RCA-14RP4 is a short, lightweight, directly viewed, rectangular, glass picture tube of the low-voltage electrostatic-focus and magnetic-deflection type. Designed primarily for low-cost, lightweight, transportable instruments, the 14RP4 has a spherical Filterglass faceplate, a screen 12-1/8" x 9-5/8" with slightly curved sides and rounded corners, and a typical projected screen area of 108 square inches.

DATA

General:
Heater, for Unipotential Cathode: 6.3 volts
Current: 0.6 ± 10% amp
Direct Inter-electrode Capacitances:
Grid No. 1 to all other electrodes: 6 μuf
Cathode to all other electrodes: 5 μuf
External conductive coating to ULTOR® 750 max. μuf 500 min. μuf
Diagonal: 90°
Horizontal: 85°
Vertical: 65° Ion-Trap Gun: Requires External Single-Field Magnet

Tube Dimensions:
Overall length: 14-9/16" ± 1/16"
Greatest width: 13-1/16" ± 1/16"
Greatest height: 10-9/16" ± 1/8"
Diagonal: 14" ± 1/8"
Neck length: 6-7/8" ± 3/16"

Screen Dimensions (Minimum):
Greatest width: 12-1/8"
Greatest height: 9-5/8"
Diagonal: 13-1/16"
Projected area: 106 sq. in.
Cap.: Recessed Small Cavity (JETEC No. J1-21)
Bulb: J12 Base: Small-Scale Duodecal 6-Pin (JETEC No. 86-63)
Weight (Approx.): 8.5 lbs
Mounting Position: Any

GRID-DRIVE® SERVICE

Unless otherwise specified, voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:
ULTOR® VOLTAGE: 14000 max. volts
GRID-No. 4 VOLTAGE:
Positive value: 500 max. volts
Negative value: 500 max. volts
GRID-No. 2 VOLTAGE: 400 max. volts
GRID-No. 1 VOLTAGE:
Negative peak value: 160 max. volts
Negative bias value: 110 max. volts
Positive bias value: 50 max. volts
Positive peak value: 2 max. volts
PEAK HEATER—CATHODE VOLTAGE:
Heater negative with respect to cathode: 180 max. volts
Heater positive with respect to cathode: 180 max. volts

Employing wide-angle (180°) deflection, the 14RP4 has a very short length—a length approximately 2 inches shorter than a type having the same size faceplate and 70° deflection. Other design features of the 14RP4 include an external conductive bulb coating which forms a supplementary filter capacitor; and an ion-trap gun requiring an external, single-field magnet.
Equipment Design Ranges:
With any ultor voltage ($E_{uk}$) between 8000 and 14000 volts and grid-No. 2 voltage ($E_{gk}$) between 200 and 400 volts

Grid-No. 4 Voltage Required for Focus:
Changes directly with $E_{gk}$ at the rate of approximately 30 volts for each 1000-volt change in $E_{gk}$;
Changes inversely with $E_{gk}$ at the rate of approximately 10 volts for each 100-volt change in $E_{gk}$;
Changes inversely with ultor current at the rate of approximately 25 volts for each 50-ma change in ultor current.

For typical values, see Examples of Use of Design Ranges.

Grid-No.1 Voltage ($E_{uk}$) for Visual Extinction of Focused Raster...

Grid-No.1 Video Drive from Raster Cutoff
(Black Level):
White-level value (Peak positive)...
Same value as determined for $E_{uk}$ except video drive is positive voltage.

