



TRIAD MANUFACTURING CO., INC.

MANUFACTURERS OF

• RADIO TUBES •

PAWTUCKET, RHODE ISLAND.

U. S. A.



Technical Data

TRIAD TYPE 5W4G

(Full-Wave Rectifier)

CHARACTERISTICS:

Filament Voltage AC..... 5.0 Volts
Filament Current..... 1.5 Amperes

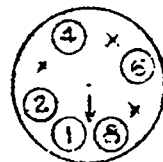
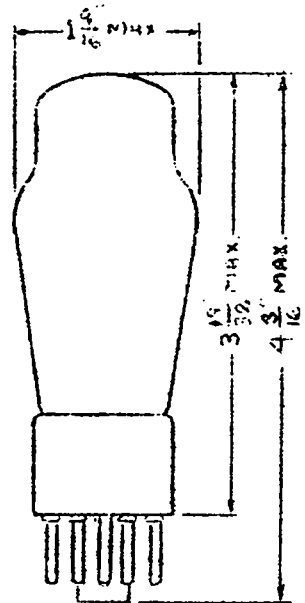
OPERATING CONDITIONS:

Filament Voltage..... 5.0 Volts
A-C Voltage per Plate (RMS)..... 500 Volts Max.
D-C Output Current..... 110 Ma. Max.

Note:- These characteristics
are identical to the type 5W4.

BASING CONNECTION

Pin #1 - No Connection	Pin #5 - Omitted
Pin #2 - Filament	Pin #6 - Plate
Pin #3 - Omitted	Pin #7 - Omitted
Pin #4 - Plate	Pin #8 - Filament



March 25, 1937

from RMA release #109, March 30, 1937

ADDRESS ALL COMMUNICATIONS DIRECT TO THE COMPANY

ALL ORDERS OR CONTRACTS ARE SUBJECT TO THE APPROVAL OF THE COMPANY

RADIO MANUFACTURERS ASSOCIATION



SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

SUB-COMMITTEE ON TUBE NUMBERING

E. W. WILBY, CHAIRMAN
711 FIFTH AVENUE
NEW YORK, N. Y.

May 25th, 1937

To Tube Engineer:

Correction on Tube
Standardization Release
#109 re 5W4G.

Your attention is called to a correction in the full wave filament type high vacuum rectifier designated as 5W4G.

The a-c voltage per plate rms should read 350 volts max instead of the previously published 500 volts max.

With this correction the all metal type 5W4 and the glass enveloped 5W4G are completely interchangeable with regard to electrical characteristics.

Very truly yours,

Edward Wilby
Chairman
Tube Numbering

eww:lg

E. I. A.
REGISTRATION
FILE

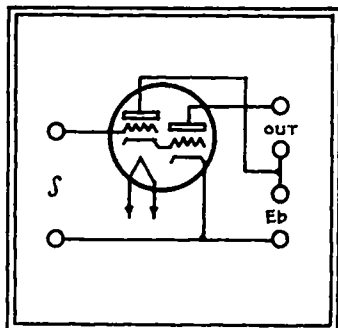


TRIADYNE 6AB6 G

TECHNICAL BULLETIN 111



TRIAD MANUFACTURING COMPANY, INC., PAWTUCKET, R.I.



Since the Triadyne 6B5 was developed by Triad Manufacturing Company in the Spring of 1935, leading manufacturers of automobile radio sets have selected this tube, and its counterpart the 6N6 G, for their higher priced models, although the tube was primarily designed for AC sets. The inherent qualities of this "dynamic coupling" type of power tube, especially its unique overload characteristic, made the tube desirable for auto receivers in spite of the fact that its physical size and its heater current are not entirely suitable for this application.

The new 6AB6 G tube was developed by Triad in order to provide the manufacturer of auto sets with a tube having the 6B5 performance but consuming less battery current and utilizing less space. The 6AB6 G heater consumes 0.5 amperes at 6.3 volts; this represents a 37% reduction in heater power compared with the 6B5. The overall size has been reduced by using the small octal base and the ST-12 bulb. This permits a more compact and convenient arrangement of parts. Due to the similarity of the new tube to the well-known 6B5, a detailed description of its performance will not be given here. However, the curve data appearing on the following pages will be found useful.

The 6AB6 G is strictly a Class A tube and the AB of its type number has no significance other than the fact that these letters were chosen to identify it with automobile use. Any of the ordinary high plate resistance voltage amplifiers may be used to supply the signal to the 6AB6 G, and a grid resistor of 1 megohm is permissible under any operating condition. As is the case with other "dynamic coupling" Triadyne power tubes, this tube comprises two triodes in the same bulb connected internally. The "dynamic coupling" arrangement produces higher plate efficiency than is possible with other triodes, but retains all of the desirable features of triode performance. Another important feature is the essentially constant power output delivered when the load resistance is varied, thereby minimizing the effects of loud speaker resonant peaks at various frequencies and giving the entire system a better overall frequency characteristic. This is shown by the power output and distortion curve of figure 2, where the load resistance is varied over a ratio of almost five to one.

It should be kept in mind that the tube is intended for lower power service than the 6B5-6N6 G, where the normal plate voltage does not exceed 250. For this reason, the 6AB6 G is not entirely interchangeable with and should not be used as a replacement for the 6N6 G in AC sets or P.A. systems whose plate voltage might be in excess of 250. For single ended sets having 250 volts available for the output tube, 3.5 watts can be obtained at 10% distortion. Grid current does not flow, however, until the tube delivers about 4.25 watts. In push-pull applications where no bias is used, 9 watts may be obtained at 8% distortion. Since it is desirable to utilize as little battery current as possible, biasing of the push pull stage is recommended. A 5 volt bias which may be obtained by a cathode self-bias resistor, drops the no-signal output plate current from 68 to 50 ma. Nearly the same power output is available, but the input signal required is somewhat greater. It should be understood that no driving power is required for this type of operation.



DISTORTION VERSUS POWER OUTPUT

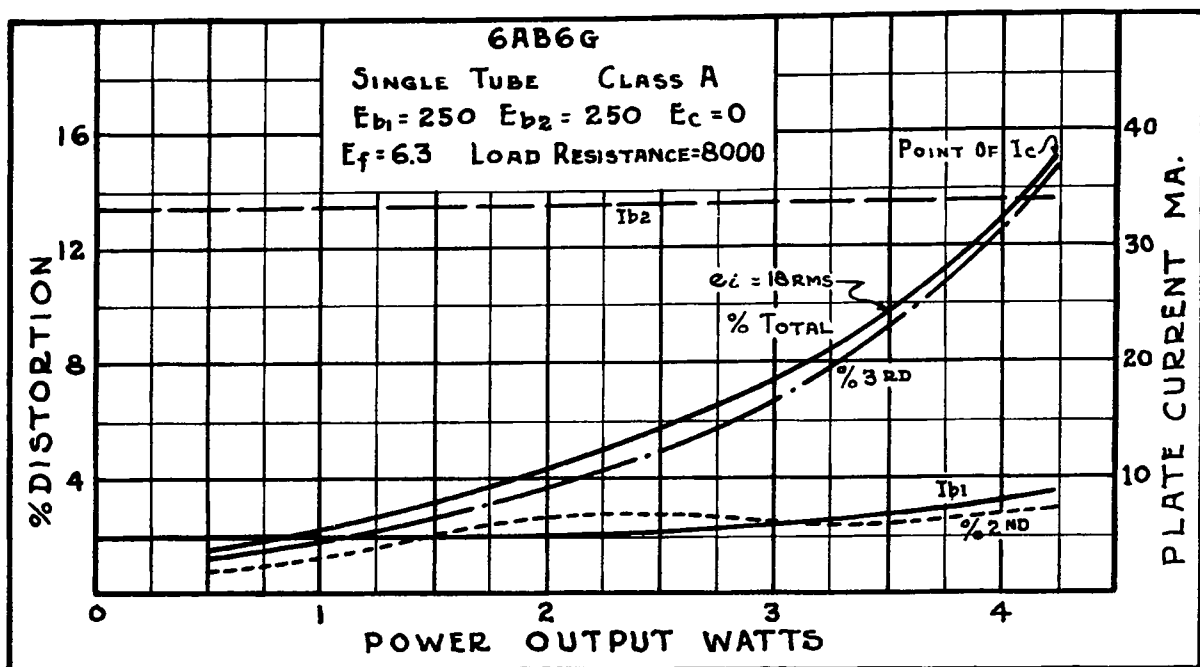


Figure No. 1

DISTORTION VERSUS LOAD RESISTANCE

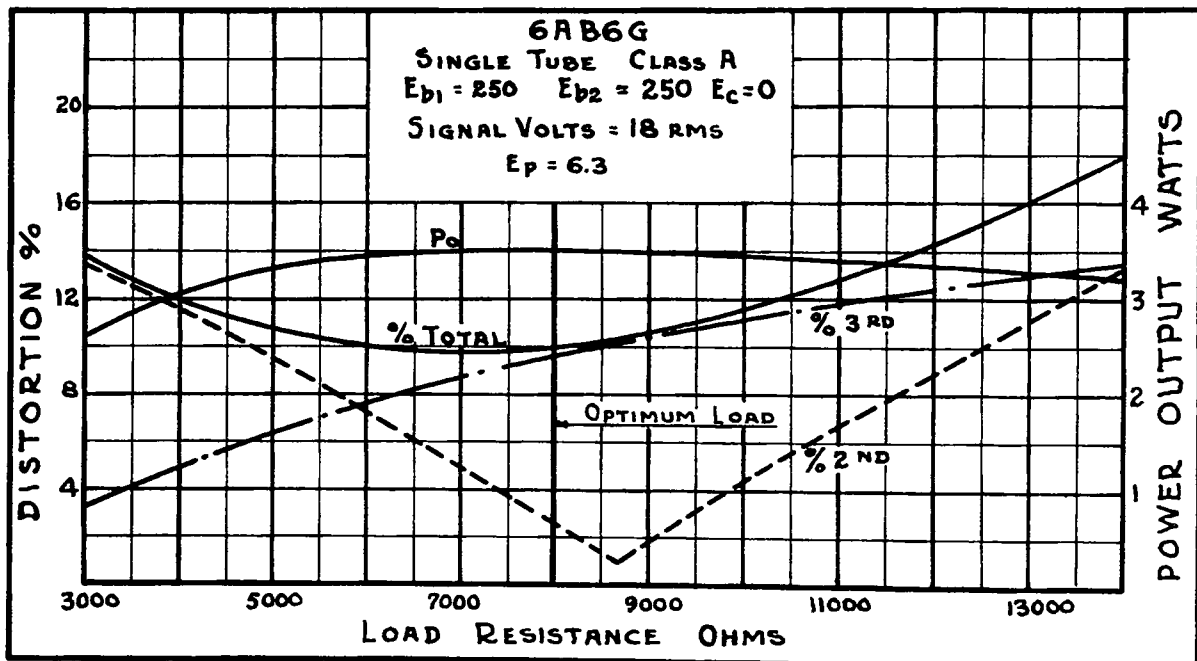


Figure No. 2

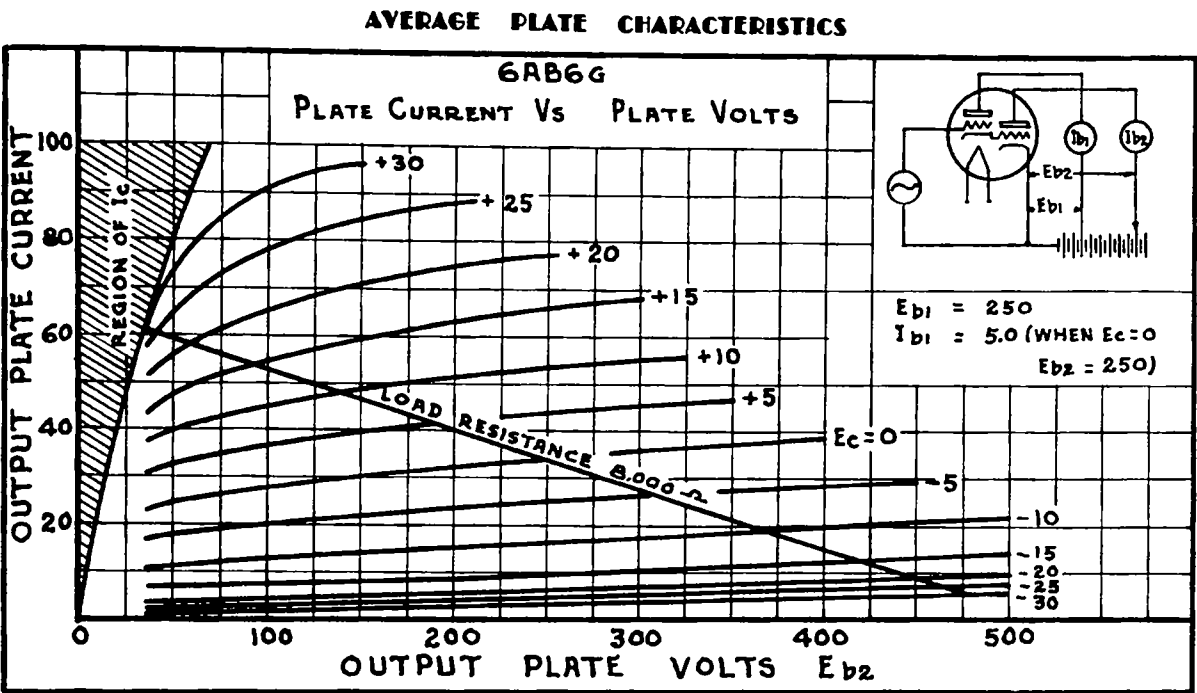


Figure No. 3

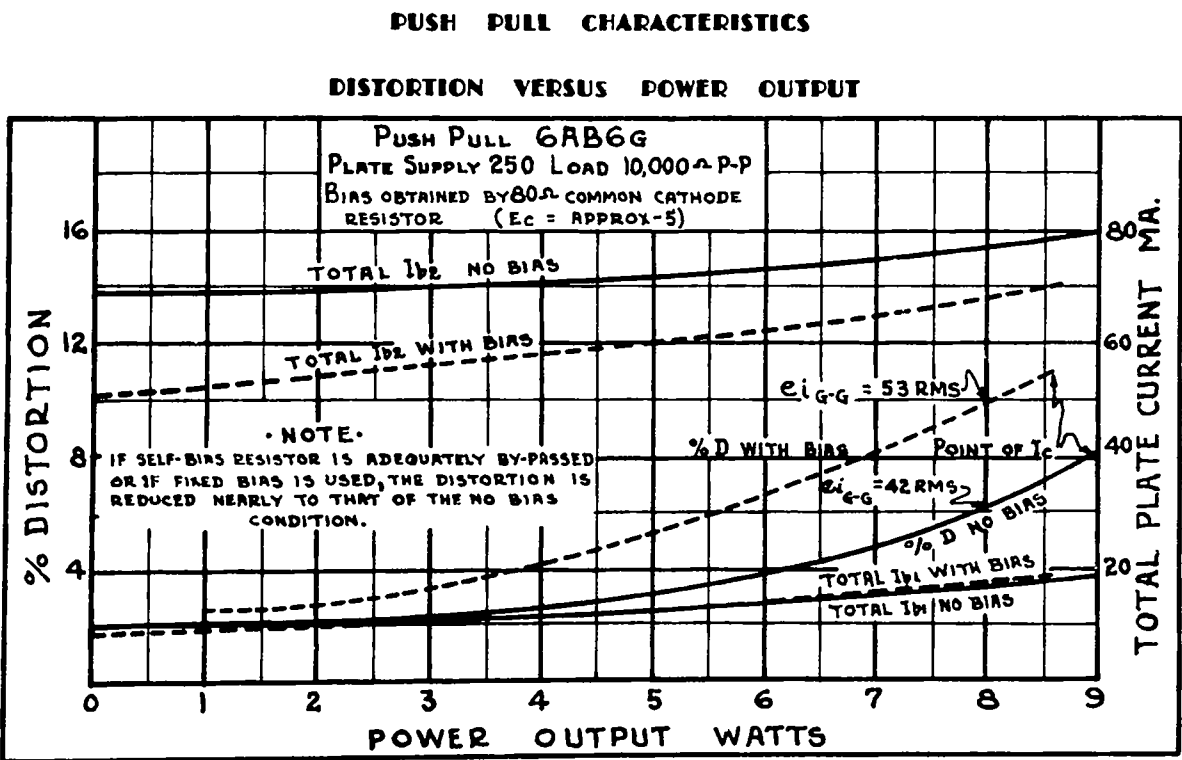


Figure No. 4

TRIADYNE 6AB6 G

AVERAGE ELECTRICAL CHARACTERISTICS

Heater	Coated un-potential cathode
Voltage	6.3 a-c or d-c
Current	0.5 ampere

AMPLIFIER (CLASS A)

	Single	Push Pull	
Output Plate (P ₂)	250	250	max. volts
Input Plate (P ₁)	250	250	max. volts
Grid	0	0	volts
Plate Current (P ₂)	34	68	ma.
Plate Current(P ₁)	5	10	ma.
Amplification Factor	72		
Plate Resistance	40,000		ohms
Mutual Conductance	1,800		umhos
Load Resistance	8,000	10,000 p-p	ohms
Power Output	3.5	8	watts
Harmonic Distortion	10	6.5	%
Signal Volts For Rated Power	18	42 g-g	r.m.s.

