

# GAMMATRON

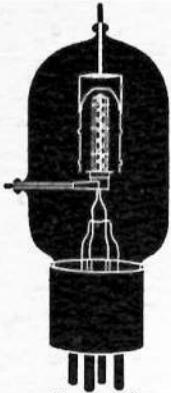
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*Electronic  
Products*

HEINTZ AND  KAUFMAN  
SOUTH SAN FRANCISCO LTD. CALIFORNIA U.S.A.



# WHY GAMMATRON TUBES?



tantalum tube ever constructed was designed by GAMMATRON engineers to give ruggedness and reliability to ship transmitters, the story of GAMMATRON tubes has been one of pioneering and success. Today the GAMMATRON line of transmitting tubes embraces over twenty-five types with power ratings from 20 to 5000 watts.

The GAMMATRON principle of design is outstanding by virtue of its fundamental simplicity; it consists of complete elimination of all non-essential construction within the tube. The filament, grid, and plate elements are directly supported by short, sturdy, and low resistance leads running direct from their respective connections on the surface of the envelope. Internal solid insulators are completely eliminated, while perfect alignment is maintained. Thus, the interelectrode capacity is low, and the insulation between elements is extremely high. For these reasons GAMMATRONS are suitable for very-high-frequency and high voltage use. Other tubes of ordinary design have solid insulators for alignment and high interelectrode capacities; they are not efficient at high frequencies and will fail with high voltages.

Seventeen years ago GAMMATRON engineers were the first to appreciate the advantages of tantalum as an anode and grid material because of its low gas content, the lowest of any metal, its ability to endure high temperatures, and because it will radiate large amounts of power. Tantalum is a metallic element commercially available only for the past two decades. It has the unique characteristic of releasing its gas content readily during the pumping process, and then having great gas absorptive powers during the life of the tube. Tantalum is like a sponge with respect to gases; it may be squeezed dry and is then eager to draw in gases if released during operation. No other common plate material has this desirable quality.

The GAMMATRON methods of cleaning and pumping tantalum are important in obtaining its full benefits. Tantalum's remarkable resistance to acids makes it possible to completely remove all traces of gas-causing impurities. A patented exhaust technique is employed to completely remove all of the gas. During this process the plate dissipation runs as high as ten times tube ratings—far hotter than the worst overload. When finished the vacuum is so good that if sufficient voltage were applied to grid and plate of a GAMMATRON, flash-over would occur on the outside rather than along the short internal path. Because of the presence of tantalum and complete elimination of non-essential materials, this marvelous vacuum can be maintained indefinitely. GAMMATRON tubes positively will not release gas during their

life. Ordinary tubes cannot be pumped at high temperatures because their plate material, insulators, and extra structure would fail during the exhaust process. At these low temperatures all of the gas cannot be removed, and a chemical clean-up agent, such as barium, is employed to complete the job and collect the gas which evolves during normal operation. Any overload releases quantities of gas, often beyond the ability of the getter to absorb, and the resulting free gas attacks the filament causing emission failure.

Tantalum shows color when operating at normal ratings. Thus the plate color serves as a convenient tuning indicator—a method for assuring maximum efficiency of transmitter circuits at all times. At normal plate dissipation, the plate shows a cherry red; at 85% a dull red, and color is just perceptible at 60% dissipation.

The use of cylindrical plate construction provides a tube of extremely low interelectrode capacity. A special tantalum vertical bar grid, closely spaced to the filament, avoids secondary emission, and at the same time provides an extremely high mutual conductance, which compares very favorably with the older flat-plate high-capacity tubes. Other tubes of equivalent output and power gain have from 3 to 4 times the interelectrode capacity, and are more difficult to neutralize, to keep free from parasitic oscillations, and are not efficient in VHF circuits.

One of the most recent GAMMATRON improvements, again leading the industry, was the use of a special plate cap to confine all of the electrons to the plate enclosure. This arrangement prevents high velocity electrons from bombarding the glass envelope and thus prevents these losses and glass puncture. Also, this arrangement improves the VHF efficiency of the tube and thus higher outputs are obtainable, qualifying GAMMATRONS as the ideal tubes for VHF operation.

The envelope of the tube is made of nonex, which is an extremely hard glass capable of standing a high degree of heat. Leads are carried into the tube by means of tungsten rods through specially developed seals capable of withstanding large currents at high temperatures. These connections are conveniently placed. Thus, GAMMATRON tubes are physically smaller than ordinary tubes and they fit better into circuit arrangements, particularly, VHF circuits.

Low voltage filaments are employed in GAMMATRON tubes because they are short, rugged, and filament insulators are not required. They are specially processed and possess more than ample emission for their extra long life.

Transmitting tubes do not lend themselves to mass production. They are handmade by painstaking craftsmen whose skill and devotion to their task is fired by each new GAMMATRON success. Every operation is performed with infinite care and checked to assure the highly esteemed GAMMATRON standards. This is an invisible quality built into every tube. Only finest materials obtainable are used to provide a combination for those who demand the best.

If long life, positive protection against failure due to momentary overloads, high voltage, high efficiency operation, very-high-frequency operation, low driving power, freedom from parasitics, easy neutralization, or complete reliability are needed to strengthen the weakest link in your transmitter, use GAMMATRON tubes.

# GAMMATRON TUBES

**24G**  
PLATE DISS.  
25 W.



**257B**  
PLATE DISS.  
75 W.



**454**  
PLATE DISS.  
250 W.



This complete line, covering a power range of 50 to 5,000 watts, embodies 18 years of pioneering and experience in the design and manufacture of tantalum tubes. Special plate, grid, and filament design, and new metal-to-glass seals, give Gammatrons remarkable VHF performance. Other features: ability to withstand high plate voltages, complete protection against tube failure due to overloading, and long, efficient operating life. The Gammatron engineers responsible for these developments will be glad to help you with your special problems.

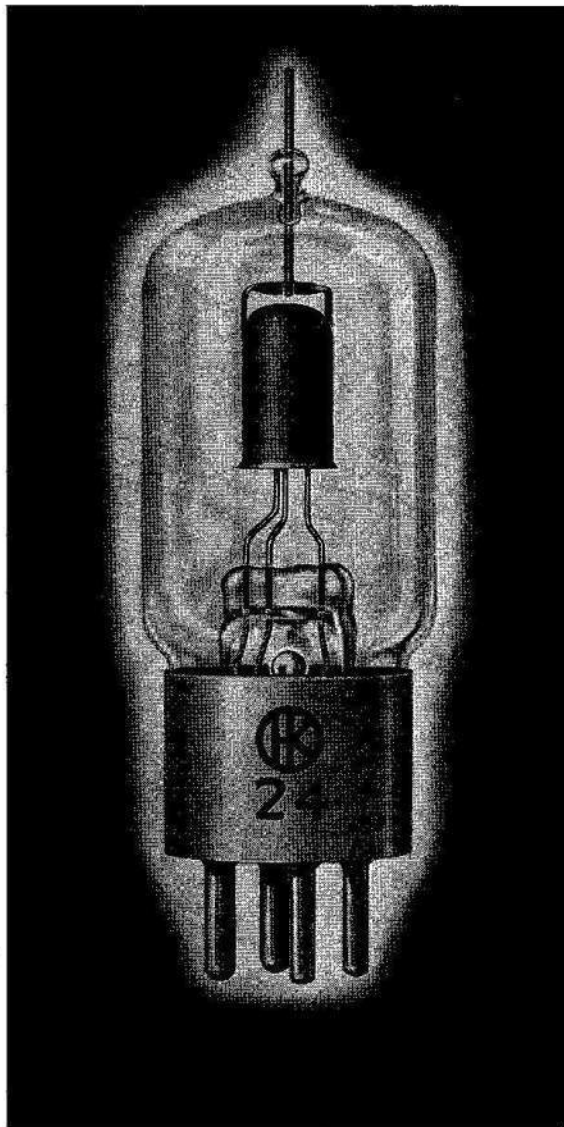


TYPE NO.	24	24G	54	254	257B*	354C	354E	454L	454H	654	854L	854H	1054L	1554	3054
<b>MAX. POWER OUTPUT:</b> Class 'C' R. F.	90	90	250	400	300	600	600	900	900	1400	1800	1800	3000	3600	5300
<b>PLATE DISSIPATION:</b> Watts	25	25	50	100	75	150	150	250	250	300	450	450	750	1000	1500
<b>AVERAGE AMPLIFICATION FACTOR</b>	25	25	27	25	—	14	35	13.5	27	22	16	30	13.5	12.5	19
<b>MAXIMUM RATINGS:</b> Plate Volts Plate M. A. Grid M. A.	2000 75 25	2000 75 25	3000 150 30	4000 225 40	4000 150 25	4000 300 60	4000 300 85	5000 375 60	5000 375 85	4000 600 100	6000 600 80	6000 600 110	6000 1000 150	5000 1000 250	5000 2000 500
<b>MAX. FREQUENCY, Mc.:</b> Power Amplifier	250	300	200	175	150	50	50	150	150	50	100	100	75	30	30
<b>INTERELECTRODE CAP.:</b> Cg-p u.u.f. Cg-f u.u.f. Cp-f u.u.f.	1.3 2.1 0.2	1.6 1.8 0.2	1.8 2.0 0.2	2.7 2.5 0.4	0.08 10.5 in 4.7 out	3.3 4.4 0.7	3.3 4.6 0.5	3.2 3.9 0.7	3.5 4.1 0.6	5.4 6.6 0.8	5.2 6.7 0.9	4.7 8.8 0.7	5.3 7.9 1.2	11.5 15.2 1.2	13.1 23.0 2.0
<b>FILAMENT:</b> Volts Amperes	6.3 3.0	6.3 3.0	5.0 5.0	5.0 7.5	5.0 7.5	5.0 10.0	5.0 10.0	5.0 10.0	5.0 10.0	7.5 15.0	7.5 12.0	7.5 12.0	7.5 20.0	11.0 22.5	14.0 45.0
<b>PHYSICAL:</b> Max. Height, Inches Max. Diameter, Inches Weight, Oz. Base	4 3/8 1 1/8 1 1/4 Small UX	4 3/8 1 1/8 1 1/4 Small UX	5 1/2 2 1/8 2 1/2 Std. UX	7 1/4 2 1/4 5 Std. 50 Watt	6 7/8 2 1/4 5 1/2 Giant 7 Pin	9 7/8 3 3/8 8 1/2 Std. 50 Watt	9 7/8 3 3/8 8 1/2 Std. 50 Watt	10 1/8 3 1/2 8 Std. 50 Watt	10 1/8 3 1/2 8 Std. 50 Watt	10 1/2 3 1/2 12 Std. 50 Watt	12 5/8 5 1/8 15 Std. 50 Watt	12 5/8 5 1/8 15 Std. 50 Watt	17 7 1/8 36 John-son #214	19 6 1/8 54 HK 255	30 1/2 9 1/4 200 HK 255

WRITE FOR FULL DATA ON ALL **GAMMATRONS**



# GAMMATRON TYPE 24



## GENERAL PURPOSE TRIODE

Medium mu universal triode, 25 watt radiation cooled tantalum plate. Special design permits high voltage operation and unusual VHF efficiency.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Base . . . . .	Small Four Pin Ceramic
Net Weight . . . . .	1 $\frac{1}{4}$ Ounces
Shipping Weight . . . . .	1 $\frac{1}{4}$ Pounds
Maximum Height . . . . .	4 $\frac{3}{8}$ Inches
Maximum Diameter . . . . .	1-7/16 Inches

### ELECTRICAL DATA

Filament Voltage . . . . .	6.3 Volts
Filament Current . . . . .	3.0 Amps
Normal Plate Dissipation . . . . .	25 Watts
Maximum Average Plate Current . . . . .	75 MA.
Maximum Average Grid Current . . . . .	25 MA.
Maximum Plate Voltage . . . . .	2000 Volts
Average Amplification Constant . . . . .	25

### INTERELECTRODE CAPACITANCES

Grid-Plate . . . . .	1.3 Mmfd.
Grid-Filament . . . . .	2.1 Mmfd.
Plate-Filament . . . . .	0.2 Mmfd.

The type 24 Gammatron is a tube of unusual capabilities. The use of a long capped tantalum plate helps to confine all of the electron stream for useful power output. Its uniquely designed tantalum grid is closely spaced to the filament providing short electron time flight thus reducing losses at very high frequencies. Internal insulators are not required while at the same time perfect alignment is maintained. Thus the interelectrode capacities are low enabling the tube to operate free of parasitic oscillations.

With the use of tantalum and the elimination of unnecessary internal structures, it is possible to completely outgas

Gammatron tubes without the use of the usual "getter." This excellent vacuum is retained throughout the full life of the tube, thus insuring you against failures caused by gas release due to overloads. The filament may then be operated in a manner consistent with high thermionic efficiency and long life.

The tantalum plate is designed to run hot. A cherry red color is an indication of normal operation and no damage will result at this temperature. The convenience of the use of the plate color as an indication of proper circuit efficiency and tuning will be appreciated immediately after trying the 24 GAMMATRON:

5000 4-46

## HEINTZ AND KAUFMAN LTD.

SOUTH SAN FRANCISCO, CALIFORNIA, U. S. A.



## TYPE HK-24

The information on this page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions, Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.

### RADIO FREQUENCY POWER AMPLIFIER— CLASS "C" UNMODULATED

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
		2000	1500	1000 Volts
D.C. Plate Voltage	2000	2000	1500	1000 Volts
D.C. Plate Current	75	56	75	75 M. A.
D.C. Grid Current	20	18	18	18 M. A.
D.C. Grid Voltage	-250	-140	-120	-100 Volts
Peak R.F. Grid Voltage		250	240	220 Volts
Grid Driving Power		4.0	3.8	3.6 Watts
Plate Dissipation	25	25	25	18 Watts
Plate Efficiency		81	80	76 Percent
Power Output		90	90	57 Watts
Plate Input	112 Watts			

### RADIO FREQUENCY POWER AMPLIFIER— CLASS "C" PLATE MODULATED

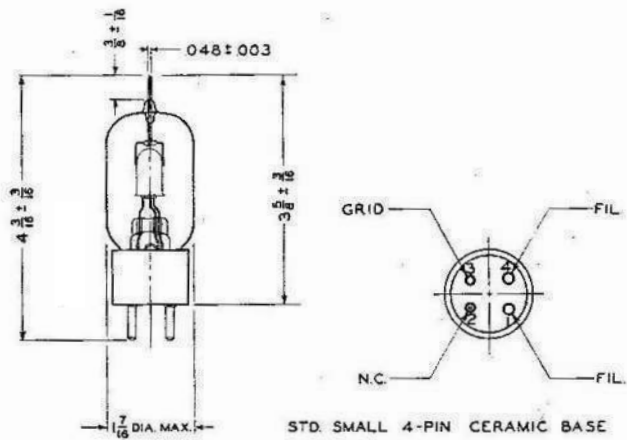
(Carrier Conditions for use with 100% Modulation)

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
		1500	1250	1000 Volts
D.C. Plate Voltage	1500	1500	1250	1000 Volts
D.C. Plate Current	60	50	60	60 M. A.
D.C. Grid Current	20	20	20	20 M. A.
D.C. Grid Voltage	-250	-145	-125	-105 Volts
Peak R.F. Grid Voltage		245	230	210 Volts
Grid Driving Power		4.5	4.1	3.8 Watts
Plate Dissipation	17	15	15	13 Watts
Plate Efficiency		80	80	78 Percent
Power Output		60	60	47 Watts
Plate Input	75 Watts			

### RADIO FREQUENCY DOUBLER AMPLIFIER

(Feedback Voltage Neutralized by Conventional Methods)

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
		1500	1250	1000 Volts
D.C. Plate Voltage	1500	1500	1250	1000 Volts
D.C. Plate Current	70	50	58	70 M. A.
D.C. Grid Voltage	-250	-240	-250	-250 Volts
D.C. Grid Current	18	12	14	18 M. A.
Peak R.F. Grid Voltage		345	365	380 Volts
Driving Power		3.9	4.7	6.4 Watts
Plate Dissipation	25	24	24	25 Watts
Tube Efficiency		68	67	64 Percent
Power Output		51	49	45 Watts



### AUDIO FREQUENCY POWER AMPLIFIER— CLASS "B" MODULATOR

	Maximum Rating Per Tube	Typical Operation, 2 Tubes		
		1500	1250	1000
D.C. Plate Voltage	1500	1250	1000	500 Volts
D.C. Plate Current— Maximum Signal	75	136	150	150 M. A.
D.C. Plate Current— Zero Signal		24	30	70 M. A.
D.C. Grid Voltage	-250	-42	-29	0
Peak A.F. Grid-to- Grid Voltage		256	248	190 Volts
Load Resistance (Plate to Plate)		21200	15000	6400 Ohms
Plate Dissipation	25	50	45	30 Watts
Plate Efficiency		70	69	60 Percent
Driving Power— (Nominal)		4.2	4.5	3.5 Watts
Power Output		120	105	45 Watts

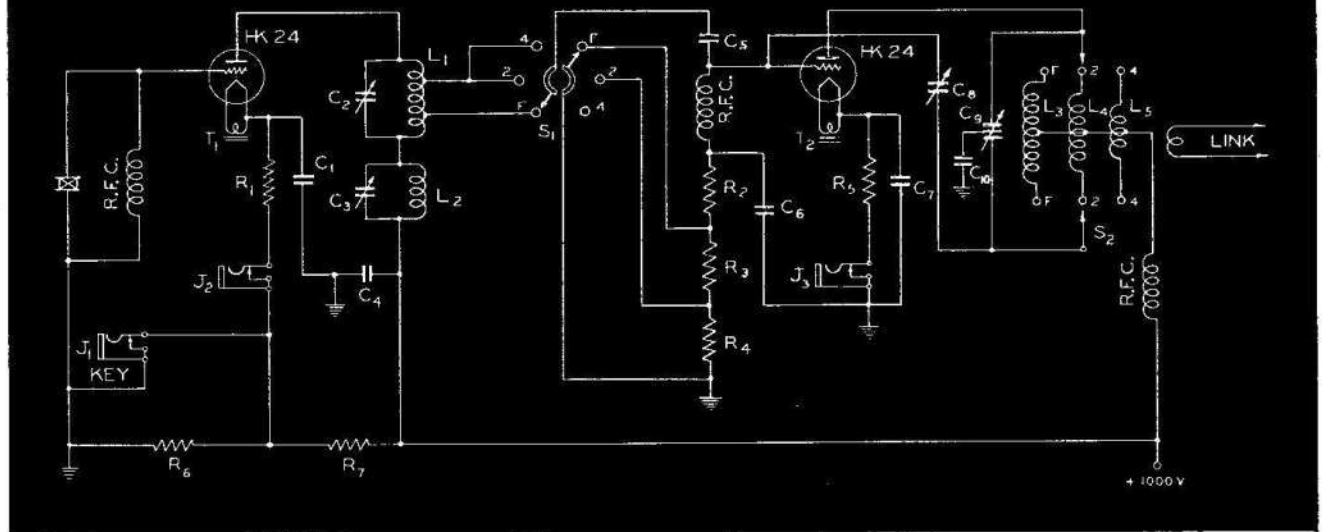
### RADIO FREQUENCY TRIPLER AMPLIFIER

(Feedback Voltage Neutralized by Conventional Methods)

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
		1500	1250	1000 Volts
D.C. Plate Voltage	1500	1500	1250	1000 Volts
D.C. Plate Current	60	31	36	45 M. A.
D.C. Grid Voltage	-250	-220	-230	-250 Volts
D.C. Grid Current	15	7	9	11 M. A.
Peak R.F. Grid Voltage		295	315	350 Volts
Driving Power		1.9	2.5	3.5 Watts
Plate Dissipation	25	25	25	25 Watts
Tube Efficiency		47	45	45 Percent
Power Output		22	20	20 Watts

# Gammatron Tubes

## HK-3 BAND EXCITER OR TRANSMITTER



### HK-3 BAND EXCITER OR TRANSMITTER

There is a universal need for an exciter or low power transmitter that is inexpensive, easy to build, easy to adjust, and requires a minimum of crystals. The exciter shown on this page has these features and will operate on three bands with a single crystal. It will give sufficient power output to excite a pair of 24 or 54 GAMMATRONS or a single 254 GAMMATRON on 10 meters and does not depend on regenerative action for its operation. Thus, it is not unstable and hard to tune as many of the previously published harmonic amplifiers have been. If desired, high speed keying of the crystal oscillator may be employed. A 160, 80 or 40 meter crystal may be used to give outputs on the fundamental, second and fourth harmonics with approximate respective powers of 50, 35 and 20 watts. The high fourth harmonic output is due to the circuit  $C_3 - L_2$  which accentuates this voltage, giving a peaked wave form.

#### CRYSTAL OSCILLATOR

The crystal oscillator may be safely operated at 1000 volts with a 40 meter crystal, and 160 or 80 meter crystal may be safely operated with 1250 volts on the plate. The power output of the crystal stage is approximately 20 watts. This value depends greatly on the crystal activity. The tank condenser  $C_1$  is tuned slightly to the low capacity side of resonance for best output and least crystal duty. The condenser  $C_3$  is tuned to maximum capacity for operation on the fundamental and second harmonics and for resonance or maximum output of the harmonic amplifier when operated on the fourth harmonic. The oscillator will key excellently with crystals from 1.5 to 4 Mc., and 7 Mc. crystals key well, but are somewhat chirpy. If keying is not desired the resistors  $R_6$  and  $R_7$  may be eliminated and  $J_2$  tied directly to ground.

#### HARMONIC AMPLIFIER

The excitation to the amplifier is adjusted with the taps on  $L_1$ . For fundamental operation the grid current should be 20 M. A. and the inductance  $L_1$  tapped approximately 28% from the cold end. For second and fourth harmonic operation the coil tap should be approximately 55% from the cold end, and grid currents should be 11 and 4 M. A., respectively. Total cathode current should not exceed on the fundamental, 100 M. A., second, 80 M. A., and fourth har-

monic, 60 M. A. The neutralization should be adjusted with  $C_8$  while operating on the fundamental.

#### COMPONENTS

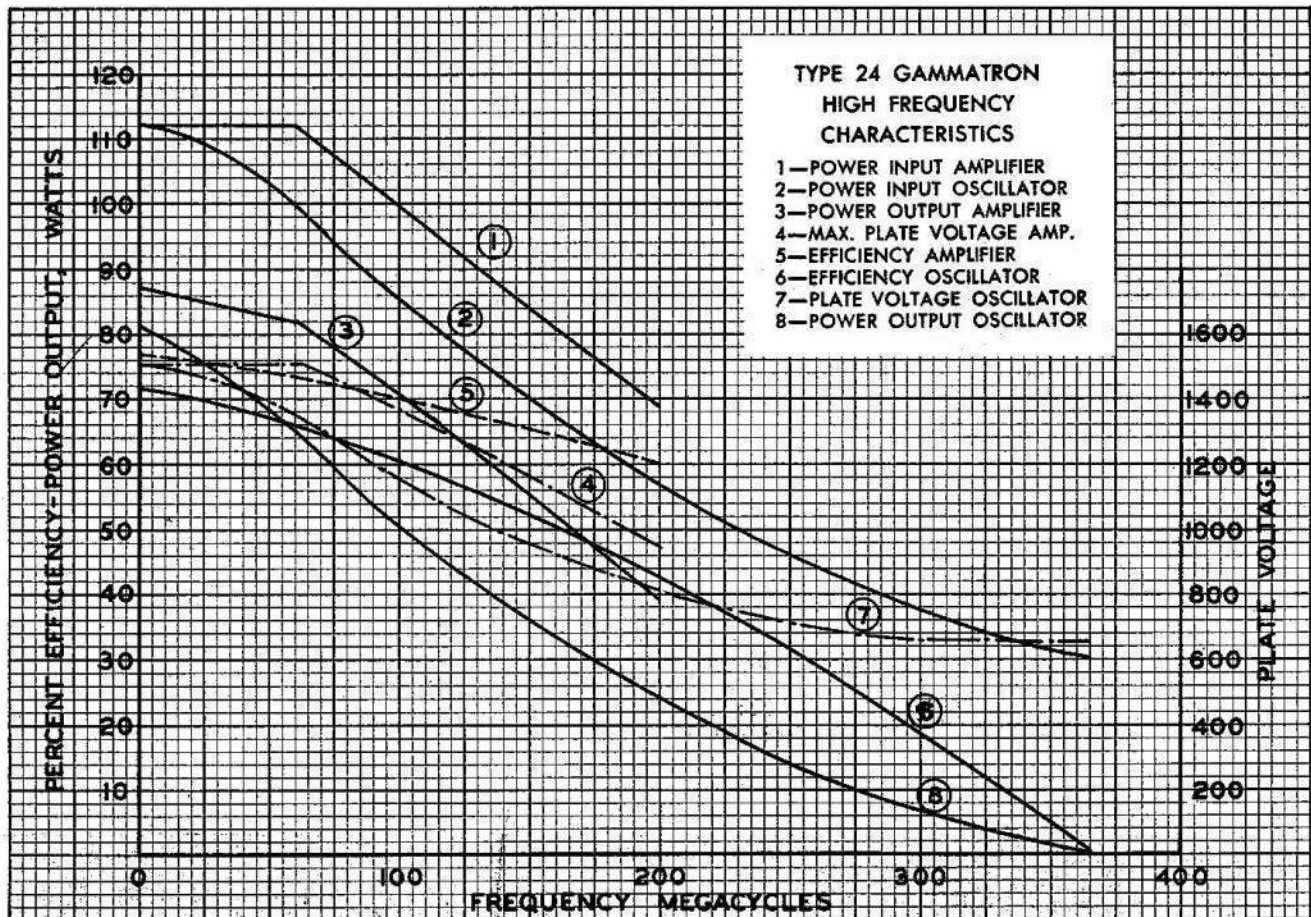
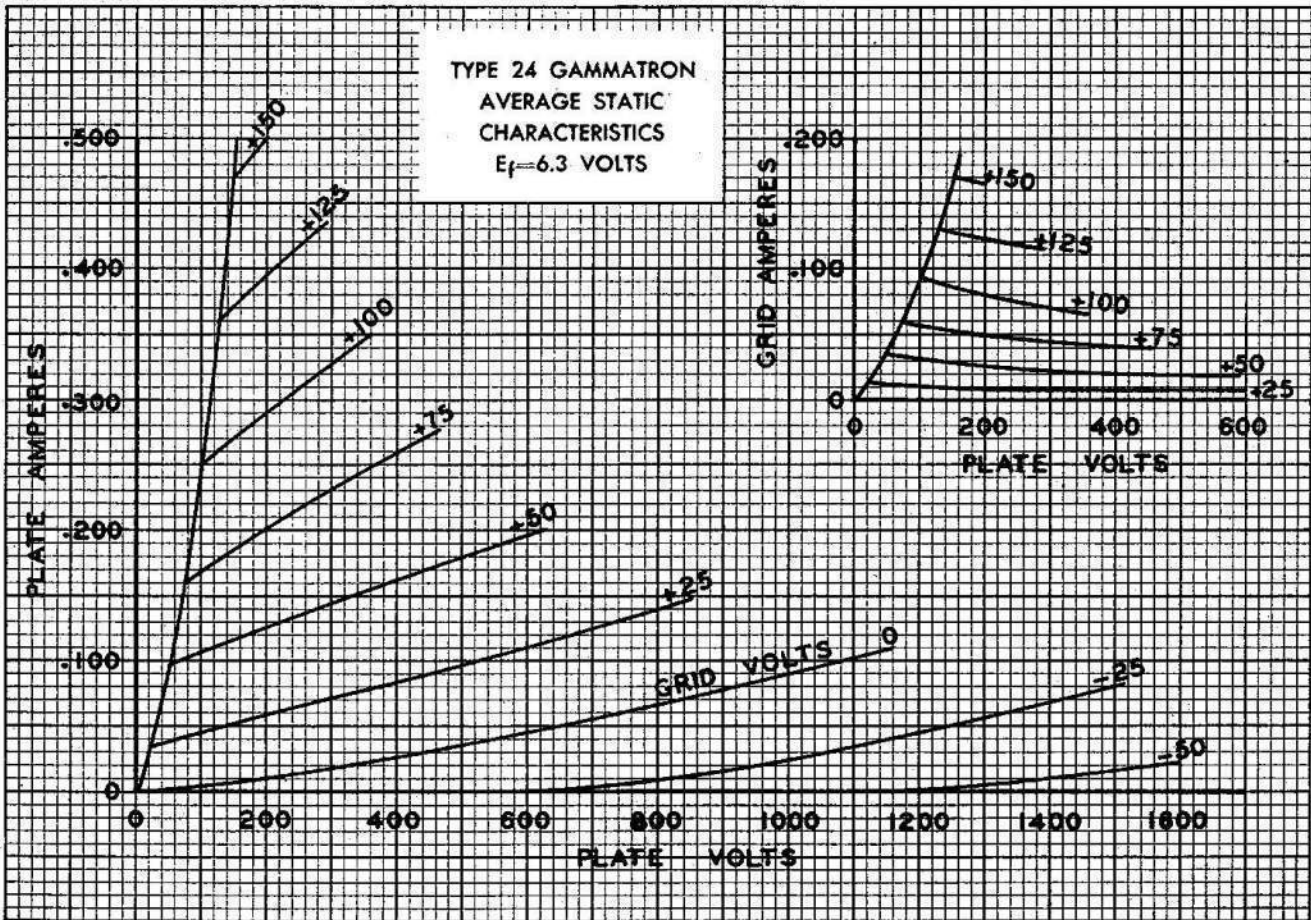
- $R_1$ —1500 Ohm, 10 Watt resistor.
- $R_2$ —2500 Ohm, 5 Watt resistor.
- $R_3$ —17500 Ohm, 5 Watt resistor.
- $R_4$ —20000 Ohm, 1 Watt resistor.
- $R_5$ —1000 Ohm, 10 Watt resistor.
- $R_6$ —10000 Ohm, 10 Watt resistor.
- $R_7$ —100000 Ohm, 20 Watt resistor.
- $C_1$ —.01 mf. 500 Volt mica condenser.
- $C_2$ —50 mmf. Receiving condenser.
- $C_3$ —35 mmf. Midget condenser.
- $C_4$ —.005 mf. 1500 Volt mica condenser.
- $C_5$ —.000250 mf. 1500 Volt mica condenser.
- $C_6$ —.01 mf. 500 Volt mica condenser.
- $C_7$ —.01 mf. 500 Volt mica condenser.
- $C_8$ —1.4 mmf. neutralizing condenser.
- $C_9$ —50-50 mm. split stator 2000 Volt condenser
- $C_{10}$ —.005 mf. 1500 Volt mica condenser
- $J_1, J_2, J_3$ —Single circuit closing jacks.
- $S_1, S_2$ —2 pole, 3 point ceramic switches (ganged if desired).
- $T_1, T_2$ —6.3 Volt, 3 Ampere filament transformers.

