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PANAXIS ELECTRONICS PLEASE CONTACT

Eric Hoppe

Progressive Concepts

305 South Bartlett Road

Streamwood, IL 60107

PHONE. 630.736.9822 Fax: 630.736.0353

www.progressive-concepts.com

COMPILED BY JEFF MORRISON APRIL 14, 2015

CONSTRUCTION PLANS

AMT 25

25 WATT AM TRANSMITTER

BUILT BY

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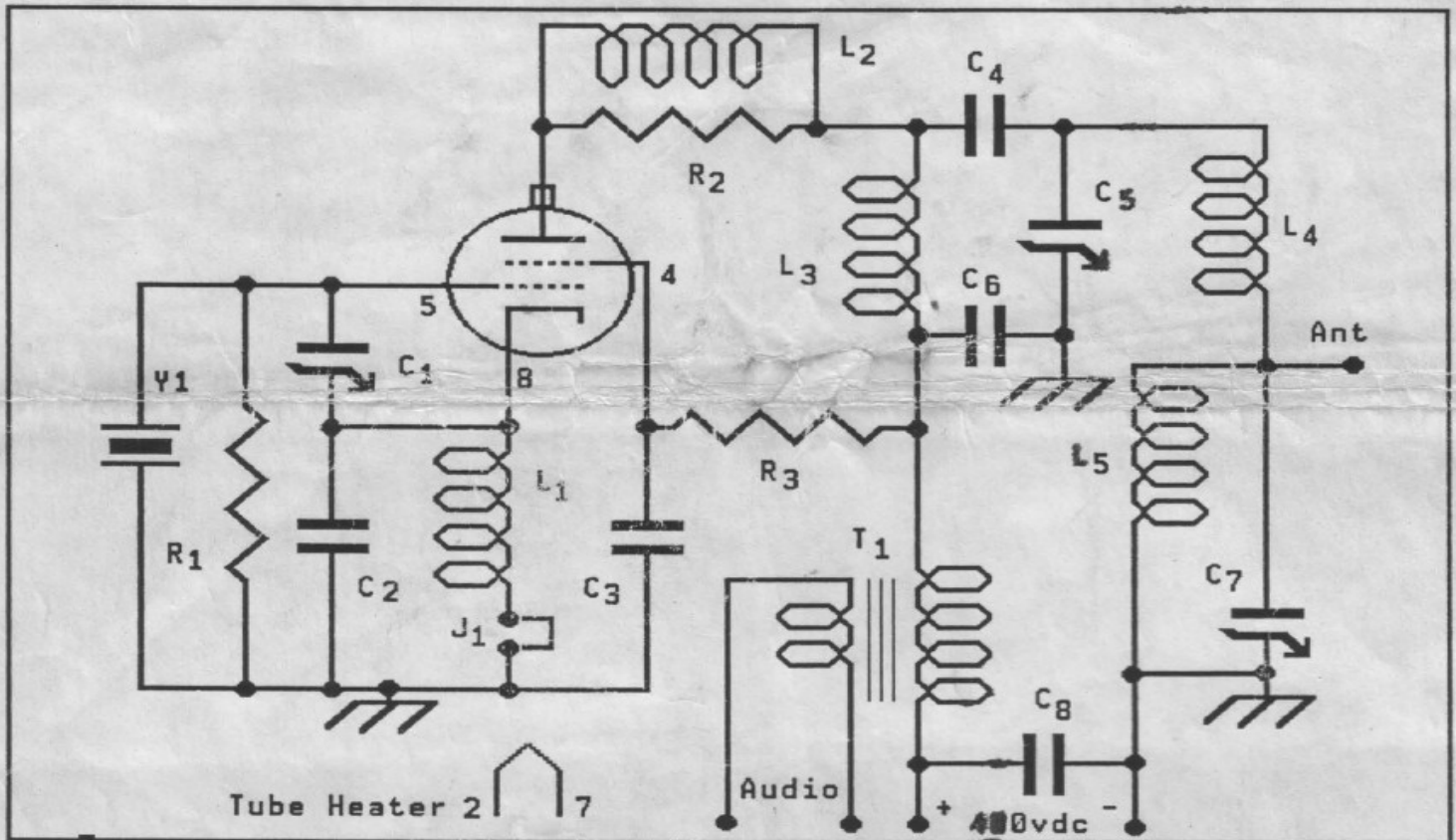
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Construction Plans