PUSH PULL AMPLIFIER (CLASS AB)*

Output Plate (P ₂)	245	max. volts
Input Plate (P ₁)	245	max. volts
Self-Bias Resistor**	80	ohms
Zero-Signal Plate Current(P ₂)	50	ma.
Full Signal Plate Current (P ₂)	68	ma.
Zero Signal Plate Current (P ₁)	8	ma.
Full Signal Plate Current (P ₁)	17	ma.
Load Resistance	10,000 p-p	ohms
Power Output	8	watts
Harmonic Distortion	10	%
Signal Volts For Rated Power	53 g-g	r.m.s.

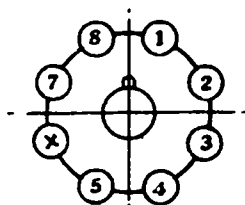
Push Pull values are for two tubes.

*Grid current does not flow during any part of the input cycle.

**Common cathode resistor which is not by-passed by capacitance. If this resistor is adequately by-passed or if a fixed bias of -5 volts is used, the Class AB distortion is reduced nearly to that of the Class A push pull.

The total resistance introduced into the grid circuit by the input coupling device should not exceed 1.0 megohm.

6AB6 G Base Connections



Bottom View of Base

- Pin 1 - No Connection
- Pin 2 - Heater
- Pin 3 - Output Plate (p₂)
- Pin 4 - Input Plate (p₁)
- Pin 5 - Input Grid
- Pin 7 - Heater
- Pin 8 - Cathode

Physical Dimensions

- Max. Overall Length 4-1/2"
- Max. Diameter 1-9/16"
- Bulb ST 12
- Base Small Octal 7-Pin

RADIO MANUFACTURERS ASSOCIATION



SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N.W.
WASHINGTON, D. C.

R.M.A. DATA BUREAU
90 West Street
New York, N. Y.

Release No. 99A

July 11, 1940

To
Tube Engineers:

The inclusion of a resistor in the structure of the tube type 6AB6G requires the modification of the basing designation applicable to this tube type.

As originally announced, the assigned basing designation was 7W.

To the modified basing the extended designation 7AU-0-0 has been assigned.

Respectfully yours,

R.M.A. DATA BUREAU

By

LCFH:MJ

***We believe that the circuit shown above for Dynamic Coupled operation is covered by patents controlled by
Revelation Patents Holding Company.**

TRIADYNE 6AC5 G

AVERAGE ELECTRICAL CHARACTERISTICS

Heater	Coated uni-potential cathode
Voltage	6.3 a-c or d-c
Current	0.4 amperes

CLASS "A" POWER AMPLIFIER

Plate Voltage	250 max. volts
Grid Voltage	+13 volts
Plate Current	32 ma.
Grid Current	5.0 ma.
Amplification Factor	125
Plate Resistance	36,700 ohms
Transconductance	3,400 umhos
Plate Dissipation	10 max. watts

TYPICAL OPERATION

CLASS "A" DYNAMIC COUPLED AMPLIFIER EMPLOYING A TYPE 76 DRIVER

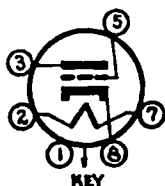
Plate Supply	250 volts
Driver Plate Current	5.5 ma.
Power Section Plate Current	32 ma.
External Grid Bias*	0 volts
Load Resistance	7,000 ohms
Rated Power Output	3.7 watts
Harmonic Distortion	10%
Signal Volts For Rated Output	16.5 r.m.s.
Max. Power Output (start of driver grid current)	4.3 watts

*Bias voltage for both the driver and power sections is automatically developed by the Dynamic Coupled connection and driver grid current does not flow during any part of the cycle up to 4.3 watts output.

A 25,000 ohm resistor should be connected between grid and cathode of the power tube to prevent a current surge occurring while the tube is warming up.

The total resistance in the type 76 grid circuit should not exceed 1 megohm.

BASE CONNECTIONS



PIN ARRANGEMENT

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 5 - Grid
Pin 7 - Heater
Pin 8 - Cathode

PHYSICAL DIMENSIONS

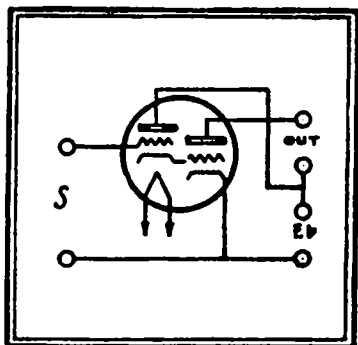
Max. Overall Length	4-1/8"
Max. Diameter	1-9/16"
Bulb	ST12
Base	Small Octal 6 Pin

#103

TRIADYNE 6AC6 c

TECHNICAL BULLETIN 110

TRIAD MANUFACTURING COMPANY, INC., PAWTUCKET, R.I.



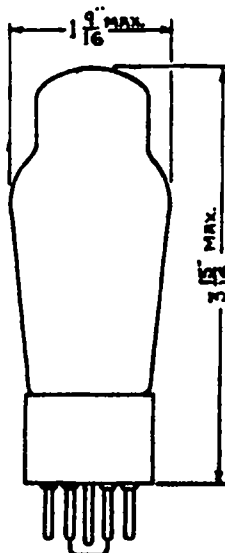
With the rapid increase in the sales of small A.C. sets, there has arisen a demand for an output tube which will operate with a low plate voltage (180 volts) in conjunction with a series speaker field. This demand has been met by the newest member of the Triadyne family, the 6AC6c, which will permit receivers of this type to be made having more power than conventional sets using a single output tube at this plate voltage.

It is expected that a 700 to 800 ohm speaker field will be used as the filter choke, which will give both ample plate supply filtering and ample speaker field power. The first electrolytic filter condenser may well be of only 300 volts rating,

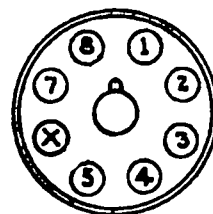
and the second condenser of only 250 volts rating. Thus we may make a set with a low voltage power supply having a 70 ma. drain that is capable of giving 3.8 watts, at 10% harmonic distortion, and which, due to the Triadyne overload characteristic, will produce more than 4 watts of audio power. It is readily seen that by the use of the 6AC6c, important economies may be made in small a-c sets with an increase of quality and power. It should be noted that the maximum plate voltage rating is 180 volts. Operation with voltage in excess of this is not recommended, and for these conditions, other members of the Triadyne family are better suited.

There will be no difficulty in providing sufficient input signal to the grid of the 6AC6c if the 75 or 6Q7c voltage amplifier is operated with a plate voltage of 180. The resistance of the grid circuit may be as high as one megohm, which is of importance in resistance coupled audio systems. In some cases, the overall audio sensitivity will be greater than in systems using a more sensitive output tube, which requires a lower value of grid resistance, and thus reduces the gain of the preceding stage.

When used in push pull operation the 6AC6c will produce 9.5 watts of audio power at a harmonic distortion of 10%. Where necessary to minimize plate current drain the push pull stage may be biased. The bias may be obtained by a common cathode resistor of 50 ohms, which reduces total output plate current to 70 ma. at no signal. Under full signal the current will rise to 100 ma. The system will deliver a maximum output of 9 watts at 12.5% distortion. The distortion can be reduced nearly to that of the unbiased system by adequately by-passing the cathode resistor.



6AC6c BASE CONNECTIONS



Bottom View of Base

- Pin 1 -
- Pin 2 - Heater
- Pin 3 - Output Plate (p.)
- Pin 4 - Input Plate (p.)
- Pin 5 - Input Grid
- Pin 6 - No Connection
- Pin 7 - Heater
- Pin 8 - Cathode

TRIADYNE 6AC6 G

AVERAGE ELECTRICAL CHARACTERISTICS

Heater Coated un-potential cathode
Voltage 6.3 a-c or d-c
Current 1.1 ampere

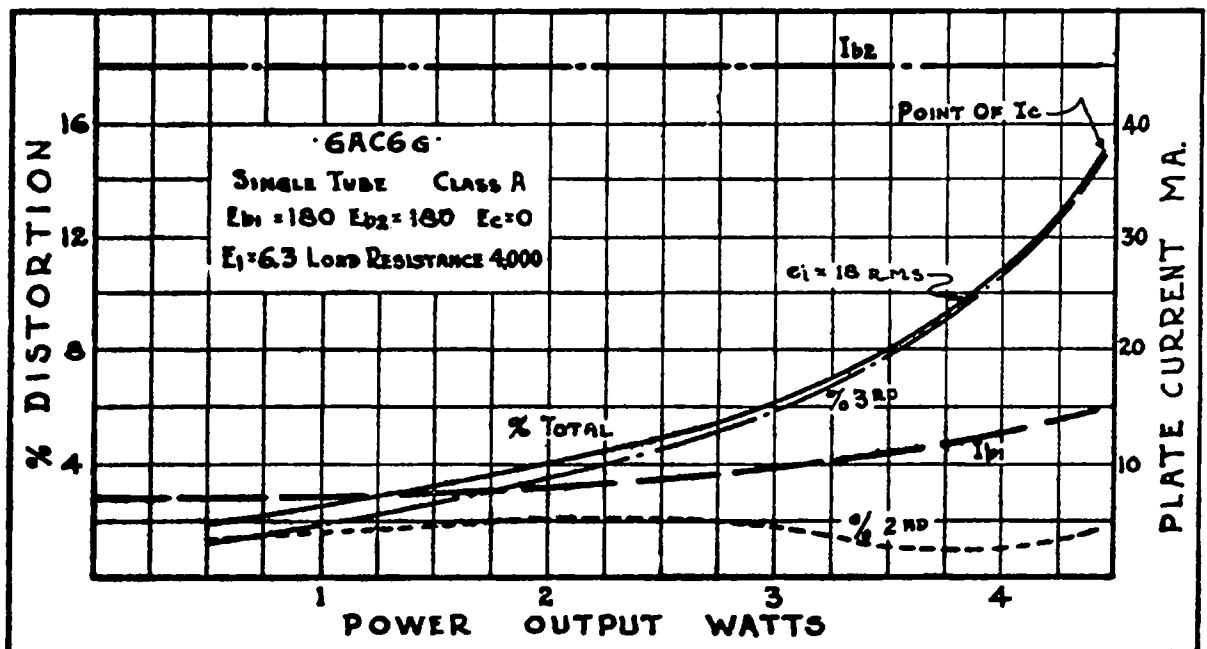
AMPLIFIER (CLASS A)*

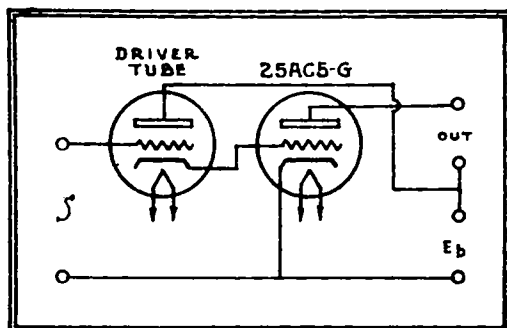
	Single	Push Pull
Output Plate (P ₂)	180	180 max. volts
Input Plate (P ₁)	180	180 max. volts
Grid	0	0 volts
Plate Current(P ₂)	45	90 ma.
Plate Current(P ₁)	7	14 ma.
Amplification Factor	54	
Plate Resistance	18,000	ohms
Mutual Conductance	3,000	umhos
Load Resistance	4,000	5,000 p-p ohms
Power Output	3.8	9.5 watts
Harmonic Distortion	10	10 %
Signal Volts For Rated Power	18	48 r.m.s.

*Grid current does not flow during any part of the cycle of the input signal.

The total resistance introduced into the grid circuit by the input coupling device should not exceed 1.0 megohm.

DISTORTION VERSUS POWER OUTPUT



25AC5 G**TRIADYNE****6AE5 G****TECHNICAL BULLETIN 116****TRIAD MANUFACTURING COMPANY, INC., PAWTUCKET, R. I.**

The Triadyne 25AC5G is a positive grid Power Amplifier Triode designed particularly for Dynamic-Coupled Class A operation, similar to the 6AC5G. This new output tube requires a 25 volt heater potential and its 0.3 ampere heater permits its use in series heater circuits commonly employed in ac-dc receivers.

In 110 volt ac-dc receivers a low mu driver is required to provide positive grid bias and to center the plate current at the nominal value of 45 ma. This necessitated the design of a new driver, the 6AE5G. This combination provides 2 watts of power output. As usual with Dynamic-Coupled amplifiers, the positive bias for the output tube and the negative bias for the driver are automatically provided by the circuit. A high value of resistance is permitted in the grid circuit of the driver, allowing the plate of the first audio to operate into a lightly loaded circuit. Since this coupling resistor is connected to the input driver rather than the output tube, grid current trouble, often encountered with other ac-dc power output tubes, is eliminated. For typical ac-dc receivers, a 6Q7G should be used for the detector and first audio with a 0.25 meg. plate resistor and 1.05 volts bias.

The 25AC5G may also be operated at 180 plate volts. The tube offers an excellent solution to the tube complement problem in low voltage ac receivers when it is economically feasible to operate the heaters in series and to use a small inexpensive transformer for the plate supply. A type 6P5G (octal base equivalent of a 76) may be used as the driver. This combination delivers 2 watts of power output. If more power is desired, a type 37 driver may be used, providing 2.7 watts.

The simple construction and conservative wide element spacing of the 25AC5G insures against life problems and failures in the field. The tube offers a most inexpensive manner of increasing the number of tubes in a receiver. This is obvious because of the inherent low cost of both the driver and output tubes and the absence of circuit components.

25AC5 G RATING - TYPICAL OPERATION

CLASS A DYNAMIC-COUPLED POWER AMPLIFIER

Driver Tube	6AE5G	6P5G	37	Type
Plate-Supply Voltage	110	180	180	Volts
Grid Voltage	*	*	*	Volts
Power Tube Plate Current	45	27	37	Ma.
Driver Plate Current	7	4	5.3	Ma.
Input Signal To Driver**	22	12	17	Volts rms
Load Resistance	2,000	8,000	5,000	Ohms
Harmonic Distortion	10	10	10	%
Power Output	2.0	2.0	2.7	Watts

*Bias voltage for both the 25AC5G and the driver is automatically developed by the Dynamic-Coupled connection.

**Driver grid current does not flow during any part of the input cycle. The total resistance in the driver grid circuit should not exceed one megohm.

We do not assume responsibility for any possible patent liability involved by the use of circuits described above.

