



# Techni-talk

## on AM, FM, TV Servicing

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### CONVERSIONS—

## GENERAL ELECTRIC MODEL 815 TO 20-INCH AND MOTOROLA VF-102 TO 14-INCH PICTURE TUBES

This is the seventh of a series of articles on converting TV receivers to use larger picture tubes. In this issue a General Electric Model 815 was converted from a sixteen-inch round to a twenty-inch rectangular picture tube, and a Motorola ten-inch FM-AM phono combination was converted to use a General Electric 14CP4 picture tube.

The following discussion is a description of the procedure followed which produced satisfactory results with respect to the particular model converted. If a conversion is attempted on a similar model of an earlier or later date or on a different model from the same manufacturer, then additional adjustments and steps may be necessary. The changes which were made have not been approved by the manufacturer and may therefore invalidate Underwriters' approval and the manufacturer's warranty.

#### GENERAL ELECTRIC MODEL 815

The General Electric Model 815 shown in Fig. 1 was originally a sixteen-inch TV receiver with a relatively small viewing area due to the straight sides of the mask. This receiver was converted to use a 20-inch picture tube as shown in Fig. 2. This model was very easy to convert, and in view of the large size cabinet and well designed chassis a conversion should be recommended whenever possible.

The following parts were used in making the conversion:

- 1—General Electric 20CP4 picture tube
- 1—RTO-085 General Electric horizontal sweep output transformer\*
- 1—RLD-024 General Electric deflection yoke\*
- 1—RET-003 ion trap magnet
- 1—Cavity type anode connector
- 1—20K ohm 1 watt resistor
- 1—6200 ohm 1 watt resistor
- 1—800K ohm 1 watt resistor
- 1—.001 mfd 600 volt capacitor
- 1—.1 mfd 600 volt capacitor
- 4—Casters to mount on bottom of matching table
- 1—6SN7-GT General Electric tube
- 1—Twenty-inch plastic picture tube mask measuring 17 in. by 21 in. (Manufactured by Hollywood Plastic Arts, 501 West Olympic Blvd., Los Angeles 15, California.)

\*These two items may or may not require replacement. Both items have been included in the total price.

List prices of the foregoing parts at the date of publication totaled \$98.15. However, allowance should be made for any differences due to transportation costs, etc.

#### CHASSIS CHANGES

The chassis picture tube and deflection yoke assembly were removed from the cabinet and the following circuit changes were made:

1. In the receiver converted it was not necessary to change the deflection yoke although this yoke was designed for the 16AP4 picture tube

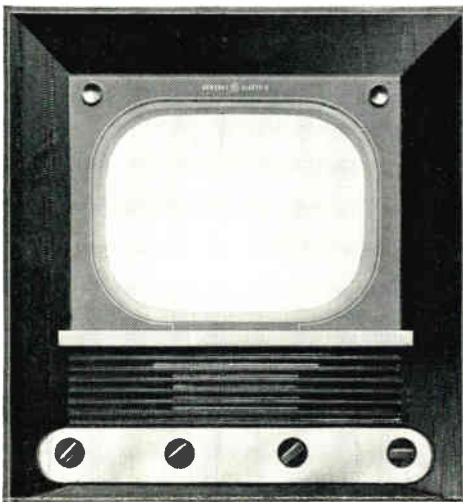


Fig. 1. General Electric sixteen-inch Model 815 before conversion.

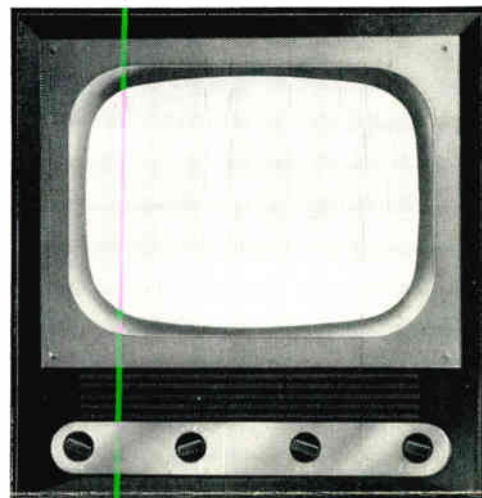


Fig. 2. General Electric Model 815 after it had been converted to use a twenty-inch picture tube.

which had a 53° deflection angle. It may be necessary to replace the yoke with a General Electric RLD-024 if any difficulty is experienced with neck shadow.