AMT25

25 Watt AM Transmitter



Parts List

C1	3-30pF	trimmer	Y1	Crystal for desired frequency
C2	100pF	mica	L2	10 turns #18 wire space-wound on R2.
C3,4,6,8	.001uF/1.6kV	disk	L4	See Text
C5	365pF	variable	J1	Wire jumper may be replaced by 150ma meter.
C7	780pF	variable	NOTE:	for the lower frequencies a mica capacitor must added across C7. For 1.8MHz it should be .001uF For the AM broadcast band, 0015uF
R1	47K 1/2'W	resistor		
R2	100 1W	resistor		
R3	15K 15W	wirewound		
L1,3,5	2.5mH	RF choke		
Tube	6DQ6A			
T1	15W Tube-type audio output transformer. 1000:8 Ohms.			
Socket	Octal type			

AMT25 - 25 Watt AM Transmitter

INTRODUCTION

This is a simple transmitter using a single tube. It uses a 6DQ6A pentode in a conventional grid-plate crystal type power oscillator circuit. Modulation is accomplished by varying the tube's plate and screen supply voltage with an audio signal. That signal comes from the output an external audio power amplifier (plate modulation).

The circuit may be configured for the 3.5MHz, 7MHz, or 14MHz Ham bands by simply changing the crystal frequency and output tank coil (L4) inductance. With a larger inductance and some additional capacitance the circuit may be configured for 1.8MHz and below into the AM broadcast band. Operation may be permitted, without a Ham license, on the AM broadcast band provided that broadcasting is limited to Carrier-Current operation in accordance with Part 15 of the FCC Rules. These Rules prohibit connection to an external antenna of any transmitter whose power input exceeds 100mW unless it has been FCC licensed.

THEORY OF OPERATION

A random radio frequency noise signal is generated across the tube's cathode choke (L1) when plate voltage is applied. That signal is coupled to the crystal circuit by way of C2 and C1. C1 is used to "trim" the crystal frequency to obtain the exact frequency desired. For example, a crystal marked "1600 kHz" may actually resonate at 1,600,050Hz. C1 would help adjust this to an exact 1,600,000Hz.

The crystal determines which of the random frequencies is allowed to pass to the control grid (pin 5) of the tube.

The control grid's signal variations increase and decrease the amount of current flowing between the cathode and plate - at the frequency of the crystal. These plate current pulses pass through L2 (a VHF suppression choke) and L3. A large signal voltage is generated across L3.

The signal generated across L3 is coupled into the output "tank" circuit through C4. Very large voltages can appear here so C4 requires a higher voltage rating than the other capacitors used in the transmitter.

C5, L4, and C7 make up the "tank" circuit. "Tank" is a term used to describe a resonate capacitive/inductive circuit. The circuit action transforms the high voltages coupled from L3, and which also appear across C5, to a lower voltage but higher current at the C7 end of L4. C7 matches the output impedance of the tank circuit to load impedance. The load impedance is generally that of a resonate antenna system or about 35 to 50 Ohms.

L5 serves two purposes. (1) It drains any static electricity charges which may appear on the antenna or its feed line, and (2) it shorts-out any D.C. voltage which might get on the antenna line because of a leaky C4 capacitor. You certainly wouldn't want to accidentally touch your antenna and find out it had 400 volts on it!

The output of this tank circuit is not suitable for Carrier-Current operation by itself. C-C operation requires a special

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coupling unit which transforms the normal 35 to 50 Ohm output to that of the A.C. power lines - about 1 to 10 Ohms. In addition the coupling unit must include fuses and coupling capacitors.

The tube's screen grid (pin 4) must have a positive potential of about 150 volts D.C. Its function is to allow greater amplification by maintaining a "virtual" plate voltage during the amplification process. It is the action of the screen grid that gives tetrode and pentode tubes greater gain than a triode tube. The 150 volts is derived by dropping 250 volts of the 400 volt plate supply across R3. Tetrode and Pentode tubes require the screen grid as well as the plate voltage be modulated. This is why the screen voltage has been derived from the plate (modulated) supply.