25AC5 G RATING (Continued)HIGH-MU POWER AMPLIFIER TRIODE
(For Dynamic-Coupled Amplifiers)**HEATER**

Voltage	25.0
Current	0.3

Coated Unipotential Cathode

Volts ac-dc

Amperes

PLATE

Voltage	180
Dissipation	10

Max. Volts

Max. Watts

STATIC AND DYNAMIC CHARACTERISTICS

Plate Voltage	110	Volts
Grid Voltage	+15	Volts
Amplification Factor	58	
Plate Resistance	15,200	Ohms
Transconductance	3,800	Umhos
Plate Current	45	Milliamperes
Grid Current	7	Milliamperes

BASE CONNECTIONS**PIN ARRANGEMENT**

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 5 - Grid
Pin 7 - Heater
Pin 8 - Cathode

PHYSICAL DIMENSIONS

Max. Overall Length	4-15/32"
Max. Diameter	1-9/16"
Bulb	ST12
Base	Small Octal 6 Pin

6AE5 G TRIODE AMPLIFIER DATA**HEATER**

Voltage	6.3
Current	0.3

Coated Unipotential Cathode

Volts ac-dc

Amperes

AMPLIFIER CLASS A

Plate	95	Volts
Grid	-15	Volts
Amplification Factor	4.2	
Plate Resistance	3,500	Ohms
Transconductance	1,200	Umhos
Plate Current	7	Milliamperes

BASE CONNECTIONS**PIN ARRANGEMENT**

Pin 1 - No Connection
Pin 2 - Heater
Pin 3 - Plate
Pin 5 - Grid
Pin 7 - Heater
Pin 8 - Cathode

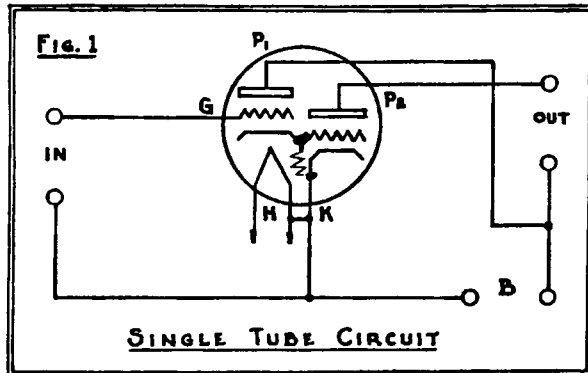
PHYSICAL DIMENSIONS

Max. Overall Length	4-1/8"
Max. Diameter	1-9/16"
Bulb	ST12
Base	Small Octal 6 Pin

TRIADYNE 6B5

TRIAD MANUFACTURING CO., PAWTUCKET, R. I.

A NEW POWER OUTPUT TUBE



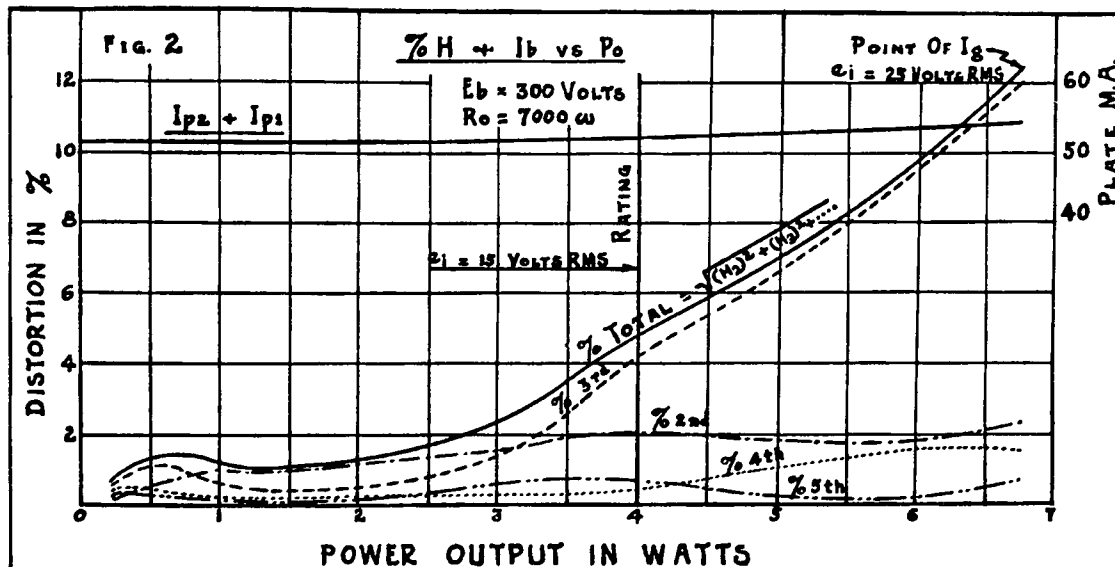
FEATURING

CLASS A OPERATION
CIRCUIT SIMPLICITY
HIGHER POWER
HIGH FIDELITY
HIGH EFFICIENCY
HIGH SENSITIVITY
NO GRID CURRENT
ZERO GRID BIAS
RETARDED OVERLOAD
UNI-POTENTIAL CATHODE
FAST 6.3 VOLT HEATER
ST-14 BULB

The growing demand for High Fidelity fostered the development of an improved power tube. The Triadyne is the answer for a universal, efficient audio system, - one which will satisfy the requirements for small table receivers as well as the finest of consoles. Its basic operating principles are truly unique. Its circuit is the simplest ever devised. The adjacent circuit diagram is startling by the very absence of component parts. The first Triadyne is the type 6B5.

To the manufacturer of Radio and Public Address Systems, the tube simplifies his design problems. For small units, a single 6B5 will deliver up to five clean watts, and for larger units, push-pull can provide as much as twenty watts. Another remarkable fact is that it requires no driver, because its grid impedance is as high as any true Class A power tube with the result that driving tubes and their coupling transformers are eliminated, thereby affecting appreciable economy. Yet, efficiency, sensitivity, and fidelity are not compromised. The tube provides more power than any other existing tube in the same size bulb. Distortion caused by overloading is far less pronounced than with other tubes when the power rating is exceeded. Detailed information is necessary to fully appreciate these advantages.

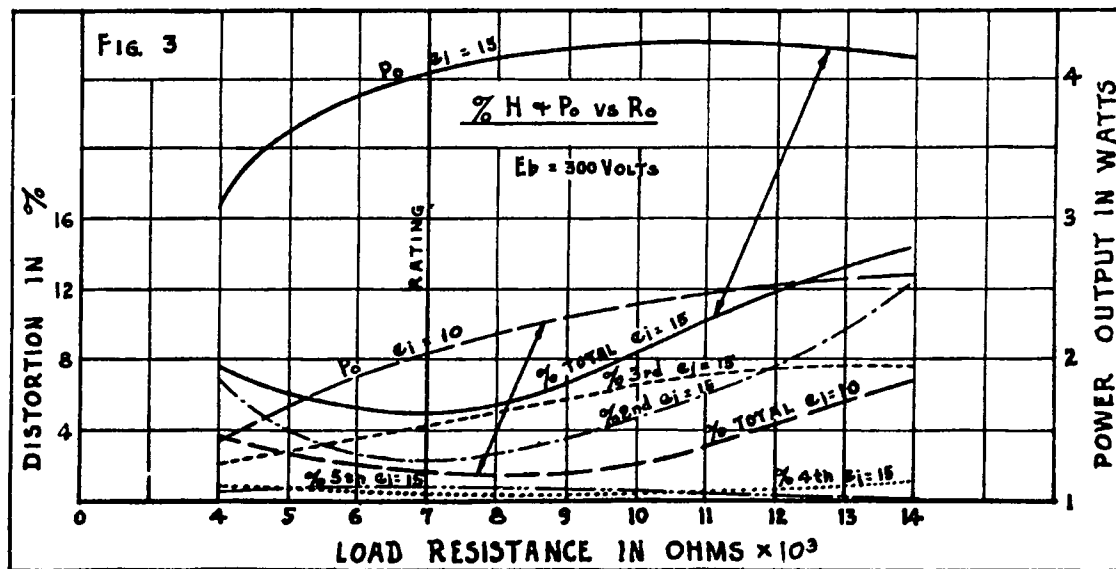
The tube operates without bias, so that there is no need for a cathode resistor and its by-pass condenser. The cathode is simply connected directly to B - . However, this grid does not draw any current, since a grid bias is automatically developed within the tube. Thus the tube may be fed by resistance coupling. With the elimination of the bias resistor and condenser, there is no frequency discrim-

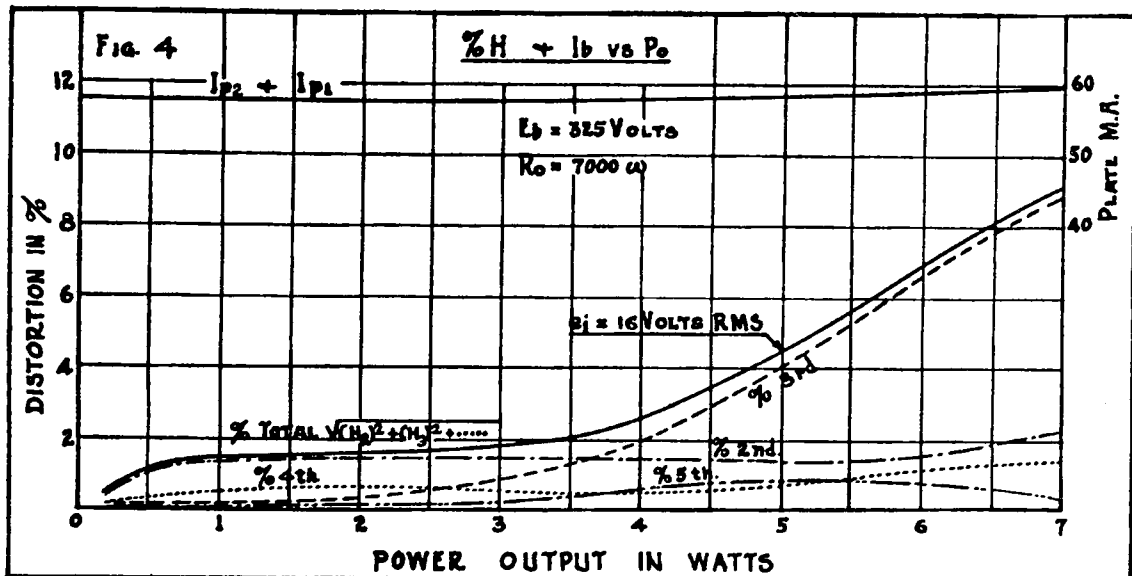


ination nor degenerative effect. Hence, the frequency characteristic is absolutely flat over the entire audio band.

The plate voltage supply for a 6B5 needs no better regulation than that of any other class A power amplifier, since this tube is operated from the center point of its plate current - grid voltage characteristic. This means that there is no appreciable increase in plate current when large signals are applied. Neither does the supply require greater filtering for a given hum output than when feeding other power tubes of equivalent sensitivity.

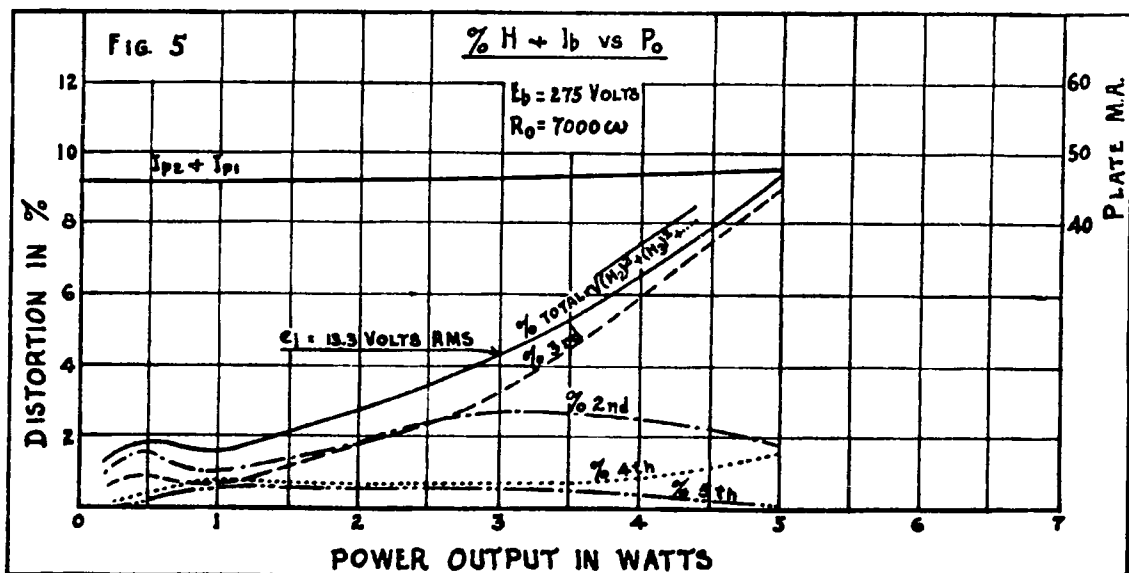
The overload characteristic is a decided improvement. The type of overload in a receiver which is decidedly objectionable occurs when the volume control is near maximum. Here peak signals produce spurts of grid current which cause unbearable squawking. Now with most output tubes, grid current flows as soon as the rating is slightly exceeded, but this is not true with the 6B5. The signal can actually increase more than 60% above the rating before the tube draws grid current. This advantage considerably retards the overload crashing. It also permits

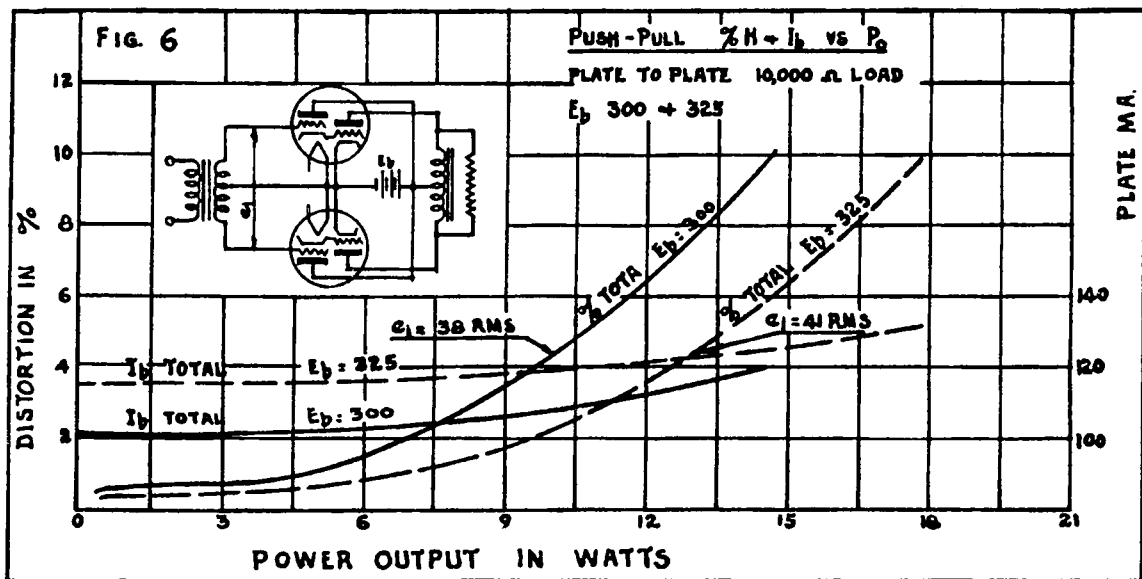




practical operation of resistance coupled push-pull. This retarded overload performance is clearly indicated in Fig. 2, - the distortion versus power output curve for 300 volt operation. Note that even when the input is increased far above the rating, considerable additional power output is available without objectionable distortion. The rated signal of only 15 volts amounts to a power sensitivity practically that of a pentode. The slight change in total plate current for full power output is also indicated.