Grid-No. 4 Current... -25 to +25 $\mu$amp
Grid-No. 2 Current... -15 to +15 $\mu$amp
Ion-Trap Magnet: Current (Average) $\sqrt{E_{gk}/14000} \times 38$ ma
Minimum Field Strength of PM Ion-Trap Magnet... $\sqrt{E_{gk}/14000} \times 43$ gausses
Field Strength of Adjustable Centering Magnet... 0 to 8 gausses

Examples of Use of Design Ranges:
With ultor voltage of 10000 14000 volts and grid-No.2 voltage of 300 300 volts

Grid-No. 4 Voltage for Focus with Ultor Current of 100 $\mu$amps...
-50 to +350 +70 to +470 volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster...
-26 to -70 -26 to -70 volts
Grid-No.1 Video Drive from Raster Cutoff
(Black Level):
White-level value (Peak positive)...
26 to 70 26 to 70 volts
Min. Field Strength of PM Ion-Trap Magnet... 36 43 gausses

Maximum Circuit Values:
Grid-No.1-Circuit Resistance... 1.5 max. megohms

** CATHODE-DRIVE® SERVICE **

Unless otherwise specified, voltage values are positive with respect to grid No.1

Maximum Ratings, Design-Center Values:
ULTOR® TO GRID-NO.1 VOLTAGE... 14000 max. volts
GRID-No.4 TO GRID-NO.1 VOLTAGE:
Positive value... 500 max. volts
Negative value... 500 max. volts
GRID-No.2 TO GRID-NO.1 VOLTAGE...
Positive peak value... 160 max. volts
Positive bias value... 110 max. volts
Negative bias value... 0 max. volts
Negative peak value... 2 max. volts
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode... 180 max. volts
Heater positive with respect to cathode... 180 max. volts

Equipment Design Ranges:
With any ultor-to-grid-No.1 voltage ($E_{ukg}$) between 8000 and 14000 volts and grid-No.2-to-grid-No.1 voltage ($E_{gkg}$) between 225 and 510 volts

Grid-No.4-to-Grid-No.1 Voltage Required for Focus:
Changes directly with $E_{gkg}$ at the rate of approximately 30 volts for each 1000-volt change in $E_{gkg}$;
Changes inversely with $E_{gkg}$ at the rate of approximately 10 volts for each 100-volt change in $E_{gkg}$;
Changes inversely with ultor current at the rate of approximately 25 volts for each 50-ma change in ultor current.

For typical values, see Examples of Use of Design Ranges.

Cathode-to-Grid-No.1 Voltage ($E_{kg}$) for Visual Extinction of Focused Raster...

Cathode-to-Grid-No.1 Video Drive from Raster Cutoff
(Black Level):
White-level value (Peak negative)...
Same value as determined for $E_{kg}$
Grid-No. 4 Current... -25 to +25 $\mu$amp
Grid-No. 2 Current... -15 to +15 $\mu$amp
Ion-Trap Magnet: Current (Average) $\sqrt{E_{kg}/14000} \times 38$ ma
Minimum Field Strength of PM Ion-Trap Magnet... $\sqrt{E_{kg}/14000} \times 43$ gausses
Field Strength of Adjustable Centering Magnet... 0 to 8 gausses

Examples of Use of Design Ranges:
With ultor-to-grid-No.1 voltage of 10000 14000 volts and grid-No.2-to-grid-No.1 voltage of 300 300 volts

Grid-No.4 Voltage for Focus with Ultor Current of 100 $\mu$amps...
-50 to +350 +70 to +470 volts
Grid-No.1 Voltage for Visual Extinction of Focused Raster...
-26 to -70 -26 to -70 volts
Cathode-to-Grid-No.1 Video Drive from Raster Cutoff
(Black Level):
White-level value (Peak negative)...
26 to 59 26 to 59 volts
Min. Field Strength of PM Ion-Trap Magnet... 36 43 gausses

Maximum Circuit Values:
Grid-No.1-Circuit Resistance... 1.5 max. megohms

- The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 1kVP4, the ultor function is performed by grid No.5. Since grid No.5, grid No.2, and collector are connected together within the 1kVP4, they are collectively referred to simply as "ultor" for convenience in presentation and curves.

- Grid drive is the operating condition in which the video signal varies the grid No.1 potential with respect to cathode.