2. It was necessary to change the horizontal sweep transformer since the original transformer developed a noticeable "whistle" after the changes and adjustments were made to sweep the 20CP4 tube. A noticeable improvement in horizontal linearity also resulted from this change.
3. L-23 which was originally connected across the damper tube parallel with the width control to reduce the width, was disconnected.
4. The original HV connector was removed and replaced with a cavity type anode connector.
5. The vertical sync circuit was improved by

changing R29 from 15K to 20K and C31 from .006 to .001 mfd. These changes are shown in Fig. 3.

6. The 6J5 vertical oscillator tube was removed and replaced with a 6SN7-GT tube. One section of the new 6SN7-GT tube was used as a vertical oscillator, and the other half was connected in parallel with the vertical output tube V12 as shown in Fig. 3.
7. R38 was removed and replaced with a 6200-ohm resistor and a .1 mfd capacitor connected in parallel.
8. R37 was replaced with a 800K ohm resistor as shown in Fig. 3.
9. C120 was removed from its original position and remounted below the chassis so that it did not interfere with the relocated speaker.

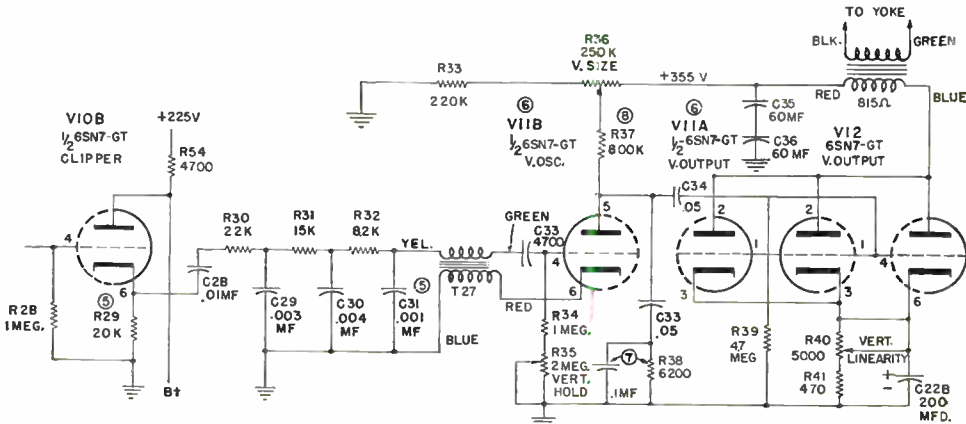


Fig. 3. Vertical oscillator and output circuits used in General Electric Model 815. The encircled numbers indicate a change which is explained in the text following that same number.

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**CABINET CHANGES**

The following cabinet changes were then made:

- The following were removed:
  - Both speakers with mounting boards
  - Wooden cross bars which held picture tube in place
  - Both lucite insulating supports for 16AP4 picture tube
  - Original picture tube mask, safety glass and ornamental brass bar which supported the safety glass.
- A template the size of the faceplate of the 20CP4 was cut out and placed over the front of the cabinet. This was centered horizontally but was about  $\frac{3}{4}$  in. above center vertically. This placement was necessary in order to have the distance from the top and each side of cabinet to the edge of the mask equal. The cabinet was marked off with a scriber and cutout with a keyhole saw.
- A hole was drilled in each corner of the new picture tube mask, and the mask was then fastened to the cabinet with oval head wood screws as shown in Fig. 2.
- The wooden block which held the deflection yoke assembly was moved  $1\frac{1}{2}$  in. closer to the front of the cabinet.
- The wooden cross bars used to hold the picture tube in place were remounted as shown in Fig. 4.
- It was also necessary to remount both speakers in a slightly different position as can be seen in Fig. 4.
- The chassis was then placed in the cabinet, and the necessary adjustments were made to obtain a linear test pattern.
- Four casters were attached to the bottom of the table. This was not necessary but in view of the weight of the complete unit, the addition of casters made it much easier to move and service.

**MOTOROLA MODEL VF-102**

The next receiver converted was a ten-inch Motorola Model VF-102 FM-AM phonograph combination. This was converted to use a General Electric 14CP4 picture tube which was the largest size that could be used without major cabinet changes. The completed conversion is shown in Fig. 5. Practically the same chassis was also used in Models VK101, VK101M, VF102A and VF102C and therefore, the same circuit changes should work on these models.

The following parts were required to make this conversion:

- General Electric RLF-038 focus coil
- General Electric 14CP4 picture tube
- General Electric 6W6-GT tube
- General Electric RET-003 ion trap magnet
- General Electric RLD-019 or RLD-014 width control
- Stancor DY-7 deflection yoke or equivalent
- Stancor A-8129 horizontal sweep transformer or equivalent
- 20KV 500 mmfd capacitor
- 2 megohm  $\frac{1}{2}$  watt resistor
- 250 ohm 1 watt resistor

1—14-inch plastic mask. The mask used was a No. 14SG manufactured by the Deity Miracle Lens Co., 141 President St., Passaic, New Jersey.

List prices of the foregoing parts at date of publication totaled \$75.92. However, allowance should be made for any differences due to transportation costs, etc.

**CHASSIS CHANGES**

The chassis was removed from the cabinet and the following changes were made:

- The 10BP4 picture tube together with the front support ring and tension springs were removed. The support ring was cut and reformed to fit the 14CP4 picture tube, and the tension springs were shortened as can be seen in Fig. 6.
- The original deflection yoke was replaced with a Stancor DY-7. There was sufficient adjustment in the mounting brackets so that repositioning of the assembly was not necessary.
- The high voltage compartment shield was removed, and the original horizontal sweep transformer was replaced with a Stancor A-8129 and wired as shown in Fig. 7. Before installing the new transformer, the horizontal linearity coil and bracket were removed from its position on the front apron of the chassis and remounted on the side using one of the shield mounting holes. The adjusting screw should not extend below the bottom of the chassis.
- The 7.5K ohm damping resistor, R-108, which was mounted vertically next to the 5V4-G damper tube, was removed since this was not needed.
- The horizontal centering control, C-133, by-pass capacitor was removed from the top of the chassis and remounted in the same hole beneath the chassis. The wires to this capacitor were fed through the grommeted hole.
- The width coil was removed and replaced with a General Electric RLD-019. The square hole was drilled out to accommodate the round mounting of the new coil.
- The 1B3-GT rectifier mounting bracket was removed by drilling out the rivets. The picture tube shield grounding spring assembly was removed and the rear section cut off at a point just behind the grounding spring. The remaining section was then remounted so that the tube set at approximately a 30-degree angle with the chassis midway between the yoke support bracket and the picture tube shield as shown in Fig. 6. The filament of the 1B3-GT tube should be wired directly to the transformer winding omitting the 3.9-ohm resistor R-109.
- The 500 mmfd HV capacitor was replaced with one having a 20KV rating, and mounted on the chassis in back of the HV rectifier bracket.
- The transformer leads from the caps of the 1B3-GT and the 6BG6-G tubes were too short and had to be replaced with longer ones. The leads going to these two tubes had to be carefully placed to prevent corona from developing. If excessive corona is present at the base of the 1B3-GT, it may be necessary to cement a plexiglass shield around it.

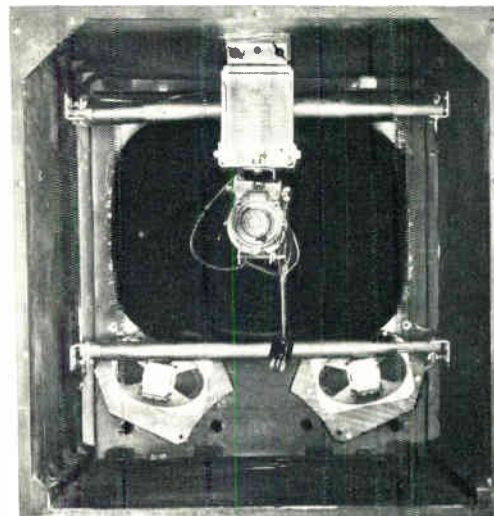


Fig. 4. Rear view of Model 815 cabinet after all changes had been made.



Fig. 5. Motorola Model VF-102 FM-AM phonograph combination after it was converted to use a General Electric 14CP4 picture tube.

10. The HV transformer compartment shield was replaced after being slightly altered due to remounting the centering capacitor and linearity coil. The front edge of the shield was bent at a right angle about 1/4 in. back of the cut-out portion to permit it to be fastened to the front apron with self-tapping screws.
11. The 6V6-GT vertical output tube was changed to a 6W6-GT. The B+ end of the two 18K ohm decoupling resistors R88 and R-144 in Fig. 8 was transferred to pin 8 of the 5U4-G audio power supply rectifier V-30. This increased the 6W6-GT plate voltage by about 40 volts.
12. The 8.2 megohm grid resistor R-86 for the 6W6-GT tube was replaced with a 2.0 megohm 1/2 watt resistor.
13. The 1-megohm resistor R-85 connected to one side of the vertical size control was shorted out.
14. The .1 mfd capacitor C-102 connected to the other side of the size control was removed.
15. The 1200-ohm cathode resistor R-87 was changed to a 250-ohm 1-watt resistor.
16. The focus coil was replaced with a General Electric R1.F-038. The 1000-ohm resistor which was connected between the focus control and one end of the focus coil was shorted out to correct the range of the focus control. This resistor is located in a small ventilated compartment at the rear of the chassis. The photograph in Fig. 6 was taken before the focus coil was changed.
17. The original electro-magnetic double magnet ion trap couldn't be used. It was not removed from the circuit, however, but was taped to the side of one of the electrolytic capacitors in front of the 5U4-G rectifiers. A General Electric RET-003 single magnet ion trap was placed on the 14CP4 picture tube and adjusted for maximum brightness.

bottom of the new panel and the top of the original section. This gave a recessed appearance to the control knobs and channel indicator and actually improved the appearance. Moving the panel did not interfere with the doors.

While these circuit modifications have been carefully tested, the General Electric Company can, of course, assume no responsibility for the application of these suggestions to the conversion of any particular receiver. General Electric

offers this article as a suggestion of one possible way of making the conversion, but it does not represent that this is the only way or the best way of accomplishing the conversion.

In the next issue conversion information on two more television receivers will be included.

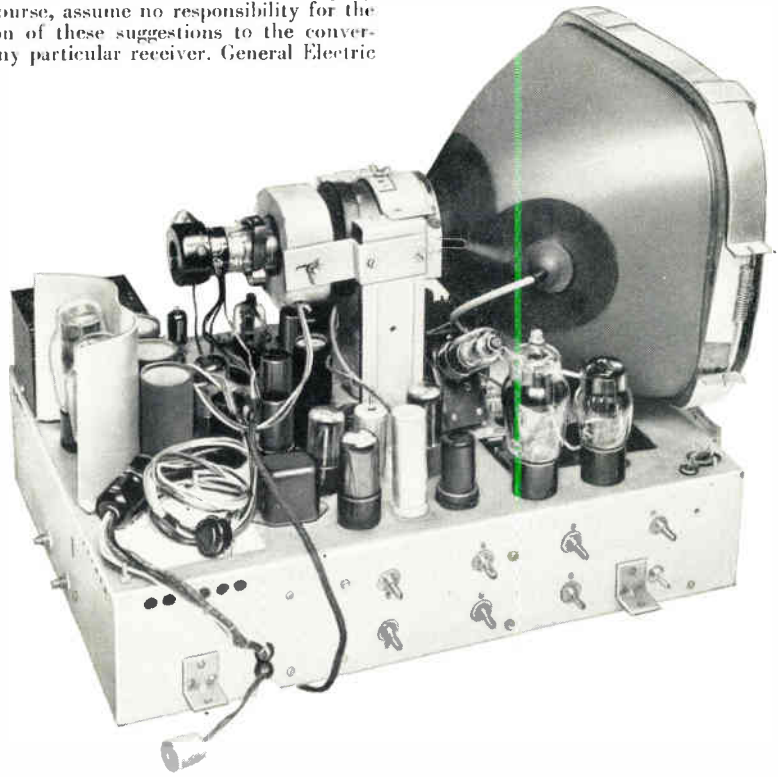


Fig. 6. Chassis of Motorola Model VF-102 after the 14CP4 picture tube was mounted and all chassis changes made.

#### CABINET CHANGES

Due to the slightly rounded face plate of the 14CP4, it was necessary to alter the front of the cabinet to accommodate the 14-in. mask. The portion of the panel above the channel indicator was removed and remounted 3/8 in. forward. Since the panel was morticed to the sides of the cabinet it would have been difficult to salvage this piece of wood. A piece of mahogany-faced 3/8 in. plywood was cut with a 12 3/8 in. by 10 in. opening. The edges were sanded and the whole piece stained to match the cabinet. The mask was fastened to the back of the piece using the mounting clips from the old mask. This permitted slight adjustment of mask centering if necessary. One-half inch by one inch strips were glued and screwed to the inside of the cabinet so that the placement of the new panel was moved forward 3/8 in. A small strip of stained plywood was used to fill the area between the

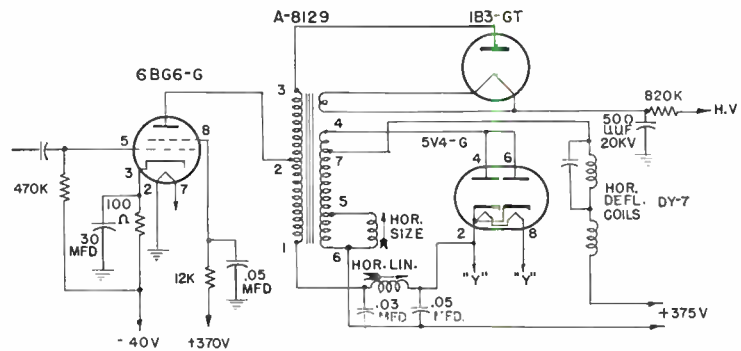


Fig. 7. Horizontal output circuit showing the changes which were necessary to sweep the 14CP4 picture tube.

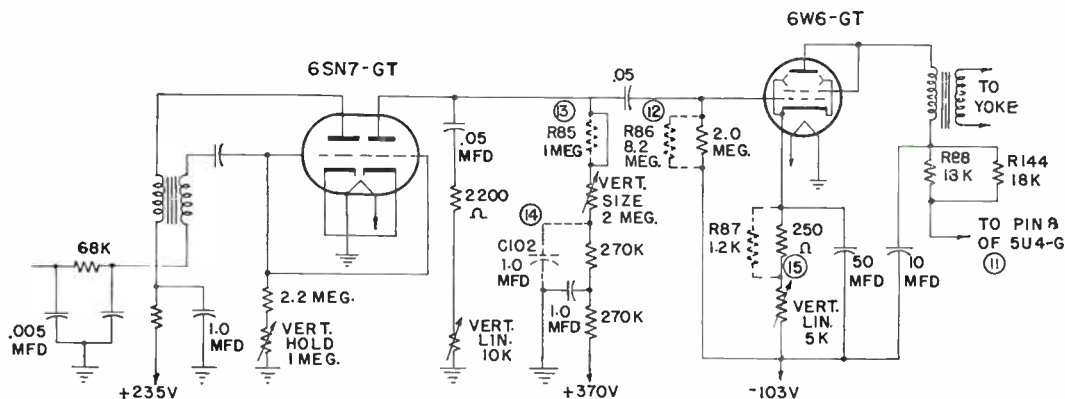


Fig. 8. Vertical oscillator and output circuits used in Motorola Model VF-102. The encircled numbers indicate a change which is explained in the text following that same number.

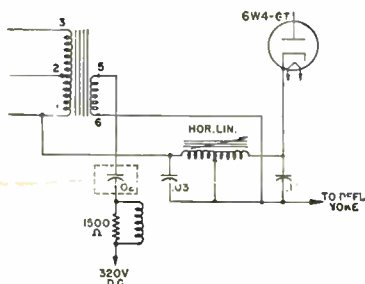
# BENCH NOTES

Contributions to this column are solicited. For each question, short cut or chronic-trouble note selected for publication, you will receive \$10.00 worth of electronic tubes. In the event of duplicate or similar items, selection will be made by the editor and his decision will be final. Send contributions to The Editor, Techni-talk, Tube Department, General Electric Company, Schenectady 5, New York.

## PICTURE FADE-OUT

I have had two calls in the past three months on Dumont Models RA-112 and RA-113, with exactly the same trouble. When the receiver is turned on and allowed to warm up, a picture appears momentarily on the screen but without horizontal synchronization and then gradually fades away.

If the 6W4-GT is removed a picture reappears and remains on the screen but the horizontal will not hold and a bright vertical line appears on the left-hand side. After thoroughly checking the chassis I found a shorted .02 mfd horizontal sweep coupling capacitor connected from terminal number 5 on the 4th winding of the flyback transformer. This capacitor is shown in the box on the drawing.



In both cases the defective capacitor had a 400 volt rating and according to Sam's Photofact Folder this capacitor should have a 600 volt rating. A new .02 mfd 600 volt capacitor restored the receiver to normal operation.

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540 East 22nd Street  
Brooklyn 26, N. Y.

## BARKHAUSEN ELIMINATION

Emerson Models No. 629, 651, and 658 may produce Barkhausen oscillation which shows up as a vertical line usually appearing on the left side of the picture tube.

If this line cannot be eliminated by the usual methods, I have found the following to do the trick.

The above models have a built-in antenna, and due to coupling the above effect is created and has been eliminated by grounding the open ends of the lead-in of the built-in antenna to the chassis.

L. Weinreb  
151-09 34th Avenue  
Flushing, New York

## EMERSON SERVICE HINTS

In regards to the Emerson Model 662B and 663B television receivers, there is usually the complaint of almost total loss of sound, plus loss of focus, and usually no video information. In every case this is due to a shorted .01 mfd coupling condenser C-23 between the 6T8 and 6V6 tubes in the audio amplifier.

In the Emerson Model 650, 654D, and 655B television receivers, poor focus can usually be traced to the 1500 ohm resistor R-35 which has increased in value. This resistor is between the focus coil lead and the field coil.

Harry C. Keller  
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Hialeah, Florida

## MINIATURE PIN NOISE

When miniature tubes, such as 1R5-1T4, etc., are making noisy contacts within the socket, I have found that by taking a pair of long nose pliers, which have serrated jaws, and rotating the jaws the long way on each tube pin, that 95% of the time all symptoms of noise due to pin contact immediately disappear. I have been using this kink for over a year and it has saved me many a headache.

Even though the pins are hardened steel, by using slight pressure on the pliers, the pins seem to become slightly ridged.

Fred W. Rioette  
Fred's Radio Sales and Service  
608 Delaware Street  
Syracuse 4, New York

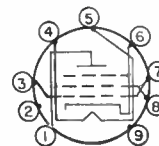
What's new!

## 6BK5

The 6BK5 is a miniature beampower pentode designed primarily for use in the power output stage of television and radio receivers in which only small driving voltages are available. Features of the tube include extremely high power sensitivity, high transconductance, and high plate efficiency. The 6BK5 can also be used to advantage as a video amplifier.

### TYPICAL OPERATION OF CLASS A<sub>1</sub> AMPLIFIER

Plate Voltage	250 Volts
Screen Voltage	250 Volts
Grid Number 1 Voltage	5.0 Volts
Peak A-F Grid Number 1 Voltage	5.0 Volts
Plate Resistance (Approx)	100,000 Ohms
Transconductance	8500 Micromhos
Zero-signal Plate Current	.35 Milliamperes
Maximum-signal Plate Current (Approx)	.37 Milliamperes
Zero-signal Screen Current	3.5 Milliamperes
Maximum-signal Screen Current (Approx)	10 Milliamperes
Load Resistance	6500 Ohms
Total Harmonic Distortion (Approx)	7 Per Cent
Power Output	3.5 Watts



## 6BX7-GT

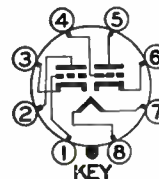
The Type 6BX7-GT is a high perveance double triode designed for use as a vertical deflection amplifier and oscillator in television receivers.

Heater Voltage (Ac or Dc)	6.3 Volts
Heater Current	1.5 Amps

### CHARACTERISTICS (Each Section)

#### Conditions:

Heater Voltage	6.3	6.3 Volts
Plate Voltage (Dc)	100	250 Volts
Grid Voltage (Dc)	0	Volts
Cathode Resistor	0	390 Ohms
Plate Current	80	42 Ma
Amplification Factor		10
Transconductance		7600 Umhos
Plate Resistance		1300 Ohms
Grid Voltage for 50 gamps Plate Current		-40 Volts
Maximum Plate Dissipation:		
Each Plate		10 Watts
Both Plates		12 Watts



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