Fig. 3 shows the power and distortion performance when the load resistance is varied over a wide range while the input signal is held constant. These curves were taken at two different signal levels. By inspection, it may be seen that the optimum load is 7000 ohms. The power does not fall off rapidly, typical of triode operation; nor does it rise, like a pentode. Therefore, a compromise is obtained between the falling triode and the increasing pentode characteristics. Hence, when the reflected speaker load is varying with the signal frequency, the high passages are not so rapidly lost nor are they objectionably exaggerated. Also the only harmonic that climbs at any appreciable rate with increasing load

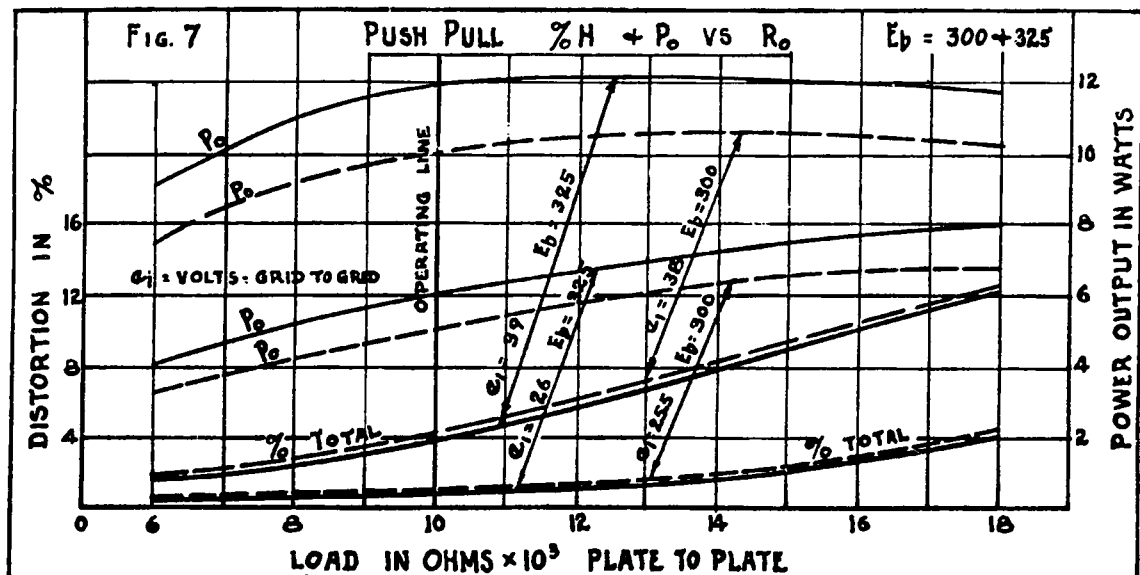


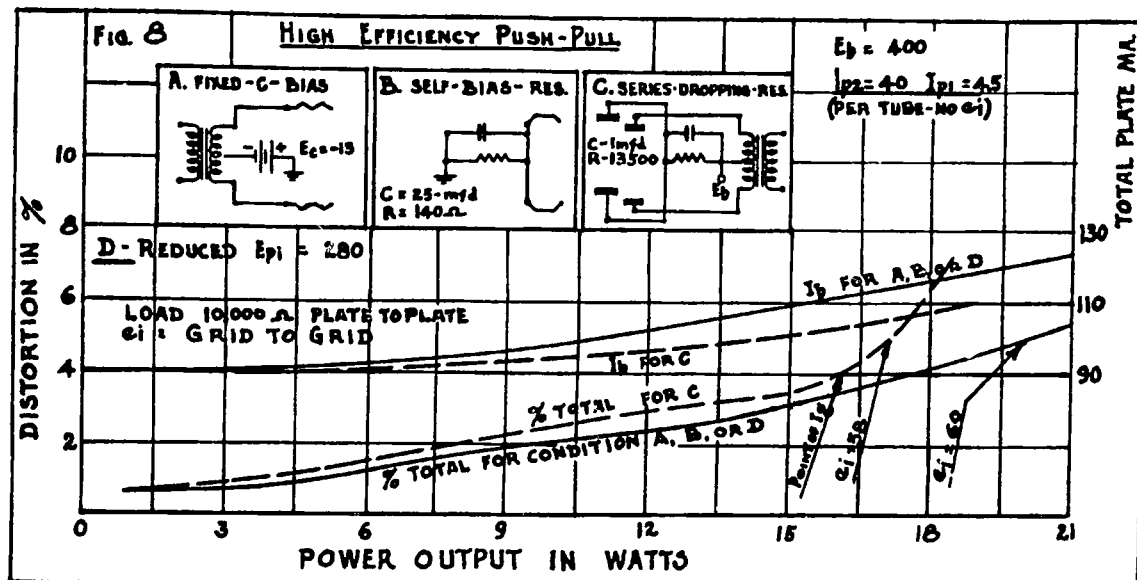


impedance is the second. These conditions aid in minimizing the transient response of the speaker. This means that overemphasis of audio peaks, occurring when the speaker resonates, will be diminished.

Performance at plate supply voltages of 325 and 275 are shown by Fig. 4 and 5 respectively. The same data as in Fig. 2 was taken with different supply voltage. 325 volt operation is the highest which may be safely recommended for ordinary operation. Its fine performance is readily appreciated when it is seen that 3.5 watts can be obtained at about 2% total distortion, 5 watts at 4.5%, and 7 watts at 9%.

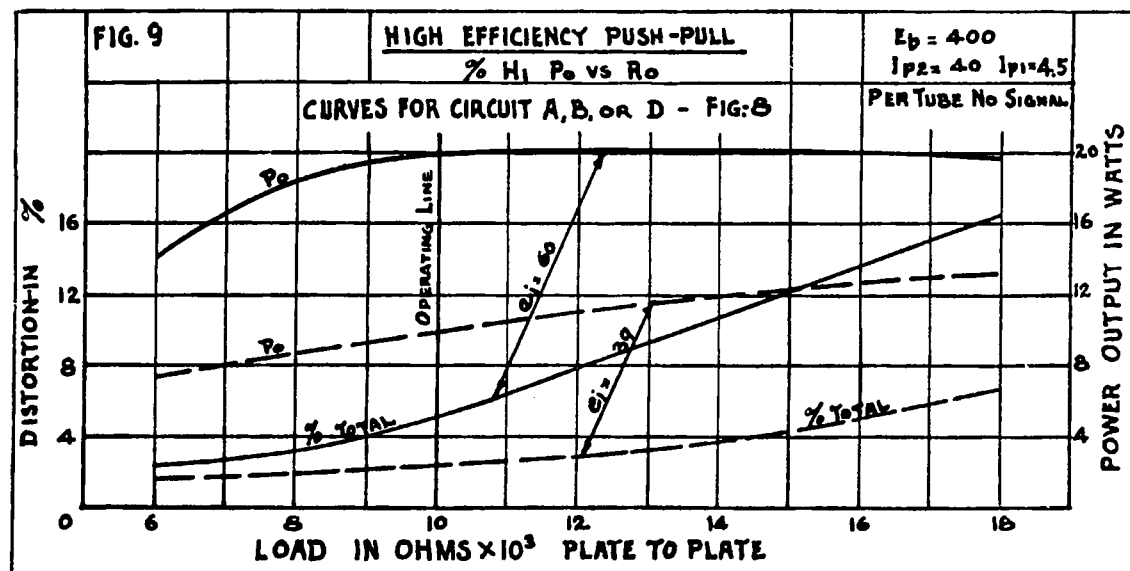
Naturally, the tubes can be used in push-pull. The simple circuit is given in Fig. 6. Again it is repeated that the grids do not take current. Thus the input transformer's secondary may be a high impedance type or resistance coupled input may be substituted for the transformer. This permits the practical employment of phase inverter circuits. The output device shown in the circuit is merely present to indicate the type of load used when taking the measurements.





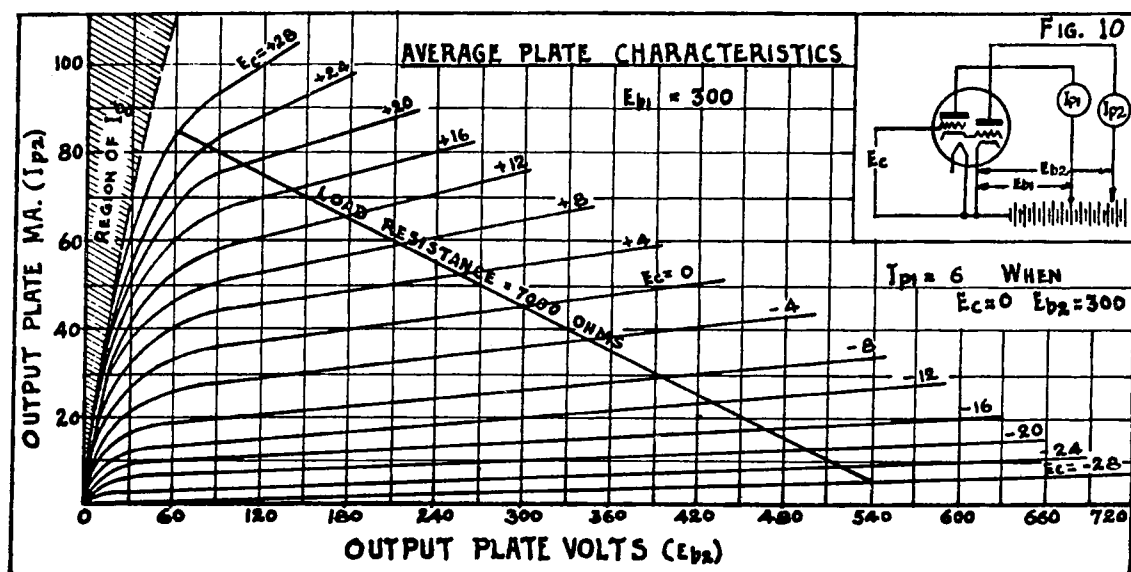
Of course, in actual operation, the usual output transformer is used. The impedance of this transformer should provide a 10,000 ohm load from plate to plate. The distortion curves are given for both 300 and 325 plate volt operation. Since the total distortion values are made up almost entirely of third harmonic, the individual harmonics have been left out purposely. Fig. 7 shows that the optimum load is 10,000 ohms. This is less than twice that recommended for single tube. Such a value can be used because of the Triadyne's harmonic distribution and the cancellation of even harmonics.

In systems where 20 watts or more are desired, the "High Efficiency Push-Pull" circuit is recommended, - Fig. 8. Here the output plates operate at 400 volts but the output plate current in each tube is held down to 40 mils at zero input signal. This amounts to 16 watts static dissipation per plate, and the dynamic plate dissipation is somewhat less. The plate heat is, therefore, no greater than when operating normally at 325 volts. Some means must be used to restrict the plate current. This can be accomplished by providing an external bias for the grid or by lowering the input plate voltage. The solid line distortion



curve of Fig. 8 shows the performance when operating under three different conditions; A, B, or D. Condition A is simply a "C" voltage in series with the center tap of the input transformer. It is represented by a battery, but naturally, it may be taken from a bleeder circuit in the power pack. Condition B supplies the same voltage by using a self-biasing resistor. The 140 ohm resistor is connected between the two cathodes and ground or B-. A by-pass condenser is necessary to suppress distortion which is introduced if an audio voltage appears across the resistor. However, since the sensitivity of the circuit is not perceptibly affected even when the by-passing is removed, the frequency characteristic is independent of the value of the condenser. A 25 mfd., condenser is all that is necessary for good quality. Condition D is for reduced input plate voltage; - that is, 280 volts. This voltage can be taken from a voltage divider on the power pack. It is interesting to note that the distortion vs power performance is the same for these three conditions. Even with the full twenty watts at 5%, the point of grid current has not yet been reached. The other distortion curve is included to show what may be expected if the input plate voltage is lowered by a series dropping resistor; - the condition C. Note that this method does not develop the power of the others. Further, increasing the capacity of the by-pass offers but little advantage. This condition is included to demonstrate what not to do. In this high efficiency system, the total plate current rises with increasing power output. However, since the total increase is only 25%, the regulation required of the power pack is even less than with other popular systems delivering equivalent power. Fig. 9 shows that a 10,000 ohm load from plate to plate is also an optimum condition for this High Efficiency circuit. When greater power is desired, the Triadynes should be used in push-pull parallel.

The usual family of plate characteristics are given in Figure 10. These are particularly interesting for they show the region wherein grid current flows and that high positive voltages may be put on the grid without swinging into this region. The average characteristics for the 6B5 follow:-

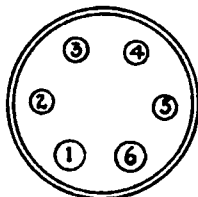


PHYSICAL DIMENSIONS

Max. Length 4-11/16"
 Max. Diameter 1-13/16"
 Bulb ST-14
 Base Medium 6-Pin

6B5 AVERAGE ELECTRICAL CHARACTERISTICS

Heater * Coated Uni-potential Cathode
 Voltage 6.3 a-c or d-c volts
 Current 0.8 amperes

BASE CONNECTIONS

Bottom View of Base

Pin 1-Heater
 Pin 2-Output Plate (p_2)
 Pin 3-Input Plate (p_1)
 Pin 4-Input Grid
 Pin 5-Cathode
 Pin 6-Heater

** 5% total harmonic distortion.

If a grid coupling resistor is used, its maximum value should not exceed 0.5 megohm.

* The potential difference between heater and cathode should not exceed 50 volts and in no case should the heater be left floating.

AMPLIFIER RATINGS (CLASS A)

Output Plate (p_2)	300	volts
Input Plate (p_1)	300	volts
Grid Bias	0	volts
Output Plate Current	45	m.a.
Input Plate Current	6.0	m.a.
Amplification Factor	58	
Plate Resistance	24,100	ohms
Mutual Conductance	2,400	micromhos

SINGLE TUBE

Load Resistance	7,000	ohms
** Power Output	4.0	watts
Input volts for rated power	15	r.m.s.

PUSH-PULL

Load Resistance (plate to plate)	10,000	ohms
** Power Output	10	watts
Input Volts for rated power (grid to grid)	38	r.m.s.

HIGH EFFICIENCY PUSH-PULL

Plate Supply	400	volts
Fixed Grid Bias	-13	volts
Or, Self-Bias Resistor (shunted by 25 mfd.)	140	ohms
Or, Reduction of input plate voltage to	280	volts
Static P_2 Current (per tube)	40	m.a.
Static P_1 Current (per tube)	4.5	m.a.
Load Resistance (plate to plate)	10,000	ohms
** Power Output	20	watts
Input Volts for rated power (grid to grid)	60	r.m.s.

From the foregoing, it is evident that existing receivers may be easily adapted to make use of the Triadyne's advantages. High fidelity triode, Class A-B, and Class B systems may be greatly simplified and, in most cases, the performance will be improved. In quality auto sets, the tube will also find a place. As a replacement tube, the service man will find many sockets where the Triadyne may fit. Sets using a Type 42 pentode will easily accommodate a 6B5 by simply eliminating the grid bias. Such a substitution is especially effective because the sensitivity and speaker load is almost identical for both tubes. The slightly higher current drain of the new tube will have no affect on the operation of most sets. A fundamental explanation of the tube's internal operation has so far been avoided in order not to burden the reader who might not be interested in such a discussion. For those who are interested, the explanation follows.

FUNDAMENTAL EXPLANATION

The basic principles of the tube's operation are simple but due to its newness an explanation would be somewhat confusing if this discussion were started by describing the finished product rather than the logical sequence in the development process.

In the first place, what is the purpose? An attempt to obtain high power, efficiency, good sensitivity, low distortion and all of this at low cost. Pentodes and Class B systems fail to meet some of these requirements. Class A triodes are unsatisfactory due to low plate efficiency and low sensitivity. Their low plate efficiency, the ratio of audio power to d-c plate power, is due to the relatively high plate voltage that is necessary to obtain an appreciable plate current swing which must be restricted to the negative portion of the I_p vs E_g characteristic.

It would seem, therefore, that one possibility of obtaining high efficiency would be to design a triode operating without a negative grid field, that is, a tube which will have only a positive I_p - E_g characteristic so that the same plate current swings can be obtained at a much lower plate voltage. This can be accomplished by increasing the μ of the tube so that very little current is present when the grid is at zero potential. This will also provide high sensitivity. Such a tube would have plate characteristics similar to those in

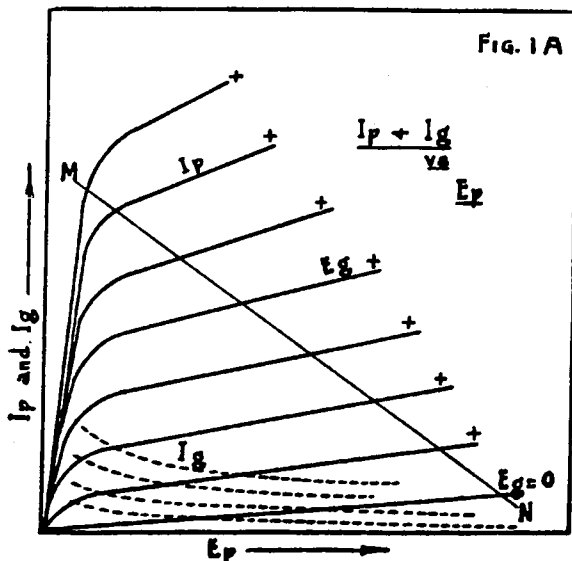
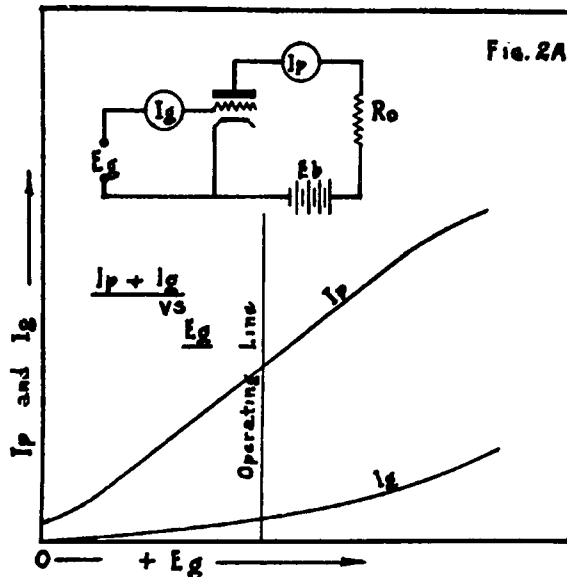


Fig. 1A. Particularly, note that the curves are for zero and positive values of grid voltage. Now, of course, a positive grid draws current so that the grid action of swinging the plate current is no longer a simple field voltage relation. Consequently, power is required in the grid circuit to swing the plate current. A few grid current curves are also shown in Fig. 1A. I_p vs E_g and I_g vs E_g curves may be plotted from these characteristics by the usual method of representing an optimum plate load resistance by the load line, MN. The result is shown in Fig. 2A.