#### COIL DATA

BAND		$L_1$	$L_2$	$L_3, L_4, L_5$
160	Diameter	1 1/2		2
	Length	2		2 1/4
	Turns	80		58
	Wire	24 DSC		22 DSC
80	Diameter	1 1/2		2
	Length	1 1/2		2
	Turns	36		24
	Wire	20 DSC		16 DSC
40	Diameter	1 1/2	1 1/2	2
	Length	1 1/2	1 1/2	2
	Turns	18	26	14
	Wire	18	20	16
20	Diameter		1	2
	Length		1 1/2	2
	Turns		22	9
	Wire		18	14
10	Diameter		1	2
	Length		1	2
	Turns		10	7
	Wire		18	14

# Gammatron Tubes





HEINTZ & KAUFMAN LTD.  
 South San Francisco  
 California

TYPE HK-24G GAMMATRON  
Very High Frequency Triode

PHYSICAL DATA

Plate ..... Cylindrical Tantalum  
 Grid ..... Vertical Bar Tantalum  
 Filament ..... Thoriated Tungsten  
 Max. Height ..... 4-3/8 Inches  
 Bulb Diameter ..... 1-3/8 Inches  
 Net Weight ..... 1-1/4 Ounces  
 Shipping Weight ..... 1-1/4 Pounds

ELECTRICAL DATA

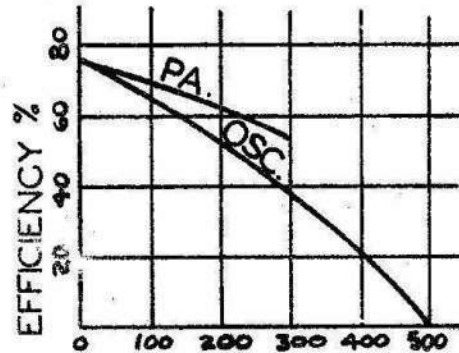
Filament Voltage ..... 6.3 Volts  
 Filament Current ..... 3.0 Amps.  
 Amplification Constant.. 25  
 Max. Plate Dissipation.. 25 Watts  
 Max. Plate Voltage ..... 2000 Volts  
 Max. Plate Current ..... 75 M. A.  
 Max. Grid Bias ..... -500 Volts  
 Max. Grid Current ..... 25 M. A.  
 Max. DC Plate Input ..... 112 Watts

INTERELECTRODE CAPACITIES

Grid-Plate..... 1.6 mmfds  
 Grid-Filament..... 1.8 mmfds  
 Plate-Filament..... 0.2 mmfds

UHF PERFORMANCE

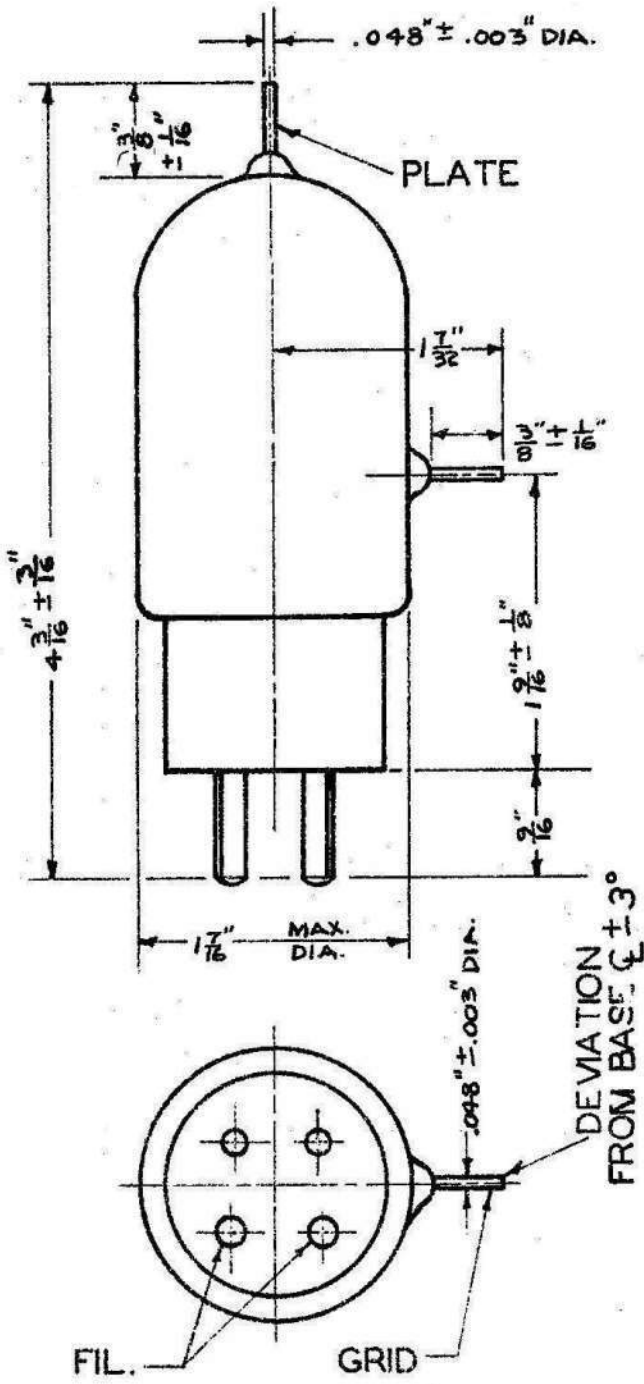
(Continuous Operation Conditions)



FREQUENCY MEGACYCLES

Max. Plate Input

Frequency	100	150	200	250	300 mc
RFA Class "C" Unmodulated	112	88	80	70	61
RFA Class "C" Plate Mod.	75	59	53	47	41



BOTTOM VIEW  
 SMALL 4-PIN BASE

Frequency  
 RFA Class "C" Unmodulated  
 RFA Class "C" Plate Mod.

For characteristic curves and operating conditions see data sheet for HK-24



**U. S. ARMY - U. S. NAVY**

**JAN**

**3C24**

**VT-204**

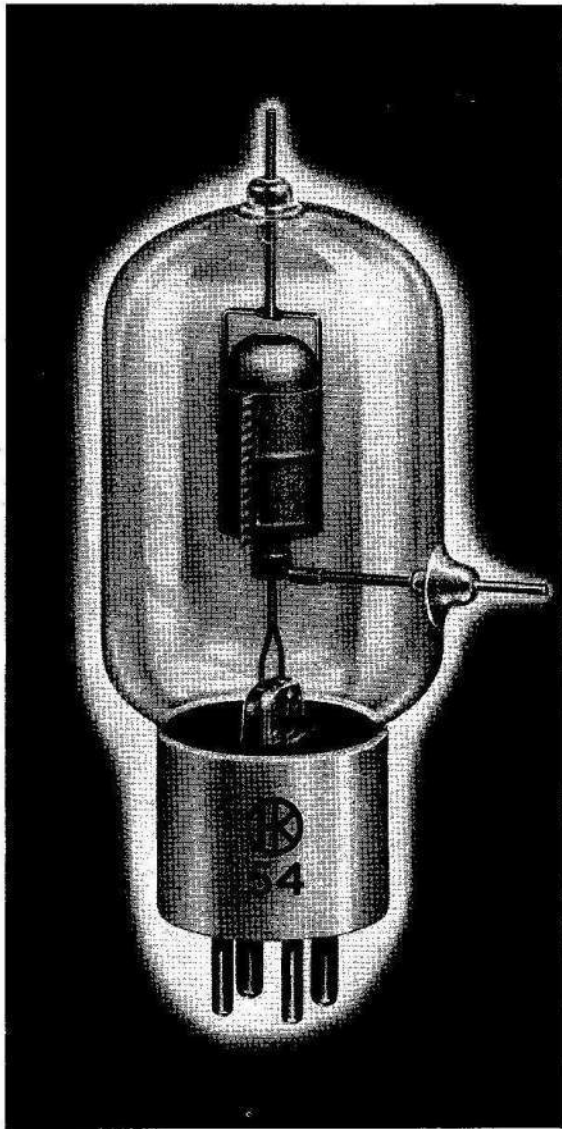
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**HEINTZ AND KAUFMAN LTD.**

**JULY 1, 1944**



# GAMMATRON TYPE 54



The Type 54 GAMMATRON has amazing power capabilities even though it is small in size. It has very low inter-electrode capacities, and it employs a domed plate construction confining the entire electron stream at very high frequencies. Thus, no power is wasted, and the VHF efficiency is unequalled by ordinary tubes. Tantalum elements are cleaned and degassed by Heintz and Kaufman's new and improved pumping process. The "getter" is eliminated, internal insulators are not used, and thus GAMMATRON tubes do not become gassy because every source of gas has been removed.

## GENERAL PURPOSE TRIODE

50 watt radiation cooled universal triode, medium mu. Special design permits high voltage operation and unusual VHF efficiency.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Base . . . . .	Medium 4 Pin Ceramic Base
Net Weight . . . . .	2½ Ounces
Shipping Weight . . . . .	8 Ounces
Maximum Height . . . . .	5⅝ Inches
Maximum Diameter . . . . .	2-1/16 Inches

### ELECTRICAL DATA

Filament Voltage . . . . .	5.0 Volts
Filament Current . . . . .	5.0 Amps.
Normal Plate Dissipation . . . . .	50 Watts
Maximum Average Plate Current . . . . .	150 MA.
Maximum Average Grid Current . . . . .	30 MA.
Maximum Plate Voltage . . . . .	3000 Volts
Average Amplification Constant . . . . .	27

### INTERELECTRODE CAPACITANCES

Grid-Plate . . . . .	1.8 Mmfd.
Grid-Filament . . . . .	2.0 Mmfd.
Plate-Filament . . . . .	0.2 Mmfd.

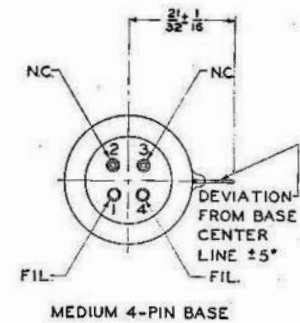
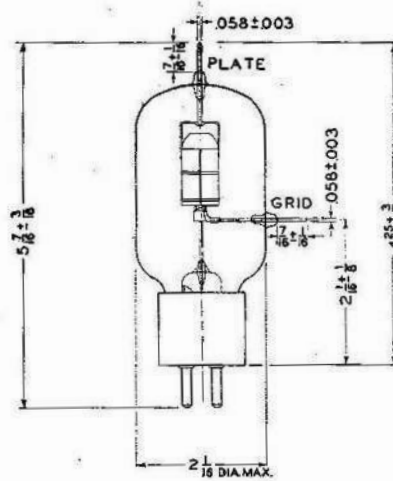
The 54 GAMMATRON has unusual stamina and is very versatile. Its excellent characteristics suit it as a Class C amplifier for low or ultra high frequencies, Class B audio amplifier, frequency multiplier and crystal oscillator.

The tantalum plate is designed to run hot. Only a perceptible glow can be seen at 25 watts dissipation, and a dull cherry red color at 50 watts dissipation. This is normal, and no damage will result at this temperature. The convenience of the use of the plate color as an indication of proper circuit efficiency and tuning will be appreciated immediately after trying the 54 GAMMATRON.



## TYPE HK 54

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



### RADIO FREQUENCY POWER AMPLIFIER Class C UNMODULATED\*

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
		250	210	100 Watts
Power Output				
Driving Power		10	9	6 Watts
DC Plate Voltage	3000	3000	2000	1000 Volts
DC Plate Current	150	100	130	135 ma
DC Grid Current	30	25	20	20 ma
DC Grid Voltage	-750	-290	-269	-130 Volts
Peak RF Grid Voltage		465	465	304 Volts
Plate Dissipation	50	50	50	35 Watts
Plate Input	300	300	260	135 Watts

\*Carrier conditions for telegraphy.

### RADIO FREQUENCY POWER AMPLIFIER CLASS C PLATE MODULATED\*

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
		180	147	92 Watts
Power Output				
Driving Power		9	9	9 Watts
DC Plate Voltage	2500	2000	1500	1000 Volts
DC Plate Current	125	110	125	125 ma
DC Grid Current	30	25	30	30 ma
DC Grid Voltage	-750	-250	-140	-130 Volts
Peak RF Grid Voltage		422	310	295 Volts
Plate Dissipation	40	40	40	35 Watts
Plate Input	225	220	188	125 Watts

\*Carrier conditions for 100% modulation and 60% average value.

### AUDIO FREQUENCY POWER AMPLIFIER CLASS B\*

	Maximum Ratings Two Tubes	Typical Operation, 2 Tubes		
		260	200	140 Watts
Power Output				
Driving Power**		12	10	10 Watts
DC Plate Voltage	2500	2000	1500	1000 Volts
DC Plate Current, Zero Signal		24	40	40 ma
DC Plate Current, Maximum Signal	300	180	198	233 ma
DC Grid Voltage		-70	-45	-25 Volts
Peak AF Grid to Grid Voltage		360	300	295 Volts
Plate Dissipation	100	100	96	91 Watts
Plate Input, Maximum Signal	375	360	296	233 Watts
Load Resistance, Plate to Plate		36000	16800	8500 Ohms
Driver Transformer Ratio***		0.75	0.6	0.6

(Full secondary to full primary)

\*All data for two tubes.

\*\*Instantaneous power at crest of cycle; effective power is 1/2 of this value.

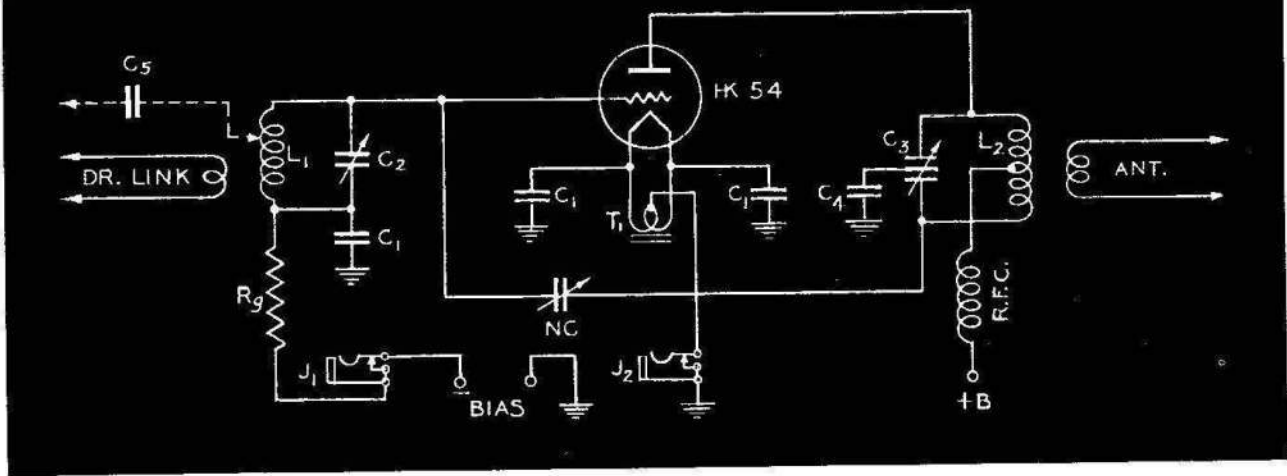
\*\*\*Driver tubes 2 - 6V6 Class A<sub>1</sub>. Plate volts 315. The use of inverse feed back is recommended to reduce distortion.

### RADIO FREQUENCY DOUBLER AMPLIFIER (Feedback neutralized by conventional methods)

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
		115	105	80
Power Output				57 Watts
Driving Power		12	12	10 Watts
DC Plate Voltage	3000	3000	2000	1500 Volts
DC Plate Current	150	55	77	100 ma
DC Grid Current	30	14	15	20 ma
DC Grid Voltage	-750	-700	-500	-420 Volts
Peak RF Grid Voltage		835	670	580 Volts
Plate Dissipation	50	48	48	43 Watts
Plate Input	165	165	155	127 Watts

# Gammatron Tubes

# TYPICAL FINAL AMPLIFIER



This typical final amplifier is capable of a maximum output of 250 watts and requires a driving power of only 10 watts. A small receiving tube such as a 6V6-G is sufficient. It may be link-coupled to the grid circuit or directly coupled with  $C_5$  to the point on  $L_1$  which provides sufficient excitation. It is advisable to supply enough fixed bias to prevent plate current flow under static conditions (see plate curve), and the remaining bias is then developed by the grid current flow through  $R_g$ . Thus: DC grid voltage = Fixed Bias + ( $R_g \times$  DC grid current).

## COMPONENTS

- $C_1$  — .01 mfd mica, 1000 volt working.
- $C_2$  — 260 mmfd variable condenser, 1500 volt rating.
- $C_3$  — 200 mmfd per section, 4500 volt rating variable condenser.
- $C_4$  — .005 mfd mica, 5000 volt working.
- $C_5$  — .001 mfd mica, 2500 volt working.
- N.C. — Neutralizing condenser .7 to 4 mmfd.
- $J_1$  and  $J_2$  — Jacks to measure grid and cathode current.
- $R_g$  — As required.
- $T_1$  — 5.0 volt, 5 ampere filament transformer.

## COIL DATA

Band	$L_1$	$L_2^*$
160 Meters	34 Turns #22 Enamel Close Wound Diameter 1½ Inches Length 1 Inch	54 Turns #18 DCC Diameter 2½ Inches Length 4 Inches
80 Meters	20 Turns #22 Enamel Diameter 1½ Inches Length 1 Inch	34 Turns #16 Diameter 2½ Inches Length 4 Inches
40 Meters	13 Turns #22 Enamel Diameter 1½ Inches Length 1 Inch	20 Turns #12 Diameter 2½ Inches Length 4 Inches
20 Meters	8 Turns #22 Enamel Diameter 1½ Inches Length 1 Inch	10 Turns #12 Diameter 2½ Inches Length 3 Inches
10 Meters	5 Turns #16 Enamel Diameter 1½ Inches Length 1 Inch	6 Turns #12 Diameter 2½ Inches Length 3½ Inches

\*Length includes ½ inch space at center for antenna or transmission line link windings.

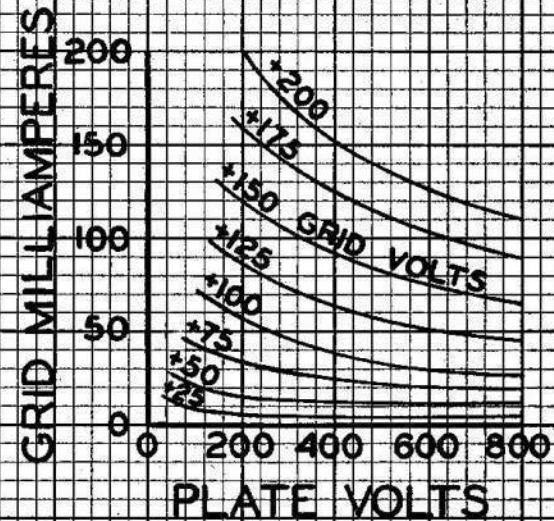
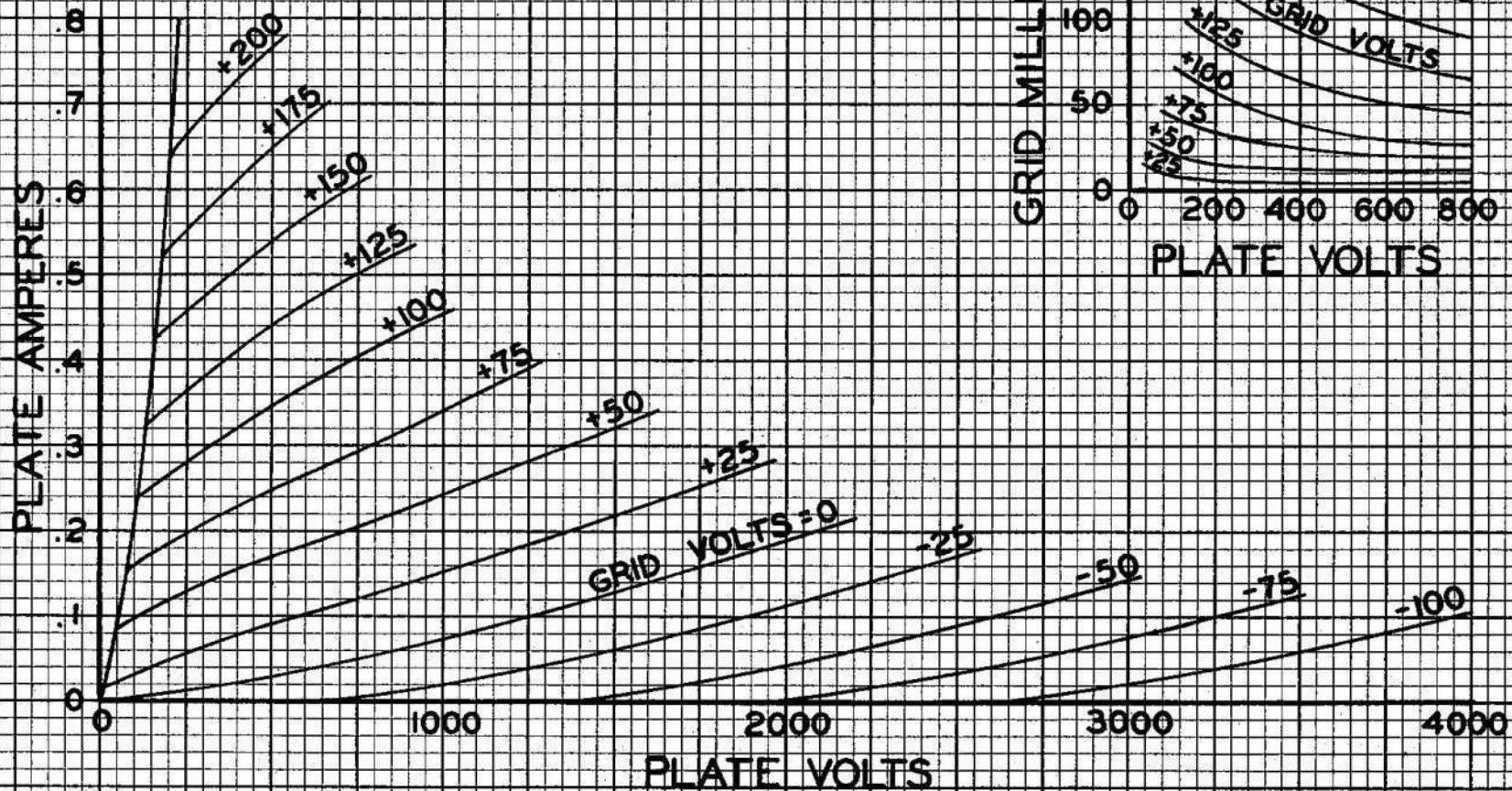
## VERY HIGH FREQUENCY PERFORMANCE

FREQUENCY	30	60	120	200 mc
<b>Class C Unmodulated</b>				
Max. Input .....	250	215	180	140 Watts
Max. Plate Volts .....	3000	2700	2500	2000 Volts
Typical Plate Efficiency .....	80	77	72	64 Percent
<b>Class C Plate Modulated</b>				
Max. Input .....	210	180	150	115 Watts
Max. Plate Volts .....	2500	2200	2000	1700 Volts

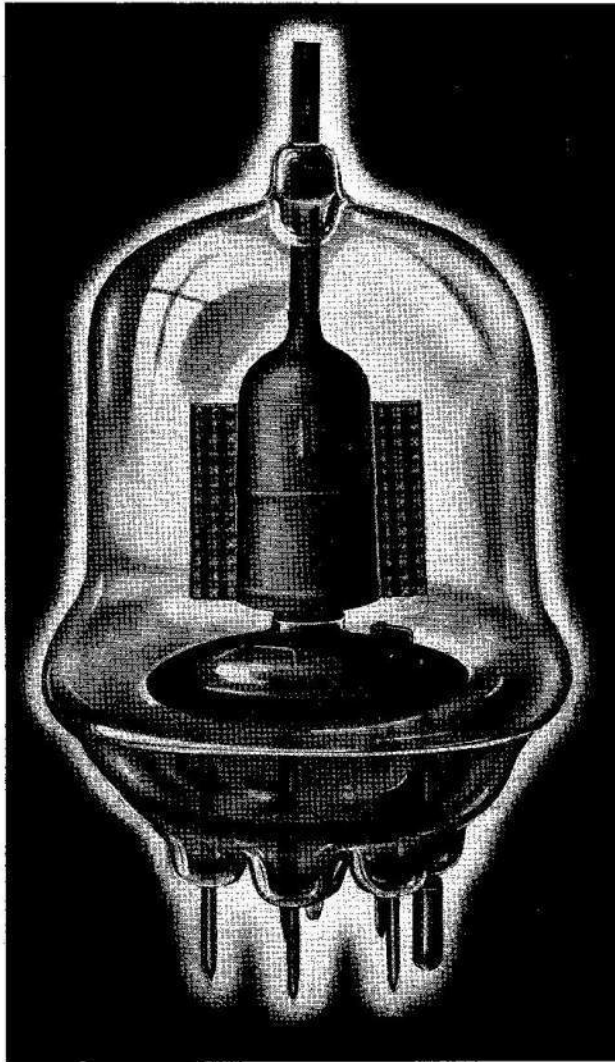
# Gammatron Tubes



TYPE 54 GAMMATRON  
AVERAGE STATIC  
CHARACTERISTICS



# GAMMATRON TYPE 57



## BEAM PENTODE

50 watt radiation cooled beam pentode. Exceptional very high frequency performance.

