

## CATHODE-RAY TUBES

### Types 20AP1, 20AP2, 20AP4, 20AP5

(Formerly designated as Types    2532A20,    2532B20,    2532D20,    2532C20)

The Type 20AP Cathode-Ray Tubes are designed for television and other large screen applications. The insulation employed, the type of sealing, and the wide spacing of the lead wires enable these tubes to be operated at high accelerating potentials.

The 20AP types have a glass bulb approximately twenty inches in diameter. The screen will provide a brilliant tele-

vision picture measuring 11¼ inches by 15 inches, or for oscillographic applications a usable screen diameter of about 17 inches. The shape of the glass bulb has been specially designed to withstand stresses induced by atmospheric pressure, and it is tested in production under a pressure greater than three atmospheres.

#### CHARACTERISTICS

##### HEATER

Voltage, a.c. or d.c.

2.5 volts

Current

2.1 amperes

##### DEFLECTION

Electrostatic

##### FOCUS

Electrostatic

##### SCREEN

Phosphor

20AP1

20AP2

20AP4

20AP5

Fluorescence

P1

P2

P4

P5

Persistence

Green  
Medium

Green  
Long

White  
Medium

Blue  
Short

##### MECHANICAL CHARACTERISTICS

Overall Length

27⅞ ± ¾ inches

Maximum Diameter

20 ± ⅜ inches

Bulb

C160Z1C

Base

12 contact peripheral

Basing

RMA Basing Designation

12A

The basing is such that:

1. The direction of the trace produced on the screen by deflecting electrodes  $D_3$  and  $D_4$  will not deviate more than  $\pm 10^\circ$  from a plane through the center of the locating key and the axis of the tube, while the angle between the direction of this trace and that of the trace produced on the screen by deflecting electrodes  $D_1$  and  $D_2$  will be  $90^\circ \pm 3^\circ$ .
2. With deflecting electrode  $D_1$  (pin No. 11) positive with respect to  $D_2$  (pin No. 9) the spot will be deflected approximately toward pin No. 9, while with  $D_3$  (pin No. 12) positive with respect to  $D_4$  (pin No. 8) the spot will be deflected approximately toward pin No. 7.

##### DIRECT INTERELECTRODE CAPACITANCES

Control Electrode (grid) to all other electrodes

6.0 uuf

Deflecting Plate  $D_1$  to Deflecting Plate  $D_2$

1.9 uuf

Deflecting Plate  $D_3$  to Deflecting Plate  $D_4$

1.2 uuf

Deflecting Plate  $D_1$  to all other electrodes

8.5 uuf

Deflecting Plate  $D_3$  to all other electrodes

7.4 uuf

$D_1$  to all other electrodes except  $D_2$

6.6 uuf

$D_2$  to all other electrodes except  $D_1$

6.9 uuf

$D_3$  to all other electrodes except  $D_4$

6.2 uuf

$D_4$  to all other electrodes except  $D_3$

6.2 uuf

##### RATINGS

Heater voltage

2.5 volts

Heater current

2.1  $\pm$  0.3 amp.

Anode #3 (Intensifier Electrode) voltage ( $E_{b3}$ )

8000 volts (max.)

Anode #2 (Accelerating Electrode) voltage ( $E_{b2}$ )

4000 volts (max.)

Anode #1 (Focusing Electrode) voltage ( $E_{b1}$ )

1800 volts (max.)

Grid (Control Electrode) voltage ( $E_{c1}$ )

Never positive

Grid Circuit Resistance

1.5 meg. (max.)

Impedance of any deflecting electrode circuit  
at heater supply frequency

1.0 meg. (max.)

## TYPICAL OPERATION

|                                                                         |      |      |                            |
|-------------------------------------------------------------------------|------|------|----------------------------|
| Heater voltage                                                          | 2.5  | 2.5  | volts                      |
| Anode #3 voltage ( $E_{b3}$ )                                           | 4000 | 8000 | volts                      |
| Anode #2 voltage ( $E_{b2}$ )                                           | 2000 | 4000 | volts                      |
| Anode #1 voltage ( $E_{b1}$ ) for focus when<br>$E_{c1} = 75\%$ cut-off | 500  | 1000 | volts $\pm 20\%$           |
| Grid voltage ( $E_{c1}$ ) for beam cut-off                              | -40  | -80  | volts $\pm 50\%$           |
| Deflection Factor:                                                      |      |      |                            |
| $D_1D_2$ Plates                                                         | 55   | 110  | d.c. volts/inch $\pm 20\%$ |
| $D_3D_4$ Plates                                                         | 55   | 110  | d.c. volts/inch $\pm 20\%$ |
| Deflection Sensitivity:                                                 |      |      |                            |
| $D_1D_2$ Plates                                                         | 0.46 | 0.23 | mm/d.c. volt (av.)         |
| $D_3D_4$ Plates                                                         | 0.46 | 0.23 | mm/d.c. volt (av.)         |