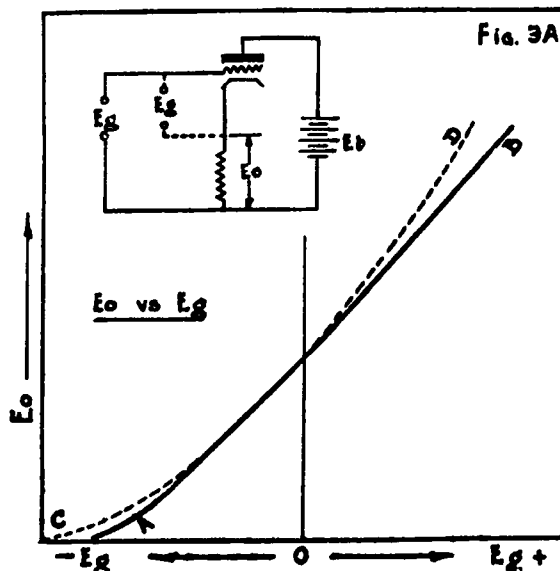
It is at once apparent that over a considerable portion, there is good linearity of plate current as a function of grid voltage, but grid current versus grid voltage is something far different. This grid current curvature means that the grid impedance of this tube is not a constant value. Further, the design limitations of such plate characteristics necessitate a relatively low average grid impedance.

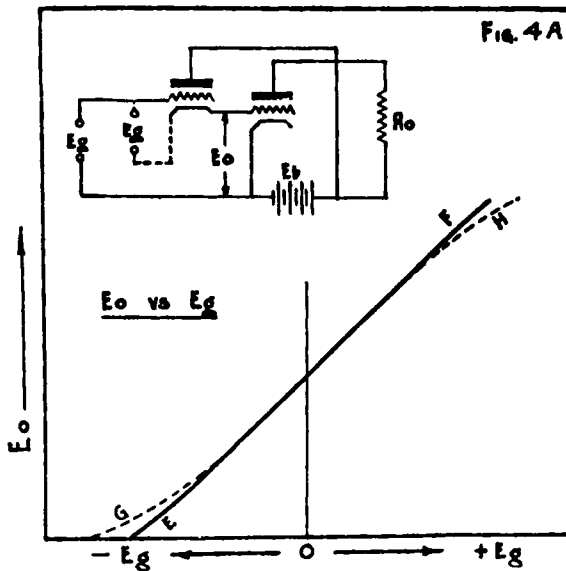
Now in order to have low distortion, a voltage must be impressed on this grid by some method which will be little affected by this varying impedance. The usual method of supplying grid power by a

driver stage and a coupling transformer is unsatisfactory due to high distortion as well as high cost.

This problem is answered by direct coupling of driver to output tube. A driver, whose plate impedance would be low enough to match the average grid impedance load, will not be considered since such a design is impractical, chiefly because it would necessitate excessive physical proportions. Consequently, a step-down ratio must be used.

First then, suppose an ordinary triode is working into a load much lower than its plate impedance, but instead of this load being in its usual location; that is, between plate and $B+$; the plate is tied directly to $B+$ and the load is placed between cathode and ground. This load will be represented by a resistor, and of course, the d-c drop across this resistor, when no signal is on the grid, produces a negative bias similar to usual self-biasing. The question is - how would the voltage developed across this resistor vary with respect to input volts? This is graphically shown in Fig. 3A, curve A-B. Fair linearity is present. This is much better than should ordinarily be expected when it is realized that the resistance value used was approximately one fifth the plate impedance of the triode. This is explained by the fact that the circuit is degenerative, as the developed voltage appears as part of the input circuit and both voltages are in phase with respect to ground. In other words, the voltage appearing directly across the grid to cathode at any instant is always equal to the input voltage minus the voltage across the resistor. The greater distortion that would be present if the circuit were not degenerative is indicated by the curvature of C-D, Fig. 3A, which represents the performance when the input signal is impressed between grid and cathode.





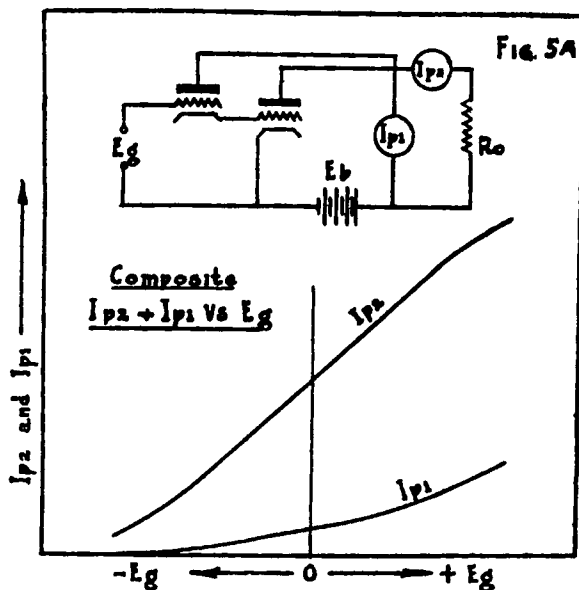
The bias voltage necessary to duplicate the plate current when E_g equals zero has been purposely omitted from the circuit drawing for the sake of simplicity. Incidentally, the input voltage scale was made one third that for the curve A-B, as then the slope of the two curves more nearly coincide which makes it easier to compare curvature. By introducing degeneration, then, it is possible to operate into a low impedance with much less distortion.

This fact suggests the possibility of using a triode for driving where its load will be between cathode and ground. Suppose the grid-cathode impedance of the output tube previously

described is substituted for the resistor, as shown in Fig. 4 A. Then the voltage drop across this impedance becomes the negative bias for the grid of the input section in the same manner as when the resistor load was used, and correspondingly, it becomes the positive bias for the output grid. Also this bias establishes the operating point for the I_p vs E_g characteristic of the output section. In designing, the desired positive bias is determined by selecting the midpoint of the I_p vs E_g curve, Fig. 2A. At this voltage, the value of grid current is determined, and the driver is simply designed so that at a negative bias equal to the selected positive bias, the driver's plate current will equal the output grid current. So much for the static current-voltage relationship.

The question now arises, how will the voltage appearing across the grid-cathode impedance vary with respect to the voltage on the driver? Curve E-F, Fig. 4A, shows the performance. The linearity is excellent. The curve G-H is included to show the relation without degeneration, and again, the greater curvature is plainly evident. Note that both curves are considerably straighter than those when a resistor load was used, Fig. 3A. This statement certainly needs clarifying because the grid-cathode impedance is not a simple fixed value as was the resistor. It is actually a varying load, for the grid current does not vary linearly with applied voltage as previously shown by the I_g curve, Fig. 2A. The reason why this changing load has an advantageous effect can be explained as follows. When a triode works into a step-down load its I_p vs E_g characteristic has pronounced curvature. Thus the plate impedance is not a linear function of the input signal. If the load impedance could be made to vary such that it maintained a constant ratio with the plate impedance throughout the signal excursion, the output voltage would become an exact replica of the input signal. In this system, the grid impedance of the output section provides a load which varies in the required manner. Also, this circuit's phase relation is such that both the plate impedance of the driver and the grid cathode impedance of the output section varies in the same direction, - that is, in sympathy with each other. Consequently, a nearly constant ratio is maintained throughout the signal excursion.

So it has been shown that the output section's plate current versus grid voltage relation is linear. Further, it has been shown that a driver can be made to produce voltage across the grid impedance of the output section which will be linear with respect to its input voltage. Thus the composite relation of out-



put plate current to input volts should likewise be linear. This is precisely the final result, see the I_{p2} curve, Fig. 5A.

This curve also indicates that a signal applied to the input grid will produce equal negative and positive peaks of I_{p2} . Therefore, this system's power supply regulation is no different from that required for a Class A triode.

The unequal peak currents of the driver, as represented by the I_{p1} curve Fig. 5A, are of such low magnitude that their effect can be neglected.

It should be clearly understood that no power is required in the driver grid circuit. Power developed by the entire linear portion of the I_{p2} curve is realized long before the input grid is swung far enough to draw current;— that is, becomes positive with respect to its cathode. This unique grid overload characteristic functions as follows. When E_g (the signal input voltage) is zero, E_o (the voltage across input cathode and ground) is the static bias of the tube. At positive values of E_g , E_o rises beyond the established bias at a rate dependent upon the gain of the driver. Since the gain of the driver must be less than unity due to the degenerative action of the circuit, the increase in E_g is faster than the increase in E_o . Not until E_g overtakes E_o , will the grid draw current.

With these fundamental principles qualitatively established, it appears possible to design a single tube, comprising both sections, which would have the desired characteristics. In spite of the power required by the driver, the overall plate efficiency of the combination would be high. The overall sensitivity would be well up because the loss due to degeneration in the driver would be well overbalanced by the high gain of the output section. The distortion would be low, and void of high frequency transient terms since there are no discontinuities in the characteristic curves. The simplicity of the arrangement is conspicuous by the absence of the usual circuit component parts.

The above theory is thoroughly confirmed by the result of this development — the new Triadyne 6B5. Both the characteristic and curve data for this tube is the quantitative proof.



TRIAD MANUFACTURING CO., INC.

FACTS OF INTEREST REGARDING THE COMPANY BEHIND THE PRODUCT

This ownership management has been pioneering in Radio advancement since 1920 with the result that today we are one of very few in the entire industry and the only privately owned manufacturing company making a complete line of radio tubes.

A complete modern laboratory including radio circuit development is maintained for cooperation with set manufacturers the world over, and to this are given the services of a large staff of renowned engineers.

Close supervision of our business and an intimate understanding of the problems of our customers achieved the remarkable sales record in 1934 of 100% gain over 1933.

Complete warehouse stocks are maintained at branch offices in Chicago, New York, Los Angeles and Seattle for the prompt servicing of Triad customers. Year in and year out, Triad has made steady forward strides because of our policy of customer satisfaction first, last and always.

We dedicate ourselves not only to our customers and own improvement, but to the betterment of the entire industry.

TRIAD MANUFACTURING CO., INC.

Factory and Home Office



#18A

RADIO MANUFACTURERS ASSOCIATION



SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N.W.
WASHINGTON, D. C.

R.M.A. DATA BUREAU
90 West Street
New York, N. Y.

RELEASE NO. 18A

SEP 29 1939

To
Tube Engineers:

The inclusion of a resistor in the structure of the 6B5 requires the modification of the basing designation applicable to this tube type.

As originally announced, the assigned basing designation was 6D.

To the modified basing the designation 6AS has been assigned.

Respectfully yours,

RMA DATA BUREAU

By: L.C.F. Horle

E. I. A.
REGISTRATION
FILE

TRIADYNE 6B5 - 6N6 MG

TECHNICAL BULLETIN 101

TRIAD MANUFACTURING COMPANY, INC., PAWTUCKET, R.I.

6B5 - Glass Type Power Output Triadyne

More than a year in development, the Triadyne tube was first introduced at the beginning of 1935. Exclusively pioneered in the laboratory of the Triad Mfg. Co., the Triadyne 6B5 is now being manufactured by most leading tube companies. Its almost universal acceptance by many prominent set manufacturers has made it one of the outstanding tube developments of the year.

Utilizing a new principle of radio tube design, the 6B5 requires less circuit considerations than other power amplifier tubes available to date. It requires no grid bias voltage inasmuch as the bias is automatically developed within the tube. The cathode connects directly to B minus, hence, no bias resistor is required or its associated by-pass condenser. The input grid does not draw grid current, thus high impedance coupling is possible. Operation of the 6B5 is strictly Class A and no special driver, or exceptional voltage regulation is necessary.

Employed in push pull operation two 6B5's will easily produce ten watts of power into a 10,000 ohm plate to plate load. Single ended it will deliver a clean five watts of power into a 7000 ohm load. Furthermore, because of a unique overload characteristic the Triadyne distortion output does not rise abruptly when more than rated signal voltage is impressed. This is explained by the fact that grid current is not encountered even when the rated signal voltage is exceeded, hence the distortion output is held well within tolerable limits.

Power sensitivity of the 6B5 is comparable to a pentode type power amplifier tube. Efficiency is comparable to a Class B type tube, yet it requires a signal of only 15 volts RMS single ended, and 38 volts RMS when employed in a push-pull circuit, for maximum rated power output. Plate voltage supply need have no better regulation than required for Class A operation since the Triadyne operates from the center point of its plate current-grid voltage characteristic.

6N6 MG - Metal-Glass Type Power Output Triadyne

Identical in all respects, electrically to the 6B5, the new 6N6 MG is available in metal shielded construction. Smaller in size, similar in appearance to the metal line, the 6N6 MG offers the finest type of output tube for mobile operation. Also available in the Triad series is the 6Z6 MG rectifier and other special tubes for a complete mobile circuit.

For those manufacturers using metal or metal-glass tubes in their standard types of receivers, the 6N6 MG fits nicely in the line up as a high quality output tube to replace the 6F6 with a resultant lowering in cost, increase sales appeal and better quality.