### ELECTRICAL DATA

Plate Dissipation . . . . .	50 Watts
Maximum Screen Input . . . . .	25 Watts
Filament Voltage . . . . .	5.0 Volts
Filament Current . . . . .	5.0 Amps.

### INTERELECTRODE CAPACITIES

Plate-Grid Capacity . . . . .	.05 Mmfd.
Input Capacity . . . . .	7.29 Mmfd.
Output Capacity . . . . .	3.13 Mmfd.

### PHYSICAL DATA

Plate . . . . .	Enclosed Cylindrical Tantalum
Grids . . . . .	Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Socket . . . . .	Johnson #101 or #247
Envelope . . . . .	Nonex Glass
Net Weight . . . . .	2 $\frac{1}{4}$ Ounces
Shipping Weight . . . . .	6 Ounces
Maximum Height . . . . .	4 $\frac{1}{16}$ Inches
Maximum Diameter . . . . .	2 $\frac{3}{8}$ Inches

The type HK-57 is capable of very high frequency operation and does not require neutralization. It has very low driving power requirements, will stand high plate and screen voltages, and will stand large momentary overloads. These features are made possible through the use of tantalum plate and grid elements and an advanced design by Heintz and Kaufman Ltd. engineers. The HK-57 is the only multi-element tube in its class capable of this kind of performance.

High mutual conductance in combination with high voltage capabilities makes the grid driving power requirements of the HK-57 very low. And under many conditions the power consumed is negligible. This feature reduces the number and size of the preliminary stages required in any transmitter resulting in savings and advantages that are obvious.

The plate and grid leads are short and sturdy, resulting in low lead inductance. The suppressor grid and screen grid are each supported with two parallel leads. All four leads are terminated on the base so that they may be individually bypassed to ground. The feedback capacity is extremely low and thus it is possible to operate the HK-57 even at very high frequencies without neutralization. This feature makes the HK-57 adaptable to instant band switching circuits and such circuits may be designed with a minimum of controls.

Installation into practical circuits is facilitated by the unique physical design of the HK-57. The input and output circuits are readily isolated and complete shielding is assured when the base shell is grounded.

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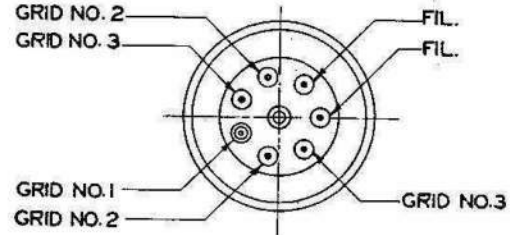
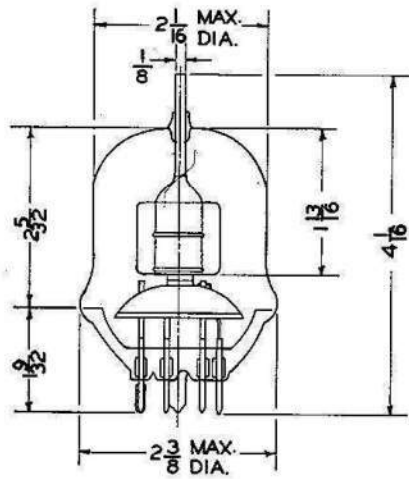
## HEINTZ AND KAUFMAN LTD.

SOUTH SAN FRANCISCO, CALIFORNIA, U.S.A.



## TYPE HK-57

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" UNMODULATED

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE*			
		250	166	125	Watts
Power Output . . . . .		250	166	125	Watts
Driving Power . . . . .		.18	.15	.14	Watts
D.C. Plate Volts . . . . .	3000	3000	2000	1500	Volts
D.C. Plate Current . . . . .	150	100	110	105	M. A.
D.C. Suppressor Voltage . . . . .		-0-	+30	+30	Volts
D.C. Suppressor Current . . . . .		-0-	1	4	M. A.
D.C. Screen Voltage . . . . .	500	450	450	450	Volts
D.C. Screen Current . . . . .	20	2	2	4	M. A.
D.C. Control Grid Voltage . . . . .	400	-175	-145	-145	Volts
D.C. Control Grid Current . . . . .	15	1	1	1	M. A.
Peak R.F. Control Voltage . . . . .		195	160	160	Volts
Plate Dissipation . . . . .	50†	50	50	32	Watts
D.C. Plate Input . . . . .	300	300	216	157	Watts

\*Other values to obtain similar results may be used provided the maximum ratings are not exceeded.  
†Continuous rating. Intermittent rating 75 watts.

### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" PLATE MODULATED

(100% Modulation Peaks, 60% Average Value)

	Maximum Rating Per Tube	TYPICAL CARRIER CONDITIONS, 1 TUBE			
		200	135	125	Watts
Power Output . . . . .		200	135	125	Watts
Driving Power . . . . .		.18	.2	.2	Watts
D.C. Plate Volts . . . . .	3000	2500	2000	1500	Volts
D.C. Plate Current . . . . .	135	96	88	105	M. A.
D.C. Suppressor Volts . . . . .		-0-	+30	+30	Volts
D.C. Suppressor Current . . . . .		-0-	3	4	M. A.
D.C. Screen Volts . . . . .	500	450	450	450	Volts
D.C. Screen Current . . . . .	20	2	2	4	M. A.
D.C. Control Grid Volts . . . . .	400	-175	-145	-145	Volts
D.C. Control Grid Current . . . . .	15	1.	1.5	1.5	M. A.
Peak R.F. Control Voltage . . . . .		190	165	165	Volts
Plate Dissipation . . . . .	40	40	40	32	Watts
D.C. Plate Input . . . . .	250	240	175	157	Watts

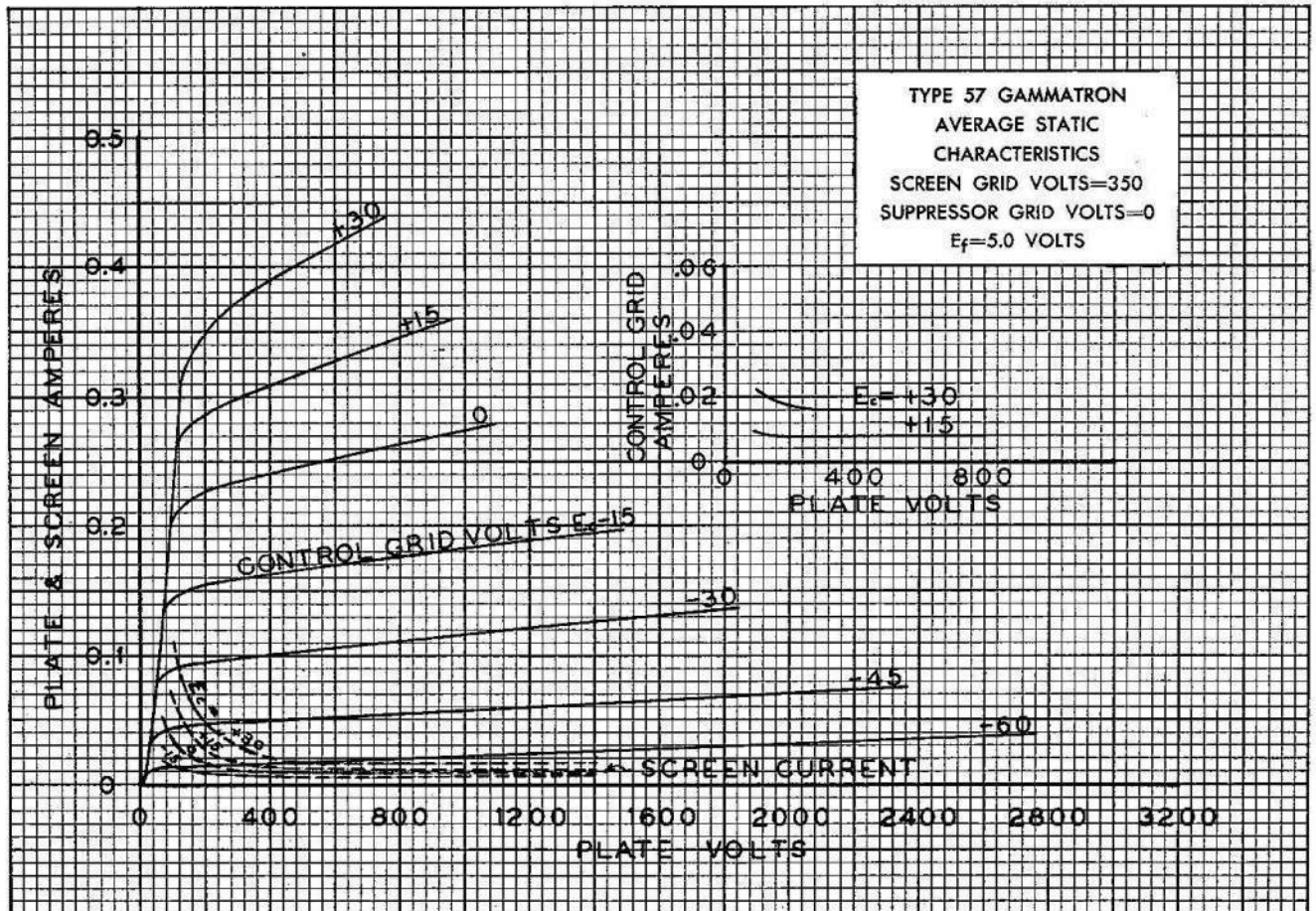
# Gammatron Tubes

## RADIO FREQUENCY POWER AMPLIFIER CLASS "C" SUPPRESSOR GRID MODULATED

TYPICAL CARRIER CONDITIONS, 1 TUBE

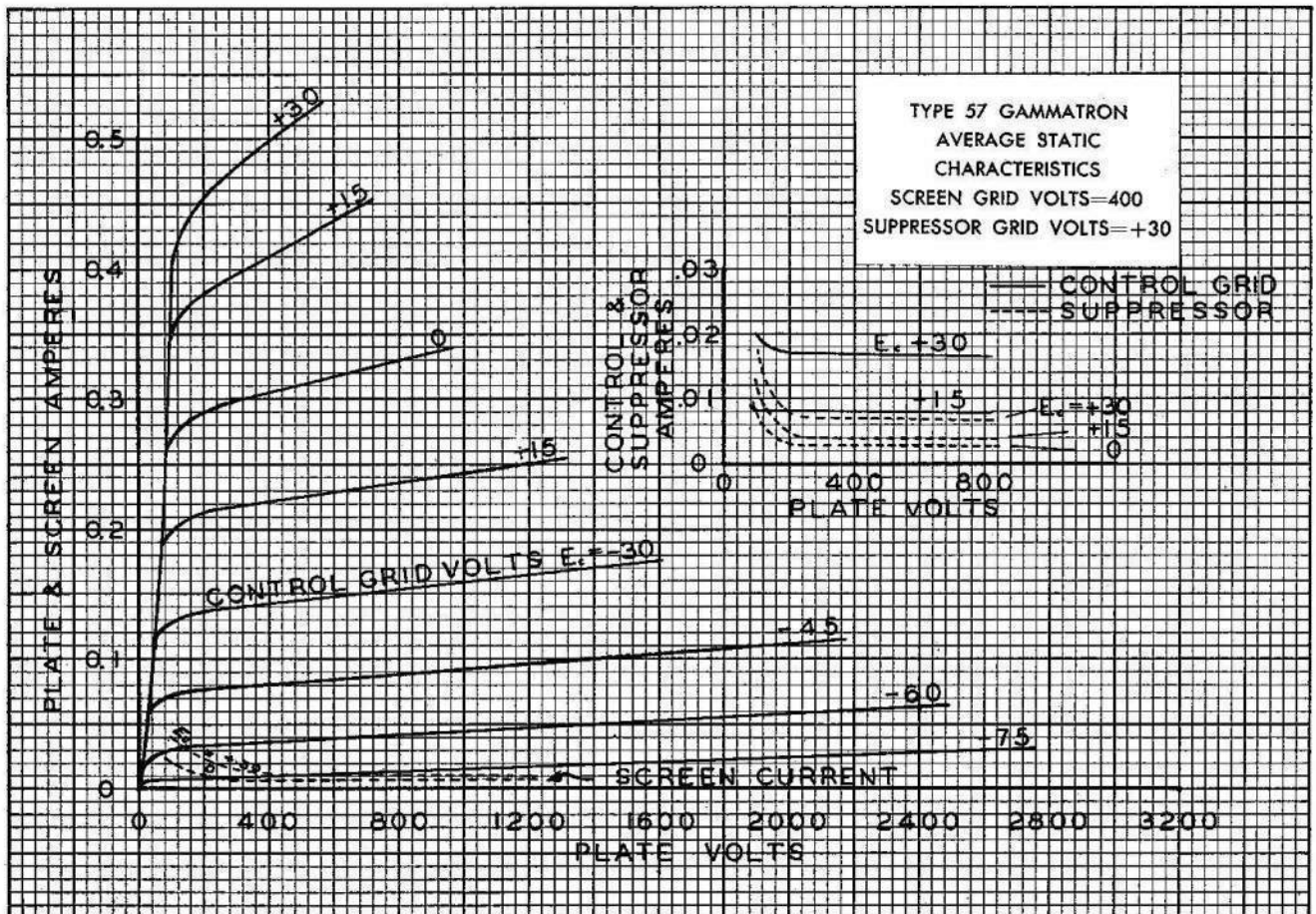
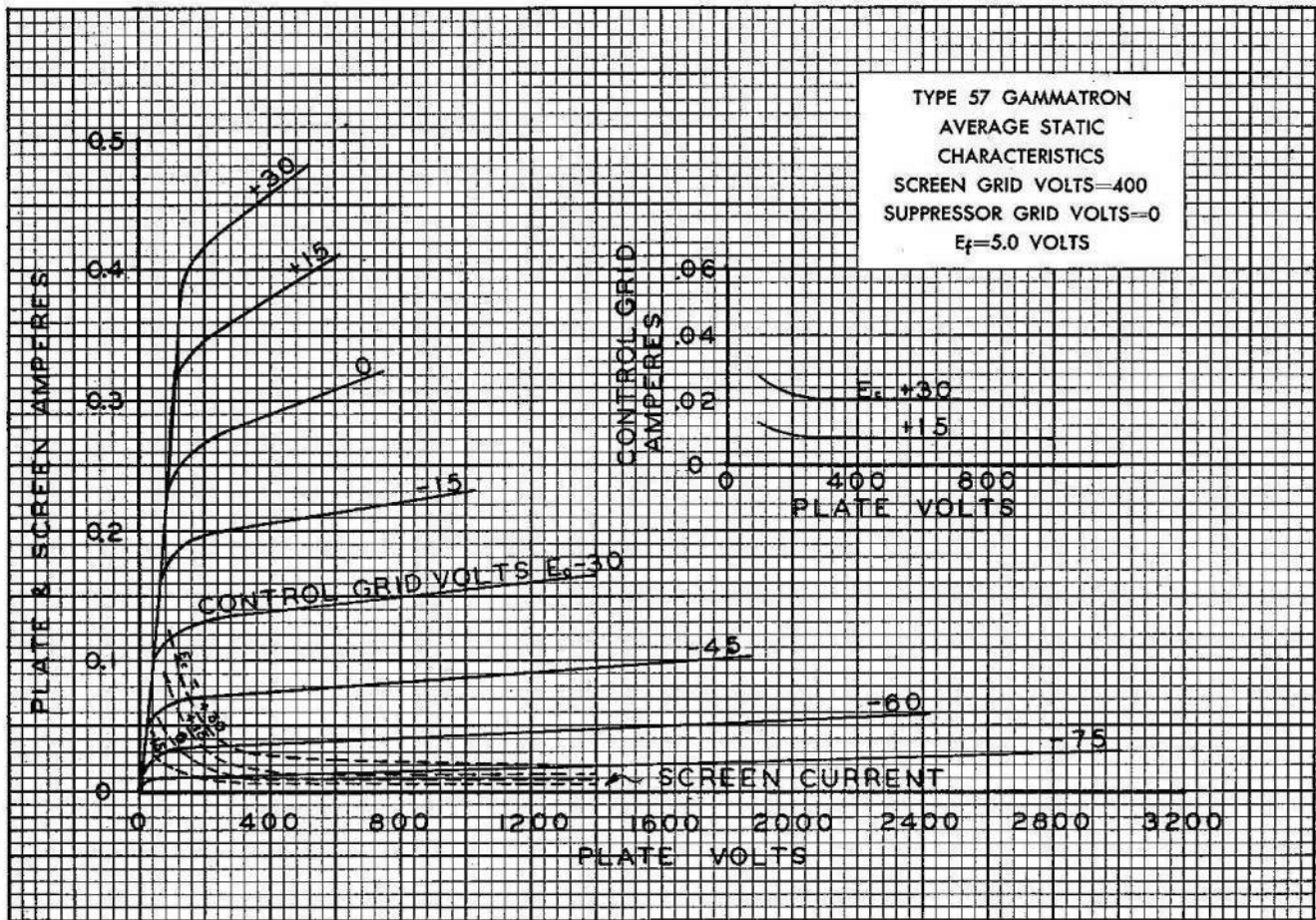
Power Output . . . . .	90	50	23	Watts
Driving Power . . . . .	0.6	0.3	0.2	Watts
Audio Power . . . . .	100	140	121	Milliwatts
D.C. Plate Voltage . . . . .	2000	1500	1000	Volts
D.C. Plate Current . . . . .	80	58	40	M. A.
D.C. Suppressor Voltage . . . . .	-190	-150	-120	Volts
D.C. Screen Voltage* . . . . .	450	400	350	Volts
D.C. Screen Current . . . . .	14	11	12	M. A.
Screen Series Resistor† . . . . .	110,000	100,000	56,000	Ohms
D.C. Control Grid Voltage . . . . .	-240	-210	-180	Volts
D.C. Control Grid Current . . . . .	2.5	1.5	1.0	M. A.
Peak R.F. Driving Voltage . . . . .	265	230	200	Volts
Peak A.F. Modulating Voltage . . . . .	240	182	160	Volts
Plate Dissipation . . . . .	50	25	17	Watts
Suppressor Circuit Resistance‡ . . . . .	300,000	120,000	100,000	Ohms
Modulation Percentage . . . . .	94	95	94	%

\*Screen voltage obtained from plate source through specified dropping resistor.  
 †Screen series resistor value specified provides the regulation required.  
 ‡Load shown to modulator.

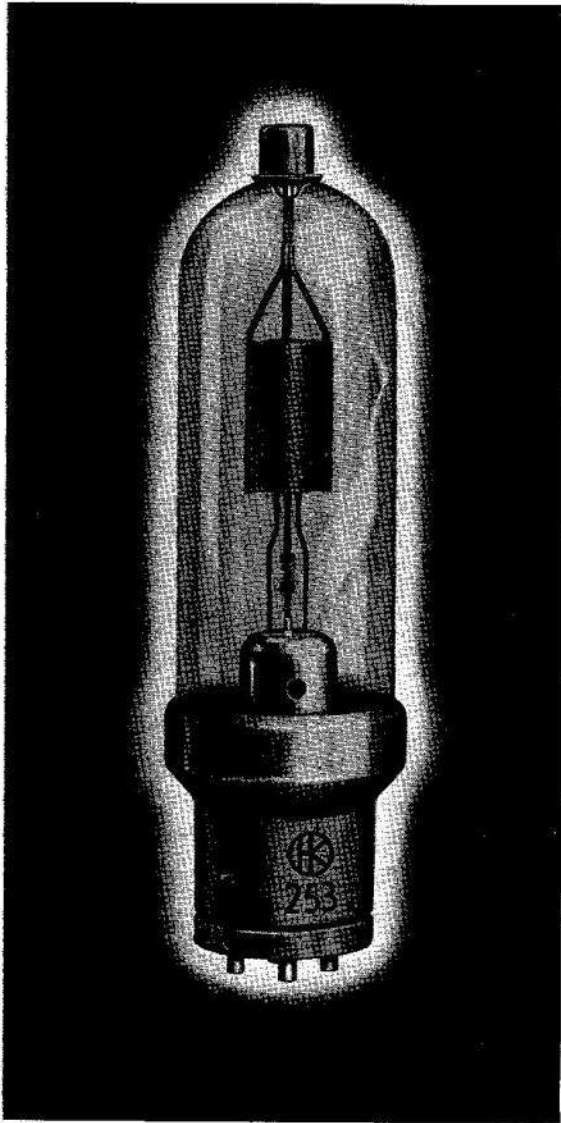


# Gammatron Tubes





# GAMMATRON TYPE 253



## HIGH-VACUUM HALF-WAVE RECTIFIER

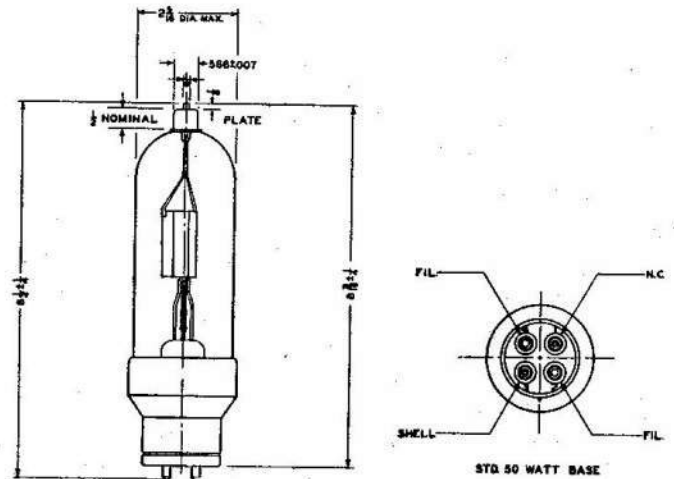
### PHYSICAL DATA

Plate . . . . .	Tantalum
Filament . . . . .	Thoriated Tungsten
Blank . . . . .	Nonex Glass
Base . . . . .	Standard Fifty Watt
Net Weight . . . . .	9 Ounces
Shipping Weight . . . . .	4 Pounds
Max. Height . . . . .	8¾ Inches
Max. Diameter . . . . .	2½ Inches

### ELECTRICAL DATA

Filament Voltage . . . . .	5.0 Volts
Filament Current . . . . .	10 Amps.
Max. Peak Inverse Voltage . . . . .	15,000 Volts
Max. Peak Plate Current . . . . .	3.0 Amps.
Max. Average Plate Current . . . . .	.35 Amps.

The 253 GAMMATRON is a half-wave high-vacuum rectifier with a thoriated tungsten filament. It has excellent voltage regulation because of close filament to plate spacing. It will stand high inverse plate voltages because of its superior vacuum. No time delay is necessary since the thoriated tungsten filament is ready for operation immediately after application of voltage. The starting characteristics of the 253 are not affected by extreme cold nor is the inverse voltage rating reduced by excessive temperatures as is the case with mercury vapor rectifiers.



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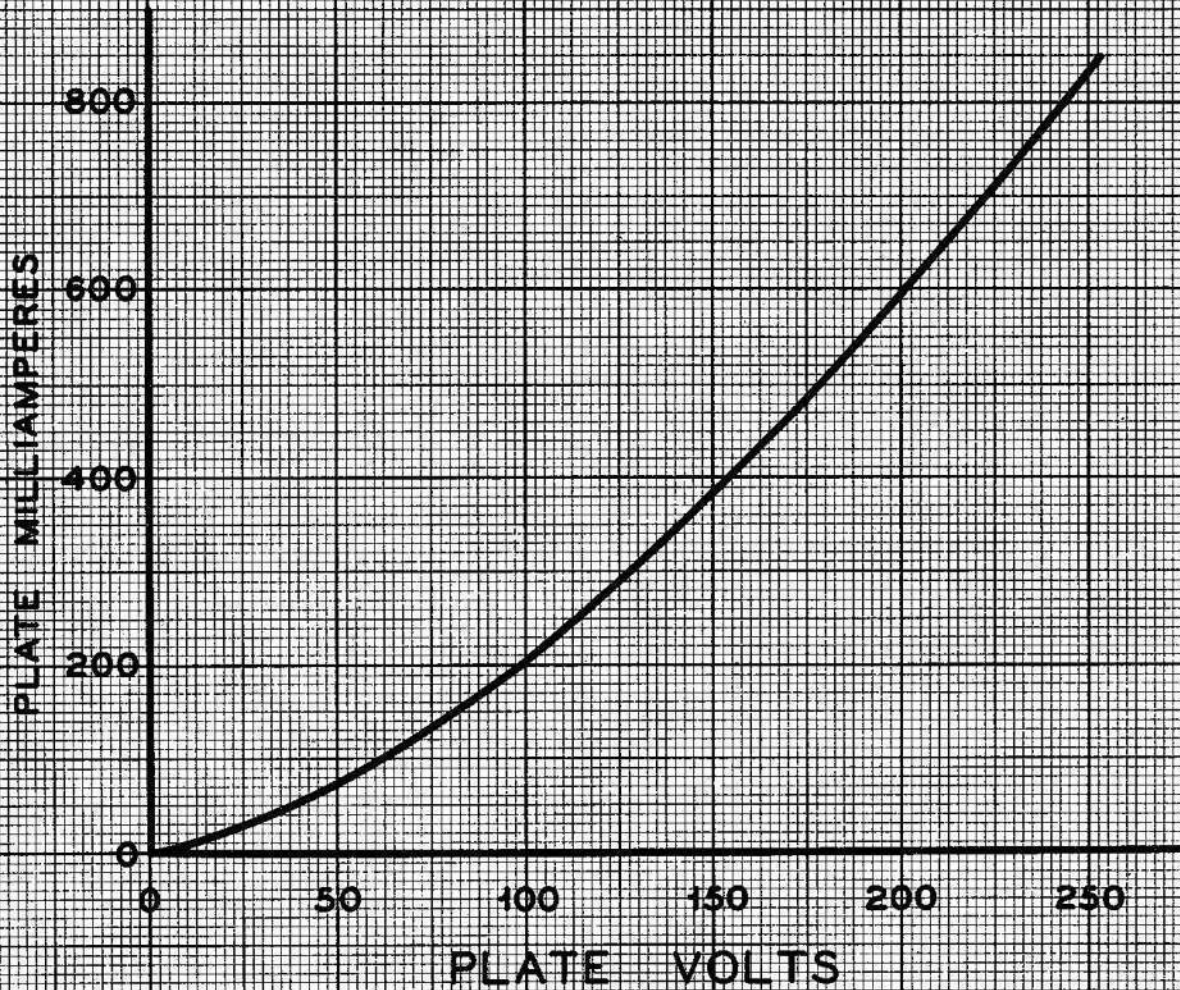
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# TYPE 253 GAMMATRON

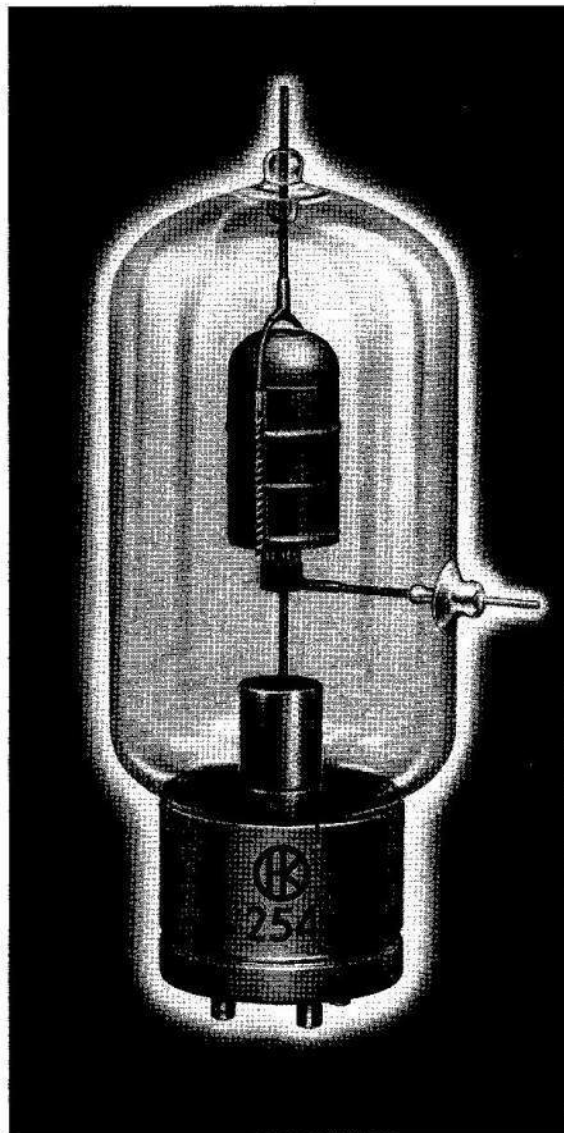
AVERAGE STATIC  
CHARACTERISTIC

$E_f = 5.0$  volts





# GAMMATRON TYPE 254



## GENERAL PURPOSE TRIODE

Medium mu universal triode, 100 watt radiation cooled tantalum plate. Special design permits high voltage operation and unusual VHF efficiency.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Net Weight . . . . .	5 Ounces
Net Weight . . . . .	6½ Ounces
Shipping Weight . . . . .	1½ Pounds
Maximum Height . . . . .	7¼ Inches
Maximum Diameter . . . . .	2½ Inches

### ELECTRICAL DATA

Filament Voltage . . . . .	5.0 Volts
Filament Current . . . . .	7.5 Amps
Normal Plate Dissipation . . . . .	100 Watts
Maximum Average Plate Current . . . . .	225 MA.
Maximum Average Grid Current . . . . .	60 MA.
Maximum Plate Voltage . . . . .	4000 Volts
Average Amplification Constant . . . . .	25

### INTERELECTRODE CAPACITANCES

Grid-Plate . . . . .	2.7 Mmfd.
Grid-Filament . . . . .	2.5 Mmfd.
Plate-Filament . . . . .	0.4 Mmfd.