The modulation transformer is connected in series with the plate/screen supply voltage. In a transmitter with an internal audio amplifier the impedances of the primary and secondary might be very much the same. In this circuit however an external amplifier, such as a PA or HiFi amplifier is used instead. Since these amplifiers usually have an 8 Ohm output, our modulation transformer must have an 8 Ohm input. Actually, the transformer's primary winding is has a 1000 Ohm impedance, its secondary, 8 Ohms. We achieve an 8 Ohm input, 1000 Ohm modulating impedance by simply reversing the transformer connections.

Voltage variations across the 1000 Ohm winding of the transformer are in series with the plate/screen supply and therefore change the voltage value at an audio rate. Both the plate and screen

voltages are varied together to assure close to 100% modulation capability.

If CW operation (on-off code) is desired then an audio signal is not fed to the transformer. Instead a telegraph key is connected in place of the jumper J1.

To facilitate tuning, a 0-150 mA DC meter can be inserted in series with the key. If no key is used then the meter simply replaces jumper J1.

OPERATION:

Very Important! Do not operate the circuit without a "load". The final load will be a resonant antenna, but for testing purposes a dummy load of 50 Ohms should be used. If you don't have a dummy load, the in a pinch you can use a 117v AC standard 25 to 40 watt incandescent lamp.

Switch on the tube's heater voltage and allow at least a 30 second warm-up.

With a 0 - 150 mA meter replacing J1, apply a reduced plate voltage of 100 to 200 volts. Slowly adjust C5 for a MINIMUM reading on the meter. Adjust C7 to match the output to the dummy load, incandescent lamp, (later an antenna). Adjust C7 for higher cathode current, and if a lamp is used, for brightness.

C5 is used to "resonate" the the "tank". Tuning it to the proper frequency lowers the plate current. C7 matches the transmitter to the LOAD. Cathode current increases as more power is transferred to the load. Cathode current should not continuously exceed 90 to 100 mA. The two will interact with each other so the procedure should be done several times.

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When you are satisfied that tuning is working well you can increase the plate supply to 400 volts.

What they say is "dip the plate" and "peak the grid" - or in this case the "load". Repeat the "dip" and "peak" procedure several times to assure proper tuning and loading.

An incandescent lamp is only an approximate load, the dummy load is more accurate. However, because antennas usually are NOT non-reactive "perfect" loads, it will be necessary to retune when the actual antenna is connected.

If you have a frequency counter handy you should adjust C1 to trim the crystal to your exact operating frequency.

For AM operation, apply 8 Ohm audio from the output of a PA or Hi-Fi amplifier to the transmitter's modulation transformer. About 13 watts of audio is required for 100% modulation.

When finished operating, the plate supply should be switched off first, then the heater voltage may be switched off.

CONSTRUCTION

The size of the coils, tube, modulation transformer and all makes this circuit a poor candidate for a PC board. The whole circuit should therefore be constructed on an aluminum chassis while keeping all wiring as short as possible.

Good layout says the tube, coils and tuning capacitors should be at one end of the chassis. The modulation transformer somewhere close to the tube near the middle of the chassis. This leaves room at the other end of the

chassis if you wish to install power supply components and a transformer.

The circuit was originally designed for a separate power supply having a 400 volt output at 120 milliamperes. The tube heater requires 6.3 volts at 3.5 amperes.

For convenience, L4 and the crystal can be of the plug-in type. Appropriate sockets are installed on the chassis. This way the Amateur bands or the AM broadcast band can be selected by simply plugging-in the proper crystal and coil combination.

A suitable coil form would be 1.25 inches in diameter and about 3 inches long. The following winding data are based on these dimensions using #16 varnished wire:

14 MHz band: 7 turns spaced at 8 turns per inch.

7 MHz band: 17 turns spaced at 8 turns per inch.

3.5 MHz band: 35 turns spaced at 12 turns per inch.

1.8 MHz band: 25 uH *toroidal coil installed on a plug-in form.

AM broadcast band: 300 uH *toroidal coil installed on a plug-in form.

* Amidon Associates is the recommended supplier for toroidal cores and winding data.

Amidon Associates
PO Box 956
Torrance, CA 90508
(213) 763-5770 (voice)
(213) 763-2250 (FAX)

end.