

EITEL-McCULLOUGH, Inc.

SAN BRUNO, CALIFORNIA

RX21A

MERCURY
VAPOR
RECTIFIER

The Eimac RX21A is a half-wave mercury vapor rectifier incorporating features which enable it to withstand high peak inverse voltages and to conduct at relatively low applied voltages. The shielded ribbon filament, edge-wise-wound, provides a large emission reserve and long life.

GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Coated	
Voltage	2.5 volts
Current	10 amperes
Tube Voltage Drop (approx.)	15 volts

MECHANICAL

Base ¹	Medium, 5-pin
Basing	See base connection diagram
Maximum Overall Dimensions:	
Length	8.0 inches
Diameter	2.25 inches
Net Weight	5 ounces
Shipping Weight	1 pound

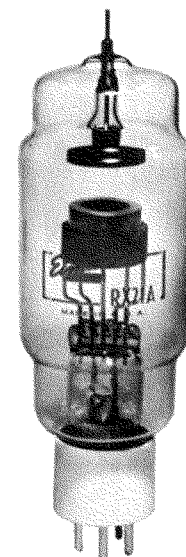
MAXIMUM RATINGS (single tube)

PEAK INVERSE ANODE VOLTAGE ²	11,000 MAX. VOLTS
PEAK ANODE CURRENT	3 MAX. AMPERES
AVERAGE ANODE CURRENT	.75 MAX. AMPERES
SUPPLY FREQUENCY	150 MAX. C. P. S.
CONDENSED-MERCURY TEMPERATURE RANGE ³	20-60 °C

¹In order to carry the ten amperes of filament current the adjacent pins have been connected in parallel within the base. Similar connections should be made in the socket.

²Temperatures in excess of 60° C limit the peak-inverse rating to 5,000 volts with a corresponding reduction in permissible RMS supply voltages to one-half those listed in the table.

³Operation at 40° plus or minus 5° C is recommended.



APPLICATION

MECHANICAL

MOUNTING—The RX21A must be mounted vertically, base down.

COOLING—Provisions should be made for adequate air circulation around the tube, because cooling is accomplished by convection. The temperature of the condensed-mercury in the RX21A should be kept within the ranges given under "MAXIMUM RATINGS". This temperature should be maintained at 40 degrees plus or minus 5 degrees C for most satisfactory operation of the tube. To measure the condensed-mercury temperature a thermocouple or small thermometer may be attached to the bulb in the area designated on the outline drawing, using a very small amount of putty. A condensed-mercury temperature lower than the recommended value raises the voltage at which the tube becomes conducting and tends to reduce the life of the filament. A temperature higher than recommended lowers the voltage at which the tube becomes conducting and tends to increase the life of the filament, but reduces the peak inverse voltage rating of the tube. When it is necessary to use a shield around the RX21A care must be taken to insure adequate ventilation and maintenance of normal condensed-mercury temperature.

ELECTRICAL

CAUTION SHOULD BE OBSERVED IN MEASURING THE FILAMENT VOLTAGE, AS THE FILAMENT CIRCUIT MAY BE AT A HIGH D-C POTENTIAL.

FILAMENT VOLTAGE—For maximum tube life, the filament voltage as measured directly at the filament pins, should be held at the rated value of 2.5 volts. Unavoidable variations in filament voltage must be kept within the range of 2.4 to 2.6 volts. A filament voltage less than the minimum recommended value may cause a high tube voltage drop, with consequent bombardment of the filament and eventual loss of emission. A filament voltage higher than the recommended maximum value will also decrease the life of the filament.

The plate-circuit return of each tube should preferably be connected to the center tap of the transformer winding supplying the filament voltage. This precaution is recommended to insure uniform starting voltage for each tube when several are used in a given circuit.

The filament of the RX21A should be allowed to reach operating temperature before the plate voltage is applied. Under normal conditions, a delay of approximately 30 seconds will be required. The delay time should be increased if there is any evidence of arc-back within the tube. In radio transmitter applications the filament should be kept at its rated voltage during "standby" periods to avoid delay due to warm-up. It is desirable to use a protective relay in the plate circuit to prevent the application of plate voltage before the filament has reached operating temperature. This relay should have a time delay adjustable up to a maximum of one minute.