The Type 254 GAMMATRON is capable of high voltage operation, long life, unusual VHF efficiency and has the ability to stand heavy over-loads. These results are achieved by the use of a tantalum grid and plate in combination with unique Heintz and Kaufman engineering developments.

The plate and grid are mounted on short, sturdy, low resistance leads. Internal insulators are not required while perfect alignment is maintained, thus the interelectrode capacity is low and the insulation high. A plate dome confines the electron stream within the plate, eliminating destructive bombardment of the envelope and plate seal and also improving the plate efficiency. These features combine to give exceptional VHF performance.

The grid seal is protected from failure at very severe VHF loads by means of a silver film. This patented device prevents electrolytic currents from decomposing the glass at the tungsten seal, and thus grid cracks sometimes experienced in ordinary tubes are eliminated.

The use of tantalum and the elimination of unnecessary internal structures makes it possible to exhaust GAMMATRON tubes at very high temperatures. This technique completely eliminates all of the internal gas, the usual "getter" is not necessary, and the tube cannot become soft even due to heavy overloads. The ability of tantalum to reabsorb gas even though operating at high temperatures insures an excellent vacuum permanently, and long filament life.

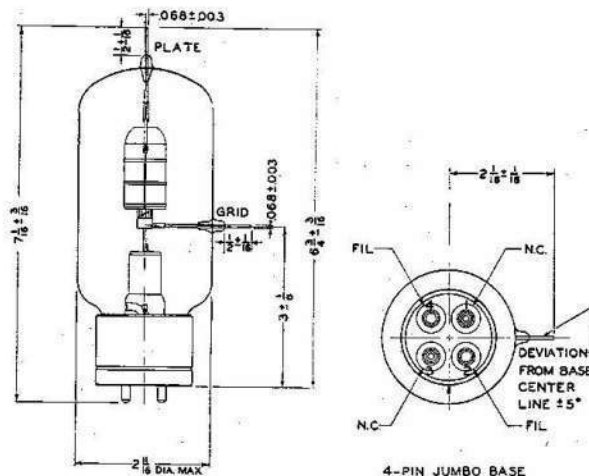
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## TYPE HK 254

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



### RADIO FREQUENCY POWER AMPLIFIER CLASS C UNMODULATED\*

	Maximum Rating Per Tube	Typical Operation, 1 Tube			
		400	330	25	125 Watts
Power Output.....	400	400	330	25	125 Watts
Driving Power.....	12	18	25	25	25 Watts
DC Plate Voltage.....	4000	4000	3000	2000	1000 Volts
DC Plate Current.....	225	125	165	215	225 ma
DC Grid Current.....	60	30	40	55	60 ma
DC Grid Voltage.....	-1000	-260	-245	-230	-195 Volts
Peak RF Grid Voltage.....		450	480	500	480 Volts
Plate Dissipation.....	100	100	100	100	80 Watts
Plate Input.....	500	500	500	430	225 Watts

\*Carrier conditions for telegraphy.

### RADIO FREQUENCY POWER AMPLIFIER CLASS C PLATE MODULATED\*

	Maximum Rating Per Tube	Typical Operation, 1 Tube			
		335	275	25	115 Watts
Power Output.....	335	335	275	25	115 Watts
Driving Power.....	19	23	25	25	23 Watts
DC Plate Voltage.....	3000	3000	2500	2000	1000 Volts
DC Plate Current.....	180	140	168	180	180 ma
DC Grid Current.....	60	35	40	45	45 ma
DC Grid Voltage.....	-800	-355	-360	-355	-315 Volts
Peak RF Grid Voltage.....		580	610	620	580 Volts
Plate Dissipation.....	85	85	85	85	65 Watts
Plate Input.....	420	420	420	360	180 Watts

\*Carrier conditions for 100% modulation and 60% average value.

### AUDIO FREQUENCY POWER AMPLIFIER CLASS B\*

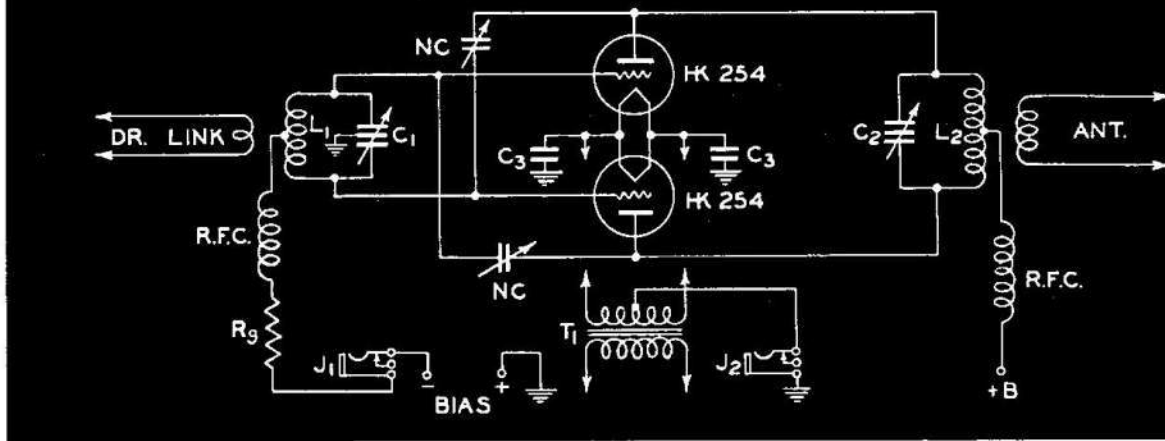
	Maximum Ratings Two Tubes	Typical Operation, 2 Tubes			
		430	400	47	280 Watts
Power Output.....	430	420	400	47	280 Watts
Driving Power**.....	20	25	47	47	60 Watts
DC Plate Voltage.....	3000	3000	2500	2000	1000 Volts
DC Plate Current, Zero Signal.....	30	40	45	45	70 ma
DC Plate Current, Max. Signal.....	500	200	240	280	480 ma
DC Grid Voltage.....	-110	-80	-60	-60	-15 Volts
Peak AF Grid to Grid Voltage.....	470	460	520	520	530 Volts
Plate Dissipation.....	200	170	180	160	200 Watts
Plate Input, Max. Signal.....	600	600	600	560	480 Watts
Load Resistance, Plate to Plate.....	36,400	25,200	16,400	4,000	4,000 Ohms

\*All data for two tubes.

\*\*Instantaneous power at crest of cycle: effective power is 1/2 of this value.

# Gammatron Tubes

TYPICAL FINAL AMPLIFIER



This typical final push-pull amplifier is capable of a maximum unmodulated output of 750 watts and requires a driving power of less than 50 watts. The driver stage may consist of an HK 24 or a pair of 807 tubes which may be link coupled with the grid inductance,  $L_1$ . It is advisable to supply enough fixed bias to prevent plate current flow under static conditions (see plate curve), and the remaining bias is then developed by the grid current flow through  $R_g$ . Thus: DC grid voltage = Fixed Bias + ( $R_g \times$  DC grid current).

COMPONENTS

- $C_1$  — Split-stator transmitting condenser, 100 mmfd. per section 0.07 inch air gap.
- $C_2$  — Split-stator transmitting condenser, 75 mmfd. per section 0.20 inch air gap.
- $C_3$  — .01 mfd. paper condenser.
- N.C. — Neutralizing condensers 0.5 to 10 mmfd.
- $J_1$  and  $J_2$  — Jacks to measure grid and cathode current.
- $R_g$  — As required by operating conditions (see data).
- $T_1$  — 5.0 volt, 15 ampere filament transformer.

COIL DATA

Band	$L_1$	$L_2$
160 Meters	85 turns # 24 DCC Close Wound Diameter 1 3/4 Inches	30 Turns # 12 Length 4 1/2 Inches Diameter 5 Inches
80 Meters	52 Turns # 18 Enamel Close Wound Diameter 1 3/4 Inches	22 Turns # 12 Length 3 Inches Diameter 5 Inches
40 Meters	30 Turns # 14 Enamel Close Wound Diameter 1 3/4 Inches	22 Turns # 12 Length 3 3/8 Inches Diameter 2 1/2 Inches
20 Meters	12 Turns # 14 Enamel Length 1 3/8 Inches Diameter 1 3/4 Inches	8 Turns # 12 Length 1 1/8 Inches Diameter 2 1/2 Inches
10 Meters	6 Turns # 14 Enamel Length 1 3/8 Inches Diameter 1 3/4 Inches	6 Turns 1/4-Inch Copper Tubing Length 4 Inches Diameter 2 1/2 Inches

VERY HIGH FREQUENCY PERFORMANCE

FREQUENCY	30	60	120	200 mc
<b>Class C Unmodulated</b>				
Max. Input	500	430	360	280 Watts
Max. Plate Volts	4000	3200	2700	2300 Volts
Typical Plate Efficiency	80	77	72	64 Percent
<b>Class C Plate Modulated</b>				
Max. Input	420	360	300	230 Watts
Max. Plate Volts	3000	2600	2200	1900 Volts

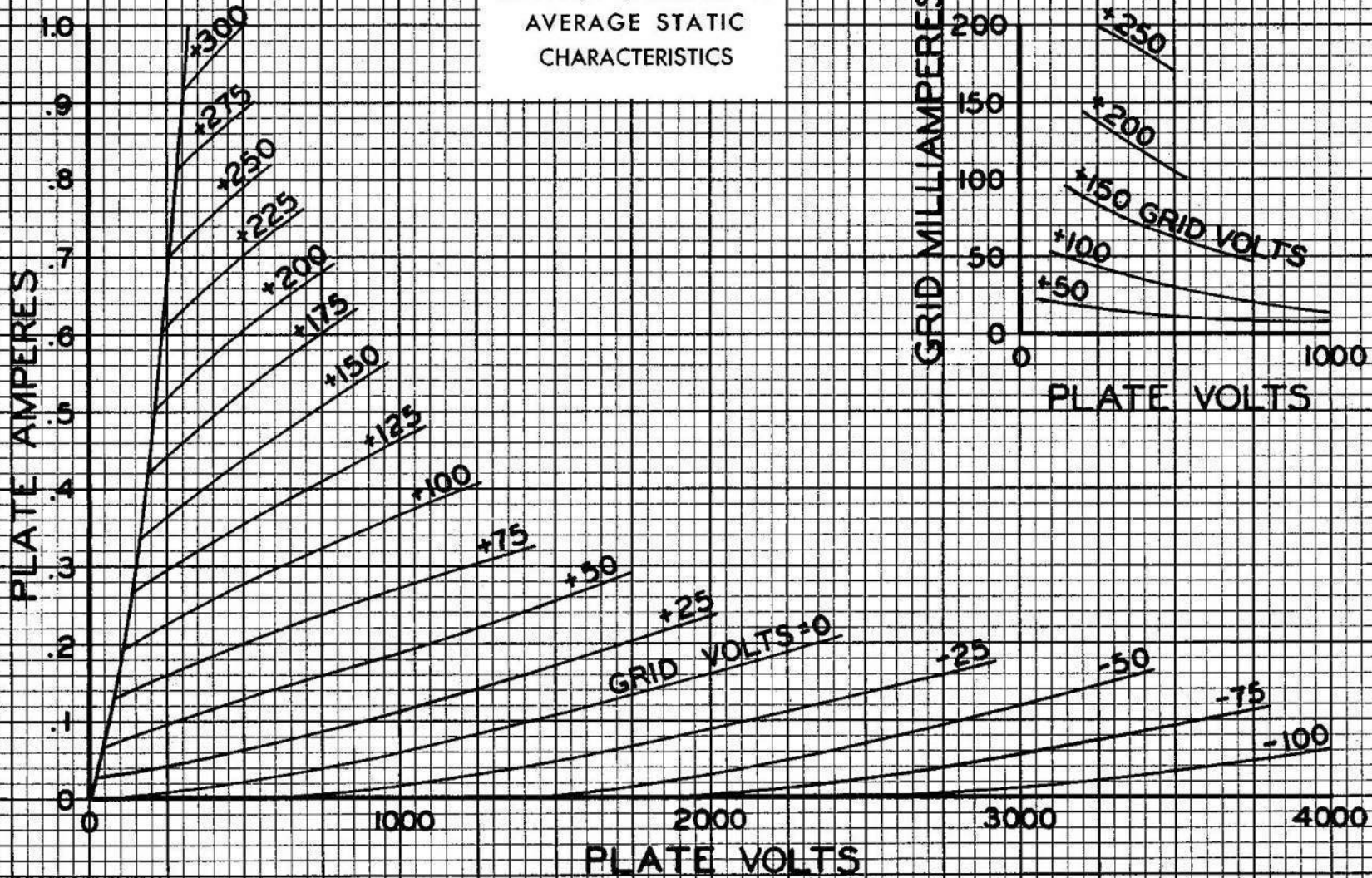
RADIO FREQUENCY DOUBLER AMPLIFIER  
(Feedback neutralized by conventional methods)

	Maximum Rating Per Tube	Typical Operation, 1 Tube		
Power Output		150	125	80 Watts
Driving Power		10	12	12 Watts
DC Plate Voltage	4000	2500	2000	1500 Volts
DC Plate Current	225	100	112	120 ma
DC Grid Current	60	10	12	12 ma
DC Grid Voltage	-1000	-850	-920	-900 Volts
Peak RF Grid Voltage		1050	1150	1125 Volts
Plate Dissipation	100	100	100	100 Watts
Plate Input	250	250	225	180 Watts

*Gammatron Tubes*

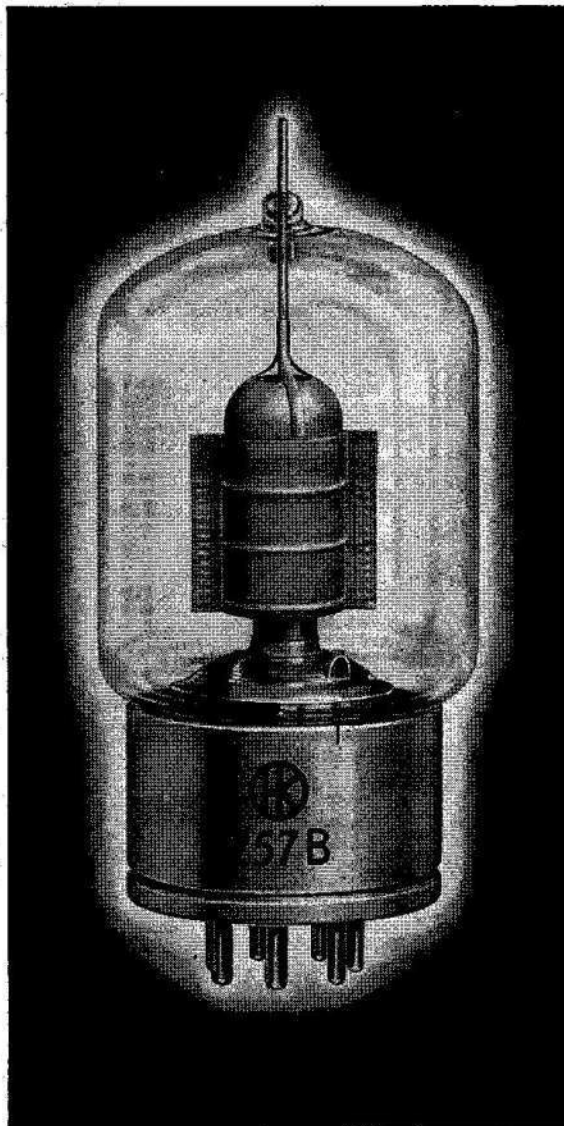


TYPE 254 GAMMATRON  
AVERAGE STATIC  
CHARACTERISTICS



# GAMMATRON TYPE 257B

JAN 4E 27



## BEAM PENTODE

75 watt radiation cooled beam pentode. Exceptional very high frequency performance.

### ELECTRICAL DATA

Plate Dissipation . . . . .	75 Watts
Maximum Screen Input . . . . .	25 Watts
Filament Voltage . . . . .	5.0 Volts
Filament Current . . . . .	7.5 Amps.

### INTERELECTRODE CAPACITIES

Plate-Grid Capacity . . . . .	0.08 Mmfd.
Input Capacity . . . . .	10.5 Mmfd.
Output Capacity . . . . .	4.7 Mmfd.

### PHYSICAL DATA

Plate . . . . .	Enclosed Cylindrical Tantalum
Grids . . . . .	Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Base . . . . .	Giant 7-pin Bayonet
Envelope . . . . .	Nonex Glass
Net Weight . . . . .	6 Ounces
Shipping Weight . . . . .	1 Pound
Maximum Height . . . . .	6 $\frac{3}{16}$ Inches
Maximum Diameter . . . . .	2 $\frac{1}{8}$ Inches

The type HK-257B is capable of very high frequency operation and does not require neutralization. It has very low driving power requirements, will stand high plate and screen voltages, and will stand large momentary overloads. These features are made possible through the use of tantalum plate and grid elements and an advanced design by Heintz and Kaufman Ltd. engineers. The HK-257B is the only multi-element tube in its class capable of this kind of performance.

High mutual conductance in combination with high voltage capabilities makes the grid driving power requirements of the HK-257B very low. And under many conditions the power consumed is negligible. This feature reduces the number and size of the preliminary stages required in any transmitter resulting in savings and advantages that are obvious.

The plate and grid leads are short and sturdy, resulting in low lead inductance. The suppressor grid and screen grid are each supported with two parallel leads. All four leads are terminated on the base so that they may be individually bypassed to ground. The feed back capacity is extremely low and thus it is possible to operate the HK-257B even at very high frequencies without neutralization. This feature makes the HK-257B adaptable to instant band switching circuits and such circuits may be designed with a minimum of controls.

Installation into practical circuits is facilitated by the unique physical design of the HK-257B. The input and output circuits are readily isolated and complete shielding is assured when the base shell is grounded.

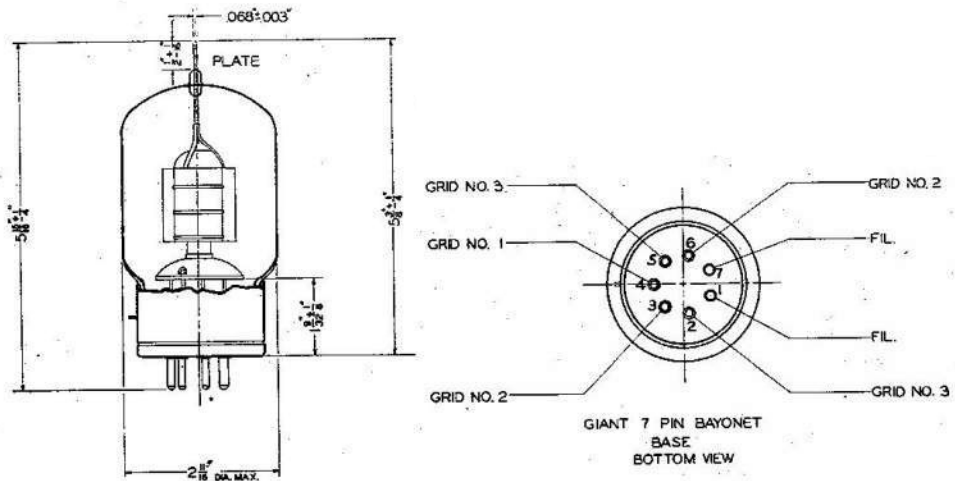
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## HEINTZ AND KAUFMAN LTD.

SOUTH SAN FRANCISCO, CALIFORNIA, U. S. A.

## TYPE HK-257B

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



## MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

### RADIO FREQUENCY POWER AMPLIFIER— CLASS "C" UNMODULATED

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE*						
		235	230	230	230	225		
Power Output . . . . .		235	230	230	230	225	110	Watts
Driving Power . . . . .		0	0.1	0.2	1.4	1.9	2.4	Watts
DC Plate Volts . . . . .	4000	3000	2000	2000	2000	2000	1000	Volts
DC Plate Current . . . . .	150	100	150	150	150	150	150	M. A.
DC Suppressor Voltage . . . . .		60	60	0	60	0	60	Volts
DC Suppressor Current . . . . .		3	3	0	4	0	6	M. A.
DC Screen Voltage . . . . .	750	750	750	750	500	500	400	Volts
DC Screen Current . . . . .	30	8	11	18	11	25	20	M. A.
DC Control Grid Voltage . . . . .	-500	-200	-200	-200	-200	-290	-180	Volts
DC Control Grid Current . . . . .	25	0	0.4	0.7	6	8	10	M. A.
Peak R.F. Control Voltage . . . . .		170	215	225	255	270	270	Volts
Plate Dissipation . . . . .	75	65	70	70	70	75	40	Watts
DC Plate Input . . . . .	300	300	300	300	300	300	150	Watts

\*Other values to obtain similar results may be used provided the maximum ratings are not exceeded.

### RADIO FREQUENCY POWER AMPLIFIER— CLASS "C" PLATE MODULATED

(100% Modulation Peaks, 60% Average Value)

	Maximum Rating Per Tube	TYPICAL CARRIER CONDITIONS, 1 TUBE						
		200	195	145	143	95		
Power Output . . . . .		200	195	145	143	95	95	Watts
Driving Power . . . . .		0.1	0.2	0.4	1.7	1.7	1.7	Watts
DC Plate Volts . . . . .	3000	2500	2000	1500	1500	1000	1000	Volts
DC Plate Current . . . . .	135	100	125	135	135	135	135	M. A.
DC Suppressor Volts . . . . .		60	60	60	60	60	60	Volts
DC Suppressor Current . . . . .		3	3	3	4	5	5	M. A.
DC Screen Volts . . . . .	600	600	600	600	400	400	400	Volts
DC Screen Current . . . . .	30	8	10	11	11	13	13	M. A.
DC Control Grid Volts . . . . .	-500	-200	-200	-200	-130	-130	-130	Volts
DC Control Grid Current . . . . .	25	0.6	1.0	1.4	8	8	8	M. A.
Peak R.F. Control Voltage . . . . .		220	235	255	235	235	235	Volts
Plate Dissipation . . . . .	65	50	55	57	59	40	40	Watts
DC Plate Input . . . . .	250	250	250	202	202	135	135	Watts

# Gammatron Tubes



## RADIO FREQUENCY DOUBLER AMPLIFIER MAXIMUM INPUT 200 WATTS

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
		120	110	110	80
Power Output		120	110	110	80 Watts
Driving Power		0	0.2	1.8	5.5 Watts
DC Plate Voltage	4000	2000	1500	1500	1000 Volts
DC Plate Current	150	95	120	120	150 M. A.
DC Suppressor Voltage		60	60	60	60 Volts
DC Suppressor Current		2	3	4	6 M. A.
DC Screen Voltage	750	750	750	500	500 Volts
DC Screen Current	30	10	15	13	25 M. A.
DC Control Grid Voltage	-500	-400	-400	-330	-400 Volts
DC Control Grid Current	25	0	0.5	5	12 M. A.
Peak R.F. Control Voltage		400	425	400	510 Volts
Plate Dissipation	75	70	70	70	70 Watts
DC Plate Input	200	190	180	180	150 Watts

## CLASS "A" AMPLIFIER—AUDIO AND TELEVISION

	2 Tubes Overbiased	1 TUBE OPERATION	
		30	25
Power Output	315	30	25 Watts
DC Plate Voltage	1500	1000	500 Volts
DC Plate Current Zero Signal	80	75	150 M. A.
DC Plate Current Max. Signal	292		M. A.
DC Screen Voltage	750	300	500 Volts
DC Screen Current Zero Signal	2	5	10 M. A.
DC Screen Current Max. Signal	38		M. A.
DC Suppressor Voltage	60	0	0 Volts
DC Control Grid Voltage (Approx.)	-125	-27	-36 Volts
Peak Audio Voltage	240	27	36 Volts
Plate Input Max. Signal	438		Watts
Plate Dissipation Max.	150	75	75 Watts
Load Resistance		12,000	2600
Load Resistance, Plate to Plate	12,000		Ohms

## RADIO FREQUENCY POWER AMPLIFIER— CLASS "C" SUPPRESSOR GRID MODULATED (Maximum Input 110 Watts)

	Maximum Rating Per Tube	TYPICAL CARRIER CONDITIONS, 1 TUBE		
		35	33	32
Power Output		35	33	32 Watts
Driving Power		.4	1.4	2.0 Watts
Audio Power		100*	100*	500† Milliwatts
DC Plate Voltage	2000	2000	1500	1000 Volts
DC Plate Current	100	55	70	90 M. A.
DC Suppressor Voltage	-500	-300	-210	-135 Volts
Peak Suppressor Current		0	0	3 M. A.
DC Screen Voltage‡	600	500	500	600 Volts
DC Screen Current		27	44	41 M. A.
Screen Resistor		2000	2000	5000 Ohms
DC Control Grid Voltage	-500	-130	-130	-130 Volts
DC Control Grid Current	25	3	8	11 M. A.
Peak R.F. Driving Voltage		150	195	200 Volts
Peak A.F. Modulating Voltage		300	210	175 Volts
Plate Dissipation	75	75	72	60 Watts

\*Use Type 6C5 tube or equal with 1:2 step-up transformer ratio.

†Use receiving type pentode as 6F6 and 1:1 transformer ratio.

‡Source voltage. Apply through indicated resistor.

