

## Vertical-Deflection Oscillator and Amplifier

For operation in a 525-line, 30-frame system

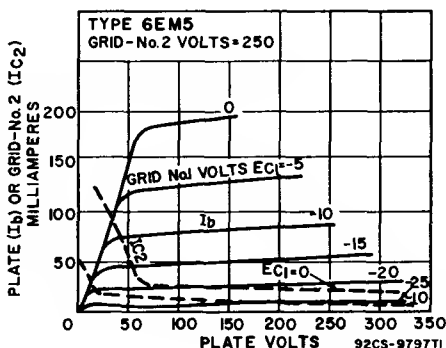
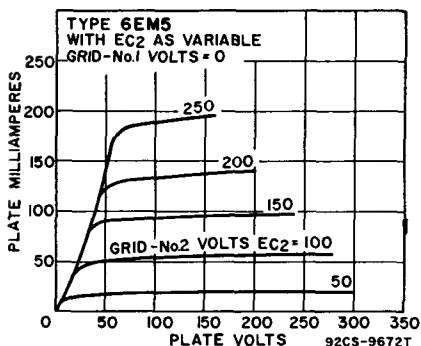
## MAXIMUM RATINGS (Design-Center Values)

|                                                       |                   |       |
|-------------------------------------------------------|-------------------|-------|
| DC Plate Voltage                                      | 315               | volts |
| Peak Positive-Pulse Plate Voltage# (Absolute Maximum) | 2200 <sup>A</sup> | volts |
| Grid-No.2 (Screen-Grid) Voltage                       | 285               | volts |
| Peak Negative-Pulse Grid-No.1 (Control-Grid) Voltage  | 250               | volts |
| Peak Cathode Current                                  | 210               | mA    |
| Average Cathode Current                               | 60                | mA    |
| Plate Dissipation                                     | 10                | watts |
| Grid-No.2 Input                                       | 1.5               | watts |
| Bulb Temperature (At hottest point)                   | 250               | °C    |

## MAXIMUM CIRCUIT VALUE

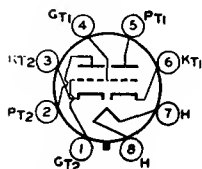
|                              |     |         |
|------------------------------|-----|---------|
| Grid-No.1-Circuit Resistance | 2.2 | megohms |
|------------------------------|-----|---------|

# Pulse duration must not exceed 15% of a vertical scanning cycle (2.5 milliseconds).

<sup>A</sup> Under no circumstances should this absolute value be exceeded.

Refer to chart at end of section.  
For replacement use type 6EM7/6EA7.

6EM7



## DUAL TRIODE

Glass octal type used as combined vertical-deflection amplifier and vertical-deflection oscillator in color and black-and-white television receivers. Outlines section, 13A; requires octal socket. For curve of average plate characteristics, Unit No.1, refer to type 6DR7 (Unit No.1). Types 10EM7, and 13EM7/15EA7 are identical with type 6EM7/6EA7 except for heater ratings.

## 6EM7/6EA7

10EM7,  
13EM7/15EA7

| Heater Voltage (ac/dc)                        | 6EM7/6EA7 | 10EM7     | 13EM7/15EA7 |         |
|-----------------------------------------------|-----------|-----------|-------------|---------|
| Heater Current                                | 6.3       | 9.7       | 13          | volts   |
| Heater Warm-up Time (Average)                 | 0.925     | 0.6       | 0.45        | seconds |
| Heater-Cathode Voltage:                       |           |           |             |         |
| Peak value                                    | ±200 max  | ±200 max  | ±200 max    | volts   |
| Average value                                 | 100 max   | 100 max   | 100 max     | volts   |
| Direct Interelectrode Capacitances (Approx.): | Unit No.1 | Unit No.2 |             |         |
| Grid to Plate                                 | 4.8       | 10        |             | pF      |
| Grid to Cathode and Heater                    | 2.2       | 7         |             | pF      |
| Plate to Cathode and Heater                   | 0.6       | 1.8       |             | pF      |

Class A<sub>1</sub> Amplifier

## CHARACTERISTICS

|                                                                    | Unit No.1 | Unit No.2 |            |
|--------------------------------------------------------------------|-----------|-----------|------------|
| Plate Voltage                                                      | 250       | 150       | volts      |
| Grid Voltage                                                       | -3        | -20       | volts      |
| Amplification Factor                                               | 64        | 5.4       |            |
| Plate Resistance (Approx.)                                         | 40000     | 750       | ohms       |
| Transconductance                                                   | 1600      | 7200      | $\mu$ mhos |
| Plate Current                                                      | 1.4       | 50        | mA         |
| Plate Current, for plate voltage of 60 volts and zero grid voltage | —         | 95        | mA         |
| Plate Current, for grid voltage of -28 volts                       | —         | 10        | mA         |
| Grid Voltage (Approx.):                                            |           |           |            |
| For plate current of 10 $\mu$ A                                    | -5.5      | —         | volts      |
| For plate current of 100 $\mu$ A                                   | —         | -45       | volts      |

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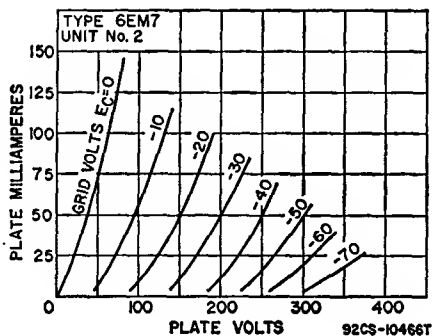
## MAXIMUM RATINGS (Design-Maximum Values)

|                                    | Unit No.1<br>Oscillator | Unit No.2<br>Amplifier |       |
|------------------------------------|-------------------------|------------------------|-------|
| DC Plate Voltage                   | 330                     | 330                    | volts |
| Peak Positive-Pulse Plate Voltage# | —                       | 1500                   | volts |
| Peak Negative-Pulse Grid Voltage   | 400                     | 250                    | volts |
| Peak Cathode Current               | 77                      | 175                    | mA    |
| Average Cathode Current            | 22                      | 50                     | mA    |
| Plate Dissipation                  | 1.5                     | 10                     | watts |

## MAXIMUM CIRCUIT VALUES

|                                  |     |     |         |
|----------------------------------|-----|-----|---------|
| Grid-Circuit Resistance:         |     |     |         |
| For grid-resistor-bias operation | 2.2 | 2.2 | megohms |
| For cathode-bias operation       | 2.2 | 2.2 | megohms |

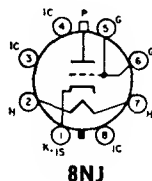
# Pulse duration must not exceed 15% of a vertical scanning cycle (2.5 milliseconds).



## 6EN4

SHARP-CUTOFF  
BEAM TRIODE

Glass octal type used as a shunt voltage-regulator tube in the high-voltage power supply of color television receivers. Outlines section, 21B; requires octal socket. Socket terminals 3, 4, and 8 should not be used as tie points. For high voltage and X-ray safety considerations, refer to page 93.



|                                                |           |        |
|------------------------------------------------|-----------|--------|
| Heater Voltage (ac/dc)                         | 6.3       | volts  |
| Heater Current                                 | 0.2       | ampere |
| Peak Heater-Cathode Voltage                    | —450* max | volts  |
| Direct Interelectrode Capacitances (Approx.):† |           |        |
| Grid to Plate                                  | 1         | pF     |
| Plate to Cathode and Heater                    | 2.6       | pF     |
| Grid to Cathode and Heater                     | 1         | pF     |