When an RX21A is first installed, the filament should be operated at normal voltage for approximately ten minutes with no plate

voltage applied, in order that the mercury may be properly distributed. It will not be necessary to repeat this procedure unless the mercury is spattered on the filament and plate during subsequent handling.

SHIELDING—Electromagnetic and electrostatic fields tend to cause the mercury vapor to break down, are detrimental to tube life and make proper operation difficult. Consequently, the RX21A should be isolated from such fields as exist around a transmitter or other similar equipment. When the tubes are located in the region of such fields, shielding with adequate ventilation should be used around the tubes. R-f filtering should also be employed when the tubes are affected by r-f voltages.

FILTERING—A "choke input" filter will allow the greatest usable d-c output current to the load. When using a section of filter between rectifier and load, to prevent exceeding the maximum peak current of 3 amperes, a suitable maximum value for the first capacitor should be determined. Determination of this capacitance should be made under conditions simulating those to be used in service.

The relationship of voltage input, inductance, and capacitance is one in which a higher operating voltage requires greater input inductance, and less following capacitance to keep the peak STARTING current from exceeding 3 amperes. This is for the usual case where the supply is controlled by an on-off switch.

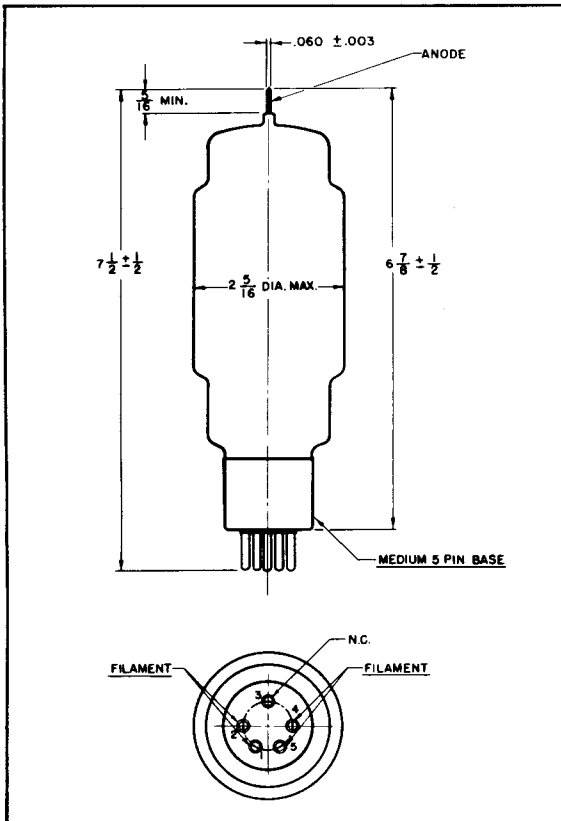
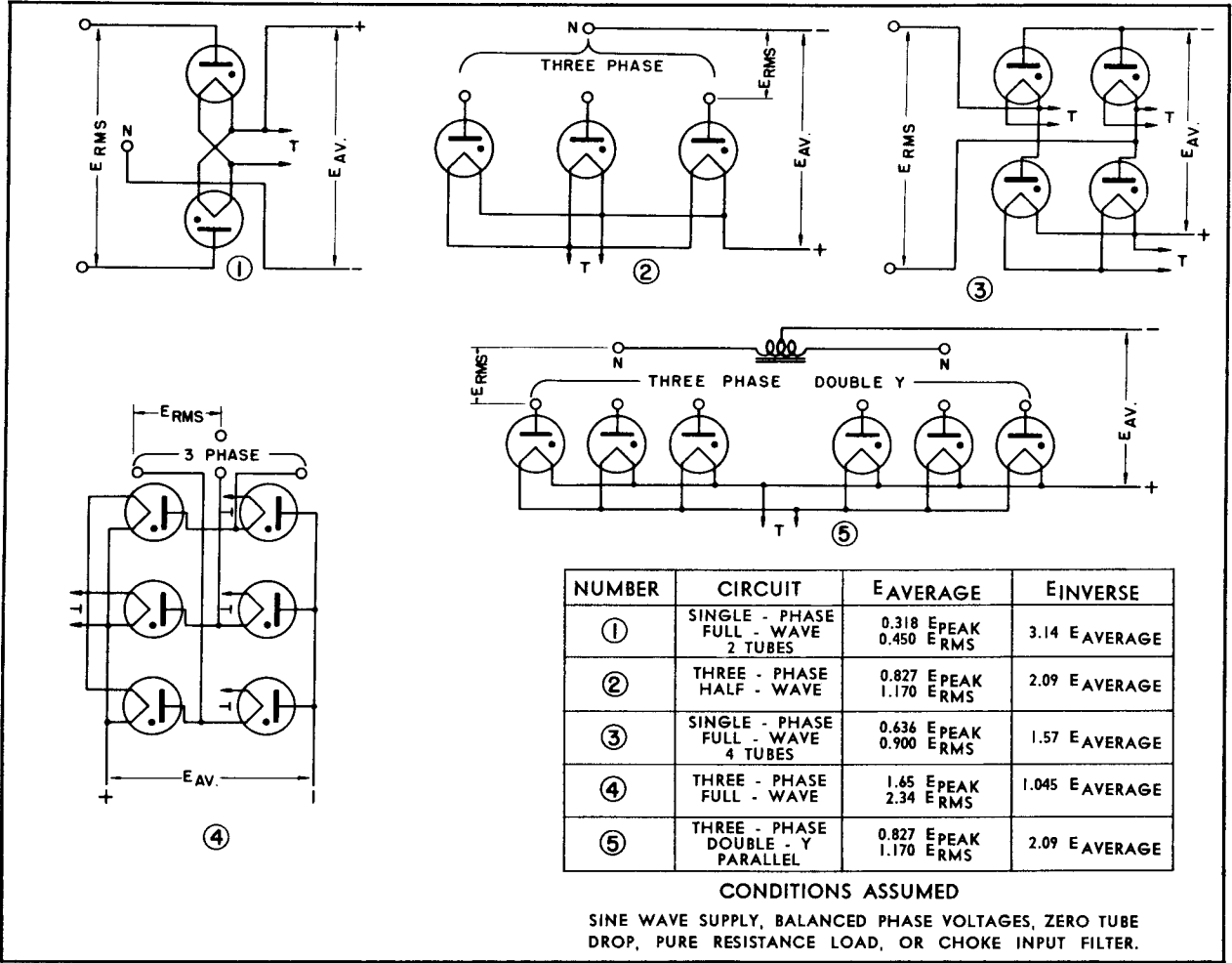
Where the rectifier plate voltage is started by a control which gradually raises the voltage from zero or a small amount to the desired operating value, starting current need not ordinarily be considered, and the characteristics of the filter may be based on preventing excessive peak current under normal operating conditions.