# Gammatron Tubes

## TYPE 257B BEAM PENTODE OPERATING NOTES

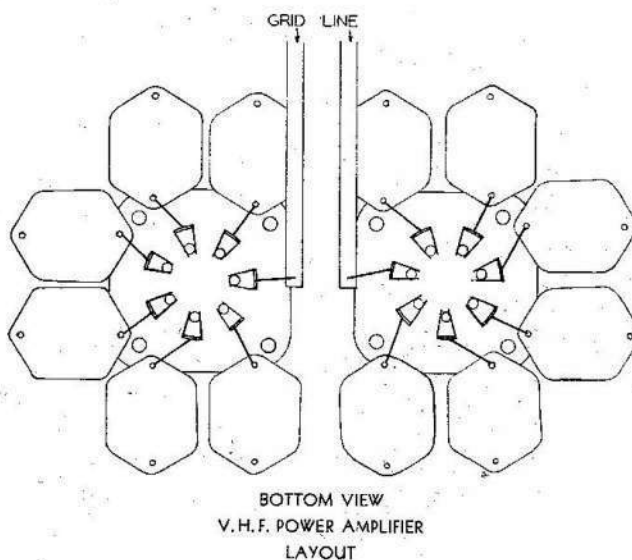
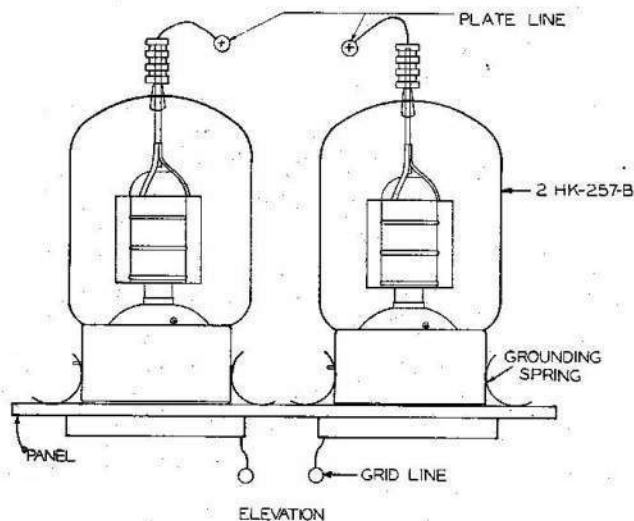
1. Protect your investment: Always provide sufficient fixed bias or cathode bias to limit the plate current to a safe value. Plate current depends on the screen voltage, not the plate voltage. The tube may be easily damaged by loss of bias because at zero bias the plate current is great with proper screen voltage. Apply reduced plate and screen voltages when tuning up transmitter.
2. The 257B has a very high transconductance and hence extreme care must be taken to prevent self-oscillation. The output and input circuits must be completely separated. Parasitic suppressors are often helpful. Screen and suppressor leads should be by-passed directly at the socket. For operation on high frequencies both parallel screen and suppressor leads should be by-passed to the filament. Because the internal screening shield is inside the metallic base shell, it is only necessary to provide spring contacts grounding the base shell to the panel to complete the shielding.
3. In employing various combinations of plate and screen voltages, the following general rules will be helpful:
  - (1) Driving requirements and screen current are lower with high screen voltage.
  - (2) Driving requirements are lower and screen current is decreased with approximately 60 volts applied to the suppressor.
  - (3) For the majority of applications zero suppressor voltage will be satisfactory.
4. Apply screen voltage or excitation after plate voltage or at the same time, not before. Remove screen voltage or excitation before plate voltage or at same time.
5. In tuning the tank coil to resonance there may be little change in plate current when the amplifier is loaded. Use the tantalum plate as a resonance indicator. Minimum plate temperature indicates resonance.

### VERY HIGH FREQUENCY RATINGS

Percentage maximum plate voltage and input power based on low frequency ratings shown on previous page.

Frequency	75	120	150 Mc.
Class "B" or Grid			
Modulated R. F. P. A. ....	100%	90%	80%
Class "C" R. F. P. A.			
Telegraph or Telephone .....	100%	75%	50%

### VHF POWER AMPLIFIER LAYOUT



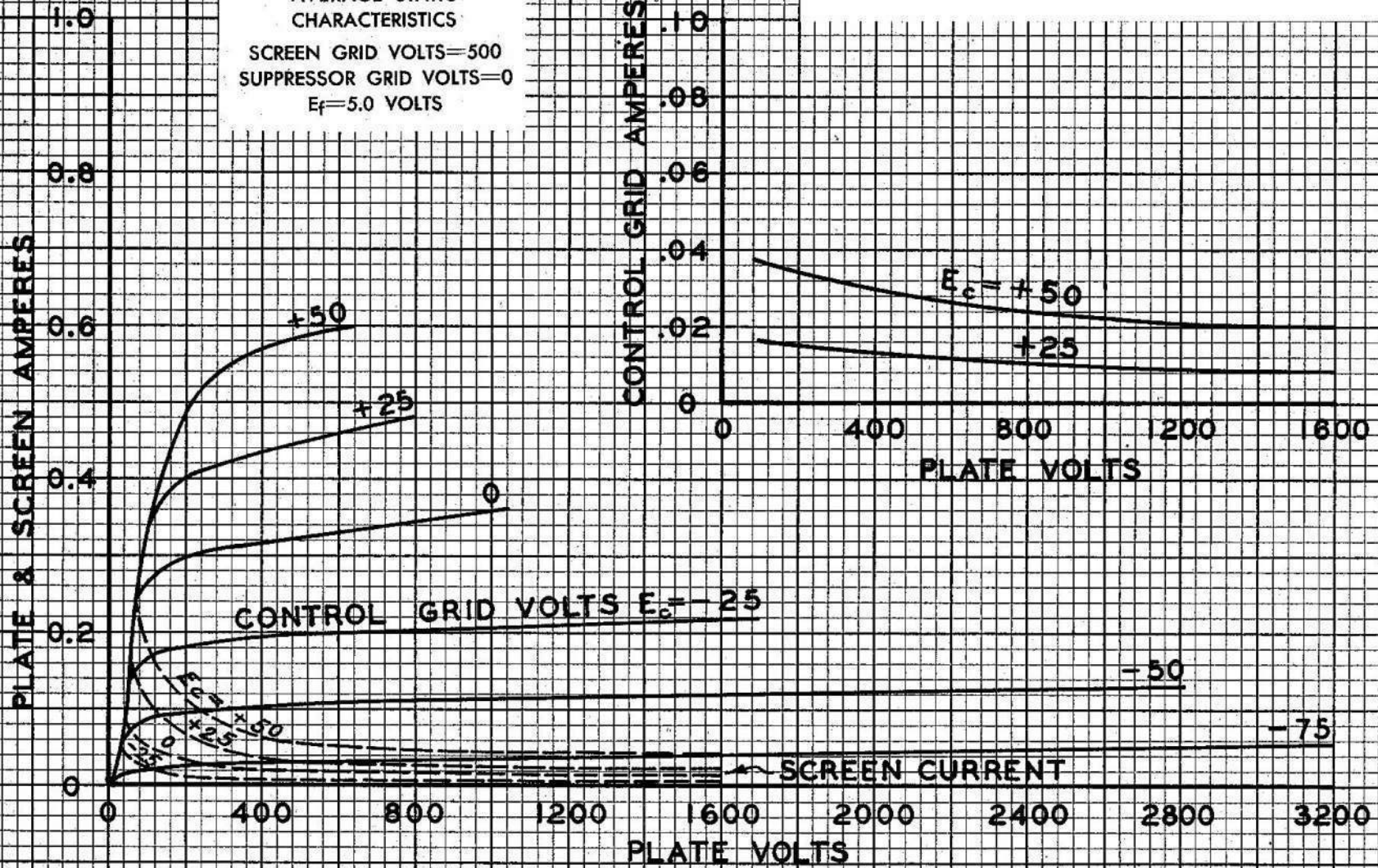




TYPE 257B GAMMATRON

AVERAGE STATIC  
CHARACTERISTICS

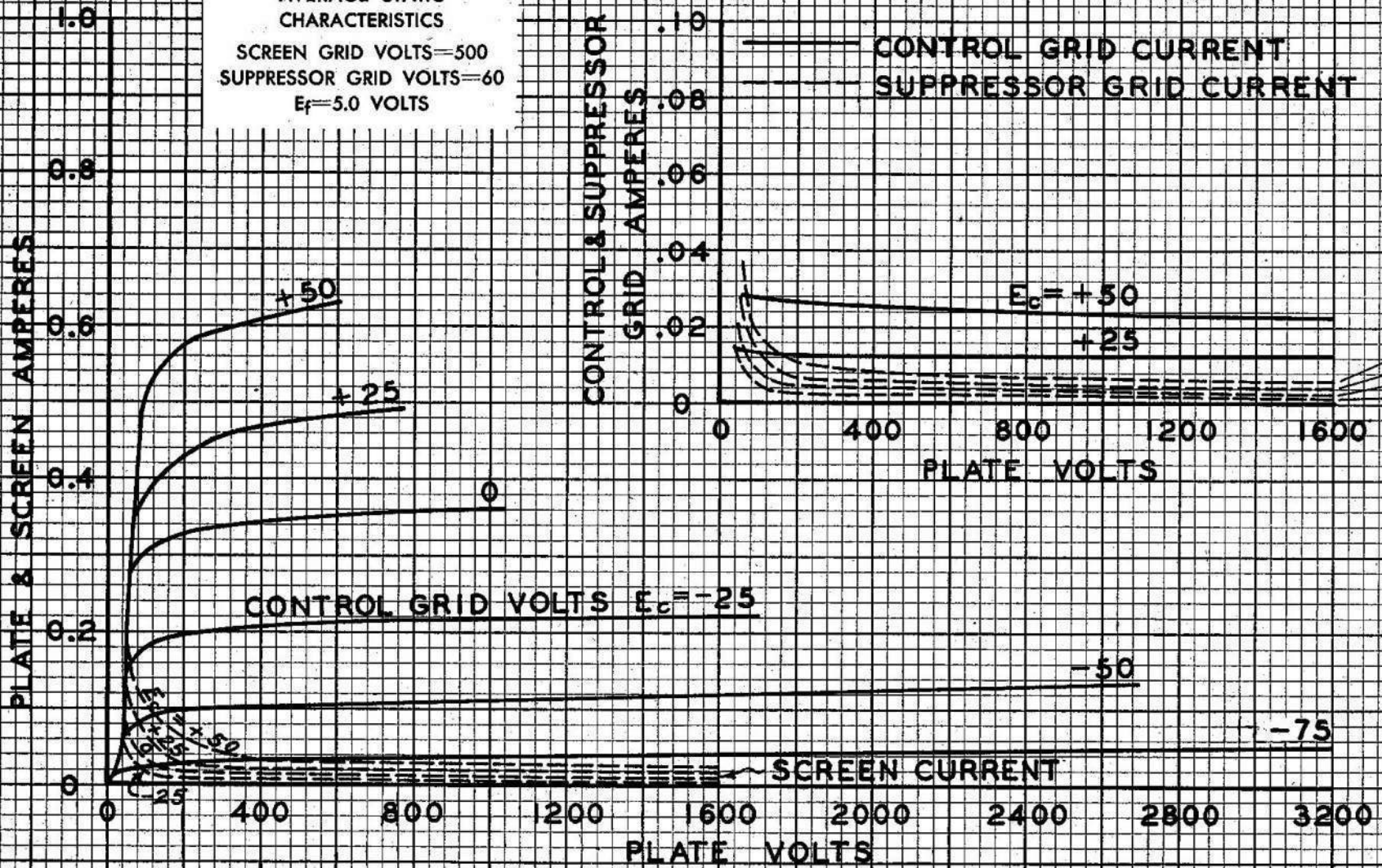
SCREEN GRID VOLTS=500  
SUPPRESSOR GRID VOLTS=0  
 $E_f=5.0$  VOLTS



**TYPE 257B GAMMATRON**

AVERAGE STATIC  
CHARACTERISTICS

SCREEN GRID VOLTS = 500  
SUPPRESSOR GRID VOLTS = 60  
 $E_f = 5.0$  VOLTS

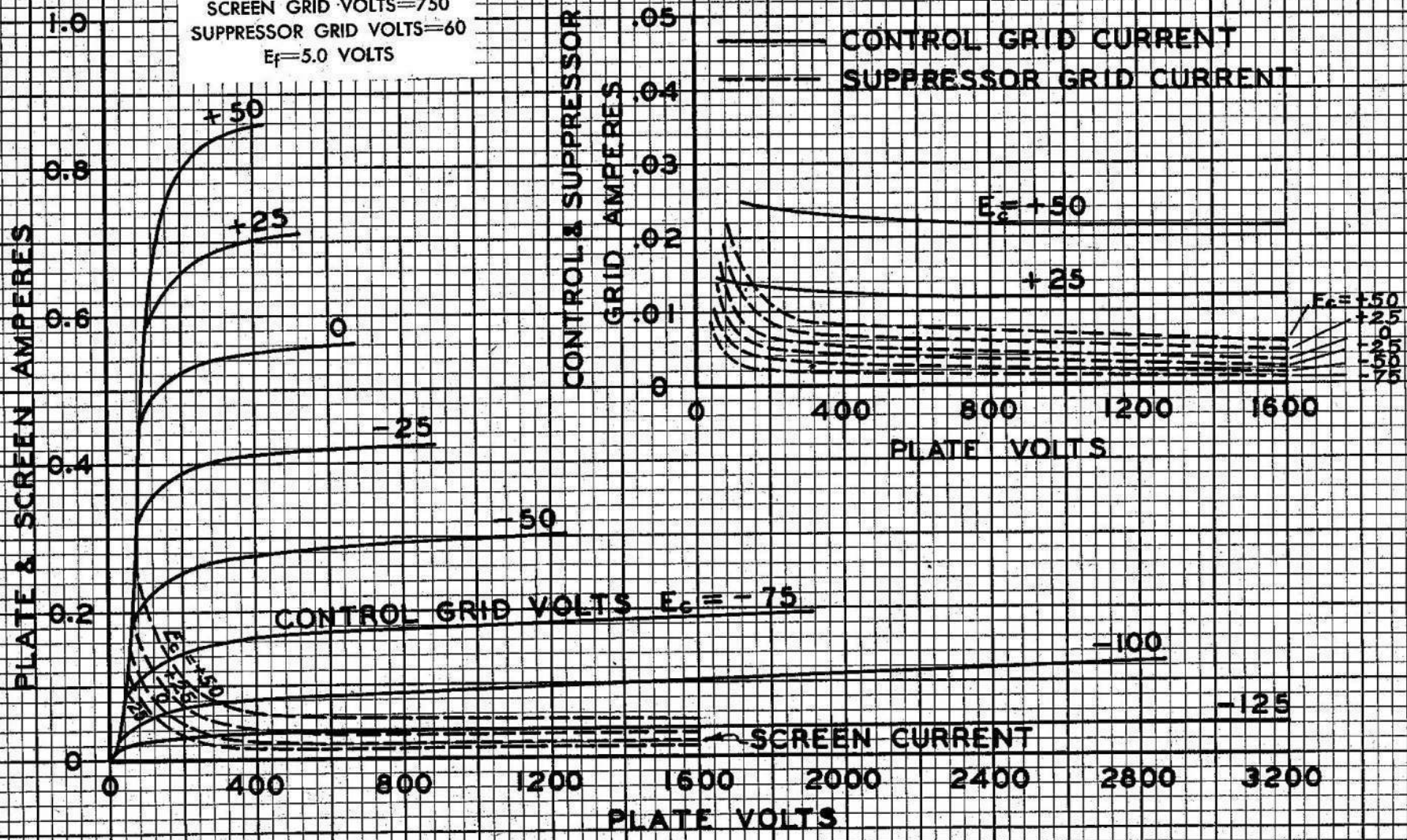




TYPE 257B GAMMATRON

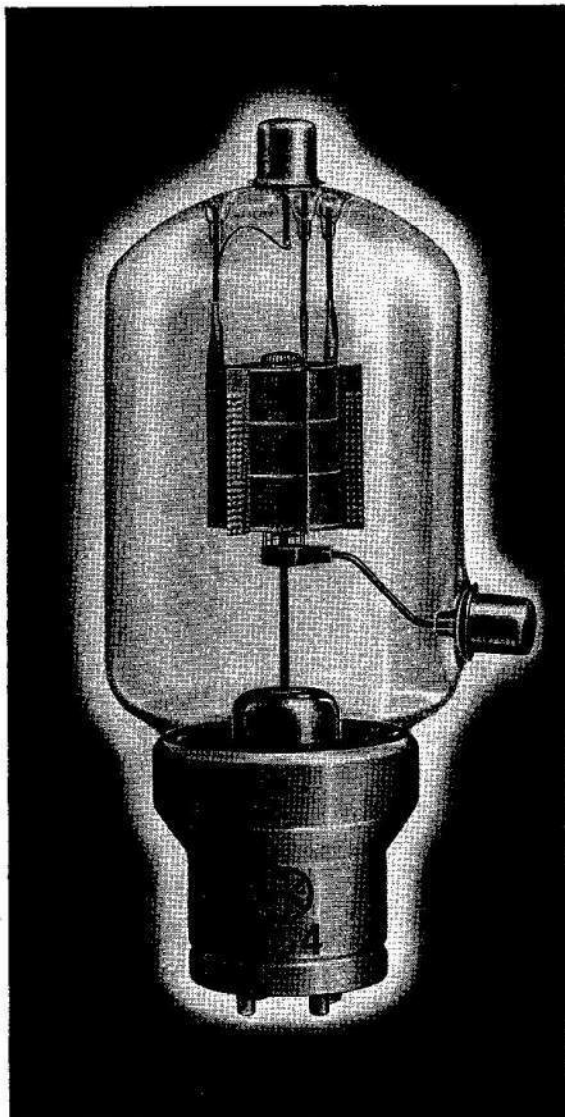
AVERAGE STATIC  
CHARACTERISTICS

SCREEN GRID VOLTS=750  
SUPPRESSOR GRID VOLTS=60  
 $E_f=5.0$  VOLTS





# GAMMATRON TYPE 354



## GENERAL PURPOSE TRIODE

150 watt radiation cooled triode, available in two amplification factors: The C a low mu of 14 and the E a high mu of 35. Exceptional HF performance and ability to withstand high voltages.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Base . . . . .	Standard Fifty Watt
Net Weight . . . . .	8½ Ounces
Shipping Weight . . . . .	3 Pounds
Maximum Height . . . . .	9 <sup>3</sup> / <sub>16</sub> Inches
Maximum Diameter . . . . .	3 <sup>7</sup> / <sub>16</sub> Inches

### ELECTRICAL DATA

	C	E
Filament Voltage . . . . .	5.0	5.0 Volts
Filament Current . . . . .	10	10 Amps.
Normal Plate Dissipation . . . . .	150	150 Watts
Maximum Plate Input . . . . .	750	750 Watts
Maximum D.C. Plate Current . . . . .	300	300 M. A.
Maximum D.C. Plate Voltage . . . . .	4000	4000 Volts
Maximum D.C. Grid Current . . . . .	60	85 M. A.
Average Amplification Constant . . . . .	14	35
Grid-Plate Capacitance . . . . .	3.3	3.3 Mmfd.
Grid-Filament Capacitance . . . . .	4.4	4.6 Mmfd.
Plate-Filament Capacitance . . . . .	0.7	0.5 Mmfd.

The 354 GAMMATRON is a general purpose triode. It has a tantalum plate and grid and embodies the fundamental design features characteristic of GAMMATRON transmitting tubes. Scientific engineering, combined with the highest manufacturing skill, results in a definite superiority over tubes of conventional design.

The plate and grid are mounted on short, direct, low inductance leads. Internal insulators are completely eliminated while perfect alignment is maintained and extremely high interelectrode insulation is permitted. Thus, with the use of tantalum and the elimination of unnecessary internal struc-

ture, it is possible to completely out-gas GAMMATRON tubes without the use of the usual "getter." This excellent vacuum is retained throughout the full life and it is not possible to cause this tube to go soft due to overload. The filament may then be operated in a manner consistent with high thermionic efficiency and long life.

The GAMMATRON method of design results in a tube that is easy to neutralize because of its low interelectrode capacity. It is easy to drive because of its special vertical grid bar design, and it has extremely long life because of its ability to maintain a permanent vacuum of a high degree.

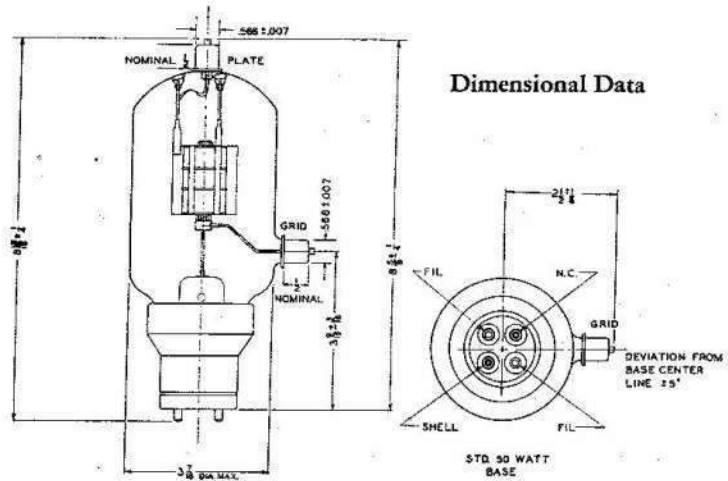
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SOUTH SAN FRANCISCO, CALIFORNIA, U. S. A.

# TYPE 354 GAMMATRON

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



## RADIO FREQUENCY POWER AMPLIFIER CLASS "C" UNMODULATED

	Maximum Rating Per Tube	C				Maximum Rating Per Tube	E			
		Typical Operation, 1 Tube					Typical Operation, 1 Tube			
Power Output.....		600	600	450		600	600	450	Watts	
Driving Power.....		15	29	31		16	23	28	Watts	
DC Plate Voltage.....	4000	4000	3000	2000	4000	4000	3000	2000	Volts	
DC Plate Current.....	300	187	250	300	300	185	250	300	ma	
DC Grid Current.....	60	30	50	60	75	45	55	65	ma	
DC Grid Voltage.....	-1000	-400	-400	-300	-1000	-220	-220	-200	Volts	
Peak RF Grid Voltage.....		580	650	570		420	470	475	Volts	
Plate Dissipation.....	150	135	150	150	150	150	150	150	Watts	
Plate Input.....	750	750	750	600	750	750	750	600	Watts	

## RADIO FREQUENCY POWER AMPLIFIER\* CLASS "C" PLATE MODULATED

	Maximum Rating Per Tube	C				Maximum Rating Per Tube	E			
		Typical Operation, 1 Tube					Typical Operation, 1 Tube			
Power Output.....		505	450	380	275		505	450	375	Watts
Driving Power.....		22	25	27	25		25	27	32	Watts
DC Plate Voltage.....	3000	3000	2500	2000	1500	3000	3000	2500	2000	Volts
DC Plate Current.....	250	210	230	250	250	250	210	230	250	ma
DC Grid Current.....	60	50	55	60	60	75	50	55	60	ma
DC Grid Voltage.....	-1000	-300	-300	-275	-225	-1000	-325	-325	-350	Volts
Peak RF Grid Voltage.....		500	515	505	455		560	575	625	Volts
Plate Dissipation.....	127	125	125	120	100	127	125	125	125	Watts
Plate Input.....	635	630	575	500	375	635	630	575	500	Watts

\*Carrier Conditions for 100% modulation peaks and 60% average value.

# Gammatron Tubes

## AUDIO FREQUENCY POWER AMPLIFIER\*

### CLASS "B"

	Maximum Rating 2 Tubes	C			E		
		Typical Operation, 2 Tubes			Typical Operation, 2 Tubes		
Power Output.....		810	700	660	810	700	660 Watts
Driving Power**.....		55	50	60	45	50	60 Watts
DC Plate Voltage.....	4000	3000	2500	2000	3000	2500	2000 Volts
DC Plate Current, Zero Signal.....		50	60	70	50	60	70 ma
DC Plate Current, Max. Signal.....	600	370	400	480	370	400	480 ma
DC Grid Voltage.....		-220	-175	-140	-70	-50	-35 Volts
Peak AF Grid to Grid Voltage.....		740	630	640	470	460	470 Volts
Plate Input, Max. Signal.....	1125	1110	1000	960	1110	1000	960 Watts
Load Resistance Plate to Plate.....		19200	14400	9300	19200	14400	9300 Ohms

\*All data for two tubes.

\*\*Instantaneous power at crest of cycle; effective power is 1/2 of this value.

## RADIO FREQUENCY POWER AMPLIFIER\*

### CLASS "B"

	Maximum Rating Per Tube	C			E		
		Typical Operation, 1 Tube			Typical Operation, 1 Tube		
Power Output.....		90	75	60	90	75	60 Watts
Driving Power**.....		6	10	28	5	11	30 Watts
DC Plate Voltage.....	3000	3000	2000	1000	3000	2000	1000 Volts
DC Plate Current.....	250	80	112	210	80	112	210 ma
DC Grid Current.....		0	0	10	1	5	18 ma
DC Grid Voltage.....		-250	-150	-75	-75	-50	-25 Volts
Peak RF Grid Voltage.....		195	160	180	112	120	157 Volts
Plate Dissipation.....	150	150	150	150	150	150	150 Watts
Plate Input.....	240	240	225	210	240	225	210 Watts

\*Carrier Conditions for 100% modulation.