POWER OUTPUT, HARMONICS, PLATE CURRENT VERSUS R_L

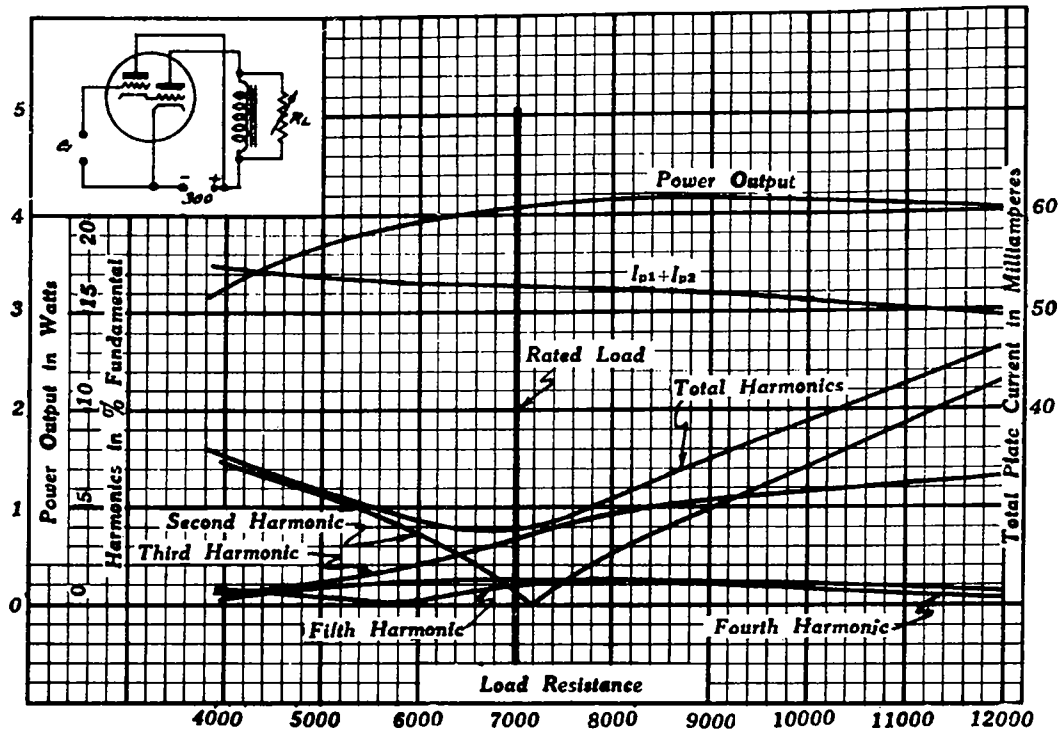


Figure NO. 1

POWER OUTPUT, HARMONICS, PLATE CURRENT VERSUS LOAD RESISTANCE
Push - Pull Operation

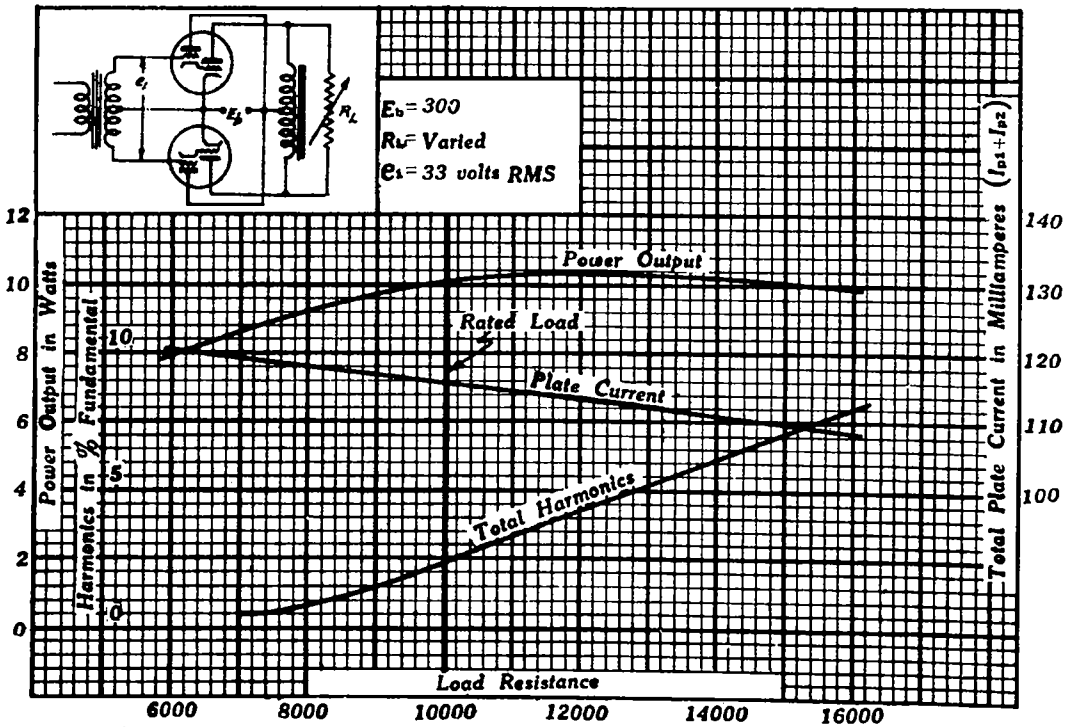


Figure NO. 2



POWER OUTPUT, HARMONICS, PLATE CURRENT VERSUS SIGNAL VOLTS

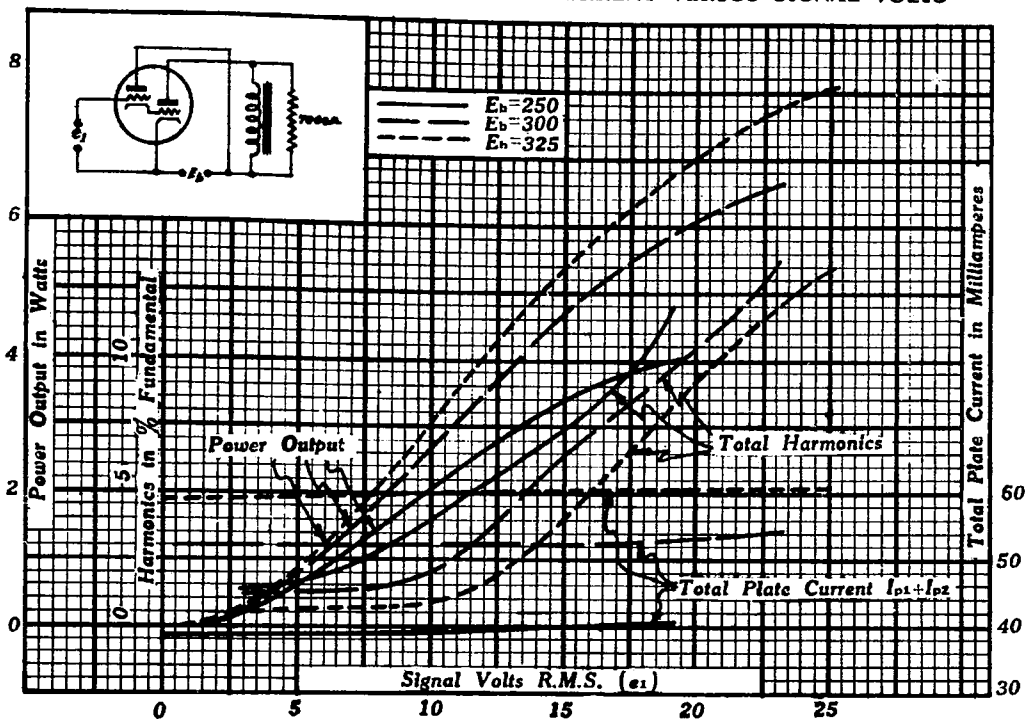


Figure NO. 3

POWER OUTPUT, HARMONICS, PLATE CURRENT VERSUS SIGNAL VOLTS

Push - Pull Operation

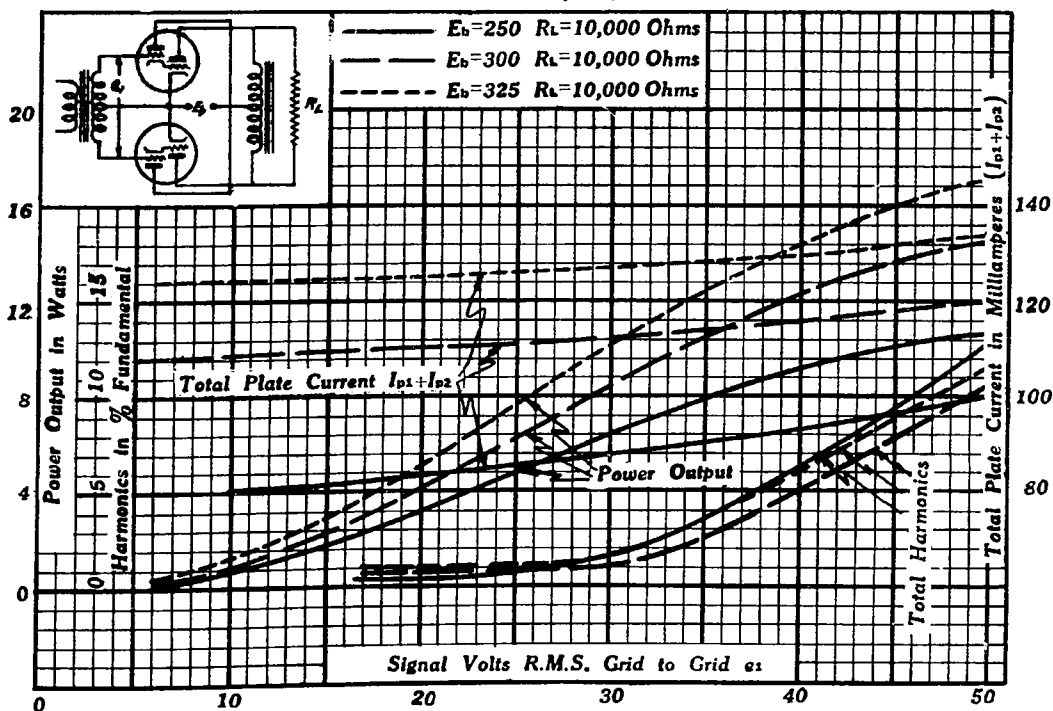


Figure NO. 4

TRIADYNE 6B5 - 6N6 MG

AVERAGE ELECTRICAL CHARACTERISTICS

Heater
Voltage
Current

Coated uni-potential cathode
6.3 volts
0.8 ampere

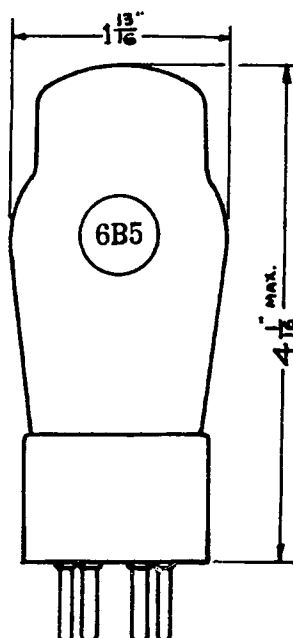
Output Plate	250	300	325	volts
Input Plate	250	300	325	volts
Grid Bias	0	0	0	volts
Output Plate Cur.	33	45	51	ma.
Input Plate Cur.	6.5	8.0	9	ma.
Amp. Fact.		58		
Plate Res.		24,100		ohms
Mut. Cond.		2,400		umhos.

SINGLE TUBE CLASS A

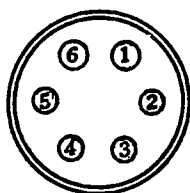
Load Res.	7,000	7,000	7,000	ohms
Total Distortion	5	5	5	%
Power Output	2.5	4.0	5.2	watts
Input Signal	13.5	15	17	r.m.s.

PUSH-PULL CLASS A

Load Res. (p. to p.)	10,000	10,000	10,000	ohms
Total Distortion	5	5	5	%
Power Output	8.5	10	13.5	watts
Input Signal (g. to g.)	38	38	42	r.m.s.

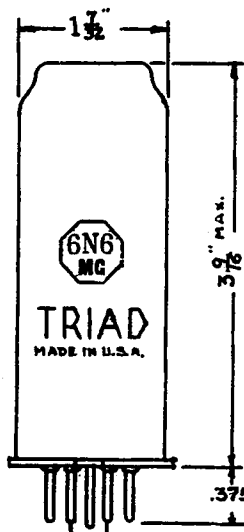


6B5 BASE CONNECTIONS

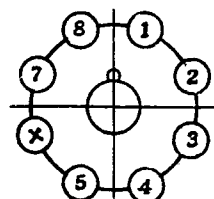


Bottom View of Base

- Pin 1 - Heater
- Pin 2 - Output Plate (p₂)
- Pin 3 - Input Plate (p₁)
- Pin 4 - Input Grid
- Pin 5 - Cathode
- Pin 6 - Heater



6N6 MG BASE CONNECTIONS



Bottom View of Base

- Pin 1 - Shell
- Pin 2 - Heater
- Pin 3 - Output Plate (p₂)
- Pin 4 - Input Plate (p₁)
- Pin 5 - Input Grid
- Pin 7 - Heater
- Pin 8 - Cathode

55A

RADIO MANUFACTURERS ASSOCIATION



SUITE 701-4 AMERICAN BUILDING
1317 F STREET, N. W.
WASHINGTON, D. C.

R.M.A. DATA BUREAU
90 West Street
New York, N. Y.

RELEASE NO. 55A

SEP 29 1939

To
Tube Engineers:

The inclusion of a resistor in the structure of the 6N6 requires the modification of the basing designation applicable to this tube type.

As originally announced, the assigned basing designation was 7W.

To the modified basing the designation 7AU has been assigned.

Respectfully yours,

RMA DATA BUREAU

By: L.C.F. Horle

from RMA release #131,
April 11, 1938



TRIAD MANUFACTURING CO., INC.

MANUFACTURERS OF
• RADIO TUBES •
PAWTUCKET, RHODE ISLAND.

U.S.A.



#131

TRIAD MANUFACTURING CO., INC.

PLEASE ADDRESS REPLY ATTENTION OF

TENTATIVE DATA SHEET

TUBE TYPE 6P5G

Triode Amplifier Detector

HEATER RATING

Voltage (AC-DC)	6.3 Volts
Current	0.3 Amperes

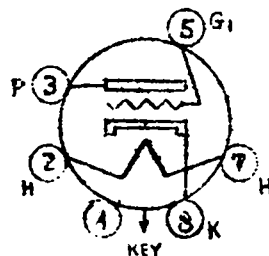
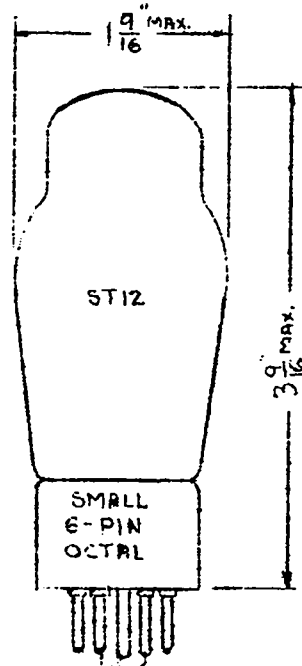
DIRECT INTERELECTRODE CAPACITANCE

Grid to Plate	2.8 μmf
Grid to Cathode	3.5 μmf
Plate to Cathode	2.5 μmf

OPERATING CONDITIONS - CLASS A AMPLIFIER

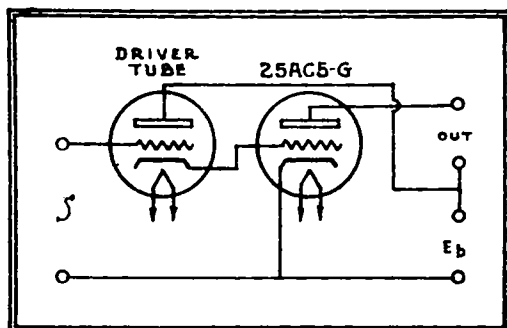
Plate	250 Volts max.
Grid	-13.5 Volts
Plate Current	5.0 ma
Amplification Factor	13.8
Plate Resistance	9500 ohms
Mutual Conductance	1450 μmhos

The 6P5G is similar in design and electrical characteristics to Type 76 except for octal base.



ADDRESS ALL COMMUNICATIONS DIRECT TO THE COMPANY

ALL ORDERS OR CONTRACTS ARE SUBJECT TO THE APPROVAL OF THE COMPANY

25AC5 G**TRIADYNE****6AE5 G****TECHNICAL BULLETIN 116****TRIAD MANUFACTURING COMPANY, INC., PAWTUCKET, R. I.**

The Triadyne 25AC5G is a positive grid Power Amplifier Triode designed particularly for Dynamic-Coupled Class A operation, similar to the 6AC5G. This new output tube requires a 25 volt heater potential and its 0.3 ampere heater permits its use in series heater circuits commonly employed in ac-dc receivers.

In 110 volt ac-dc receivers a low mu driver is required to provide positive grid bias and to center the plate current at the nominal value of 45 ma. This necessitated the design of a new driver, the 6AE5G. This combination provides 2 watts of power output. As usual with Dynamic-Coupled amplifiers, the positive bias for the output tube and the negative bias for the driver are automatically provided by the circuit. A high value of resistance is permitted in the grid circuit of the driver, allowing the plate of the first audio to operate into a lightly loaded circuit. Since this coupling resistor is connected to the input driver rather than the output tube, grid current trouble, often encountered with other ac-dc power output tubes, is eliminated. For typical ac-dc receivers, a 6Q7G should be used for the detector and first audio with a 0.25 meg. plate resistor and 1.05 volts bias.

The 25AC5G may also be operated at 180 plate volts. The tube offers an excellent solution to the tube complement problem in low voltage ac receivers when it is economically feasible to operate the heaters in series and to use a small inexpensive transformer for the plate supply. A type 6P5G (octal base equivalent of a 76) may be used as the driver. This combination delivers 2 watts of power output. If more power is desired, a type 37 driver may be used, providing 2.7 watts.

The simple construction and conservative wide element spacing of the 25AC5G insures against life problems and failures in the field. The tube offers a most inexpensive manner of increasing the number of tubes in a receiver. This is obvious because of the inherent low cost of both the driver and output tubes and the absence of circuit components.