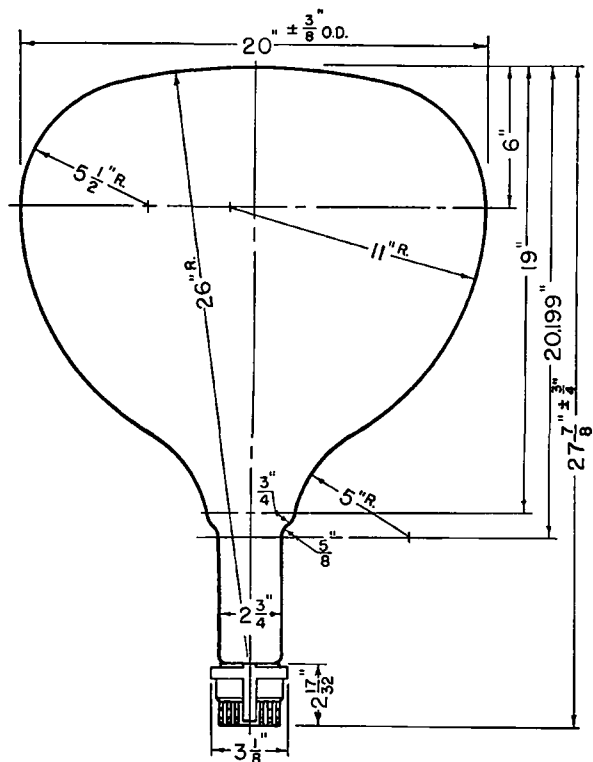
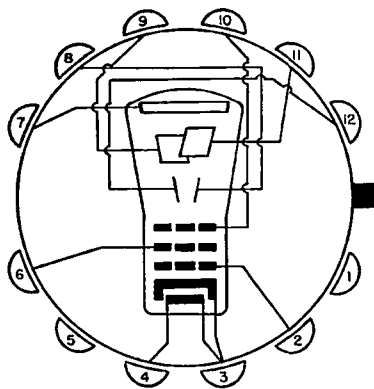
### Deflection with Intensifier at Second Anode Potential

|                               | FACTOR                           | SENSITIVITY                  |
|-------------------------------|----------------------------------|------------------------------|
| D <sub>1</sub> D <sub>2</sub> | 22 d.c. volts/kv. in. $\pm 20\%$ | 0.12 mm. kv./d.c. volt (av.) |
| D <sub>3</sub> D <sub>4</sub> | 18 d.c. volts/kv. in. $\pm 20\%$ | 0.14 mm. kv./d.c. volt (av.) |

## SPECIAL INSTALLATION NOTES

The 20AP type Cathode-Ray Tubes are mechanically capable of withstanding shocks encountered in ordinary handling and room temperature variations. Because of its large evacuated volume, the glass bulb is under considerable strain due to atmospheric pressure, and the tube must be protected from hard bumps and extreme, sudden changes in temperature. Care should also be taken to avoid scratching the glass bulb since such scratches weaken the glass. It is suggested that a piece of plate glass be placed before the screen on the tube when mounted in television receivers, to protect it from accidental shocks.

The base of the 20AP types fits a twelve-contact socket which can be supported by the base of the cathode-ray tube. The tube may be mounted in any position. One convenient horizontal mounting consists of a rubber block supporting the neck of the bulb, the screen end resting on a padded support, and the socket supported by the base of the tube itself.



Bottom View of Base

- |        |                        |
|--------|------------------------|
| Pin #1 | No Connection          |
| 2      | Control Electrode      |
| 3      | Heater & Cathode       |
| 4      | Heater                 |
| 5      | No Connection          |
| 6      | Focusing Electrode     |
| 7      | Intensifier Electrode  |
| 8      | Deflection Plate $D_4$ |
| 9      | Deflection Plate $D_2$ |
| 10     | Accelerating Electrode |
| 11     | Deflection Plate $D_1$ |
| 12     | Deflection Plate $D_3$ |

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