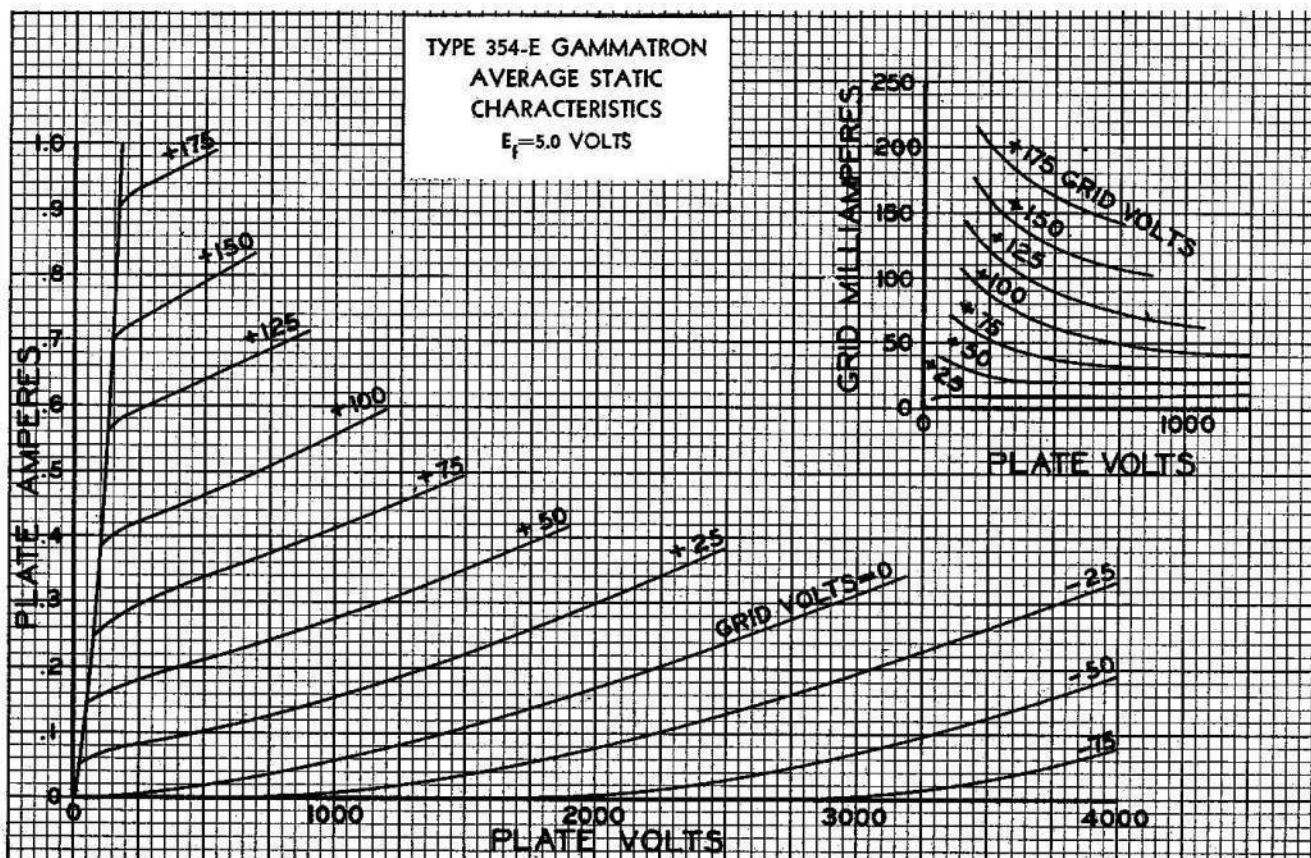
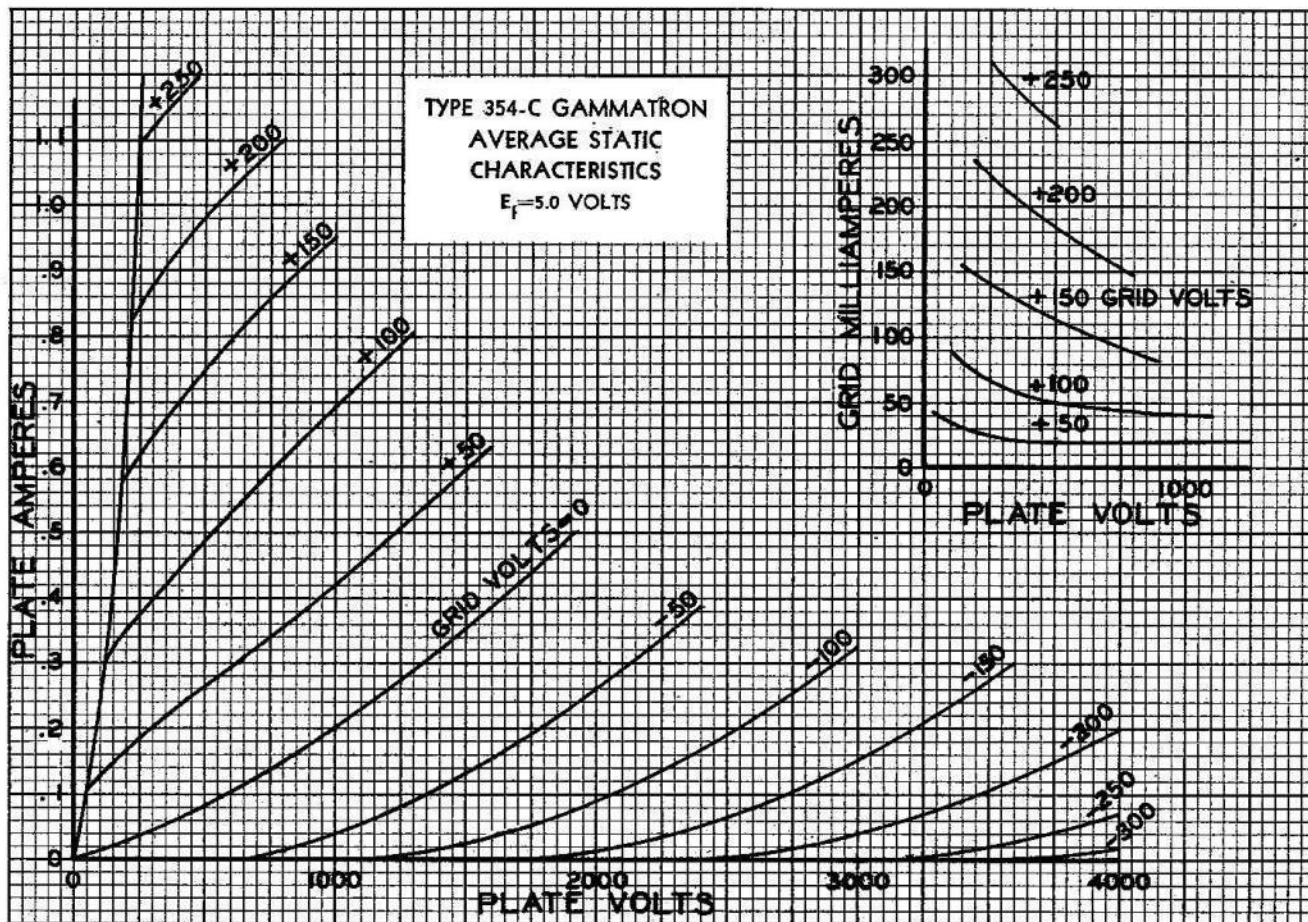
\*\*RF Power at crest of audio cycle.

## HIGH FREQUENCY PERFORMANCE C AND E

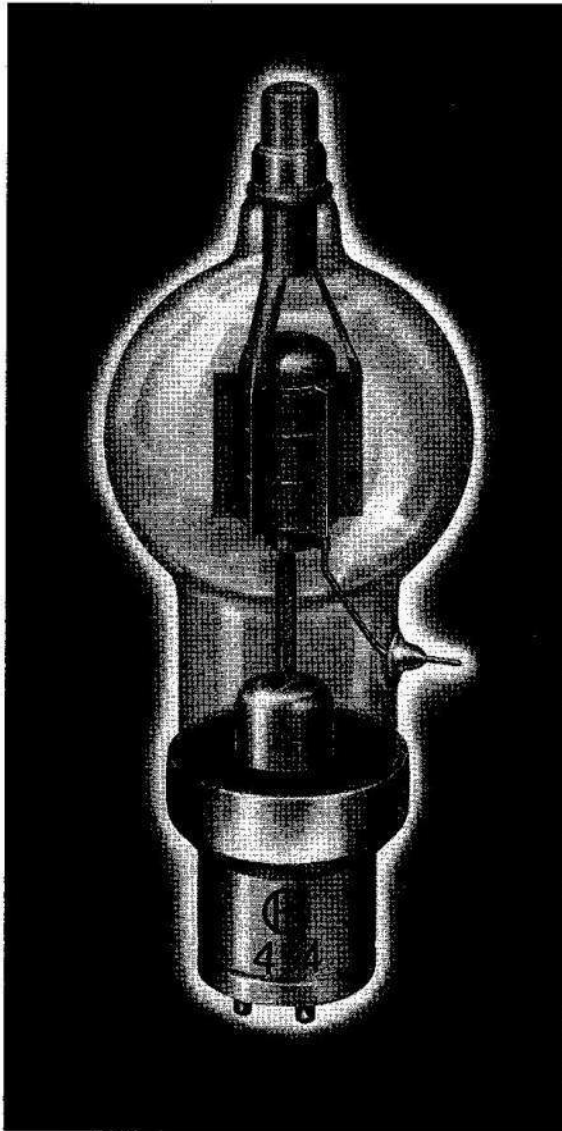
Frequency	15	25	35	mc
<b>Class C Unmodulated</b>				
Max. Input.....	600	555	450	Watts
Max. Plate Volts.....	3200	3000	2400	Volts
Typical Plate Efficiency.....	75	73	67	Pct.
<b>Class C Modulated</b>				
Max. Input.....	510	470	380	Watts
Max. Plate Volts.....	2500	2400	2000	Volts
<b>Class B Linear</b>				
Max. Input.....	225	220	215	Watts
Max. Plate Volts.....	3200	3000	2400	Volts

# Gammatron Tubes





# GAMMATRON TYPE 454



## GENERAL PURPOSE TRIODE

250 watt radiation cooled triode, available in two amplification factors: **Low mu** 13.5 and **High mu** 27. Exceptional VHF performance and ability to stand high voltages.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Blank . . . . .	Nonex Glass
Base . . . . .	Standard Fifty Watt
Net Weight . . . . .	9 Ounces
Shipping Weight . . . . .	2½ Pounds
Shipping Volume . . . . .	0.6 Cu. Feet
Maximum Height . . . . .	10⅛ Inches
Diameter . . . . .	3⅛ Inches

### ELECTRICAL DATA

	<b>L</b>	<b>H</b>
Filament Voltage . . . . .	5.0	5.0 Volts.
Filament Current . . . . .	10	10 Amps.
Normal Plate Dissipation . . . . .	250	250 Watts
Maximum Average Plate Current . . . . .	375	375 M. A.
Maximum Plate Voltage . . . . .	5000	5000 Volts
Maximum Average Grid Current . . . . .	60	85 M. A.
Average Amplification Constant . . . . .	13.5	27
Grid-Plate Capacitance . . . . .	3.2	3.5 mmf.
Grid-Filament Capacitance . . . . .	3.9	4.1 mmf.
Plate-Filament Capacitance . . . . .	0.7	0.6 mmf.

Unique constructional features make this tube capable of high voltages and of unusual very high frequency performance. It has exceptional ruggedness, electrical stamina, and extra long life.

Copper thimble connectors are used for the plate terminal. They are high current capacity connectors possessing low resistance. Because of improved radiation, they run at least 50 degrees Centigrade cooler at the copper to glass seal than do ordinary tungsten seals. Their design relieves glass strains, and hence the seal positively will not fail. Heavy, rugged leads provide perfect support and alignment to the elements without the use of insulators. Their low inductance com-

bined with low interelectrode capacity provides easy neutralization and reduces circuit losses at high frequencies.

The VHF efficiency is high because of the use of an enclosed plate which confines all electrons to give useful output. Ordinary open plate tubes operate at lower efficiency because of escaped electrons. Electron bombardment is eliminated, lifting voltage limitations. Operation as a neutralized power amplifier up to 150 mc is practical with 70% efficiency.

New tantalum cleaning and pumping techniques give the 454 extra long life, and make it more gas free—more failure proof. A result of 17 years of GAMMATRON progress.

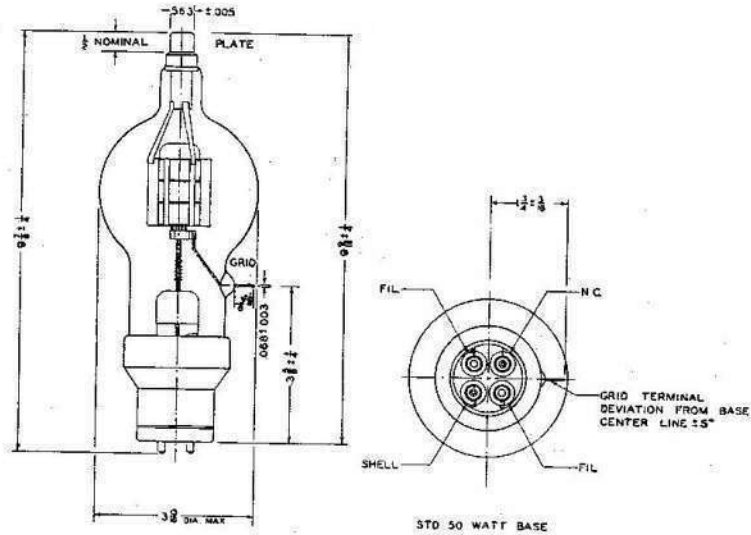
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## HEINTZ AND KAUFMAN LTD.

SOUTH SAN FRANCISCO, CALIFORNIA, U. S. A.

## TYPE HK 454

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" UNMODULATED

	<b>L</b>				<b>H</b>			
	Maximum Rating Per Tube	Typical Operation, 1 Tube			Maximum Rating Per Tube	Typical Operation, 1 Tube		
Power Output.....		900	750	525		900	775	540 Watts
Driving Power.....		26	35	40		27	35	40 Watts
DC Plate Voltage.....	5000	4000	3000	2000	5000	4000	3000	2000 Volts
DC Plate Current.....	375	280	325	375	375	280	335	375 ma
DC Grid Current.....	60	37	50	60	85	55	70	80 ma
DC Grid Voltage.....	-1000	-500	-450	-375	-1000	-300	-275	-250 Volts
Peak RF Grid Voltage.....		790	780	735		555	565	560 Volts
Plate Dissipation.....	250	225	225	225	250	225	225	210 Watts
Plate Input.....	1125	1125	975	750	1125	1125	1000	750 Watts

### RADIO FREQUENCY POWER AMPLIFIER\* CLASS "C" PLATE MODULATED

	<b>L</b>				<b>H</b>			
	Maximum Rating Per Tube	Typical Operation, 1 Tube			Maximum Rating Per Tube	Typical Operation, 1 Tube		
Power Output.....		760	560	440		760	575	450 Watts
Driving Power.....		30	32	33		28	33	31 Watts
DC Plate Voltage.....	4000	3500	2500	2000	4000	3500	2500	2000 Volts
DC Plate Current.....	300	270	300	300	300	270	300	300 ma
DC Grid Current.....	60	45	50	55	85	60	70	70 ma
DC Grid Voltage.....	-1000	-450	-400	-350	-1000	-275	-250	-225 Volts
Peak RF Grid Voltage.....		730	710	660		525	515	490 Volts
Plate Dissipation.....	210	190	190	160	210	190	175	150 Watts
Plate Input.....	950	950	750	600	950	950	750	600 Watts

\*Carrier Conditions for 100% modulation peaks and 60% average value.

# Gammatron Tubes



## AUDIO FREQUENCY POWER AMPLIFIER\*

### CLASS "B"

	Maximum Rating 2 Tubes	L			H		
		Typical Operation, 2 Tubes			Typical Operation, 2 Tubes		
Power Output.....		1020	960	800	1020	960	900 Watts
Driving Power**.....		70	85	80	45	75	90 Watts
DC Plate Voltage.....	4000	3500	2500	2000	3500	2500	2000 Volts
DC Plate Current, Zero Signal.....		60	90	100	60	90	100 ma
DC Plate Current, Max. Signal.....	750	410	550	640	410	550	660 ma
DC Grid Voltage.....		-260	-165	-125	-110	-75	-50 Volts
Peak RF Grid to Grid Voltage.....		930	850	800	560	590	600 Volts
Plate Input, Max. Signal.....	1500	1435	1375	1280	1435	1375	1320 Watts
Load Resistance Plate to Plate.....		20,000	10,000	6400	20,000	10,000	6400 Ohms

\*All data for two tubes.

\*\*Instantaneous power at crest of cycle; effective power is 1/2 of this value.

## RADIO FREQUENCY POWER AMPLIFIER\*

### CLASS "B"

	Maximum Rating Per Tube	L			H		
		Typical Operation, 1 Tube			Typical Operation, 1 Tube		
Power Output.....		125	115	100	130	115	105 Watts
Driving Power**.....		12	20	26	12	20	28 Watts
DC Plate Voltage.....	4000	3000	2000	1500	3000	2000	1500 Volts
DC Plate Current.....	300	115	170	215	120	170	220 ma
DC Grid Current.....		0	1	3	1	4	6 ma
DC Grid Voltage.....		-250	-170	-125	-120	-80	-60 Volts
Peak RF Grid Voltage.....		235	225	225	155	165	175 Volts
Plate Dissipation.....	250	225	225	225	225	225	225 Watts
Plate Input.....	360	350	340	320	360	340	330 Watts

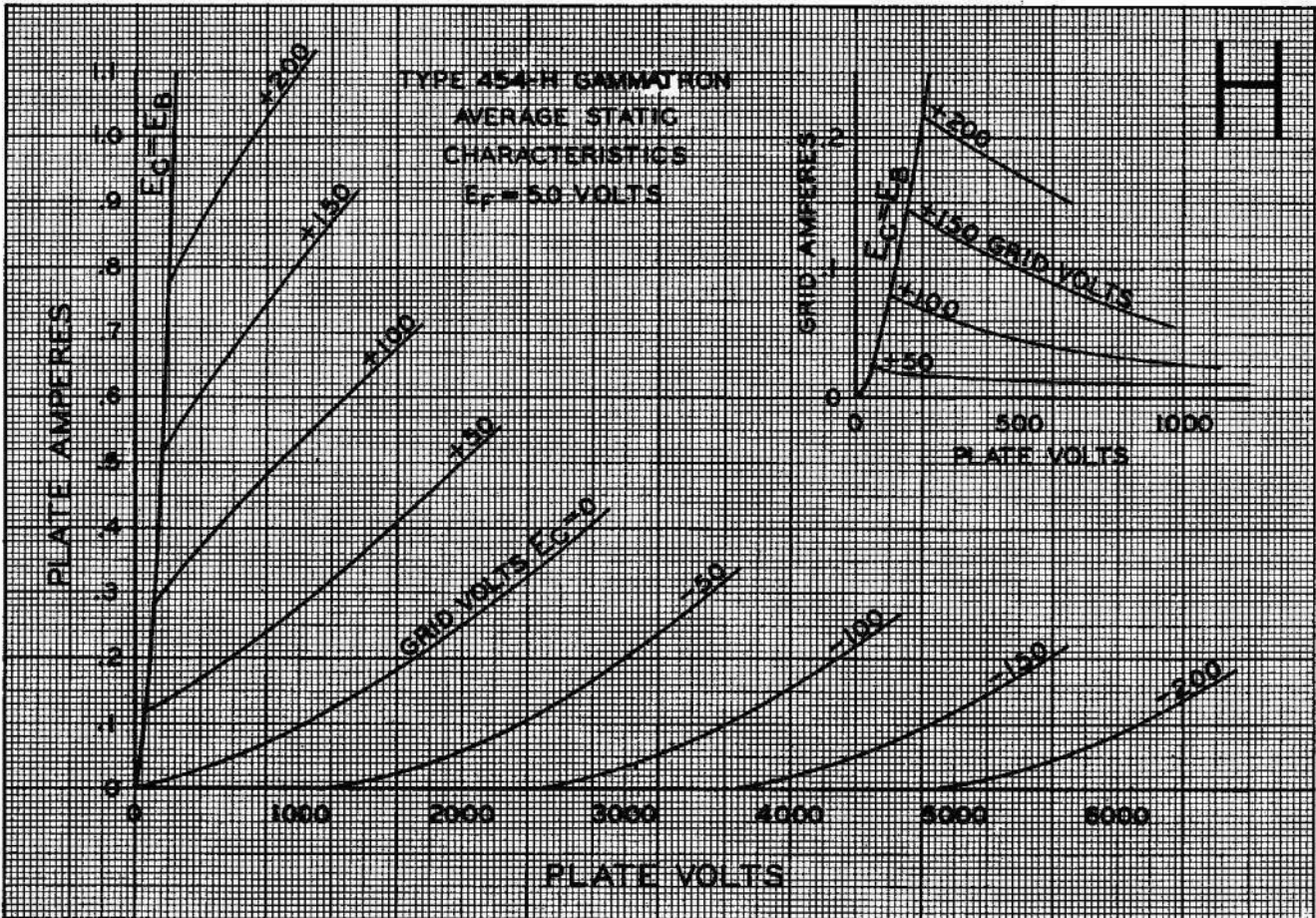
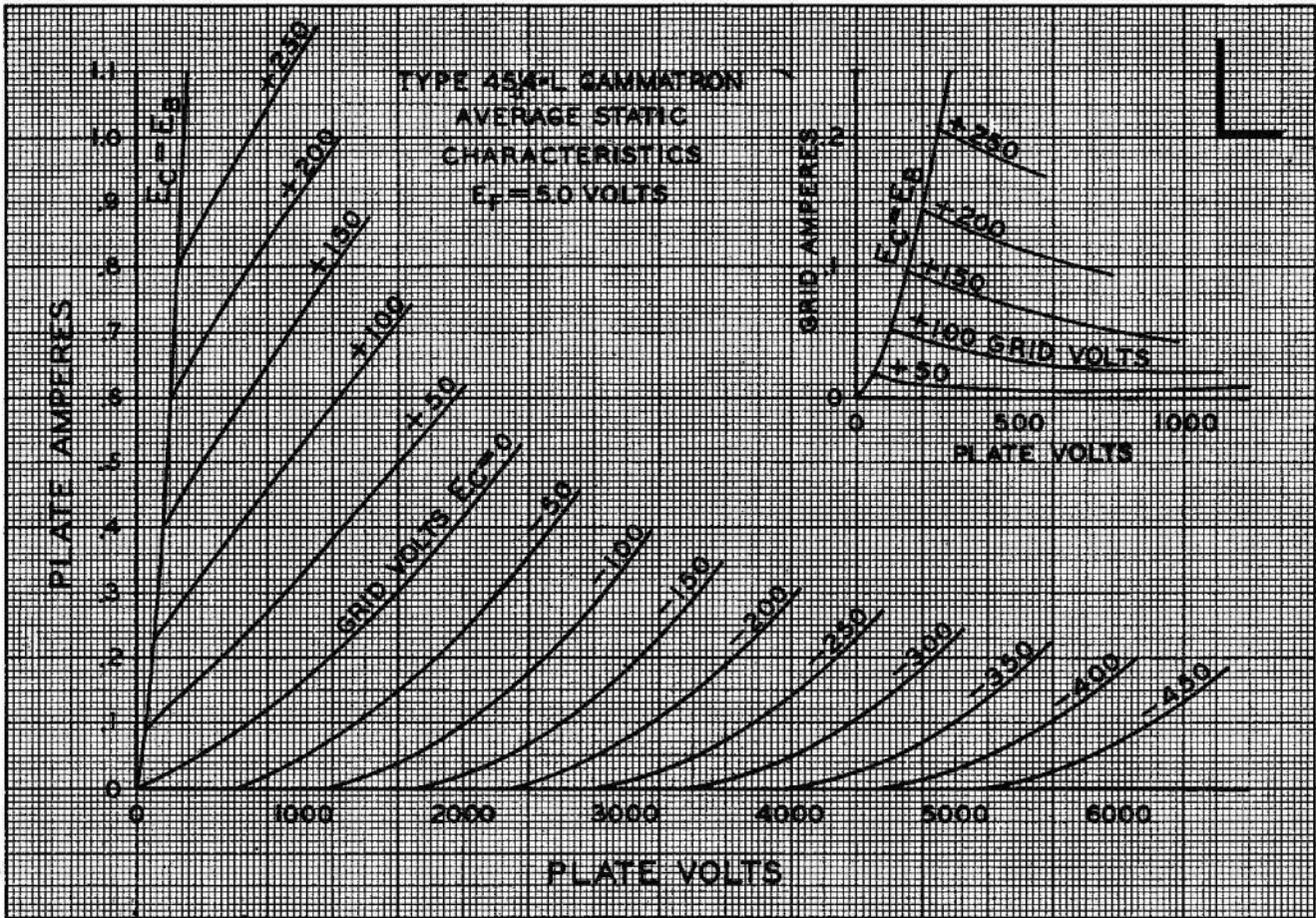
\*Carrier Conditions for 100% modulation.

\*\*RF Power at crest of audio cycle.

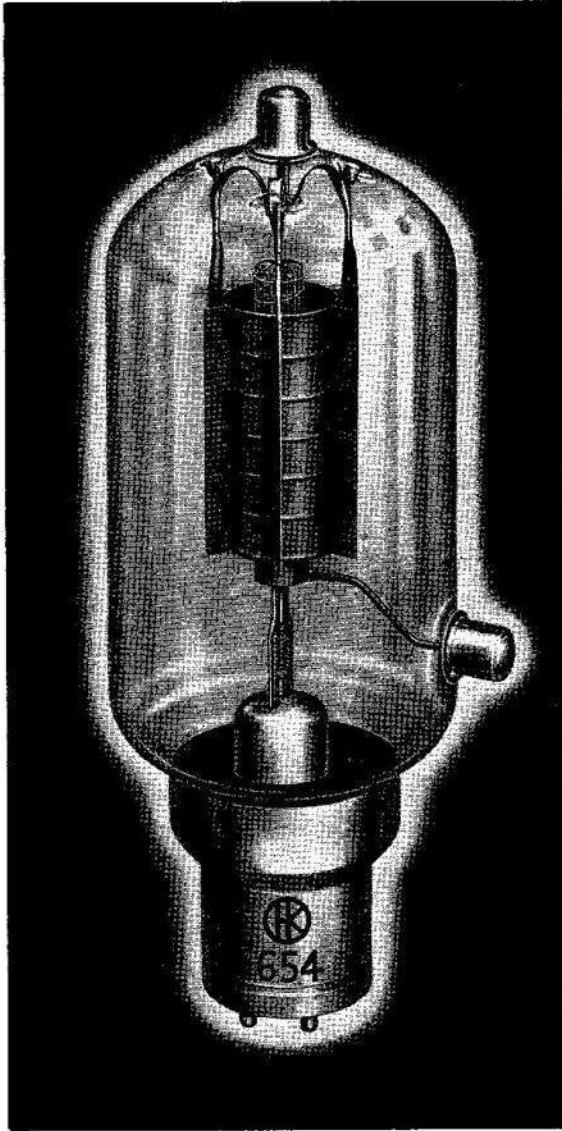
## VERY HIGH FREQUENCY PERFORMANCE L AND H

Frequency	25	50	100	150 mc
<b>Class "C" Unmodulated</b>				
Typical Plate Efficiency, Percent.....	80	78	74	69
Max. Plate Input, Watts.....	1125	1000	860	720
Max. Plate Voltage, Volts.....	5000	4400	3800	3200
<b>Class "C" Modulated</b>				
Typical Plate Efficiency, Percent.....	80	78	74	69
Max. Plate Input, Watts.....	950	850	730	650
Max. Plate Voltage, Volts.....	4000	3600	3100	2750
<b>Class "B" Linear</b>				
Typical Plate Efficiency, Percent.....	35	34	32	30
Max. Plate Input, Watts.....	360	350	340	330
Max. Plate Voltage, Volts.....	4000	3900	3800	3700

# Gammatron Tubes



# GAMMATRON TYPE 654



## GENERAL PURPOSE TRIODE

Medium  $\mu$  universal triode, 300 watt radiation cooled tantalum plate. Special design permits high voltage operation.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Blank . . . . .	Nonex Glass
Base . . . . .	Standard Fifty Watt
Base Insulator . . . . .	Ceramic
Net Weight . . . . .	14 Ounces
Shipping Weight . . . . .	6.5 Pounds
Maximum Height . . . . .	10 $\frac{1}{8}$ Inches
Maximum Width . . . . .	4 $\frac{3}{8}$ Inches

### ELECTRICAL DATA

Filament Voltage . . . . .	7.5 Volts
Filament Current . . . . .	15 Amps.
Normal Plate Dissipation . . . . .	300 Watts
Maximum Average Plate Current . . . . .	0.6 Amps.
Maximum Plate Voltage . . . . .	4000 Volts
Maximum Average Grid Current . . . . .	0.10 Amps.
Average Plate Impedance . . . . .	3700 Ohms
Average Amplification Constant . . . . .	22

### INTERELECTRODE CAPACITANCES

Grid-Plate Capacitance . . . . .	5.4 mmfd.
Grid-Filament Capacitance . . . . .	6.6 mmfd.
Plate-Filament Capacitance . . . . .	0.8 mmfd.

The 654 GAMMATRON is a general purpose triode. It has a tantalum plate and grid and embodies the fundamental design features characteristic of GAMMATRON transmitting tubes. Scientific engineering, combined with the highest manufacturing skill, results in a definite superiority over tubes of conventional design.

The plate and grid are mounted on short, direct, low inductance leads. Internal insulators are completely eliminated while perfect alignment is maintained and extremely high interelectrode insulation is permitted. Thus, with the use of tantalum and the elimination of unnecessary internal struc-

ture, it is possible to completely out-gas GAMMATRON tubes without the use of the usual "getter." This excellent vacuum is retained throughout the full life and it is not possible to cause this tube to go soft due to overload. The filament may then be operated in a manner consistent with high thermionic efficiency and long life.

The GAMMATRON method of design results in a tube that is easy to neutralize because of its low interelectrode capacity. It is easy to drive because of its special vertical grid bar design, and it has extremely long life because of its ability to maintain a permanent vacuum of a high degree.

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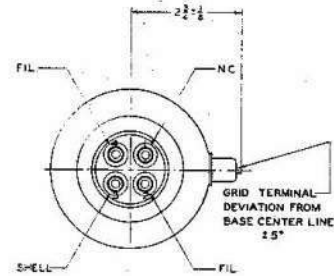
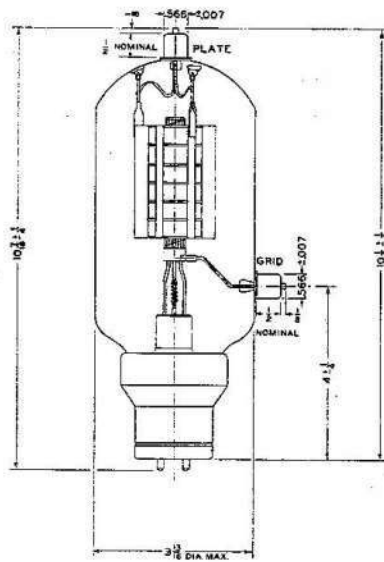
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## TYPE HK 654

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



STD. 50 WATT BASE

### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" UNMODULATED

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
		1400	1125	720	Watts
Power Output		1400	1125	720	Watts
Driving Power		85	69	57	Watts
DC Plate Voltage	4000	4000	3000	2000	Volts
DC Plate Current	600	425	475	500	M. A.
DC Grid Current	100	75	75	75	M. A.
DC Grid Voltage	-1500	-735	-522	-380	Volts
Peak R.F. Grid Voltage		1130	915	760	Volts
Plate Dissipation	300	300	300	280	Watts
Plate Input	1700	1700	1425	1000	Watts

### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" PLATE MODULATED\*

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
		945	805	655	Watts
Power Output		945	805	655	Watts
Driving Power		60	65	70	Watts
DC Plate Voltage	3000	3000	2500	2000	Volts
DC Plate Current	475	400	420	450	M. A.
DC Grid Current	125	95	100	110	M. A.
DC Grid Voltage	-1000	-390	-390	-365	Volts
Peak R.F. Grid Voltage		720	740	720	Volts
Plate Dissipation	225	255	255	255	Watts
Plate Input	1200	1200	1060	910	Watts

\*Carrier conditions for 100% modulation peaks and 60% average value.

