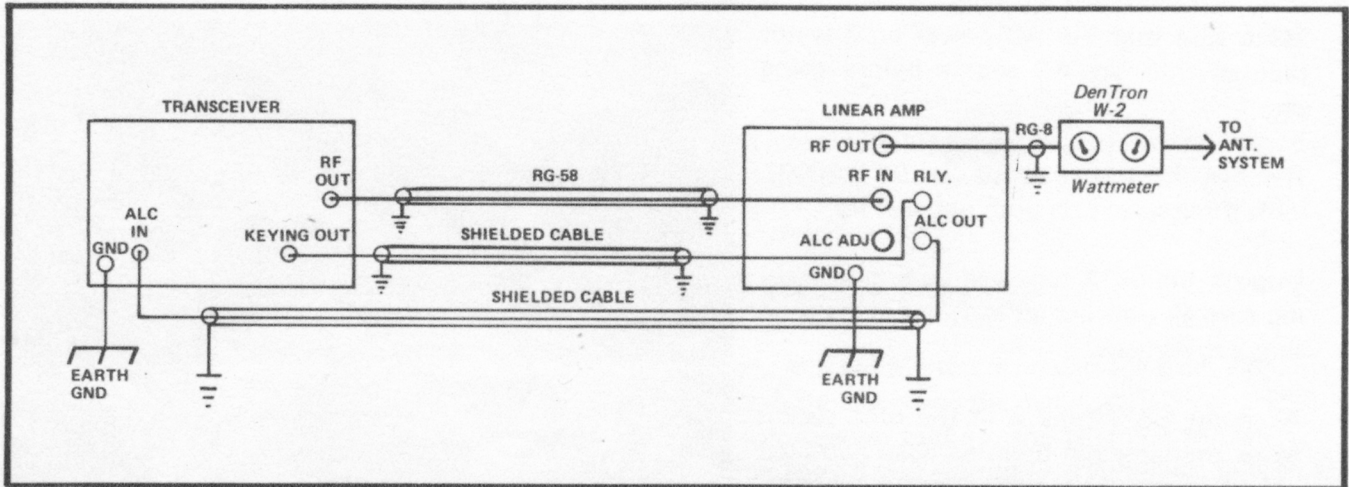
Warning

NEVER ATTEMPT TO OPERATE THE[®] DTR-2000L WITHOUT FIRST CONNECTING IT TO AN ANTENNA OR 50 OHM DUMMY LOAD OF SUFFICIENT POWER HANDLING CAPACITY OR SERIOUS DAMAGE MAY RESULT TO THE AMPLIFIER!

Installation Instructions - Tune-up Procedures

The DTR-2000L is factory wired to operate from 234 AC nominal at 15 amps. If 117AC is used, you will have to rewire the terminal block per the schematic diagram and install a 30 AMP 250 V fuse. See the DTR-2000L Schematic for attaching a plug to the line cord.

117 VAC operation is not recommended unless you have an independent 117 V line with at least a 30 AMP breaker or fuse in the service box. For 117VAC change-over, see page 8.



1. Position the DTR-2000L in such a way that the rear, sides, and top of the unit are clear of all obstructions. This will assure adequate air circulation, which is a must.
2. Connect a known 50 Ohm load to the antenna jack using RG8 or equivalent type coax. (The safest load is the DenTron Big Dummy, etc.)
3. Connect the DTR-2000L keying lead to your transmitter using shielded cables (See your Transmitter Owner's Manual).
4. Connect the R.F. input jack to the transmitter output using 50 Ohm coax cable.
5. Connect the DTR-2000L ALC output to the transmitter ALC input using shielded cable. (Check your Transmitter Manual to make sure that it is compatible with negative going ALC.)

6. Position the DTR-2000L front panel switches as follows:

PWR – OFF
STDBY/OPERATE – STANDBY
CW/SSB – CW

7. Insert the AC plug on the DTR-2000L power cord, into the appropriate AC outlet.
8. Turn the main power switch "on". Plate voltage should read approximately 1800 V DC on meter!
9. Allow approximately 3 minutes and the ready light will come on indicating that the DTR-2000L is ready to tune.

FROM THIS POINT ON, EXERCISE CARE AND FOLLOW THE PROCEDURES CAREFULLY.

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1. (160 M through 40 M) Set the load control at 1 on the scale.
(20 M through 15 M) use 3 on the load scale.
2. Set the tune control and band switch to the band being tuned.
3. Tune exciter to your input power that is normally used! Now decrease output of exciter to achieve 50 Watts. (Use carrier drive control!)
4. Tune DTR-2000L for maximum output in CW position on a wattmeter such as the DenTron W-2 Wattmeter. 1 KW DC input will not be achieved at this point. Increase drive level control and retune amplifier until 1 KW DC input is achieved.