25AC5 G RATING - TYPICAL OPERATION

CLASS A DYNAMIC-COUPLED POWER AMPLIFIER

Driver Tube	6AE5G	6P5G	37	Type
Plate-Supply Voltage	110	180	180	Volts
Grid Voltage	*	*	*	Volts
Power Tube Plate Current	45	27	37	Ma.
Driver Plate Current	7	4	5.3	Ma.
Input Signal To Driver**	22	12	17	Volts rms
Load Resistance	2,000	8,000	5,000	Ohms
Harmonic Distortion	10	10	10	%
Power Output	2.0	2.0	2.7	Watts

*Bias voltage for both the 25AC5G and the driver is automatically developed by the Dynamic-Coupled connection.

**Driver grid current does not flow during any part of the input cycle. The total resistance in the driver grid circuit should not exceed one megohm.

We do not assume responsibility for any possible patent liability involved by the use of circuits described above.

25AC5 G RATING (Continued)HIGH-MU POWER AMPLIFIER TRIODE
(For Dynamic-Coupled Amplifiers)

HEATER		Coated Unipotential Cathode	
Voltage	25.0	Volts ac-dc	
Current	0.3	Amperes	
PLATE			
Voltage	180	Max. Volts	
Dissipation	10	Max. Watts	

STATIC AND DYNAMIC CHARACTERISTICS

Plate Voltage	110	Volts
Grid Voltage	+15	Volts
Amplification Factor	58	
Plate Resistance	15,200	Ohms
Transconductance	3,800	Umhos
Plate Current	45	Milliamperes
Grid Current	7	Milliamperes

BASE CONNECTIONS**PIN ARRANGEMENT**

Pin 1 - No Connection
 Pin 2 - Heater
 Pin 3 - Plate
 Pin 5 - Grid
 Pin 7 - Heater
 Pin 8 - Cathode

PHYSICAL DIMENSIONS

Max. Overall Length 4-15/32"
 Max. Diameter 1-9/16"
 Bulb ST12
 Base Small Octal 6 Pin

6AE5 G TRIODE AMPLIFIER DATA

HEATER		Coated Unipotential Cathode	
Voltage	6.3	Volts ac-dc	
Current	0.3	Amperes	

AMPLIFIER CLASS A

Plate	95	Volts
Grid	-15	Volts
Amplification Factor	4.2	
Plate Resistance	3,500	Ohms
Transconductance	1,200	Umhos
Plate Current	7	Milliamperes

BASE CONNECTIONS**PIN ARRANGEMENT**

Pin 1 - No Connection
 Pin 2 - Heater
 Pin 3 - Plate
 Pin 5 - Grid
 Pin 7 - Heater
 Pin 8 - Cathode

PHYSICAL DIMENSIONS

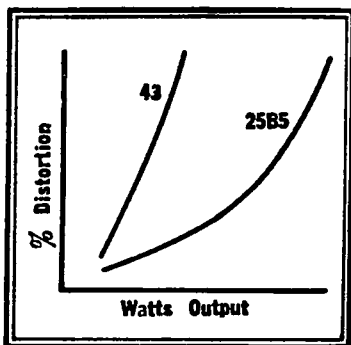
Max. Overall Length 4-1/8"
 Max. Diameter 1-9/16"
 Bulb ST12
 Base Small Octal 6 Pin

#88

TRIADYNE 25B5 - 25N6 G

TECHNICAL BULLETIN 106

TRIAD MANUFACTURING COMPANY, INC., PAWTUCKET, R.I.



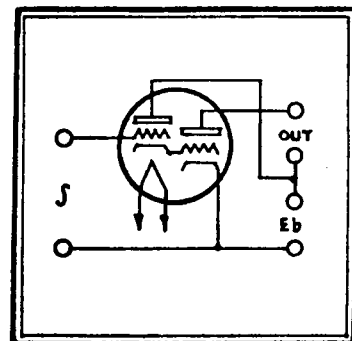
Relative Overall Audio Performance
Of A Typical AC-DC Receiver Using
A 43 Tube Converted For 25B5

In the development of ac-dc receivers, the stumbling block has been for years the power output tubes available. The 43 tube rated at 0.9 watts no longer fills the requirements for high quality audio in the better ac-dc lines. With this in mind, a new member of the Triadyne Family has been added, the 25B5 and its octal base counterpart 25N6 G. This tube operates on the "dynamic coupling" principle which has been commercially tested and approved by the now famous Triadyne 6B5.

When used as a single ended Class A amplifier with a 110 volts d-c supply, the 25B5 will develop 2 watts of audio at 9% total harmonic distortion; this being almost twice the power obtainable from other available popular pentodes at any distortion level. Experimental work on various pentode adaptations in our laboratory has indicated that it is possible, by extremely close spacings and by design methods not fully approved by our Engineering Staff, to produce ac-dc pentodes somewhat approaching the 25B5 in total power. However, in each attempt it was found that the distortion was higher and the factor of safety in design was far too low. Moreover, with any pentode the distortion rise on overload was found to be intolerable when compared to the new Triadyne 25B5.

Where price is the sole factor, it is not believed that the new ac-dc Triadyne will fully supersede the 43 any more than the latter type has replaced the 38. However, the simplicity of the circuit (no grid bias required), and the subsequent reduction in parts cost, make it possible for a manufacturer to use the new tube in conjunction with a better speaker suitable for its use at a slight increase in overall cost, which will result in a true high quality ac-dc job. In large receivers where even greater power is desired, the new tube may be operated in the conventional push-pull manner. The tube's excellent performance at 180 volts suggest its use for other fields than 110 ac-dc lines; for example, it should fit nicely in medium size a-c receivers.

The radio set division of Triad Mfg. Co. is at the present time making set conversions to use the 25B5. From the information thus gained, bulletins will be issued from time to time. To those manufacturers desiring our cooperation in rushing conversion work, a laboratory fully equipped for set measurements is available. The performance curve of a typical conversion is shown on this page. The set was originally designed by one of the leading manufacturers and it represents the best of the ac-dc sets on the market using a single output tube.





DISTORTION VERSUS POWER OUTPUT

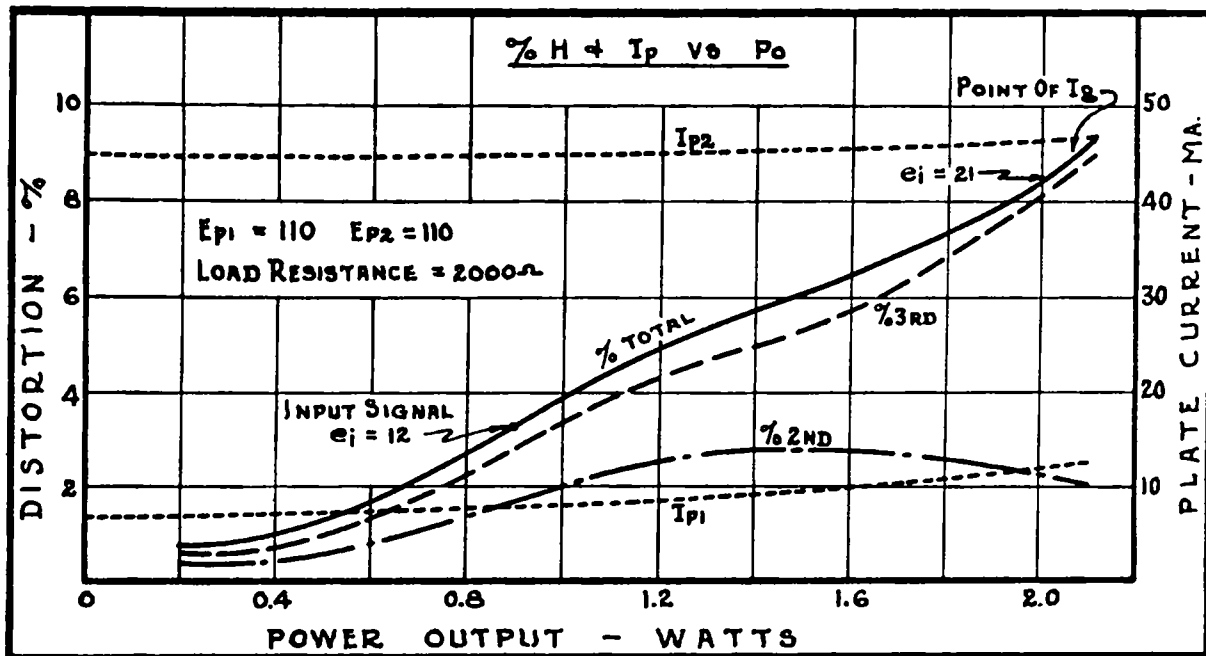


Figure NO. 1

DISTORTION VERSUS LOAD RESISTANCE

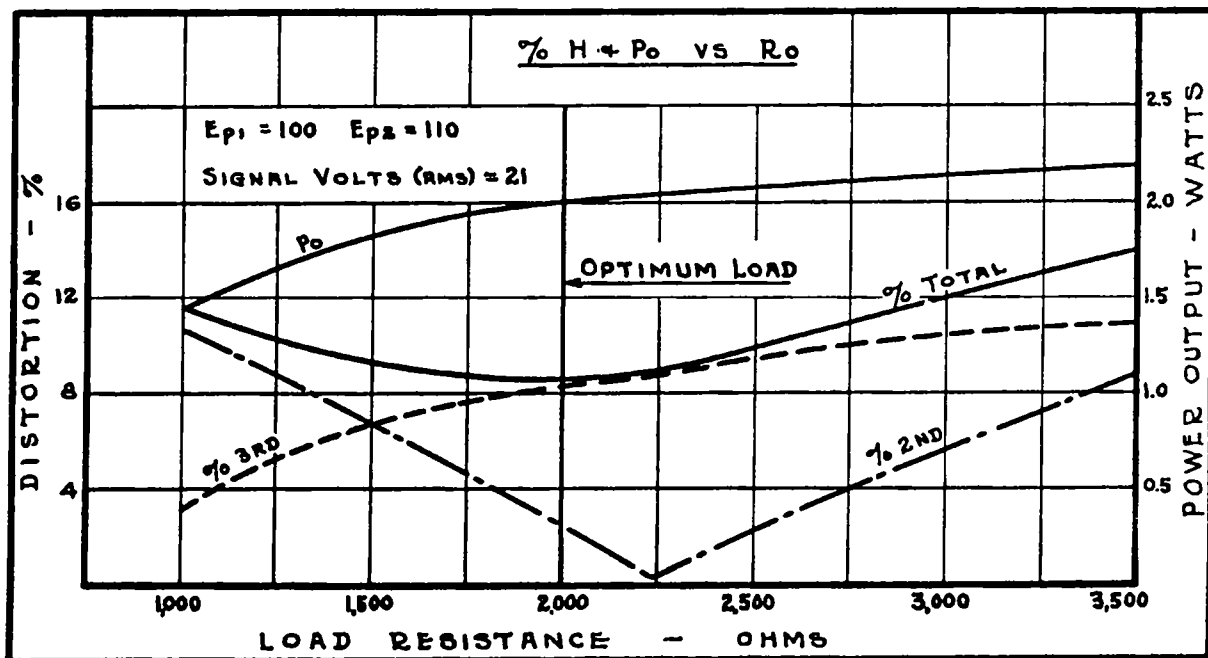


Figure NO. 2



AVERAGE PLATE CHARACTERISTICS

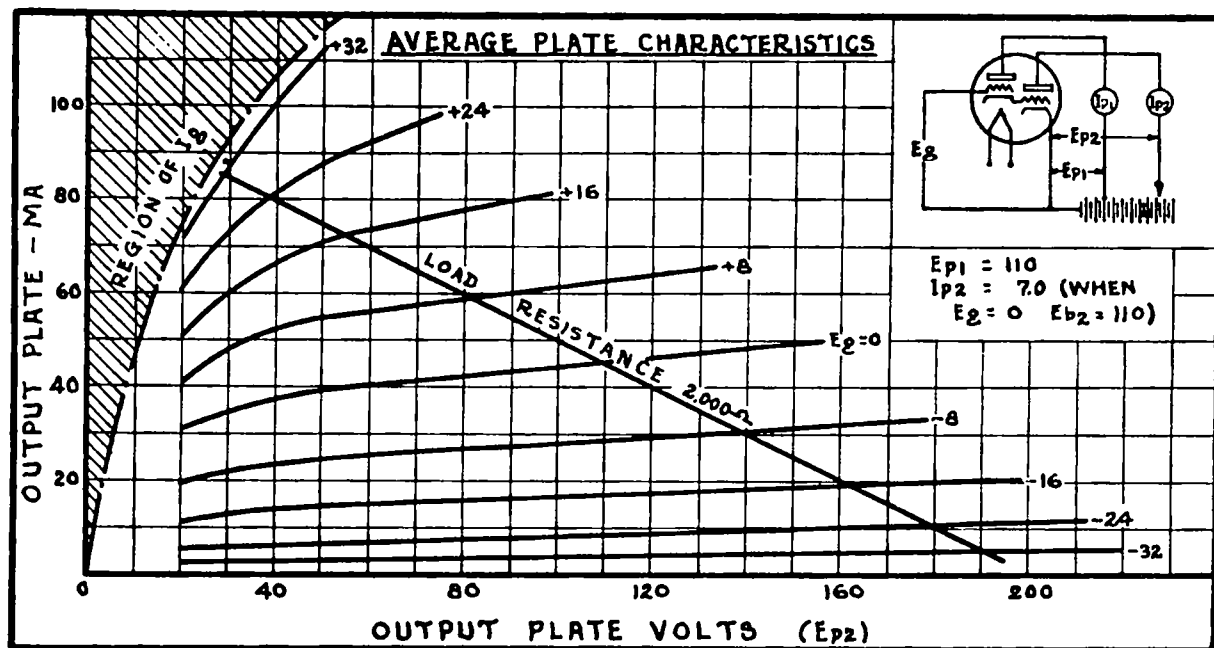


Figure NO. 3

To assist in preliminary work a table of recommended values for detector and voltage amplifier circuits is shown below. For the better receivers, we recommend using diode detection and we have found that the 6Q7 is the most satisfactory tube.

Diode Detector & First Audio - 100 Volt Operation

Tube	Grid Volts	*Cathode Res. Ohms	Plate Res. Megohms	Screen Volts	Screen Res. Megohms	Approx. Audio Gain
6Q7	-1.05	6000	0.25	—	—	40
6R7	-3.5	8000	0.1	—	—	11
6B7	-2.0	10000	0.25	30	—	45

Plate Detector - 100 Volt Operation

**6C6	—	25000	0.5	40 or 1.0	—
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NOTE - For the above data, the grid resistor of the following tube is assumed to be 1.0 megohm and the grid coupling condenser between this resistor and the plate resistor, 0.02 mfd.

* If the tube is operated self-biased, the cathode resistor must be shunted by suitable capacity to avoid degeneration effects.

** Other combinations of resistors for operating the 6C6 as a plate detector may give slightly higher gain but these values were selected as being the best compromise between gain and maximum audio output from a 30% modulated RF signal.

TRIADYNE 25B5 - 25N6 G

AVERAGE ELECTRICAL CHARACTERISTICS

Heater	Coated uni-potential cathode
Voltage	25.0 a-c or d-c
Current	0.3 amperes

AMPLIFIER (CLASS A)*

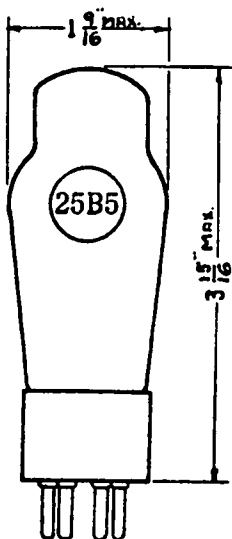
Output Plate (P ₂)	110**	180 max.	volts
Input Plate (P ₁)	110	100+	volts
Grid	0	0	volts
Plate Current (P ₂)	45	46	ma.
Plate Current (P ₁)	7	5.8	ma.
Amplification Factor	25	35	
Plate Resistance	11,400	15,200	ohms
Mutual Conductance	2,200	2,300	umhos
Load Resistance	2,000	4,000	ohms
Power Output	2.0	3.8	watts
Harmonic Distortion	9	9	%
Signal Volts For Rated Power	21	21	r. m. s.