### RADIO FREQUENCY POWER AMPLIFIER CLASS "B" LINEAR\*

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
		200	185	140	Watts
Power Output		200	185	140	Watts
Driving Power**		25	25	25	Watts
DC Plate Voltage	4000	3500	3000	2000	Volts
DC Plate Current	475	145	160	197	M. A.
DC Grid Current	100	9	1	14	M. A.
DC Grid Voltage	-1500	-137	-117	-70	Volts
Peak R.F. Grid Voltage		125	120	105	Volts
Plate Dissipation	300	300	290	255	Watts
Plate Input	500	500	475	394	Watts

\*Carrier conditions for 100% modulation.

\*\*At crest of audio cycle.

# Gammatron Tubes

## AUDIO FREQUENCY POWER AMPLIFIER

### CLASS "B"\*

	Maximum Rating Two Tubes	TYPICAL OPERATION, 2 TUBES			
		1135	1150	860	
Power Output . . . . .					Watts
Driving Power** . . . . .		50	50	50	Watts
DC Plate Voltage . . . . .	4000	3000	2500	2000	Volts
DC Plate Current Zero Signal . . . . .		100	100	100	M. A.
DC Plate Current Max. Signal . . . . .	1200	650	680	710	M. A.
DC Grid Voltage . . . . .	-1500	-105	-90	-68	Volts
Peak A.F. Grid to Grid Voltage . . . . .		600	588	560	Volts
Plate Input Max. Signal . . . . .	2000	1950	1700	1420	Watts
Load Resistance Plate to Plate . . . . .		10400	8000	5600	Ohms

\*All data for two tubes.

\*\*Instantaneous power at crest of cycle; effective power is one-half of this value.

## AUDIO FREQUENCY POWER AMPLIFIER

### CLASS "A"—SINGLE TUBE

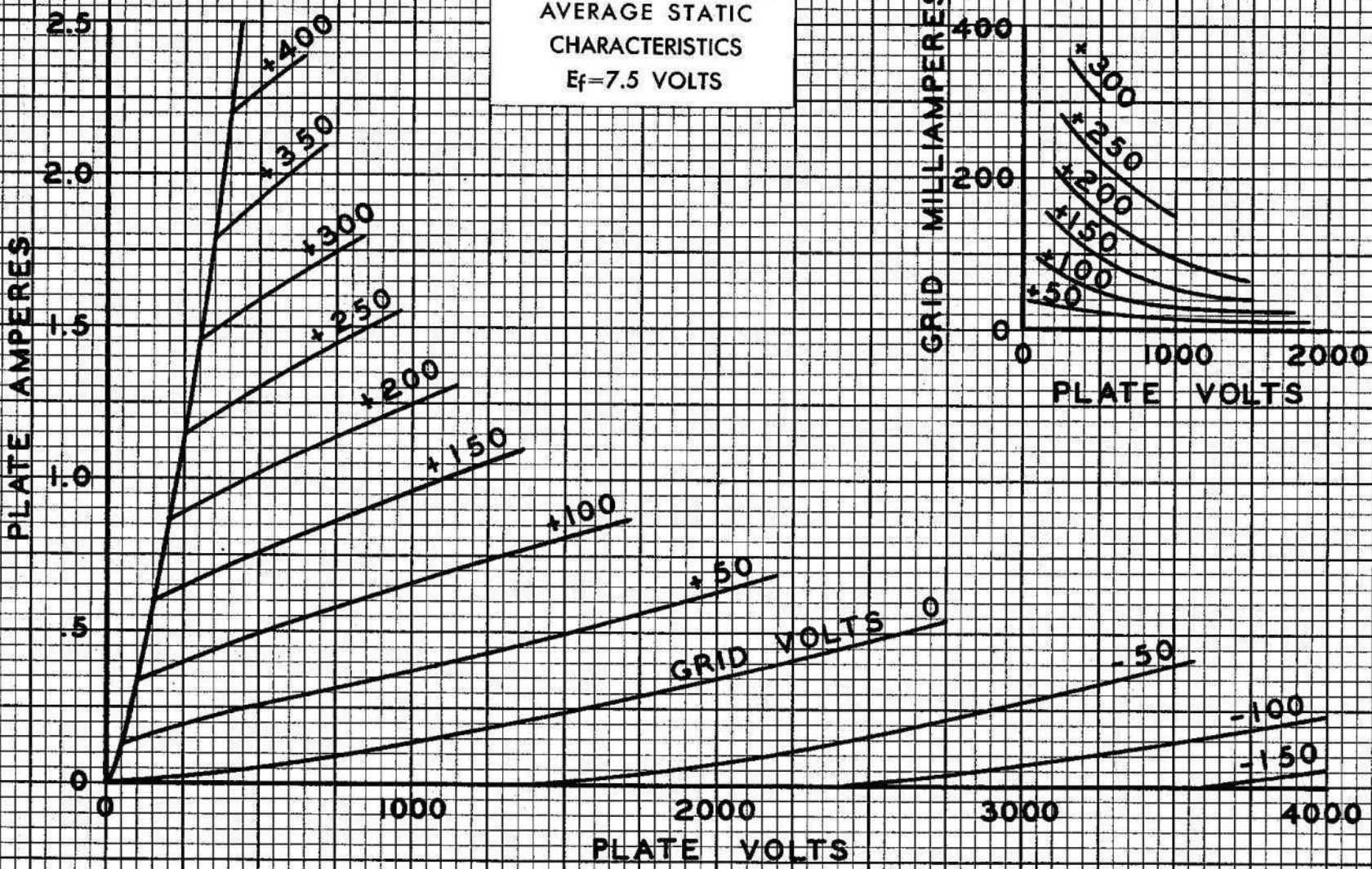
	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
		95	75	18	
Power Output . . . . .					
DC Plate Voltage . . . . .	4000	4000	3000	2000	Volts
DC Plate Current . . . . .		75	100	150	M. A.
DC Grid Voltage . . . . .		-140	-90	-40	Volts
Peak A.F. Grid Voltage . . . . .		125	85	40	Volts
Load Resistance . . . . .		30000	15000	7500	Ohms

### VERY HIGH FREQUENCY RATINGS

Frequency	25	50	75	100	150	M. C.
Class "C" Unmodulated						
Max. Input . . . . .	1050	900	750	675	525	Watts
Max. Plate Volts . . . . .	3500	3000	2500	2250	1800	Volts
Class "C" Plate Mod.						
Max. Input . . . . .	900	750	640	575	450	Watts
Max. Plate Volts . . . . .	2600	2250	1900	1700	1350	Volts
Class "B" Linear						
Max. Input . . . . .	460	440	420	410	380	Watts
Max. Plate Volts . . . . .	3500	3000	2500	2250	1800	Volts

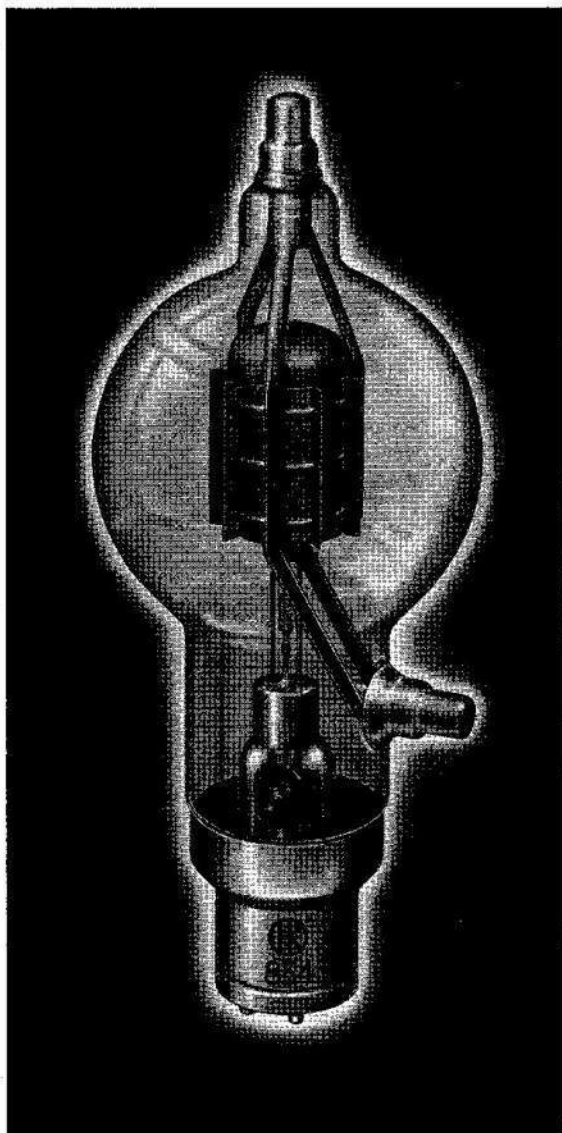
# Gammatron Tubes

TYPE 654 GAMMATRON  
AVERAGE STATIC  
CHARACTERISTICS  
 $E_f = 7.5$  VOLTS





# GAMMATRON TYPE 854



## GENERAL PURPOSE TRIODE

General purpose, 450 watt radiation cooled triode, available in two amplification factors: Low mu 16 and High mu 30. Exceptional VHF performance and ability to stand high voltages.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Blank . . . . .	Nonex Glass
Base . . . . .	Standard Fifty Watt
Net Weight . . . . .	14 Ounces
Shipping Weight . . . . .	3 1/2 Pounds
Shipping Volume . . . . .	2 Cu. Feet
Maximum Height . . . . .	12 5/8 Inches
Maximum Width . . . . .	5 3/8 Inches

### ELECTRICAL DATA

	L	H
Filament Voltage . . . . .	7.5	7.5 Volts
Filament Current . . . . .	12	12 Amps.
Normal Plate Dissipation . . . . .	450	450 Watts
Maximum Average Plate Current . . . . .	600	600 M. A.
Maximum Plate Voltage . . . . .	6000	6000 Volts
Maximum Average Grid Current . . . . .	80	110 M. A.
Average Amplification Constant . . . . .	16	30
Grid-Plate Capacitance . . . . .	5.2	4.7 mmfd.
Grid-Filament Capacitance . . . . .	6.7	8.8 mmfd.
Plate-Filament Capacitance . . . . .	0.9	0.7 mmfd.

Unique constructional features make this tube capable of high voltages and unusual very high frequency performance. It has exceptional ruggedness, electrical stamina, and extra long life.

Copper thimble connectors are used for the grid and plate. They are high current capacity connectors possessing low resistance. Because of improved radiation, they run at least 50 degrees Centigrade cooler at the copper to glass seal than do ordinary tungsten seals. Their design relieves glass strains, and hence the seal positively will not fail. Heavy rugged leads provide perfect support and alignment to the elements without the use of insulators. Their low inductance combined

with low interelectrode capacity provides easy neutralization and reduces circuit losses at high frequencies.

The VHF efficiency is high because of the use of an enclosed plate which confines all electrons to give useful output. Ordinary open plate tubes operate at lower efficiency because of escaped electrons. Electron bombardment is eliminated, lifting voltage limitations. Operation as a neutralized power amplifier up to 100 mc. is practical with up to 70 per cent efficiency.

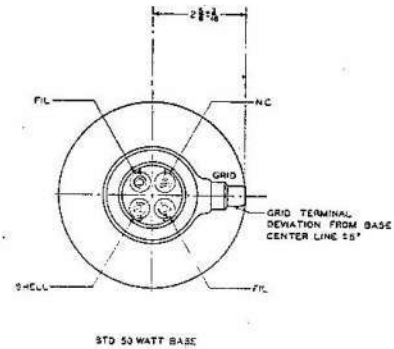
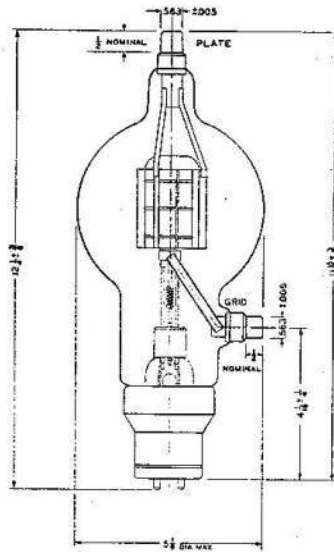
New tantalum cleaning and pumping techniques give the 854 extra long life, and make it more gas free—more failure proof. A result of 17 years of GAMMATRON progress.

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The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions, Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" UNMODULATED

	<b>L</b>					<b>H</b>					
	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE				Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE				
Power Output . . . . .		1800	1800	1275	815		1820	1800	1380	865	Watts
Driving Power . . . . .		40	70	50	55		40	60	60	60	Watts
DC Plate Voltage . . . . .	6000	5000	4000	3000	2000	6000	5000	4000	3000	2000	Volts
DC Plate Current . . . . .	600	450	560	575	600	600	450	560	600	600	M. A.
DC Grid Current . . . . .	80	45	65	65	75	110	75	100	110	110	M. A.
DC Grid Voltage . . . . .	-1500	-575	-775	-450	-375	-1500	-310	-340	-275	-250	Volts
Peak R.F. Grid Voltage . . . . .		915	1210	850	785		580	655	605	580	Volts
Plate Dissipation . . . . .	450	450	450	450	385	450	430	450	420	335	Watts
Plate Input . . . . .	2250	2250	2250	1725	1200	2250	2250	2250	1800	1200	Watts

### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" PLATE MODULATED\*

	<b>L</b>				<b>H</b>				
	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
Power Output . . . . .		1520	1085	675		1520	1110	700	Watts
Driving Power . . . . .		58	50	45		50	50	50	Watts
DC Plate Voltage . . . . .	4000	4000	3000	2000	4000	4000	3000	2000	Volts
DC Plate Current . . . . .	475	475	475	475	475	475	475	475	M. A.
DC Grid Current . . . . .	80	65	70	75	110	100	100	110	M. A.
DC Grid Voltage . . . . .	-1500	-625	-425	-325	-1500	-285	-250	-225	Volts
Peak R.F. Grid Voltage . . . . .		995	775	675		570	530	510	Volts
Plate Dissipation . . . . .	380	380	340	275	380	380	315	250	Watts
Plate Input . . . . .	1900	1900	1425	950	1900	1900	1425	950	Watts

\*Carrier conditions for 100% modulation peaks and 60% average value.

# Gammatron Tubes

## AUDIO FREQUENCY POWER AMPLIFIER

### CLASS "B"\*

	Maximum Rating 2 Tubes	L			H			
		TYPICAL OPERATION, 2 TUBES			TYPICAL OPERATION, 2 TUBES			
Power Output . . . . .		1880	1820	1510	1970	1810	1610	Watts
Driving Power** . . . . .		85	105	135	85	110	150	Watts
DC Plate Voltage . . . . .	4000	4000	3000	2000	4000	3000	2000	Volts
DC Plate Current Zero Signal . . . . .		100	130	180	100	130	180	M. A.
DC Plate Current Max. Signal . . . . .	1200	660	860	1160	670	850	1200	M. A.
DC Grid Voltage . . . . .		-315	-240	-120	-140	-95	-50	Volts
Peak R.F. Grid to Grid Voltage . . . . .		1060	1020	920	640	630	650	Volts
Plate Input Max. Signal . . . . .	2750	2640	2580	2360	2680	2550	2400	Watts
Load Resistance Plate to Plate . . . . .		14500	8100	3600	14500	8100	3600	Ohms

\*All data for two tubes.

\*\*Instantaneous power at crest of cycle; effective power is one-half of this value.

## RADIO FREQUENCY POWER AMPLIFIER

### CLASS "B"\*

	Maximum Rating Per Tube	L			H			
		TYPICAL OPERATION, 1 TUBE			TYPICAL OPERATION, 1 TUBE			
Power Output . . . . .		270	240	210	270	255	220	Watts
Driving Power** . . . . .		17	23	36	16	24	40	Watts
DC Plate Voltage . . . . .	6000	4000	3000	2000	4000	3000	2000	Volts
DC Plate Current . . . . .	400	180	230	330	180	235	335	M. A.
DC Grid Current . . . . .		0	1	5	1	3	13	M. A.
DC Grid Voltage . . . . .	-1500	-350	-250	-160	-160	-120	-75	Volts
Peak R.F. Grid Voltage . . . . .		300	275	265	175	177	190	Volts
Plate Dissipation . . . . .	450	450	450	450	450	450	450	Watts
Plate Input . . . . .	720	720	690	660	720	705	670	Watts

\*Carrier conditions for 100% modulation.

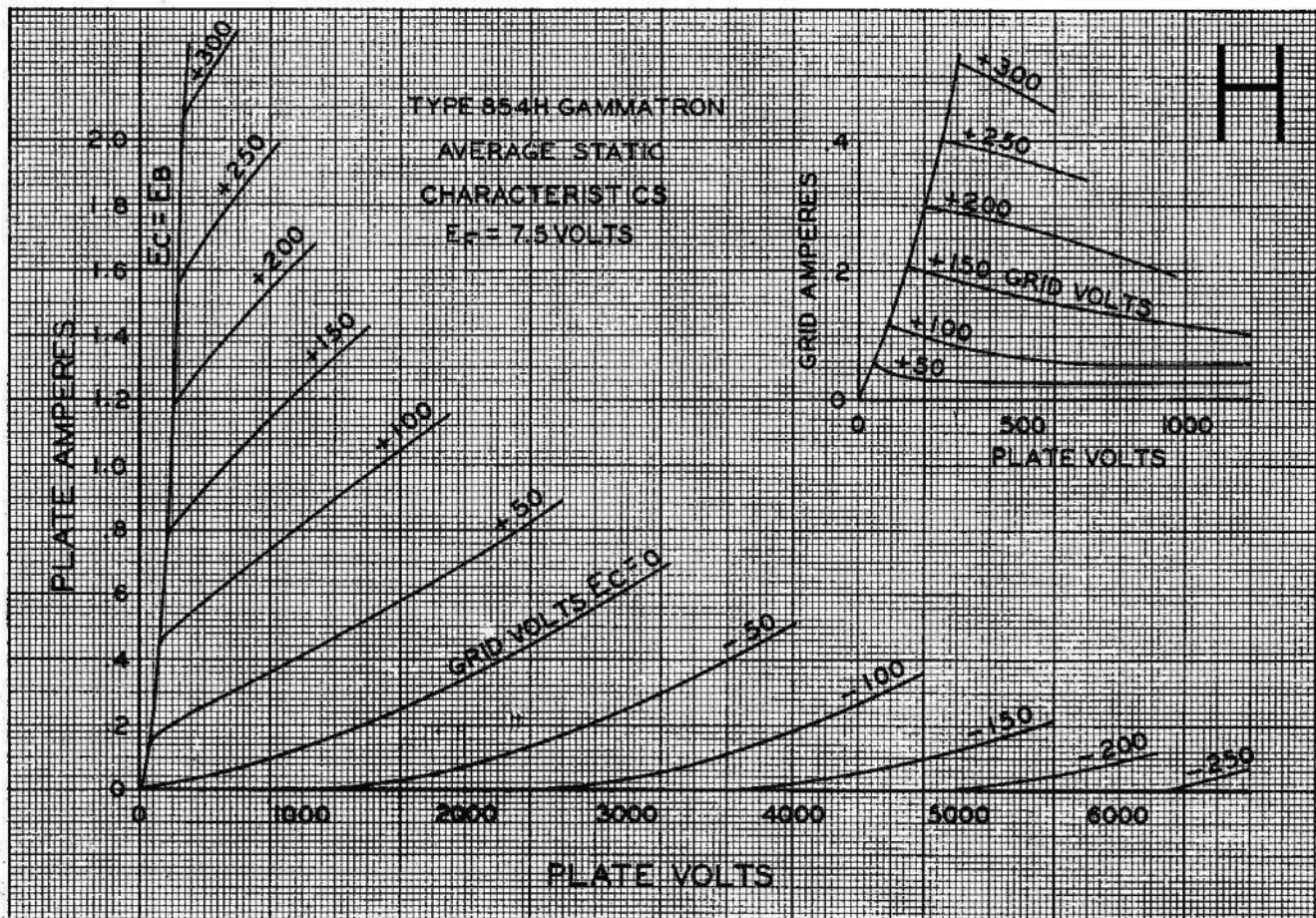
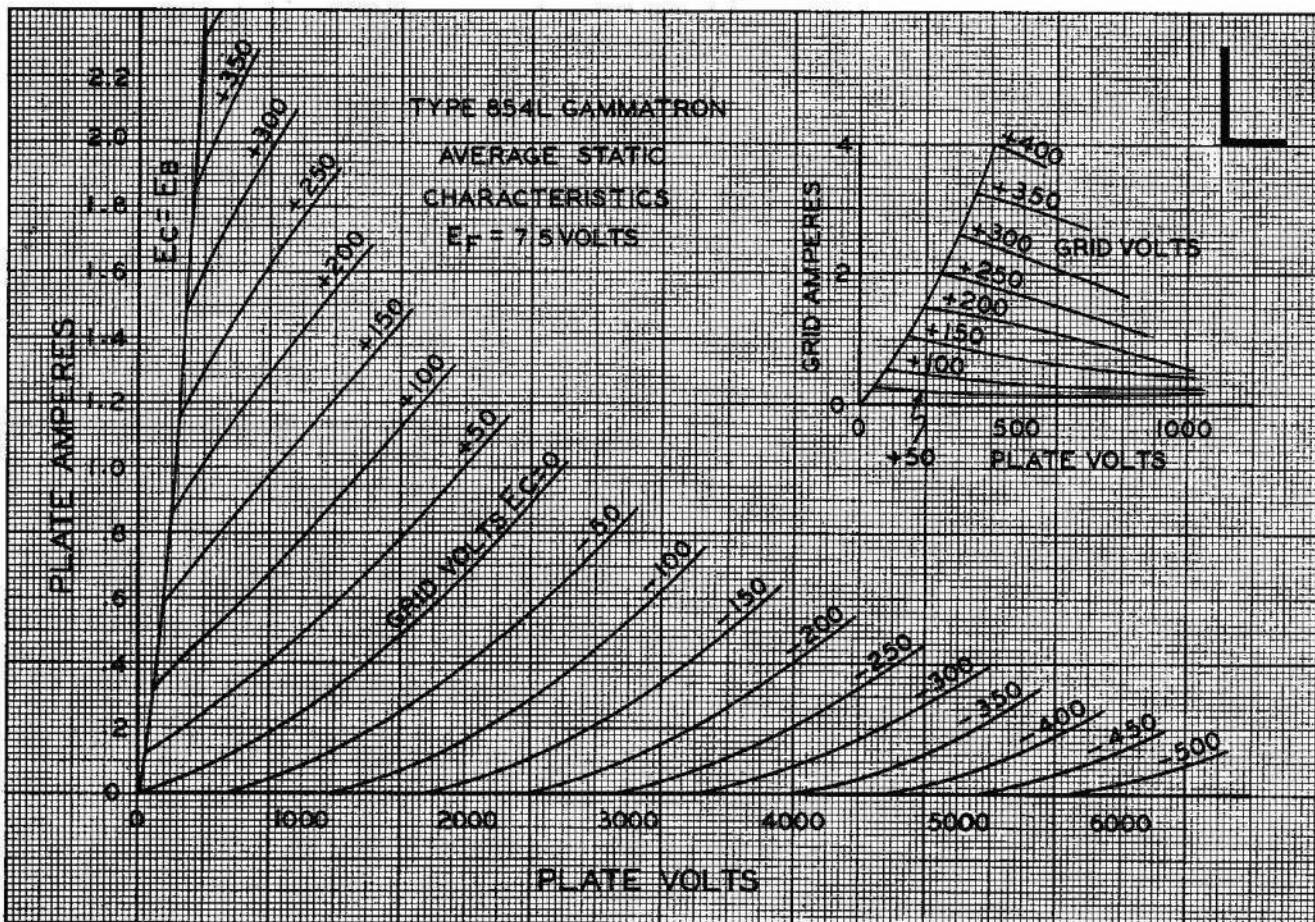
\*\*R.F. power, at crest of audio cycle.

## VERY HIGH FREQUENCY PERFORMANCE L AND H

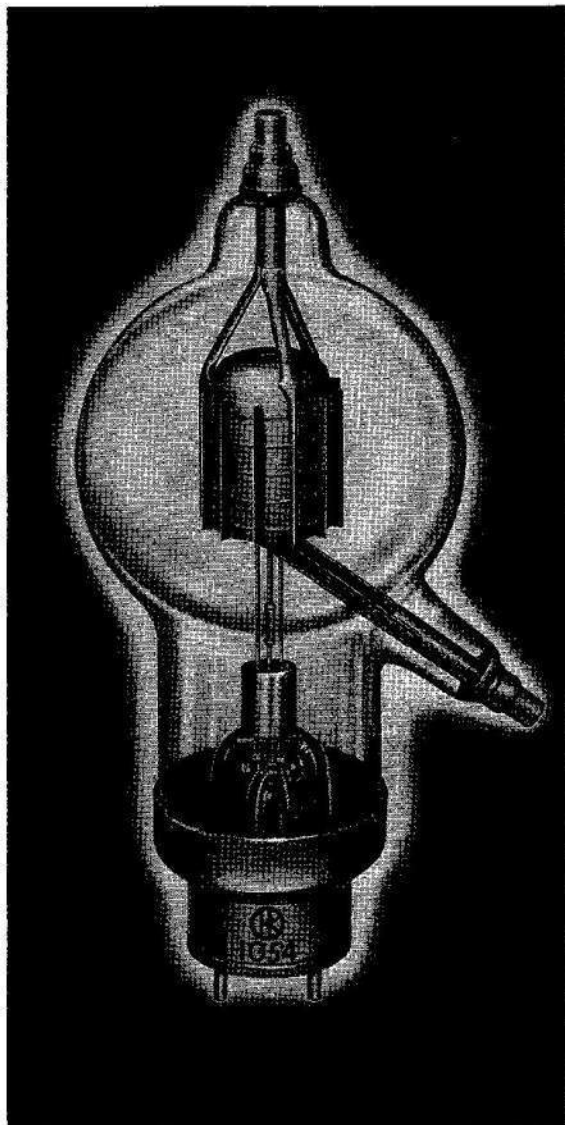
Frequency . . . . .	25	50	75	100 MC.
Class "C" Unmodulated				
Typical Plate Efficiency, per cent . . . . .	80	74	72	70
Max. Plate Input, Watts . . . . .	2250	1750	1600	1500
Class "C" Modulated				
Typical Plate Efficiency, per cent . . . . .	80	74	72	70
Max. Plate Input, Watts . . . . .	1900	1450	1350	1250
Class "B" Linear				
Typical Plate Efficiency, per cent . . . . .	35	32	31	30
Max. Plate Input, Watts . . . . .	720	680	670	660

# Gammatron Tubes





# GAMMATRON TYPE 1054L



## GENERAL PURPOSE TRIODE

Low mu, general purpose triode, 750 watt radiation cooled tantalum plate. Designed to stand high voltages and to give exceptional VHF performance.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Blank . . . . .	Nonex Glass
Net Weight . . . . .	42 Ounces
Shipping Weight . . . . .	6 Pounds
Shipping Volume . . . . .	2 Cu. Feet
Maximum Height . . . . .	17 Inches
Maximum Width . . . . .	8 $\frac{3}{8}$ Inches

### ELECTRICAL DATA

Filament Voltage . . . . .	7.5 Volts
Filament Current . . . . .	20 Amps.
Normal Plate Dissipation . . . . .	750 Watts
Maximum Average Plate Current . . . . .	1.0 Amps.
Maximum Plate Voltage . . . . .	6000 Volts
Maximum Average Grid Current . . . . .	0.150 Amps.
Average Amplification Constant . . . . .	13.5

### INTERELECTRODE CAPACITANCES

Grid-Plate Capacitance . . . . .	5.3 mmfd.
Grid-Filament Capacitance . . . . .	7.9 mmfd.
Plate-Filament Capacitance . . . . .	1.2 mmfd.