NOTE: Check the position of the CW/SSB switch to make sure it is in the CW position.

5. Recheck DTR-2000L tuning and exciter tuning, using the following example:

(Current x Voltage = Power)

Ex.: 1500 x .666 ma = 1000 Watts DC input

6. When you have completed Step V and reached the 1 KW DC input level, unkey the transmitter. The DTR-2000L will be delivering approximately 600 Watts of power out.
7. For SSB operation you need only put the CW/SSB switch in the SSB position, and select proper sideband on your exciter.

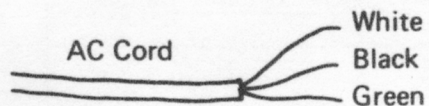
NOTE: For best efficiency and lowest distortion you should load your transmitter as heavily as you normally would and retune the DTR-2000L to maintain 1 KW input.

The DTR-2000L will accept up to 125 Watts PEP of drive without distorting or generating unwanted outputs.

Remember: 1 KW is the legal input power limit!!!

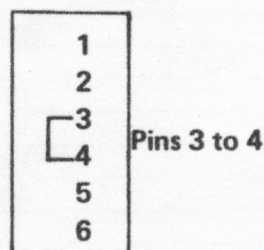
Warning

NEVER OPERATE THE DTR-2000L IN SSB WITH SWITCH IN CW POSITION. FOR RTTY AND SSTV USE DTR-2000L IN SSB POSITION ONLY WITH APPROXIMATELY 600 WATTS OUTPUT, NO MORE!!