In the single phase circuits (1 and 3), if the current drawn by the load is reduced or varies under operating conditions to values less than approximately 70% of the indicated maximum d-c load current, a swinging (input) choke will supply the necessary additional inductance to prevent the voltage from rising, and will afford proper filtering over a much greater current range.

Where a larger value of inductance is desirable to obtain additional filtering, the subsequent capacitance may be proportionately increased to aid in still further filtering without excessive peak starting and operating current. Still lower ripple may of course be obtained by added sections of filter.

When "condenser input" filter is used, the peak current will be relatively high in respect to the usable load current, and the voltage across the capacitor may be as high as 1.4 times the nominal RMS voltage of the transformer.

For parallel operation of RX21A rectifiers, suitable resistors or small inductors may be used in series with each plate lead to permit equal loading and starting characteristics. The inductors aid in reducing the peak current, and are more desirable due to their low d-c resistance. An approximate value for suitable resistors is 50 ohms, and for inductors, approximately one-third henry each.



CIRCUIT	INPUT VOLTS* MAX. A-C (RMS)	APPROX. D-C OUTPUT VOLTS TO FILTER	MAX. D-C CURRENT OUTPUT (Amperes)
①	3890 per tube	3510	1.5
②	4490 per leg	5270	2.25
③	7780 total	7020	1.5
④	4490 per leg	10,520	2.25
⑤	4490 per leg	5270	4.5

*For use under the conditions of the 11,000 volt peak inverse rating. If the RX21A is to be used under frequency and/or temperature condition such that the peak inverse voltage is limited to 5500 volts, the a-c input voltage and d-c output voltage values in the table should be multiplied by a factor of 0.5 to give new values for the 5500 volt condition.