Unique constructional features make this tube capable of high voltages and unusual very high frequency performance. It has exceptional ruggedness, electrical stamina, and extra long life.

Copper thimble connectors are used for the grid and plate. They are high current capacity connectors possessing low resistance. Because of improved radiation, they run at least 50 degrees Centigrade cooler at the copper to glass seal than do ordinary tungsten seals. Their design relieves glass strains, and hence the seal positively will not fail. Heavy rugged leads provide perfect support and alignment to the elements without the use of insulators. Their low inductance

combined with low inter-electrode capacity provides easy neutralization and reduces circuit losses at high frequencies.

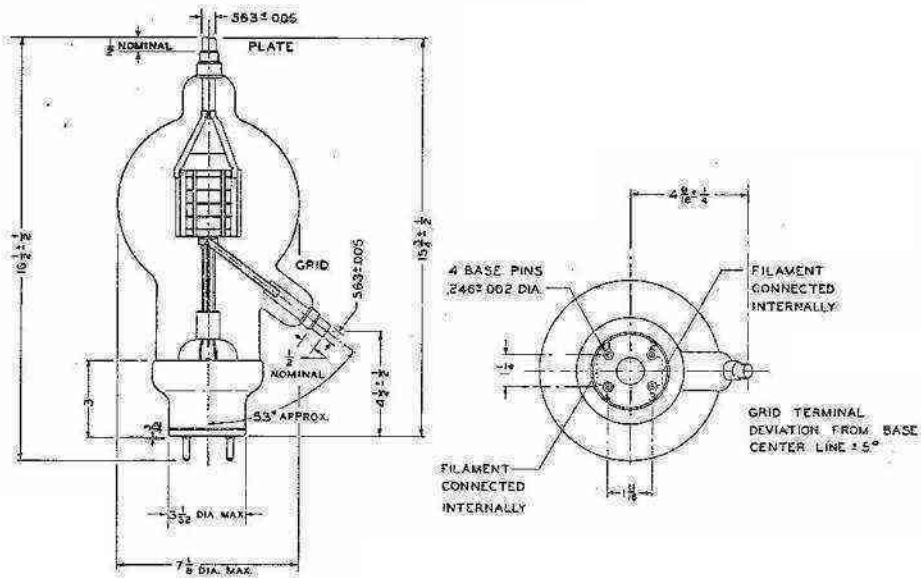
The VHF efficiency is high because of the use of an enclosed plate which confines all electrons to give useful output. Ordinary open plate tubes operate at lower efficiency because of escaped electrons. Electron bombardment is eliminated, lifting voltage limitations. Operation as a neutralized power amplifier up to 100 mc. is practical with up to 70 per cent efficiency.

New tantalum cleaning and pumping techniques give the 1054-L extra long life, and make it more gas free—more failure proof. A result of 17 years of GAMMATRON progress.

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**RADIO FREQUENCY POWER AMPLIFIER  
CLASS "C" UNMODULATED**

	Maximum Rating Per Tube		TYPICAL OPERATION, 1 TUBE				
Power Output . . . . .		3000	2450	1950	1190		Watts
Driving Power . . . . .		140	160	180	140		Watts
DC Plate Voltage . . . . .	6000	5000	4000	3000	2000		Volts
DC Plate Current . . . . .	1000	750	800	900	970		M. A.
DC Grid Current . . . . .	150	105	120	135	150		M. A.
DC Grid Voltage . . . . .	-2000	-950	-900	-875	-450		Volts
Peak R.F. Grid Voltage . . . . .		1475	1450	1475	1025		Volts
Plate Dissipation . . . . .	750	750	750	750	750		Watts
Plate Input . . . . .	3750	3750	3200	2700	1940		Watts

**RADIO FREQUENCY POWER AMPLIFIER  
CLASS "C" PLATE MODULATED\***

	Maximum Rating Per Tube		TYPICAL OPERATION, 1 TUBE				
Power Output . . . . .		2150	1705	1065			Watts
Driving Power . . . . .		150	185	130			Watts
DC Plate Voltage . . . . .	4000	4000	3000	2000			Volts
DC Plate Current . . . . .	850	690	780	850			M. A.
DC Grid Current . . . . .	150	120	150	150			M. A.
DC Grid Voltage . . . . .	-2000	-875	-825	-450			Volts
Peak R.F. Grid Voltage . . . . .		1400	1375	975			Volts
Plate Dissipation . . . . .	635	600	635	635			Watts
Plate Input . . . . .	2750	2750	2340	1700			Watts

\*Carrier conditions for 100% modulation peaks and 60% average value.

*Gammatron Tubes*



## RADIO FREQUENCY POWER AMPLIFIER

### CLASS "B" LINEAR\*

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
Power Output		410	375	300	Watts
Driving Power**		45	60	90	Watts
DC Plate Voltage	6000	4000	3000	2000	Volts
DC Plate Current	750	290	375	525	M. A.
DC Grid Current		1	2	25	M. A.
DC Grid Voltage		-300	-225	-150	Volts
Peak R.F. Grid Voltage		325	315	330	Volts
Plate Dissipation	750	750	750	750	Watts
Plate Input	1200	1160	1125	1050	Watts

\*Carrier conditions for 100% modulation.

\*\*R.F. power, at crest of audio cycle.

## AUDIO FREQUENCY POWER AMPLIFIER

### CLASS "B"\*

	Maximum Rating Two Tubes	TYPICAL OPERATION, 2 TUBES			
Power Output		2970	2860	2120	Watts
Driving Power**		200	275	330	Watts
DC Plate Voltage	4000	4000	3000	2000	Volts
DC Plate Current Zero Signal		50	70	90	M. A.
DC Plate Current Max. Signal	2000	1050	1400	1800	M. A.
DC Grid Voltage		-300	-200	-125	Volts
Peak A.F. Grid to Grid Voltage		1240	1210	1180	Volts
Plate Input Max. Signal	4500	4200	4200	3600	Watts
Load Resistance Plate to Plate		8600	4850	2125	Ohms

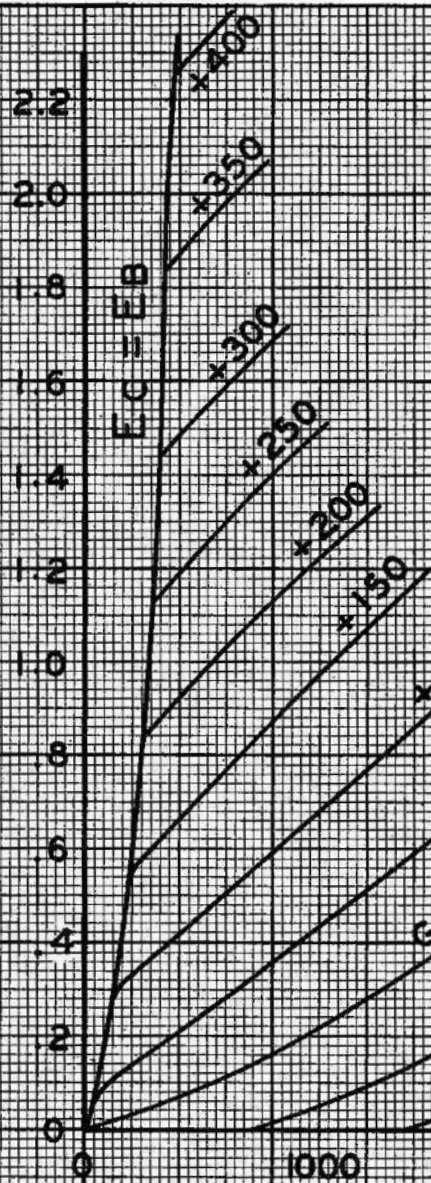
\*All data for two tubes.

\*\*Instantaneous power at crest of cycle; effective power is one-half of this value.

The information on this and the preceding pages does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.

# Gammatron Tubes

PLATE AMPERES

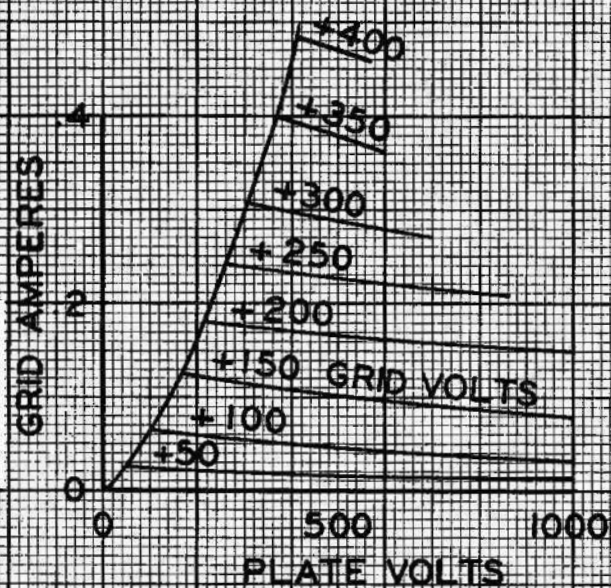


TYPE 1054 GAMMATRON

AVERAGE STATIC CHARACTERISTICS

$E_F = 7.5$  VOLTS

GRID AMPERES



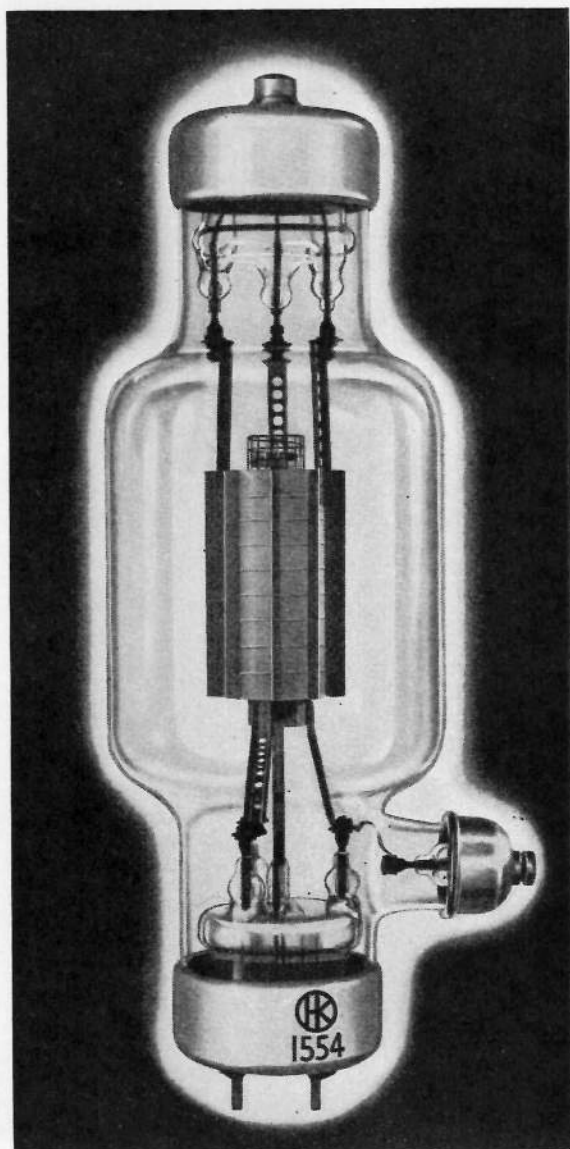
GRID VOLTS EC=0

PLATE VOLTS

0 1000 2000 3000 4000 5000 6000

-50 -100 -150 -200 -250 -300 -350 -400 -450

# GAMMATRON TYPE 1554



## GENERAL PURPOSE TRIODE

1000 watt radiation cooled universal triode, low  $\mu$ .  
Special design permits high voltage operation.

### PHYSICAL DATA

Plate . . . . .	Cylindrical Tantalum
Grid . . . . .	Braced Vertical Bar Tantalum
Filament . . . . .	Thoriated Tungsten
Envelope . . . . .	Nonex Glass
Filament Clips (mounted) . . . . .	Type HK-255-65
Net Weight . . . . .	31½ Pounds
Shipping Weight . . . . .	23 Pounds
Maximum Height . . . . .	19 Inches
Maximum Width . . . . .	7½ Inches

### ELECTRICAL DATA

Filament Voltage . . . . .	11.0 Volts
Filament Current . . . . .	22.5 Amps.
Normal Plate Dissipation . . . . .	1000 Watts
Maximum Average Plate Current . . . . .	1 Amp.
Maximum Average Plate Voltage . . . . .	5000 Volts
Maximum Average Grid Current . . . . .	0.25 Amp.
Average Dynamic Plate Resistance . . . . .	1800 Ohms
Average Amplification Constant . . . . .	12.5

### INTER-ELECTRODE CAPACITIES

Grid-Plate . . . . .	11.5 mmfd.
Grid-Filament . . . . .	15.2 mmfd.
Plate-Filament . . . . .	1.2 mmfd.

The type HK-1554 GAMMATRON is a radiation cooled low  $\mu$  triode of sturdy construction and long life. It is capable of withstanding severe overloads in continuous use without "softening."

Check these points:

- ✓ Plate and grid mounted on heavy tantalum channels anchored to sturdy solid leads which are brought through the tube envelope. No internal insulators are employed. The heavy H & K special base is full cemented and tested to eliminate "loose base" annoyance.
- ✓ The use of tantalum for grid and plate, together with the absence of internal insulators, permits extremely high exhaust temperatures through a new and improved pumping technique. Hence, de-gassing is car-

ried to a point which cannot be reached when internal insulators, other plate and grid material or conventional "getters" are utilized. This is your assurance of a tube which will not go soft when subjected to heavy overloads. Too, this permits filament operation in a manner consistent with high thermionic efficiency and long life.

- ✓ Capacitances are extremely low for a tube of this plate dissipation. The use of new and improved capacity measuring equipment insures accurate capacity data.

Here is a tube that has the years of Heintz and Kaufman engineering experience built into it. The HK-1554 has given an excellent account of itself in the field. A GAMMATRON is your assurance of the best in medium power radiation cooled transmitting tubes.

3000 1-46

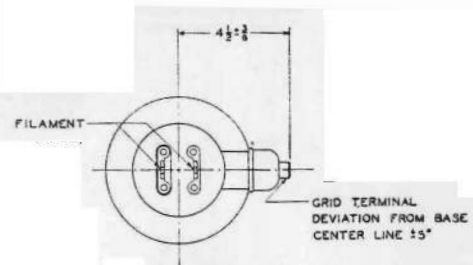
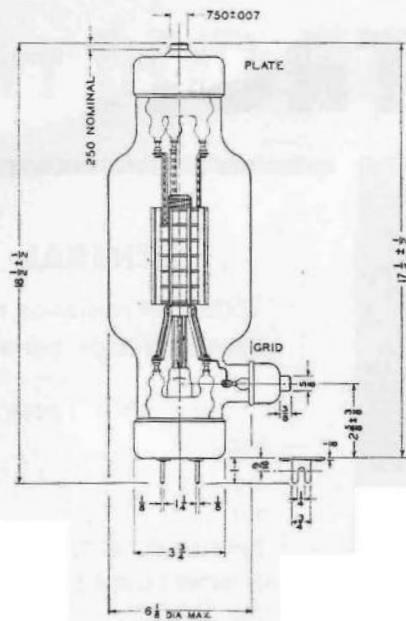
## HEINTZ AND KAUFMAN LTD.

SOUTH SAN FRANCISCO, CALIFORNIA, U · S · A



## TYPE HK-1554

The information on this and the following page does not represent exact conditions of operation to be imposed for any particular situation. Because tubes are used under many widely different conditions Heintz and Kaufman will gladly furnish information for applications which differ appreciably from the illustrative examples given.



### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" UNMODULATED

#### Maximum Rating Per Tube

#### TYPICAL OPERATION, 1 TUBE

	Maximum Rating Per Tube	3600	2900	2200	Watts
Power Output . . . . .		100	96	100	Watts
Driving Power . . . . .		5000	4000	3000	Volts
DC Plate Voltage . . . . .	5000	.900	.950	1.000	Amps
DC Plate Current . . . . .	1.000	85	95	110	M. A.
DC Grid Current . . . . .	250	-850	-650	-500	Volts
DC Grid Voltage . . . . .	-1500	1250	1075	970	Volts
Peak R.F. Grid Voltage . . . . .		900	900	800	Watts
Plate Dissipation . . . . .	1000	4500	3800	3000	Watts
Plate Input . . . . .	4500				

### RADIO FREQUENCY POWER AMPLIFIER CLASS "C" PLATE MODULATED\*

#### Maximum Rating Per Tube

#### TYPICAL OPERATION, 1 TUBE

	Maximum Rating Per Tube	2500	1800	2200	Watts
Power Output . . . . .		150	130	105	Watts
Driving Power . . . . .		4000	3000	2000	Volts
DC Plate Voltage . . . . .	4000	.800	.800	.800	Amps
DC Plate Current . . . . .	.800	120	120	120	M. A.
DC Grid Current . . . . .	250	-700	-550	-500	Volts
DC Grid Voltage . . . . .	-1500	1300	1130	930	Volts
Peak R.F. Grid Voltage . . . . .		700	600	500	Watts
Plate Dissipation . . . . .	750	3200	2400	1600	Watts
Plate Input . . . . .	3200				

\*Carrier conditions for use with 100% modulation.

# Gammatron Tubes

## RADIO FREQUENCY POWER AMPLIFIER CLASS "B" LINEAR\*

	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE			
		550	530	510	Watts
Power Output . . . . .		35	44	56	Watts
Driving Power** . . . . .		5000	4000	3000	Volts
DC Plate Voltage . . . . .	5000	.300	.375	.500	Amps
DC Plate Current . . . . .	.800	0	2	4	M. A.
DC Grid Current . . . . .	250	-350	-275	-210	Volts
DC Grid Voltage . . . . .	-1500	315	305	305	Volts
Peak R.F. Grid Voltage . . . . .		950	970	990	Watts
Plate Dissipation . . . . .	1000	1500	1500	1500	Watts
Plate Input . . . . .	1500				

\*Carrier conditions for 100% modulation.  
\*\*At crest of audio cycle.

## AUDIO FREQUENCY POWER AMPLIFIER CLASS "B"\*

	Maximum Rating Two Tubes	TYPICAL OPERATION, 2 TUBES			
		4700	4000	3000	Watts
Power Output . . . . .		155	135	115	Watts
Driving Power** . . . . .		5000	4000	3000	Volts
DC Plate Voltage . . . . .	5000	140	150	160	M. A.
DC Plate Current Zero Signal . . . . .		1.340	1.500	1.660	Amps
DC Plate Current Max. Signal . . . . .	2.000	-330	-260	-180	Volts
DC Grid Voltage . . . . .		1240	1170	980	Volts
Peak A.F. Grid to Grid Voltage . . . . .		6700	6000	5000	Watts
Plate Input Maximum Signal . . . . .	6700	8600	5800	3500	Ohms
Load Resistance Plate to Plate . . . . .					

\*All data for two tubes.  
\*\*Instantaneous power at crest of cycle; effective driving power is about one-half this value.

## AUDIO FREQUENCY POWER AMPLIFIER CLASS "A"—SINGLE TUBE

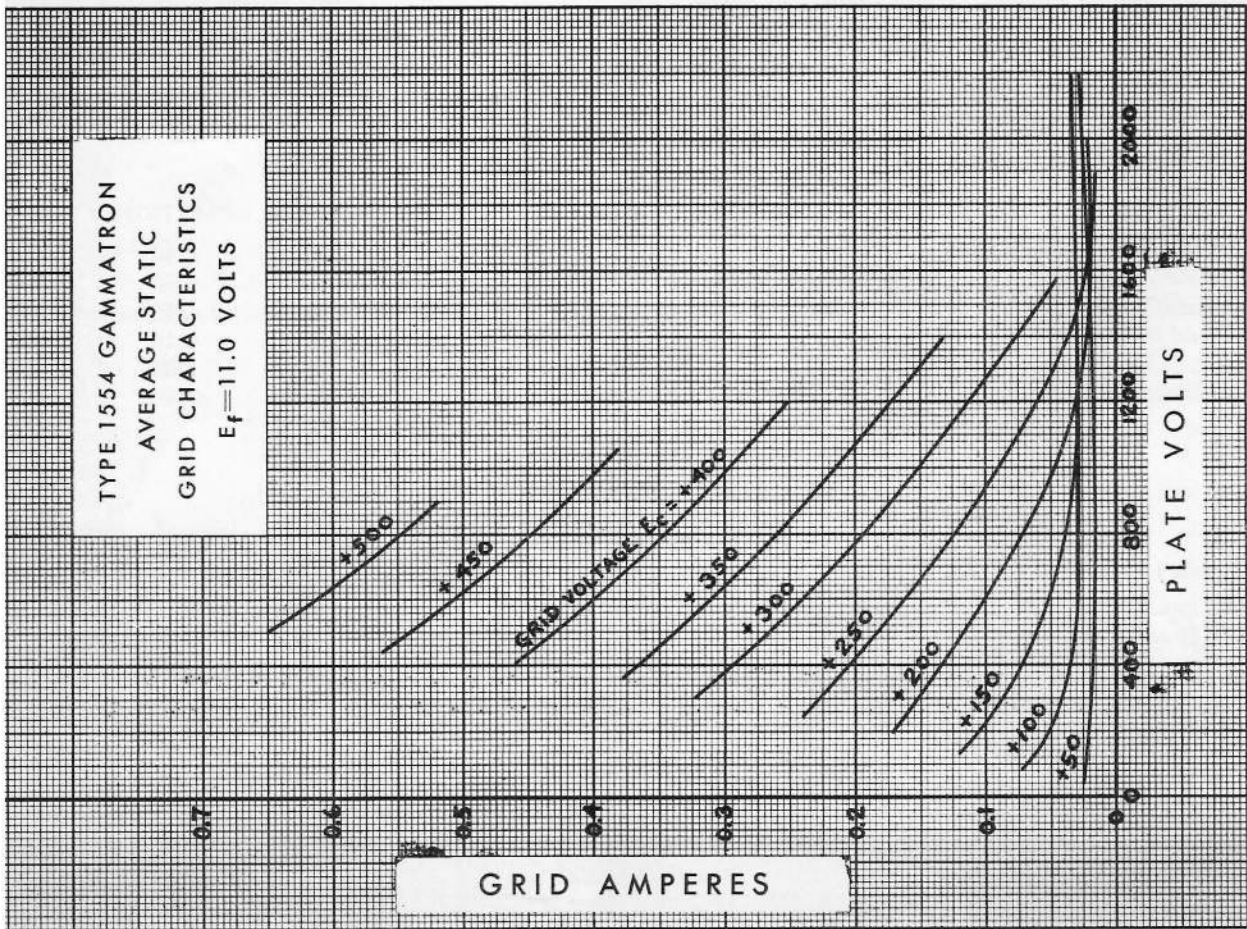
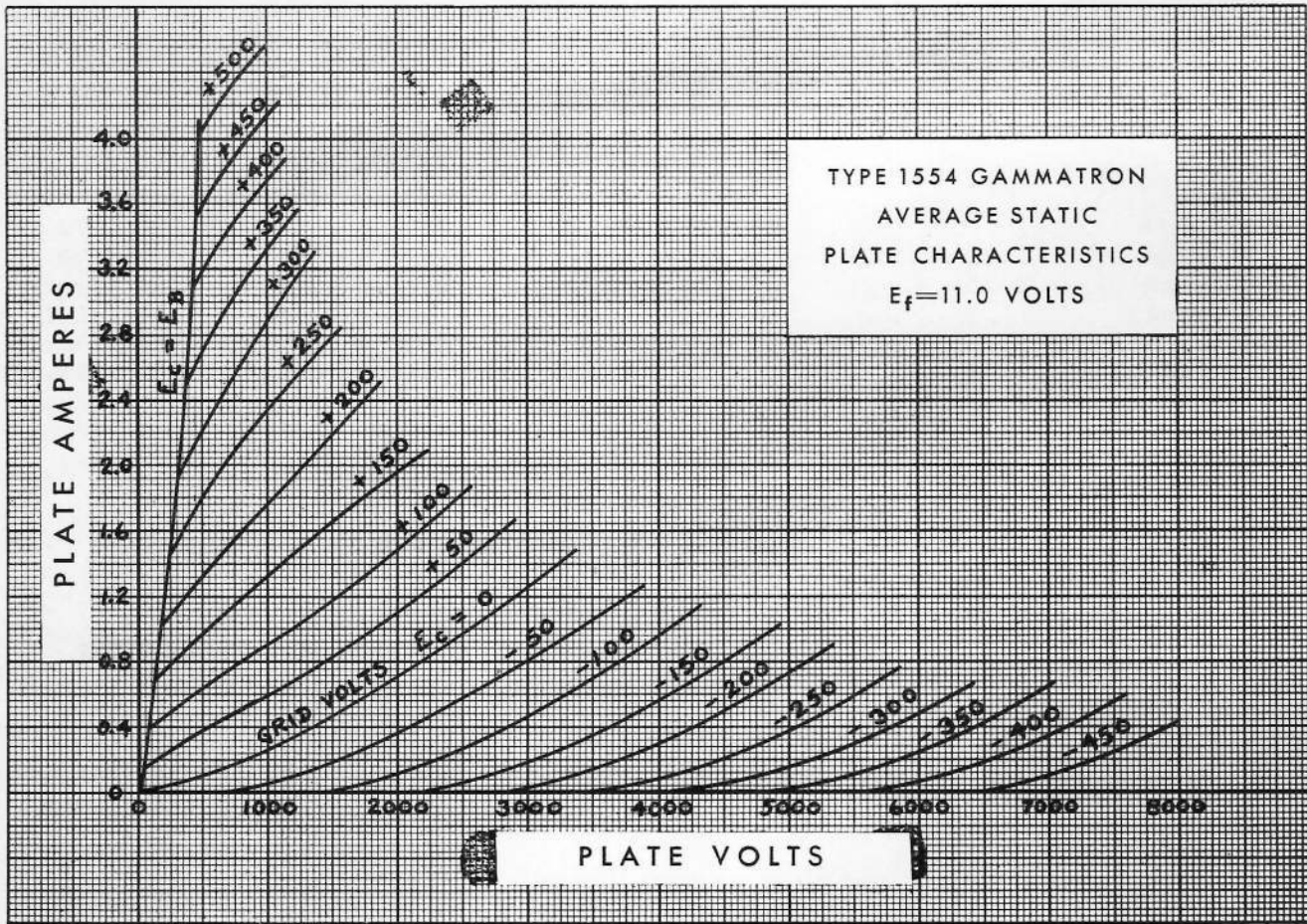
	Maximum Rating Per Tube	TYPICAL OPERATION, 1 TUBE		
		350	280	180
Power Output . . . . .		5000	4000	3000
DC Plate Voltage . . . . .	5000	200	250	300
DC Plate Current . . . . .		-300	-210	-130
DC Grid Voltage . . . . .		295	205	125
Peak A.F. Grid Voltage . . . . .		18500	9500	4000
Load Resistance . . . . .				

## ULTRA HIGH FREQUENCY RATINGS CLASS "C" UNMODULATED

Frequency . . . . .	15 M. C.	30 M. C.	
Max. Input . . . . .	2300	1800	Watts
Max. Plate Volts . . . . .	3800	3000	Volts

For plate modulated telephone the input *MUST* be 85% for a 60% average modulation level and preferably should be 67% of the rated unmodulated inputs. Plate voltage for plate modulation operation should be reduced to about 75% of the unmodulated value.

# Gammatron Tubes





210 - 18th Ave  
Santa Cruz

