

RCA Radiotron

UX-120

POWER AMPLIFIER



The '20 is a three-electrode, high-vacuum, power amplifier tube designed for operation from dry-cells. It is intended for use in the last audio stage of dry-battery-operated receivers using the '99 and/or '22.

CHARACTERISTICS

| | | |
|----------------------------------|-------------|--------------------|
| FILAMENT VOLTAGE (D. C.) | 3.0-3.3 | Volts |
| FILAMENT CURRENT | 0.125-0.132 | Ampere |
| PLATE VOLTAGE | 90 | 135 <i>max.</i> |
| GRID VOLTAGE | -16.5 | -22.5 |
| PLATE CURRENT | 3.0 | 6.5 |
| PLATE RESISTANCE | 8000 | 6300 |
| AMPLIFICATION FACTOR | 3.3 | 3.3 |
| MUTUAL CONDUCTANCE | 415 | 525 |
| LOAD RESISTANCE | 9600 | 6500 |
| UNDISTORTED POWER OUTPUT | 45 | 110 |
| GRID-PLATE CAPACITANCE | 4.1 | $\mu\text{f.}$ |
| GRID-FILAMENT CAPACITANCE | 2.0 | $\mu\text{f.}$ |
| PLATE-FILAMENT CAPACITANCE | 2.3 | $\mu\text{f.}$ |
| MAXIMUM OVERALL LENGTH | | 4 $\frac{1}{8}$ " |
| MAXIMUM DIAMETER | | 1 $\frac{3}{16}$ " |
| BULB (See page 42, Fig. 1) | | T-8 |
| BASE | | Small 4-Pin |

INSTALLATION

The **base** pins of the '20 fit the standard four-contact socket. The socket should be installed to operate the tube in a vertical position. For socket connections, see page 39, Fig. 1.

The **filament** in this tube is designed for operation with three No. 6 dry-cells connected in series. In multi-tube receivers the use of six or nine No. 6 dry-cells connected in series-parallel to give 4.5 volts will decrease the current drain per cell and give a more stable source of filament power. If storage battery operation is preferred, a four-volt storage battery may be used. In any case, a filament rheostat should be provided to maintain the voltage applied to the filament within the stated range.

APPLICATION

For **power amplifier** service, the '20 will give greatest power output when operated at a plate voltage of 135 volts and the corresponding grid bias of -22.5 volts. At 90 volts on the plate and with a corresponding grid bias of -16.5 volts, good quality of reproduction may be obtained at a lower level of power output.

In receivers employing tubes of the 3.3 volt filament type, the use of the '20 in the output stage will be found desirable.



RCA Radiotron

UY-224-A

SCREEN GRID RADIO-FREQUENCY AMPLIFIER

The '24-A is a screen grid amplifier tube containing a 2.5 volt uni-potential heater-cathode which permits operation from alternating current. This tube is recommended for use primarily as a radio-frequency amplifier in carefully shielded circuits especially designed for it. The '24-A may also be used as a screen grid detector or audio amplifier.

CHARACTERISTICS

| | | |
|-----------------------------------|---------------------------|---------------------------------------|
| HEATER VOLTAGE (A. C. or D. C.) | 2.5 | Volts |
| HEATER CURRENT | 1.75 | Amperes |
| PLATE VOLTAGE* | 180 250 | Volts |
| GRID VOLTAGE | -3 | Volts |
| SCREEN VOLTAGE | 90 90 max. | Volts |
| PLATE CURRENT | 4 | Milliamperes |
| SCREEN CURRENT | Not over $\frac{1}{3}$ of | plate current |
| PLATE RESISTANCE | 400000 600000 | Ohms |
| AMPLIFICATION FACTOR | 400 615 | |
| MUTUAL CONDUCTANCE | 1000 1025 | Micromhos |
| EFFECTIVE GRID-PLATE CAPACITANCE. | 0.01 maximum | $\mu\text{f.}$ |
| INPUT CAPACITANCE | 5.0 | $\mu\text{f.}$ |
| OUTPUT CAPACITANCE | 10.0 | $\mu\text{f.}$ |
| OVERALL LENGTH | | $4\frac{25}{32}"$ to $5\frac{1}{32}"$ |
| MAXIMUM DIAMETER | | $1\frac{13}{16}"$ |
| BULB (See page 42, Fig. 11) | | S-14 |
| CAP | | Small Metal |
| BASE | | Medium 5-Pin |

* Maximum plate voltage = 275 volts.

INSTALLATION

The base pins of the '24-A fit the standard five-contact socket. The socket may be installed to operate the tube in any position. For socket connections, see page 39, Fig. 9.

The heater of the '24-A is intended for operation from a 2.5 volt winding of the power transformer. The voltage applied to the heater terminals should be the rated value of 2.5 volts under conditions of operating load and average line voltage.

The cathode connection to the heater should be made (1) to the movable arm of a potentiometer connected across the heater winding of the power transformer, or (2) to a mid-tapped resistor across the heater winding, or (3) to the mid-point of the heater winding itself. Recommended practice is to have no voltage difference between heater and cathode. If this practice is not followed, the heater may be made negative by not more than 45 volts.