*Grid current does not flow during any part of the cycle of the input signal.

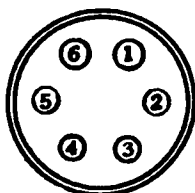
**Since no bias voltage is required, the full 110 volts necessary for plate and grid voltage on a 43 tube is available for plate voltage with this tube.

+Both plates may be operated at 180 volts provided that the grid is biased to 20 volts. Either fixed bias or self-bias (400 ohm cathode resistor) may be used.

The total resistance introduced into the grid circuit by the input coupling device should not exceed 1.0 megohm.

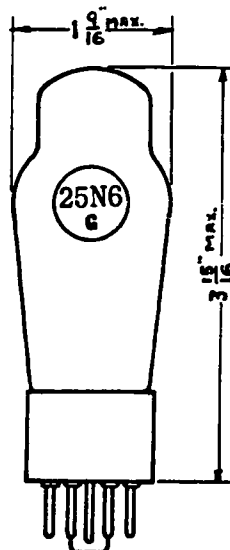


25B5 BASE CONNECTIONS

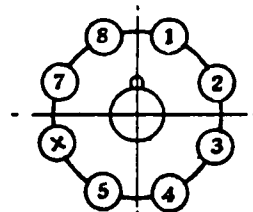


Bottom View of Base

- Pin 1 - Heater
- Pin 2 - Output Plate (p₂)
- Pin 3 - Input Plate (p₁)
- Pin 4 - Input Grid
- Pin 5 - Cathode
- Pin 6 - Heater



25N6 G BASE CONNECTIONS



Bottom View of Base

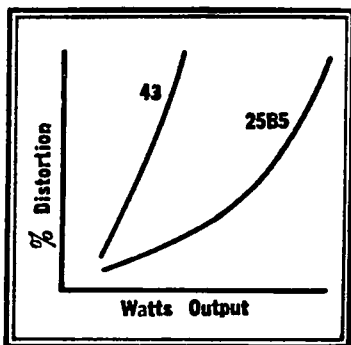
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#88

TRIADYNE 25B5 - 25N6 G

TECHNICAL BULLETIN 106

TRIAD MANUFACTURING COMPANY, INC., PAWTUCKET, R.I.



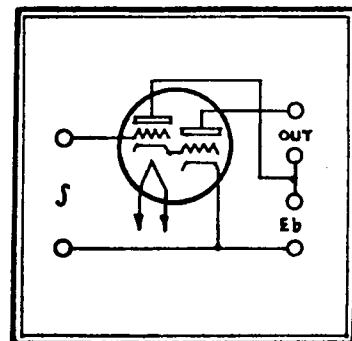
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DISTORTION VERSUS POWER OUTPUT

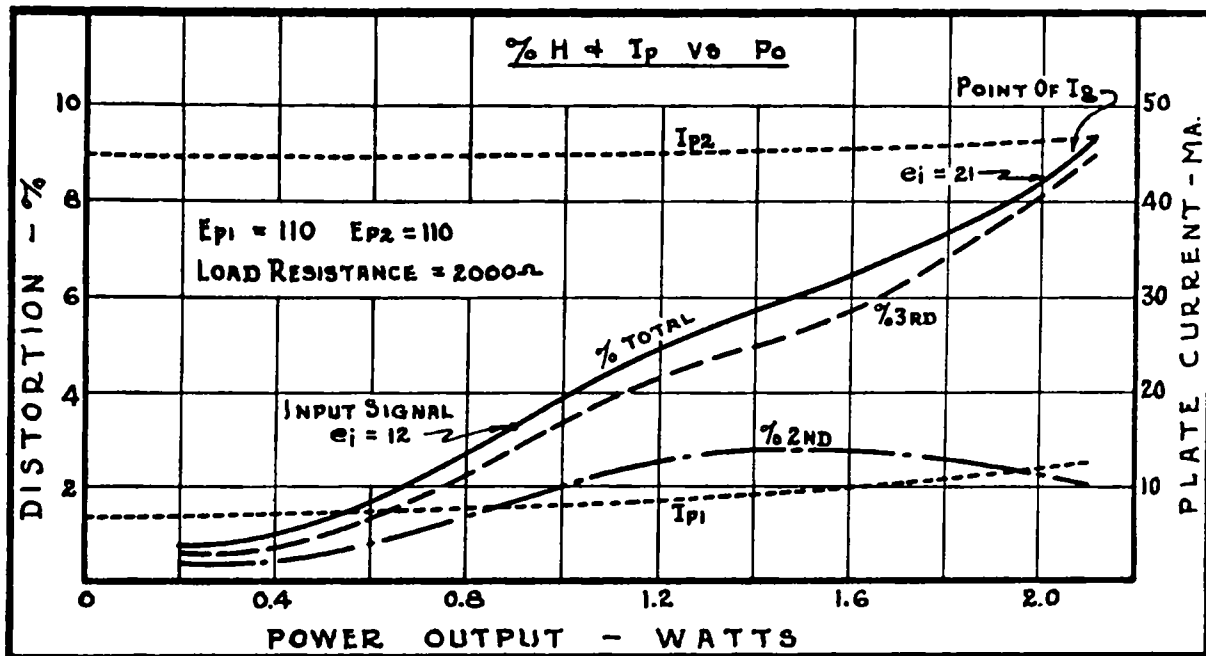


Figure NO. 1

DISTORTION VERSUS LOAD RESISTANCE

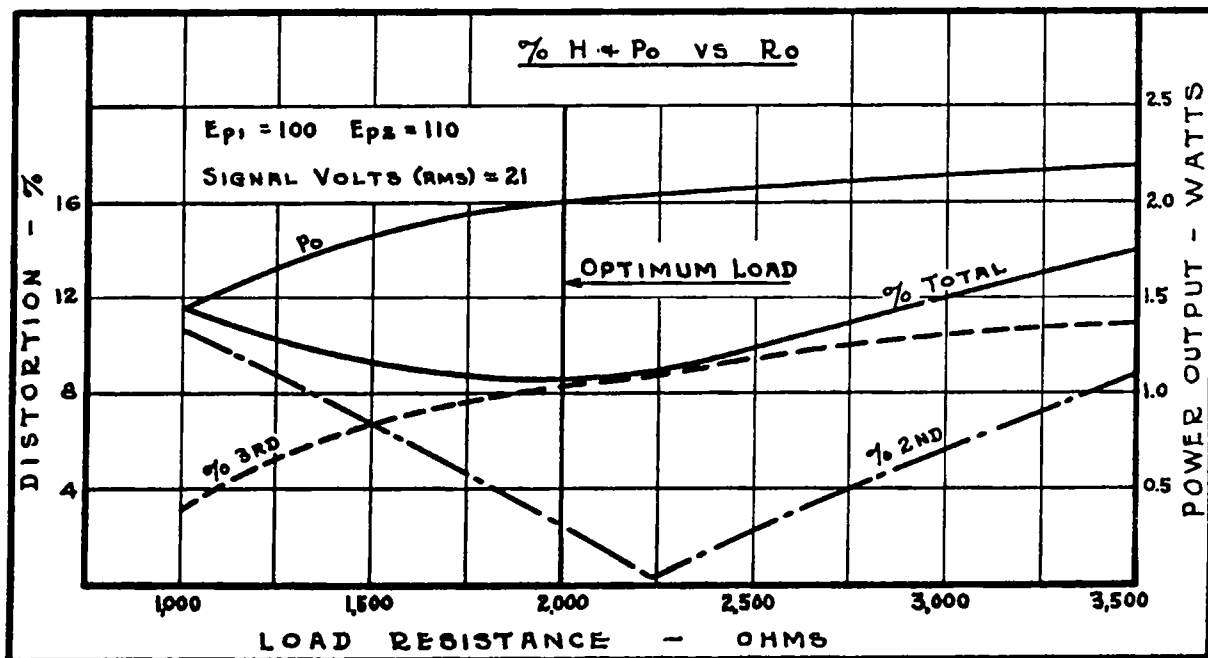


Figure NO. 2



AVERAGE PLATE CHARACTERISTICS

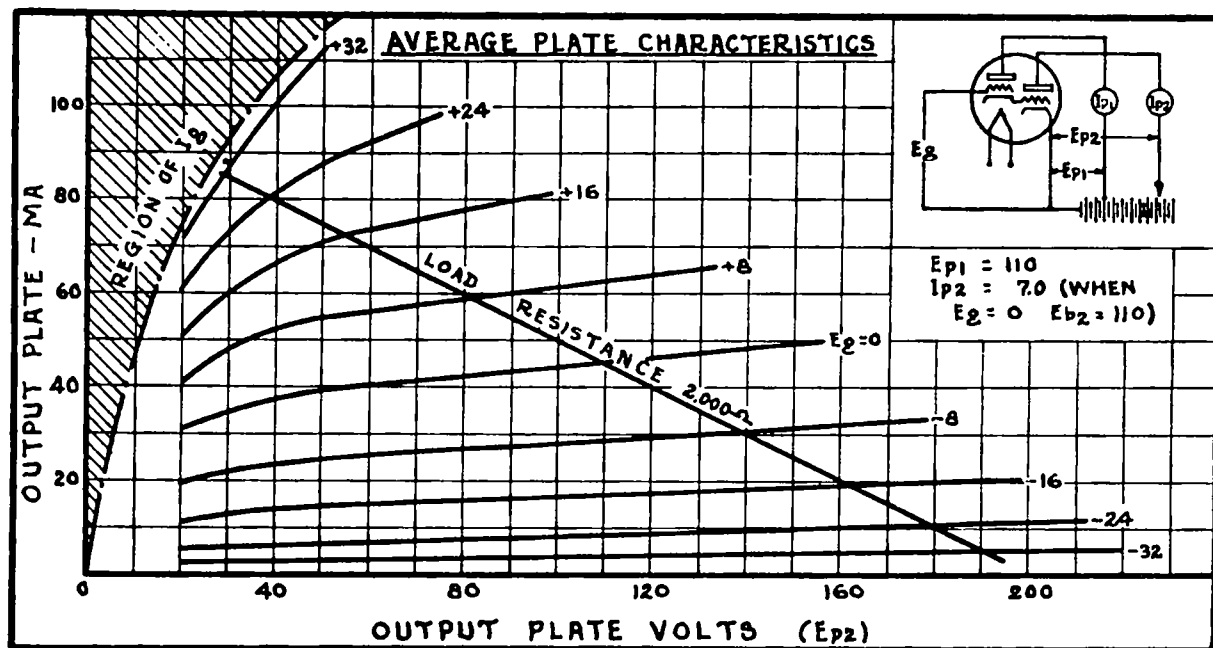


Figure NO. 3

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Plate Detector - 100 Volt Operation

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TRIADYNE 25B5 - 25N6 G

AVERAGE ELECTRICAL CHARACTERISTICS

Heater	Coated uni-potential cathode
Voltage	25.0 a-c or d-c
Current	0.3 amperes

AMPLIFIER (CLASS A)*

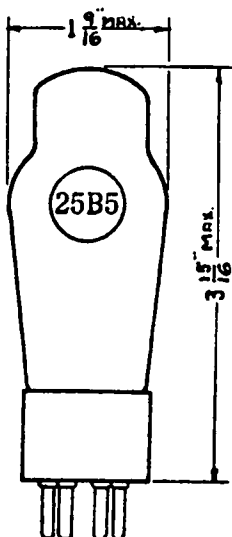
Output Plate (P ₂)	110**	180 max.	volts
Input Plate (P ₁)	110	100+	volts
Grid	0	0	volts
Plate Current (P ₂)	45	46	ma.
Plate Current (P ₁)	7	5.8	ma.
Amplification Factor	25	35	
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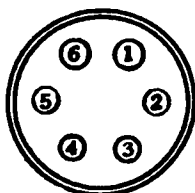
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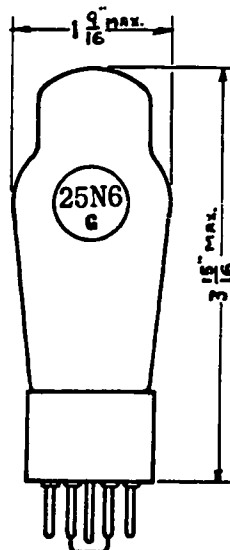


25B5 BASE CONNECTIONS

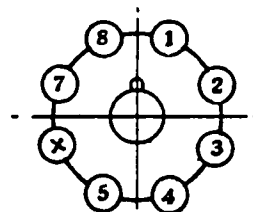


Bottom View of Base

- Pin 1 - Heater
- Pin 2 - Output Plate (p₂)
- Pin 3 - Input Plate (p₁)
- Pin 4 - Input Grid
- Pin 5 - Cathode
- Pin 6 - Heater



25N6 G BASE CONNECTIONS



Bottom View of Base

- Pin 1 -
- Pin 2 - Heater
- Pin 3 - Output Plate (p₂)
- Pin 4 - Input Plate (p₁)
- Pin 5 - Input Grid
- Pin 7 - Heater
- Pin 8 - Cathode

BALLAST TUBES FOR AC-DC RADIOS

TAPPED FOR PILOT LAMPS - TYPE 50A2 AND 50B2

TRIAD MANUFACTURING CO., PAWTUCKET, R. I.

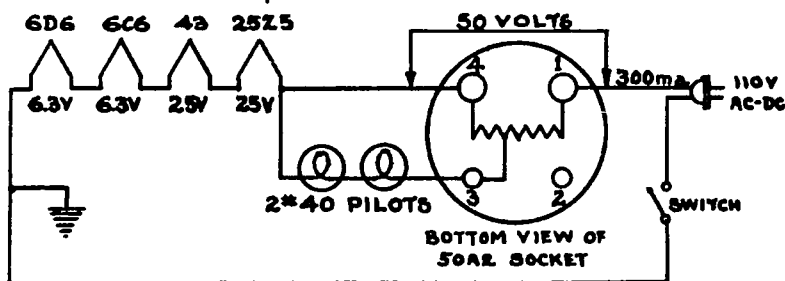
Many forms of ballast tubes have been introduced during the past year for use in connection with AC-DC sets in an effort to eliminate series resistors and heater cords which represent somewhat of a fire hazard. A ballast tube is a much better way to dissipate this heat than to use a resistor underneath the radio chassis. In addition, a ballast tube is less subject to failure than a resistor or delicate heater cord and in case of failure may be replaced much easier. The Triad 40X, 50X and 60X300 are typical examples of satisfactory ballast tubes.

A reduction of cost may be secured by using the new Triad ballast tubes since they are provided with a tap for pilot light voltages and thereby eliminate shunt resistors for the pilot lights. As a further improvement, the new ballast tubes have a much lower temperature-resistance coefficient than previous types. This feature reduces the initial current surge through the tube heaters when the set is turned on and also provides a higher heater current during the period when the tubes are warming up, thereby reducing the heating time of the set considerably.

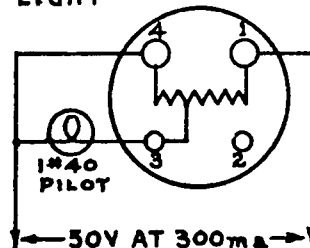
These new series of ballast tubes are designed to work with the #40 pilot lamps which have a rating of 6.3 volts at 150 ma. The new series have been carefully designed to insure that current surges will not reduce the life of the #40 pilot lamps. Continuous life tests for several weeks in radio sets with the set being turned on and off periodically, have not produced any ballast tube failures, tube heater failures, or pilot lamp failures.

The two new ballast tubes have a standard 4 pin tube base. The total resistance is connected between the filament prongs no. 1 and no. 4. The pilot light tap is connected to pin no. 3, the usual grid pin. The pilot light, or two pilot lights in series, should be connected to the grid pin and adjacent filament pin, No. 3 and no. 4.

·TYPICAL FILAMENT & PILOT CIRCUIT FOR AC-DC RADIOS·



·BOTTOM VIEW OF 50B2 SHOWING SOCKET CONNECTIONS FOR PILOT LIGHT·



Both the 50A2 and 50B2 tubes have an overall voltage drop of 50 volts at 300 ma. between the filament pins with the proper pilot light connections. The type 50A2 has a tap for two pilot lamps while the type 50B2 has a tap for only one pilot lamp as illustrated in the diagram above.



TRIAD RADIO TUBES

from RMA registration #29, May 28, 1935