- Brilliance and definition decrease with decreasing ultor voltage or ultor-to-grid-No.1 voltage. In general, the ultor voltage or ultor-to-grid-No.1 voltage should not be less than 8000 volts.

- For JETEC Ion-Trap Magnet No.117, or equivalent, located with the trailing edge of the pole pieces located over the gap between grid No.1 and grid No.2 and rotated to give maximum brightness.
§ For specimen PM ion-trap magnet, such as Heppsner Model No.O437 or equivalent, located in optimum position and rotated to give maximum brightness. For a given equipment application, the tolerance range for the strength of the PM ion-trap magnet should be added to the minimum value. The maximum strength of this magnet should not exceed the specified minimum value by more than 6 gausses. This procedure will insure use of a PM ion-trap magnet allowing adequate adjustment to permit satisfactory performance without loss of highlight brightness.

* Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid-No.1 and the other electrodes.

**OPERATING CONSIDERATIONS**

The maximum ratings in the tabulated data 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 14RP4 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.

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**Fig. 1** - Cutoff Design Chart for Type 14RP4 in Grid-Drive Service.

**Fig. 2** - Cutoff Design Chart for Type 14RP4 in Cathode-Drive Service.

The Equipment Design Ranges for the 14RP4 include a new method of showing the focusing-voltage adjustment range needed for equipment design under different design conditions of...
ulator voltage, ulator current, and grid-No.2 voltage. This new method offers equipment designers flexibility in determining the approximate focusing-voltage range to meet their particular requirements.

1. Calculate the maximum focusing-voltage range value for the increase in ulator voltage from 10000 to 12000 volts by applying the rule that the focusing voltage changes directly at the rate of approximately 30 volts for each 1000-

[Diagram of focusing-voltage range values for various voltages and currents]

Fig. 3 - Average Drive Characteristics of Type 14RF.

For example, assume the desired operating conditions are as follows: ulator voltage, 12000; grid-No.2 voltage, 250; and ulator current, 150 microamperes.

To determine the focusing-voltage range, first refer to the focusing-voltage-range values shown for the 10000-volt and 300-volt conditions given under Examples of Use of Design Ranges for Grid-Drive Service. Starting with these focusing-voltage-range values of -50 to +350 volts at 100 microamperes, then proceed to determine the new values to fit the assumed conditions as follows:

2. Calculate the maximum focusing-voltage range value for the decrease in grid-No.2 voltage from 300 to 250 volts by applying the rule that the focusing voltage changes inversely at
the rate of approximately 10 volts for each 100-volt change in grid-No.2 voltage. Since the assumed grid-No.2 voltage represents a decrease of 50 volts, the maximum focusing-voltage-range value calculated above will be increased by 1/2 of 10 volts or 5 volts. Adding this value will give 410 + 5 or 415 volts. Correspondingly, the minimum value increases to 15 volts.

3. Calculate the maximum focusing-voltage-range value for the increase in utor current from 100 to 150 microamperes by applying the rule that the focusing voltage changes inversely at the rate of approximately 25 volts for each 50-microamperes change in utor current. Since the assumed utor current represents an increase of 50 microamperes, the maximum focusing-voltage-range value calculated above will be decreased by 25 volts. The maximum range value, therefore, is 415 - 25 or 390 volts. Correspondingly, the minimum value decreases to -10 volts.

The focusing-voltage-range for the assumed conditions is, therefore, -10 to 390 volts.


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 2-3/4".


NOTE 5: TO CLEAN THIS AREA WIPED WITH SOFT DRY LINTLESS CLOTH.

NOTE 6: BULGE AT SPLICE-LINE SEAL WILL NOT PROTRUSE BEYOND THE MAXIMUM INDICATED VALUE FOR ENVELOPE WIDTH, DIAGONAL OR HEIGHT.

NOTE 7: UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS 3/4" MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.

**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: ULTOR (Grid No. 3, Grid No. 5, Collector)
- C: EXTERNAL CONDUCTIVE COATING

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