The positive screen voltage for the '24-A may be obtained from a fixed or variable tap on a voltage divider across the high voltage supply, or across a portion of the supply.

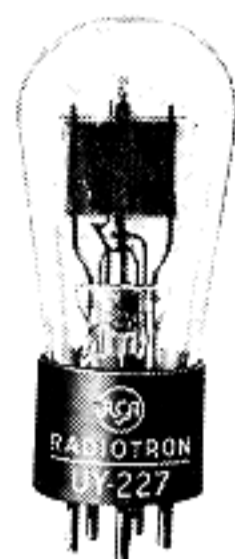
Complete shielding in all stages of the circuit is necessary if maximum gain per stage is to be obtained.

RCA Radiotron

UY-227

DETECTOR, AMPLIFIER

The '27 is a three-electrode general purpose tube containing a 2.5 volt heater-cathode of the equi-potential type which permits operation from alternating current.



CHARACTERISTICS

| | | | | | |
|---------------------------------|-------|------|-------|------|-------------------|
| HEATER VOLTAGE (A. C. or D. C.) | 2.5 | | | | Volts |
| HEATER CURRENT | 1.75 | | | | Amperes |
| PLATE VOLTAGE* | 90 | 135 | 180 | 250 | Volts |
| GRID VOLTAGE | -6 | -9 | -13.5 | -21 | Volts |
| PLATE CURRENT | 2.7 | 4.5 | 5.0 | 5.2 | Milliamperes |
| PLATE RESISTANCE | 11000 | 9000 | 9000 | 9250 | Ohms |
| AMPLIFICATION FACTOR | 9 | 9 | 9 | 9 | |
| MUTUAL CONDUCTANCE | 820 | 1000 | 1000 | 975 | Micromhos |
| GRID-PLATE CAPACITANCE | 3.3 | | | | $\mu\text{mf.}$ |
| GRID-CATHODE CAPACITANCE | 3.5 | | | | $\mu\text{mf.}$ |
| PLATE-CATHODE CAPACITANCE | 3.0 | | | | $\mu\text{mf.}$ |
| MAXIMUM OVERALL LENGTH | | | | | $4\frac{11}{16}"$ |
| MAXIMUM DIAMETER | | | | | $1\frac{13}{16}"$ |
| BULB (See page 42, Fig. 8) | | | | | S-14 |
| BASE | | | | | Medium 5-Pin |

* Maximum plate voltage = 275 volts.

INSTALLATION

The base pins of the '27 fit the standard five-contact socket. The socket may be mounted to hold the tube in any position. For socket connections, see page 39, Fig. 8.

The heater of the '27 is intended for operation from a 2.5 volt winding of the power transformer. The voltage applied to the heater terminals should be the rated value of 2.5 volts under conditions of operation and average line voltage.

The cathode connection to the heater should be made (1) to the movable arm of a potentiometer connected across the heater winding of the power transformer, or (2) to a mid-tapped resistor across the heater winding, or (3) to the mid-point of the heater winding itself. Recommended practice is to have no potential difference between heater and cathode. If this practice is not followed, the heater may be biased preferably negative, but allowably positive, with respect to the cathode by not more than 45 volts.

APPLICATION

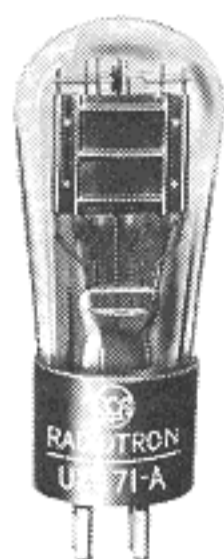
As an amplifier, the '27 is applicable to the audio or the radio-frequency stages of a receiver. Recommended plate and grid voltages are shown under CHARACTERISTICS.

As a detector, the '27 may be operated either with grid leak and condenser or with grid bias. The recommended plate voltage for grid leak and condenser detections is 45 volts (see page 16). A grid leak of from 1 to 5 megohms used with a grid condenser of $0.00025\mu\text{f.}$ is suitable. For grid bias detection, a plate voltage of 250 volts or less may be used. The corresponding grid bias should be adjusted so that the plate current when no signal is being received is approximately 0.2 milliamperes. For the conditions of 250 volts on plate and transformer coupling, the grid bias will be approximately -30 volts.

RCA Radiotron

UX-171-A

POWER AMPLIFIER



The '71-A is a power amplifier tube of low output impedance for use in the output stage of audio-frequency amplifiers.

CHARACTERISTICS

| | | |
|----------------------------|------------------------|--------------------|
| FILAMENT VOLTAGE (D. C.) | 5.0 | Volts |
| FILAMENT CURRENT | 0.25 | Ampere |
| PLATE VOLTAGE | 90 135 180 <i>max.</i> | Volts |
| GRID VOLTAGE* | -16.5 -27 -40.5 | Volts |
| PLATE CURRENT | 12 17.5 20 | Milliamperes |
| PLATE RESISTANCE | 2250 1960 1850 | Ohms |
| AMPLIFICATION FACTOR | 3 3 3 | |
| MUTUAL CONDUCTANCE | 1330 1520 1620 | Micromhos |
| LOAD RESISTANCE | 3200 3500 5350 | Ohms |
| UNDISTORTED POWER OUTPUT | 125 370 700 | Milliwatts |
| GRID-PLATE CAPACITANCE | 7.4 | $\mu\text{f.}$ |
| GRID-FILAMENT CAPACITANCE | 3.7 | $\mu\text{f.}$ |
| PLATE-FILAMENT CAPACITANCE | 2.1 | $\mu\text{f.}$ |
| MAXIMUM OVERALL LENGTH | | $4\frac{11}{16}$ " |
| MAXIMUM DIAMETER | | $1\frac{13}{16}$ " |
| BULB (See page 42, Fig. 8) | | S-14 |
| BASE | | Medium 4-Pin |

* For operation on a-c filament supply, increase grid bias voltage 2.5 volts.

INSTALLATION

The base pins of this tube fit the standard four-contact socket. The socket should be installed so that the tube will operate in a vertical position. For socket connections, see page 39, Fig. 1.

The coated filament of the '71-A may be operated from a storage battery or from the a-c line through a step-down transformer. For operation of this tube from a storage battery, a fixed or variable resistor of suitable value is required to reduce the battery voltage to 5.0 volts across the filament terminals at the socket. Most satisfactory operating performance of the tube will be obtained at the rated filament voltage.

APPLICATION

Operating conditions are given under CHARACTERISTICS for the use of this tube in the power output stage. With a d-c filament supply, the grid and the plate return should be made to the negative filament terminal.

For a-c filament supply, the plate and the grid return should be brought either to a mid-tapped resistor of 20 to 40 ohms across the filament winding, or to a mid-tap of the filament winding. To prevent overloading and distortion, the recommended negative grid bias should always be used.

Grid bias for the '71-A may be obtained from a C-battery or by means of the voltage drop in a resistor connected in the negative plate return lead. This second method is known as the self-biasing method, since the plate current determines the



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UX-280

FULL-WAVE RECTIFIER

The '80 is a full-wave rectifying tube intended for use in d-c power supply devices which operate from the a-c supply line.

CHARACTERISTICS

| | | |
|----------------------------------|-----------------|----------------------------------|
| FILAMENT VOLTAGE (A. C.) | 5.0 | Volts |
| FILAMENT CURRENT | 2.0 | Amperes |
| 1 { A-C VOLTAGE PER PLATE (RMS) | 350 | Volts |
| { D-C OUTPUT CURRENT | 125 <i>max.</i> | Milliamperes |
| 2 { A-C VOLTAGE PER PLATE (RMS) | 400 <i>max.</i> | Volts |
| { D-C OUTPUT CURRENT | 110 <i>max.</i> | Milliamperes |
| 3* { A-C VOLTAGE PER PLATE (RMS) | 550 <i>max.</i> | Volts |
| { D-C OUTPUT CURRENT | 135 <i>max.</i> | Milliamperes |
| MAXIMUM OVERALL LENGTH | | 5 ⁵ / ₈ " |
| MAXIMUM DIAMETER | | 2 ³ / ₁₆ " |
| BULB (See page 42, Fig. 10) | | S-17 |
| BASE | | Medium 4-Pin |

* This rating is permissible only with filter circuits having an input choke of at least 20 henries.

INSTALLATION

The base pins of the '80 fit the standard four-contact socket which should be mounted preferably to hold the tube in a vertical position. If it is necessary to place the tube in a horizontal position, the socket should be mounted with both of the filament pin openings, either at the top or at the bottom. This precaution locates the filament plane vertical for most satisfactory performance. For socket connections, see page 39, Fig. 2. Provision should be made for free circulation of air around the bulb since it becomes quite hot during operation.

The coated filament of the '80 is designed to operate from the a-c line through a step-down transformer. The voltage applied to the filament terminals should be the rated value of 5.0 volts under operating conditions and average line voltage.

The approximate d-c output voltage of the '80 for various values of a-c input voltages may be obtained from the curves. For the d-c voltage available at the radio set, it is necessary to subtract the voltage drop across the filter from the value read from the curves.

The filter may be of either the condenser-input or choke-input type. If an input condenser is used, consideration must be given to the instantaneous peak value of the a-c input voltage. The peak value is about 1.4 times the RMS value as measured by most a-c voltmeters. Filter condensers, therefore, especially the input condenser, should have a rating high enough to withstand the instantaneous peak value, if breakdown is to be avoided. When the input-choke method is used, the available d-c output voltage will be somewhat lower than with the input-condenser method for a given a-c plate voltage. However, improved regulation together with lower peak current will be obtained.

APPLICATION

As a full-wave rectifier, the '80 may be operated with condenser-input or choke-input filter under conditions not to exceed the ratings given under CHARACTERISTICS.

As a half-wave rectifier, two '80's may be operated in a full-wave circuit with reasonable serviceability to deliver more d-c output current than can be obtained from one tube. For this use, the plates of each '80 are tied together at the socket. The allowable voltage and load conditions per tube are the same as for full-wave service.