

### FULL-WAVE VACUUM RECTIFIER TYPES 6X4 AND 12X4

The 6X4 and 12X4 are 7-pin miniature full-wave rectifiers designed for service in compact power supplies such as automobile and ac-operated radio receivers. Like all power handling tubes, they should be adequately ventilated.

#### GENERAL DATA

##### ELECTRICAL:

|                          |                     |      |        |
|--------------------------|---------------------|------|--------|
| Cathode.....             | Coated Unipotential |      |        |
| Heater:                  | 6X4                 | 12X4 |        |
| Voltage (ac or dc) ..... | 6.3                 | 12.6 | Volts  |
| Current .....            | 0.6                 | 0.3  | Ampere |

##### MECHANICAL:

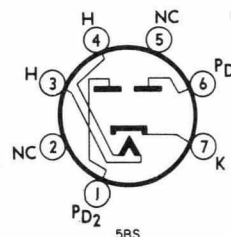
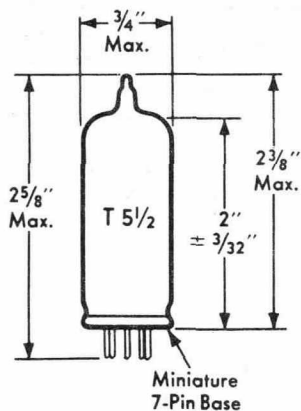
|                         |                              |
|-------------------------|------------------------------|
| Bulb .....              | T-5-1/2                      |
| Base .....              | Miniature 7-Pin (JETEC E7-1) |
| Outline .....           | 5-3                          |
| Basing .....            | 5BS                          |
| Mounting Position ..... | Any                          |

#### RECTIFIER SERVICE\*

##### MAXIMUM RATINGS:

##### Design-Center Values

|                                          |                    |         |
|------------------------------------------|--------------------|---------|
| Peak Inverse Plate Voltage .....         | 1250 max.          | Volts   |
| AC Plate-Supply Voltage per Plate .....  | See Rating Chart 1 |         |
| Steady-State Peak Plate:                 |                    |         |
| Current per Plate .....                  | 245 max.           | Ma.     |
| Transient Peak Plate Current per Plate:  |                    |         |
| Max. Duration 0.2 Second .....           | 1.1 max.           | Ampere  |
| DC Output Current .....                  | See Rating Chart 1 |         |
| Vibrator Operation:                      |                    |         |
| Duty Cycle .....                         | 75 min.            | Percent |
| DC Output Voltage .....                  | 350 max.           | Volts   |
| DC Output Current (per plate) .....      | 45 max.            | Ma.     |
| Heater-Cathode Voltage:                  |                    |         |
| Heater Negative with Respect to Cathode: |                    |         |
| DC Component .....                       | 450 max.           | Volts   |
| Total DC + Peak .....                    | 450 max.           | Volts   |
| Heater Positive with Respect to Cathode: |                    |         |
| DC Component .....                       | 100 max.           | Volts   |
| Total DC + Peak .....                    | 200 max.           | Volts   |



## TYPICAL OPERATION:

## Full-Wave Rectifier

| AC Plate Supply Voltage:                | Input to Filter |       |        |
|-----------------------------------------|-----------------|-------|--------|
|                                         | Capacitor       | Choke |        |
| Each Plate (RMS) . . . . .              | 325             | 450   | Volts  |
| Filter Input Capacitor . . . . .        | 10              | -     | uf     |
| Filter Input Choke . . . . .            | -               | 10    | Henrys |
| Total Plate-Supply Resistance per Plate | 525             | -     | Ohms   |
| DC Output Current . . . . .             | 70              | 70    | Ma.    |
| DC Output Voltage at Filter Input:      |                 |       |        |
| For DC Output Current of 35 Ma. . . . . | 365             | 395   | Volts  |
| For DC Output Current of 70 Ma. . . . . | 310             | 385   | Volts  |
| Tube Voltage Drop:                      |                 |       |        |
| $I_b = 70$ Ma. Each Plate . . . . .     |                 | 22    | Volts  |

\* For use with sinusoidal supply voltages within the frequency range of 25 to 1000 cycles per second.

## RATING CHARTS AND OPERATION CHARACTERISTICS:

The application of maximum ratings to practical circuit design is clarified by the use of Rating Charts I, II, III. These charts present limiting conditions beyond which operation of the 12X4 is not permitted. The charts together with laboratory measurements provide analysis of rectifier circuit operation.

The maximum ratings for ac plate supply voltage and dc output current are inter-dependent, and they are related to the type of filter circuit. The boundaries in Chart I for capacitor-input and for choke-input operation are based on limits of supply voltage, output current and plate dissipation. With capacitor-input filter, operation is permissible within the area bounded by points FAEDG; with choke-input filter, operation is permissible within the area bounded by points FABCDG.

Chart II defines the permissible area of operation based on the maximum steady-state peak plate current. The rectification efficiency is defined

$$\text{Rectification Efficiency} = \frac{\bar{E}}{\sqrt{2} E_s}$$

where  $\bar{E}$  is the dc output voltage at input to filter and  $E_s$  is the rms plate supply voltage per plate.

Chart III defines the minimum value of effective plate-supply resistance per plate for specific plate supply voltages such that the transient peak plate current per plate will be within the required maximum rating. This resistance consists of

$$R_s = N R_{PRI} + R_{SEC} + R_A$$

$N$  = voltage step-up ratio of plate transformer

$R_{PRI}$  = dc resistance of transformer primary

$R_{SEC}$  = average dc resistance of each transformer secondary winding

$R_A$  = dc resistance of added series resistance per plate

In these considerations, dc output voltage is measured at the input to the filter, and plate supply voltage is measured under no-load conditions.