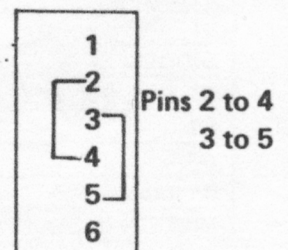


White = 1 side of 234V (117V)
Black = other side of 234V (117V)
Green = Ground

234 Volt Operation



117 Volt Operation

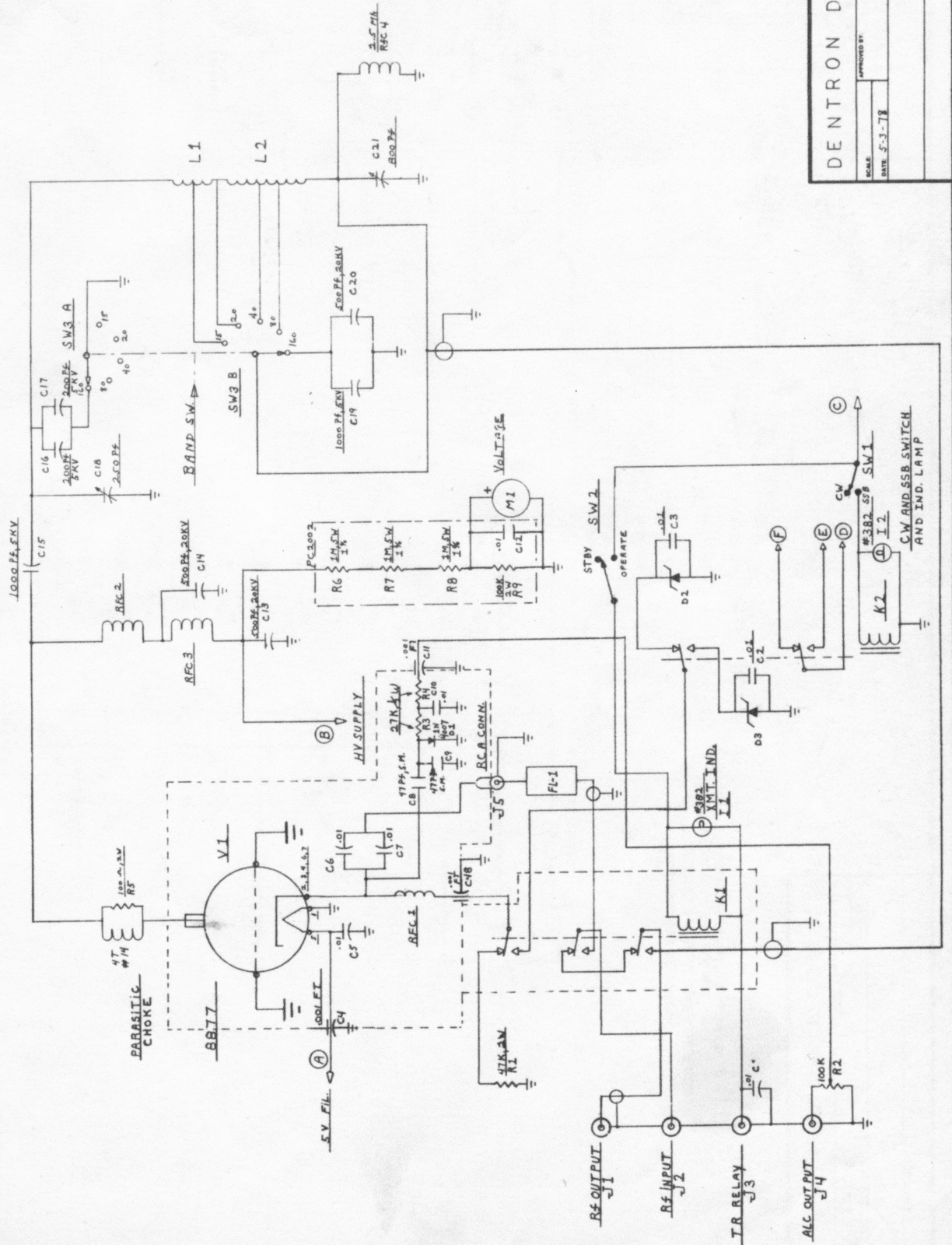


DTR-2000L Parts List

| PART NO. | DESCRIPTION |
|---|--|
| TUBES: | |
| V 1 | EIMAC 8877 Triode |
| TD 1 | Amperite 3½ Min T.D. Relay |
| CAPACITORS: | |
| C1, C2, C3, C5, C6, C7, C10, C12, C42, C43, C44, C45, C46, and C22 through C33 | .01 Disc, 1 KV |
| C8, C9 | 47 pf, S.M. |
| C4, C48, C11 | .001 F. T. Caps. |
| C34 through C41 | 150 uf at 450 VDC |
| C13, C14, C20 | 500 pf, 20 KV |
| C47 | 600 Uf at 25 VDC |
| C15, C19 | 1000 pf, 5 KV |
| C16, C17 | 200 pf, 5 KV |
| C18 | 250 pf Variable |
| C21 | 800 pf Variable |
| RESISTORS: | |
| R1 | 47K, 2W |
| R2 | 100K, 2 W POT |
| R3, R4 | 27K, ½W |
| R5 | 100 Ohm, 2 W |
| R6, R7, R8 | 1 Meg, 5 W, 1% |
| R9, R10, R11, R12, R13, R14, R15, R16, R17 | 100 K, 2 W |
| R18 | Factory Made Meter Shunt, .133 Ohms |
| Rfc - 1 | Factory Made Toroid - Rfc |
| Rfc - 2, Rfc - 3 | Factory Made Plate Choke |
| Rfc - 4 | 2.5 Mh, Rfc |
| Rfc - 5 | 8.5 uh Choke |
| L1, L2 | Factory Wound, Tapped Loading Coils |
| Parasitic Choke | 4 T, #18 Wire on R5 |
| RELAYS: | |
| K1, K2 | 12 V, Cont. Relays |
| SWITCHES: | |
| SW1, SW2, SW4 | SPST Rocker Sw. |
| SW5 | Interlock Switch |
| SW3 | 5 Pos. Band SW |
| CONNECTORS: | |
| J1, J2, J3, J4 | SO239 Coax Connector RCA Connector |
| INDICATORS: | |
| I1, I2, I3, I4, I5, I6, I7 | 12 V Lamps, #382 |
| METERS: | |
| M1, M2 | 0-1 ma Meters |
| TRANSFORMER: | |
| T1 | Dual Primary (117/234VAC), Triple Secondary (600V & 900V, HV) (5V Fil), (12V Control) |
| BLOWER: | |
| B1 | 117 VAC, 75 CFM Fan |
| DIODES: | |
| D1, D16, D17, D18 | 1N4007 |
| D2 | 1N3321 |
| D3 | 1N3308 |
| D4 through D15 | Silicone H.V. Diode, 1000V PIV 3 Amp |
| MISCELLANEOUS: | |
| FL1 | Factory Made Matching Ckt. |
| F1 | Line Fuse, 30 Amp at 117 VAC and 15 Amp at 234 VAC |

1800 428 28 97 706
 1800 428 28 97 706

52 04A
 52 51A



DENTRON DTR 2000 AMP.

SCALE: DATE: 5-3-78 APPROVED BY: DRAWN BY: M.C.G. REVISED: 6-14-78

DESIGN NUMBER:

