from RTMA release #967, April 23, 1951

Rel. 967

14GP4

KINESCOPE

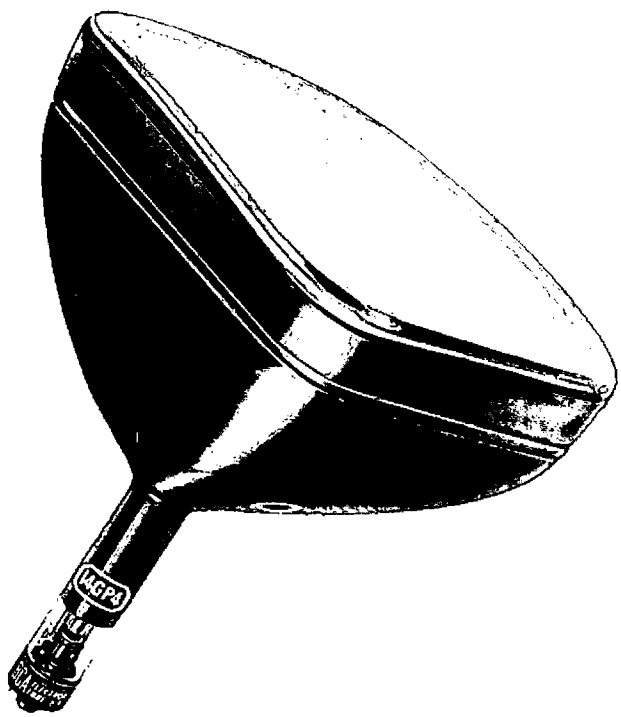
Electrostatic Focus
Magnetic Deflection
Ion-Trap Gun

Rectangular Glass Type
Filterglass Face Plate
External Conductive Coating

11-3/8" x 8-1/2" Picture Size
13-13/16" Max. Bulb Diagonal
17-3/16" Max. Length

TENTATIVE DATA

RCA-14GP4 is a short, directly viewed, rectangular, glass picture tube for use in television receivers. It has a picture size of 11-3/8" x 8-1/2". Utilizing electrostatic focusing, the 14GP4 features an electron gun of improved design



to provide good uniformity of focus over the entire picture area. Furthermore, focus is maintained automatically with variation in line voltage and with adjustment of picture brightness. Need for alignment of a focusing coil or focusing magnet is eliminated and therefore tube installation and adjustment for optimum performance are simplified. Because the electron gun is designed so that the focusing electrode (grid No.4) takes very little current, the voltage for the focusing electrode can be provided easily and economically.

The rectangular shape, which allows reproduction of the transmitted picture without waste of screen area, permits use of a cabinet having about 20 per cent less height than is required for a round-face tube having the same picture width. In addition, the chassis need not be depressed or cut out under the face of the tube and controls can be located as desired beneath the tube.

Providing pictures having high brightness, the 14GP4 has a high-efficiency, white fluorescent screen on a face made of Filterglass to provide increased picture contrast. The Filterglass face plate incorporates a neutral light-absorbing material which reduces ambient-light reflections from the phosphor and reflections within the face plate itself in a very much higher ratio than it reduces the directly viewed light of the picture. As a result, improved picture contrast is obtained.

Employing magnetic deflection, the 14GP4 is designed with a funnel-to-neck section which facilitates centering of the yoke on the neck and, in combination with a well-centered beam inside the neck, contributes to the good uniformity of focus over the entire picture area. The diagonal deflection angle is 70° and the horizontal deflection angle is 65°.

Other design features of the 14GP4 are short overall length; an external conductive coating which with the internal conductive coating forms a supplementary filter capacitor for the high-voltage supply; and an ion-trap gun requiring only a single-field, external magnet.

DATA

General:

Heater, for unipotential cathode:		
Voltage (AC or DC)	6.3	volts
Current	0.6	ampere
Direct interelectrode Capacitances:		
Grid No.1 to All Other Electrodes	6	μμf
Cathode to All Other Electrodes	5	μμf
External Conductive Coating to Ultor	2000 max. / 750 min.	μμf
Face Plate (with about 66% light transmission)	Filterglass	

Phosphor	No.4—Sulfide Type
Fluorescence	White
Phosphorescence	White
Persistence	Short
Focusing Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.):	
Diagonal	70°
Horizontal	65°
Vertical	50°
Ion-Trap Gun	Requires External, Single-Field Magnet
Overall Length	16-13/16" ± 3/8"
Greatest Diagonal of Tube at Face	13-11/16" ± 1/8"
Greatest Width of Tube at Face	12-17/32" ± 1/8"
Greatest Height of Tube at Face	9-23/32" ± 1/8"
Screen Size	11-3/8" x 8-1/2"
Cap	Recessed Small Cavity (JETEC No.J1-21)
Base	Small-Shell Duodecal 6-Pin (JETEC No.B6-63)
Mounting Position	Any

Maximum Ratings, *Design-Center Values*:

ULTOR● VOLTAGE	14000 max.	volts
GRID-NO.4 VOLTAGE	5000 max.	volts
GRID-NO.2 VOLTAGE	500 max.	volts
GRID-NO.1 VOLTAGE:		
Negative bias value	125 max.	volts
Positive bias value	0 max.	volts
Positive peak value	2 max.	volts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode:		
During equipment warm-up period not exceeding 15 seconds	410 max.	volts
After equipment warm-up period	180 max.	volts
Heater positive with respect to cathode	180 max.	volts

Typical Operation:

Ultor● voltage*	12000	volts
Grid-No.4 voltage for ultor current of 100 μamp (18.1% to 24.5% of applied ultor voltage)	2170 to 2940	volts
Grid-No.2 voltage	300	volts
Grid-No.1 voltage for visual extinction of undeflected focused spot	-33 to -77	volts
Grid-No.4 current	-15 to +25	μamp
Grid-No.2 current	-15 to +15	μamp
Field Strength of Single-Field Ion-Trap Magnet (Approx.)#	35	gausses
Ion-Trap-Magnet Current (DC, approx.)□	70	ma
Field Strength of Adjustable Centering Magnet	0 to 8	gausses

Maximum Circuit Values:

Grid-No.1-Circuit Resistance	1.5 max.	megohms

● Grid No.3, grid No.5, and collector are connected together within the tube and are collectively identified by the new word "ultor" to facilitate reference to them. The "ultor" in a cathode-ray tube is the electrode, or the electrode in combination with one or more additional electrodes connected within the tube to it, to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection.

* Brilliance and definition decrease with decreasing ultor voltage. In general, the ultor voltage should not be less than 10000 volts.

\# Measured at center of field with General Electric Gauss Meter, Cat. No. 4009X51.

□ For specimen ion-trap magnet similar to JETEC Ion-Trap Magnet No.111 located in optimum position and rotated to give maximum brightness.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data for the 14GP4 are working design-center maximums established according to the standard design-center system of rating electron tubes. Tubes so rated will give satisfactory performance in equipment designed so that these maximum ratings will not be exceeded when the equipment is operated from ac or dc power-line supplies whose normal voltage including normal variations falls within ± 10 per cent of line-center voltage value of 117 volts.

When operated at or below the maximum ratings shown in the tabulated data, *the 14GP4 does not produce any harmful x-ray radiation.* All types of picture tubes may be operated at voltages (if ratings permit) up to 16 kilovolts (absolute value) without personal injury on prolonged exposure at close range. Above 16 kilovolts, special shielding precautions for x-ray radiation may be necessary.

Tube Handling. A caution notice incorporating the information shown below is included in each 14GP4 carton. It is recommended that a similar notice be prominently displayed on equipment using the 14GP4 and be included in the equipment service bulletin.

CAUTION--HANDLE WITH CARE

Breakage of this tube, which contains a high vacuum, may result in injury from flying glass. Do not strike or scratch the tube. Never subject it to more than moderate pressure when installing in or removing from equipment.

Shatter-Proof Cover Over The Tube Face. It is recommended that receivers be designed with a shatter-proof, clear glass or plastic cover over the face of the 14GP4 to provide protection against flying glass in case of tube implosion caused by some abnormal condition.

The *conductive coating* on the exterior of the bulb *must be grounded.* Connection to the coating may be made by using a soft brush contact attached to the deflecting yoke or by means of a suitable strap around the tube at the face end of the coating. The latter arrangement minimizes radiation caused by the horizontal-scanning pulses. A contact area of at least 1/4 square inch should be used in making connection to the external coating. This coating must not be scratched and must never be washed with liquids likely to soften or dissolve lacquers.

The external bulb coating is designed to be used as one plate of a supplementary filter capacitor for the high-voltage power supply. The other plate of the capacitor is provided by the internal conductive coating on the bulb wall.

Support for the tube, which may be operated in any position, should be provided by a cushioned arrangement near the screen end of the tube, and by the deflecting-yoke mounting on the neck of the tube.

The deflecting-yoke mounting, sometimes called the mounting hood, should provide adjustment for alignment of the yoke on the neck and should also provide sufficient pressure to hold the yoke

firmly against the funnel. Some good insulating material, such as Neoprene, is required between the hood and the funnel not only to provide a cushion between them but also to prevent arcing from the recessed small cavity cap to the hood. The hood should be designed so that it can be placed as close as possible to the Reference Line (see *Outline Drawing*) without interfering with the yoke in order to reduce the amount of insulation required between hood and funnel. Furthermore, the hood should not exert undue pressure on the deflecting yoke.

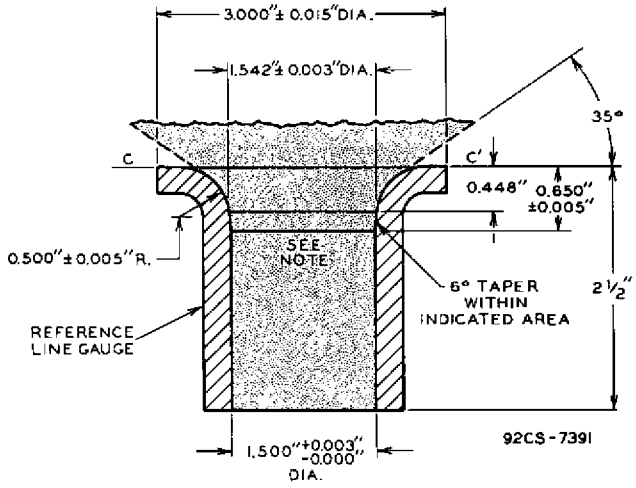


Fig. 1 - Reference-Line Gauge (JETEC No. 110) with Supplementary Information on Recommended Inside Contour of Yoke to Provide Proper Location of Yoke on Neck-Funnel Section.

The yoke should be held firmly against the funnel (see proper location under *Deflecting Yoke*), but any thrust should be absorbed by the insulating cushion. The hood should be specially braced to prevent lateral and longitudinal motion caused by buckling of the chassis which may occur during transportation of the receiver. A simple brace from the edge of the chassis usually provides the extra stiffness required; or a small foot placed directly under the yoke may be sufficient. Unless the precaution against thrust on the yoke is observed, the tube or yoke may be damaged during transportation of the receiver.

The *deflecting yoke* should have an effective length of not more than 1-11/16 inches and be designed so that the effective center of deflection of the beam is about 1.15 inches from the Reference Line (see *Outline Drawing*). This requirement is necessary to prevent the beam from striking the neck when deflection is sufficient to reach the edge of the screen.

The deflecting yoke should have an inside contour which conforms in general to the dimensions and shape shown in Fig. 1. It is to be noted that the inner surface of the end of the yoke adjacent to the funnel should not come closer to the funnel than indicated by the 35° line in Fig. 1 if adequate insulation is to be maintained across the funnel between the point of yoke contact and the recessed cap terminal.

Focusing of the beam in the 14GP4 is accomplished by adjustment of the voltage applied to grid No. 4. Because this electrode takes very low current, the focusing voltage can be easily provided. Any method used must take into account the grid-No. 4 leakage current as shown in the tabulated data. When the high voltage supply is of the pulse-operated, limited-energy type commonly used, the focusing voltage can be obtained by means of a simple rectifier system connected to a suitable tap on the horizontal-deflection-output and high-voltage transformer. Such an arrangement produces negligible drop in the output voltage of the high-voltage supply.

The *ion-trap magnet*, required to recenter the electron beam in the gun structure, should be of the single-field type. Direction of the field of the ion-trap magnet should be such that the north pole is adjacent to vacant pin position No. 8 and the south pole to pin No. 2.

To operate properly with the electron gun in the 14GP4, the ion-trap magnet should have a field strength such that the optimum position of the magnet is in the region of grid No. 2 (see Fig. 2), with any departure being in the direction of the base rather than toward the funnel. The optimum position should result in a properly centered pattern having full brightness and no shadowing at the edges.

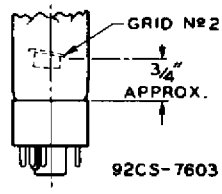


Fig. 2 - Location of Grid No. 2 in Tube Neck.

The use of an ion-trap magnet much stronger than indicated in the tabulated data tends to raise the focusing voltage beyond the indicated maximum value. Because of this fact and the absence of any shunting effect of the field by a focusing coil or magnet, it will be found that the optimum strength of the ion-trap magnetic field will be somewhat less than is required for a comparable magnetic-focus tube.

The strength of the ion-trap magnet required for other ultor voltages than that indicated will be proportional to the square root of the ultor voltage.

Centering of the pattern may be accomplished by the use of a small, adjustable centering magnet located near the base end of the deflecting yoke. The position of the centering magnet on the tube neck must be within a distance of 3-1/4 inches from the Reference Line (see *Outline*

Drawing). When the magnet is positioned at the limiting distance, the ac field of the deflecting yoke is relatively weak and will have little demagnetizing effect. When placed closer to the deflecting yoke, the magnet must be made of material capable of withstanding a stronger ac field without demagnetization. If the magnet is placed too far from the deflecting yoke, appreciable deflection defocusing or neck shadow will result.

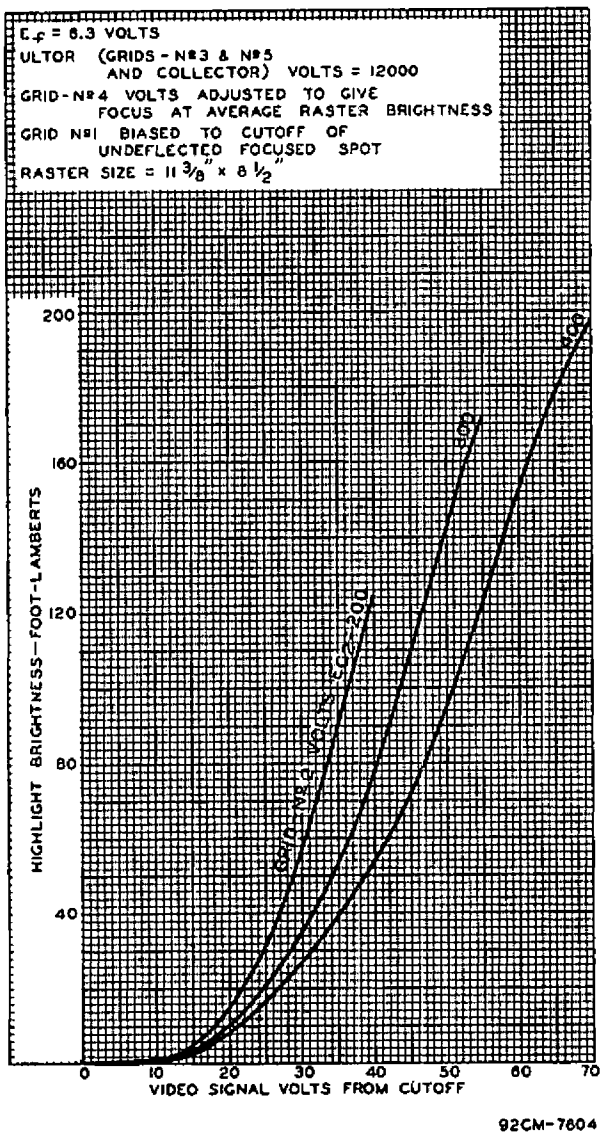


Fig. 3 - Average Grid-Drive Characteristics of Type 14GP4.

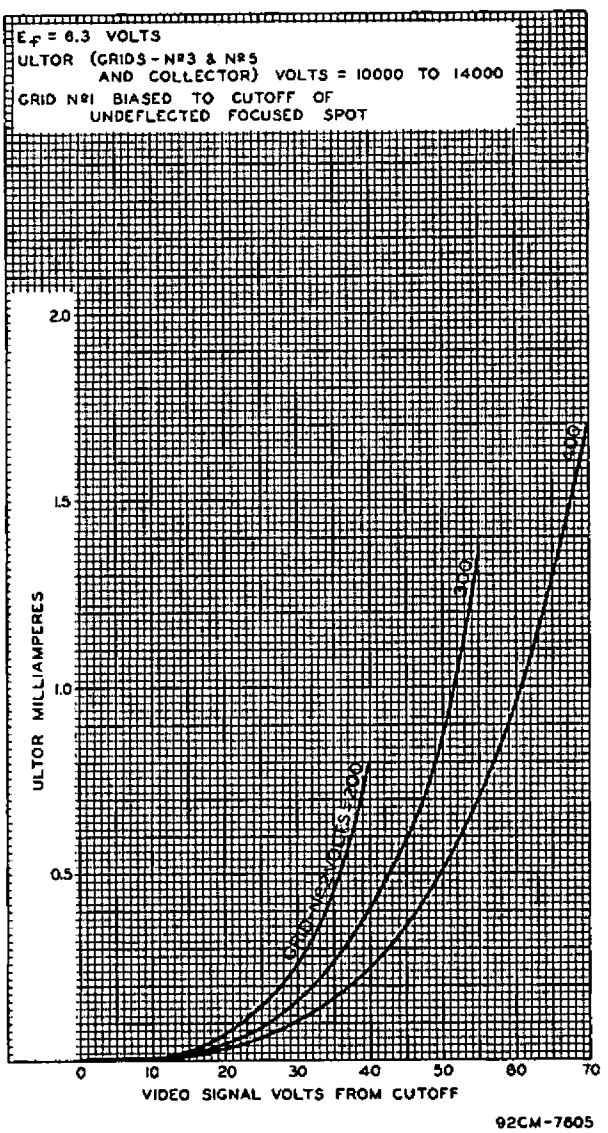
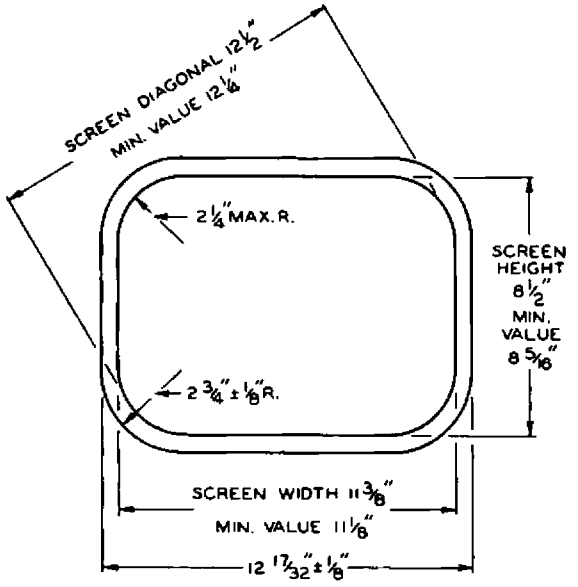
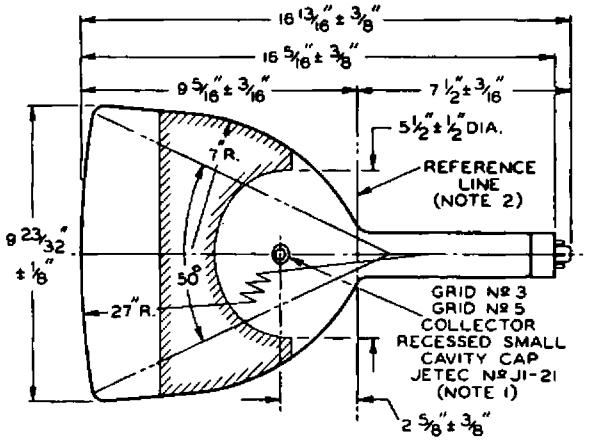
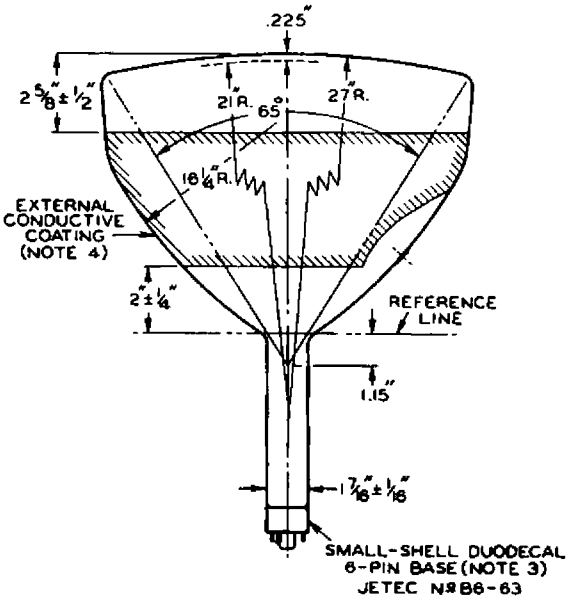


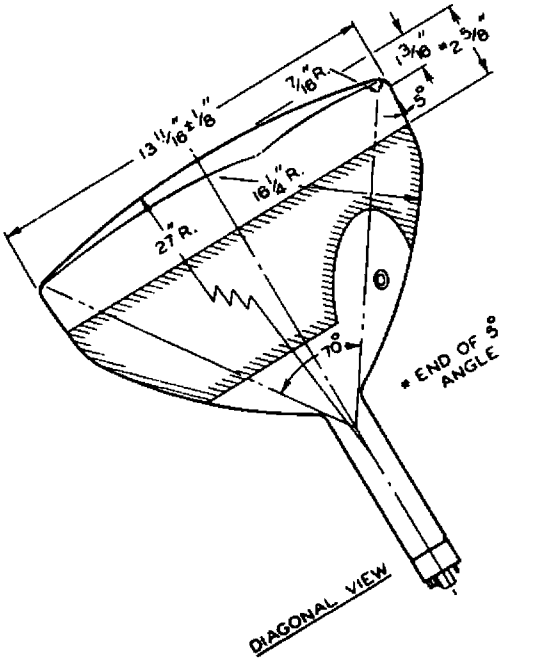
Fig. 4 - Average Grid-Drive Characteristics of Type 14GP4.

DIMENSIONAL OUTLINE









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NOTE 1: THE PLANE THROUGH THE TUBE AXIS AND PIN NO.6 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND CAP BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF ± 30°. CAP IS ON SAME SIDE AS PIN NO.6.

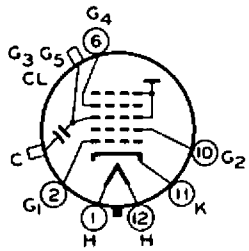
NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE (JETEC NO.110) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. BOTTOM CIRCUMFERENCE OF BASE SHELL WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF 2-1/2".

NOTE 4: EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

SOCKET CONNECTIONS

Bottom View



PIN 1: HEATER
PIN 2: GRID NO. 1
PIN 6: GRID NO. 4
PIN 10: GRID NO. 2
PIN 11: CATHODE
PIN 12: HEATER
CAP: GRID NO. 3, GRID NO. 5, COLLECTOR
C: EXTERNAL CONDUCTIVE COATING