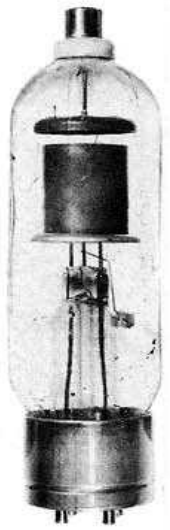
EITEL-McCULLOUGH, INC.
SAN BRUNO, CALIFORNIA

872A 872 MERCURY VAPOR RECTIFIER

The Eimac 872-A/872 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, edgewise-wound, provides a large emission reserve and long life.



GENERAL CHARACTERISTICS

ELECTRICAL

Filament: Coated		
Voltage	5.0	volts
Current	7.5	amperes
Tube Voltage Drop (approx.)	10	volts

MECHANICAL

Base	Jumbo 4-pin, RMA type A4-29	
Basing	See base connection diagram	
Maximum Overall Dimensions:		
Length	8.5	inches
Diameter	2.31	inches
Net Weight (Approx.)	8	ounces
Shipping Weight (Average)	1.5	pounds

MAXIMUM RATINGS (single tube)

PEAK INVERSE ANODE VOLTAGE[1]	10,000	MAX. VOLTS
PEAK ANODE CURRENT	5	MAX. AMPERES
AVERAGE ANODE CURRENT	1.25	MAX. AMPERES
SUPPLY FREQUENCY	150	MAX. C. P. S.
CONDENSED-MERCURY TEMPERATURE RANGE[2]	20-60	°C

[1] Temperatures 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.
[2] Operation at 40° plus or minus 5° C is recommended.

APPLICATION

MECHANICAL

MOUNTING—The 872-A/872 must be mounted vertically, base down.

COOLING—Provision should be made for adequate air circulation around the tube, because cooling is accomplished by convection. The temperature of the condensed-mercury in the 872-A/872 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 872-A/872, care must be taken to insure adequate ventilation and maintenance of normal condensed-mercury temperature.

ELECTRICAL

FILAMENT VOLTAGE—For maximum tube life, the filament voltage as measured directly at the filament pins, should be held at the rated value of 5.0 volts. Unavoidable variations in filament voltage must be kept within the range of 4.75 to 5.25 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.

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

The plate-circuit return of each tube should preferably be connected to the center tap of the transformer winding supplying the filament voltage; if this cannot be done, the return should be connected to that side of the filament to which the cathode shields are connected (pin No. 2). When the filaments of two or more tubes are connected in parallel, the filament terminals to which the cathode shields are connected should be joined. These precautions are recommended to insure uniform starting voltage for each tube when several are used in a given circuit.

The filament of the 872-A/872 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 872-A/872 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 filtering difficult. Consequently, the 872-A/872 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 5 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 5 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 872-A/872 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.

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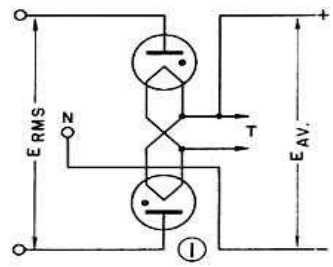
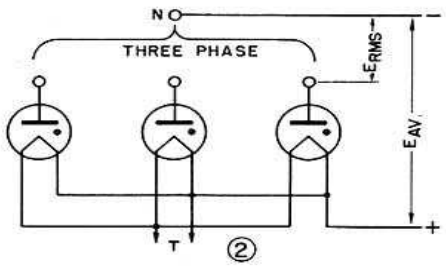
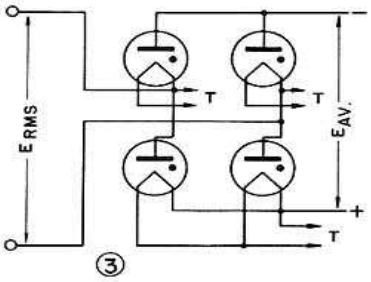
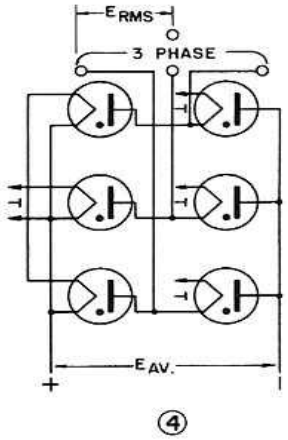
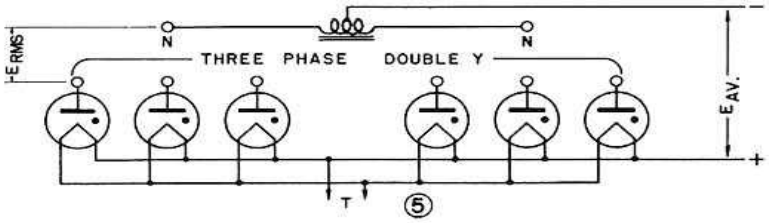






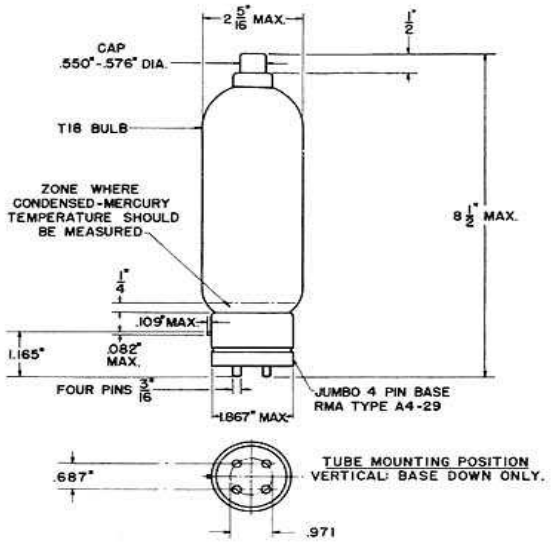




NUMBER	CIRCUIT	E AVERAGE	E INVERSE	I AVERAGE
①	SINGLE - PHASE FULL - WAVE 2 TUBES	0.318 E MAXIMUM 0.450 E RMS	3.14 E AVERAGE	0.636 I MAXIMUM
②	THREE - PHASE HALF - WAVE	0.827 E MAXIMUM 1.170 E RMS	2.09 E AVERAGE	0.827 I MAXIMUM
③	SINGLE - PHASE FULL - WAVE 4 TUBES	0.636 E MAXIMUM 0.900 E RMS	1.57 E AVERAGE	0.636 I MAXIMUM
④	THREE - PHASE FULL - WAVE	1.65 E MAXIMUM 2.34 E RMS	1.045 E AVERAGE	0.955 I MAXIMUM
⑤	THREE - PHASE DOUBLE - Y PARALLEL	0.827 E MAXIMUM 1.170 E RMS	2.09 E AVERAGE	1.91 I MAXIMUM

CONDITIONS ASSUMED

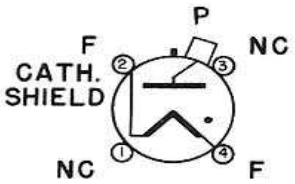
SINE WAVE SUPPLY, BALANCED PHASE VOLTAGES, ZERO TUBE DROP, PURE RESISTANCE LOAD, NO FILTER USED.



CIRCUIT	INPUT VOLTS[1] MAXIMUM A-C (RMS)	APPROX. D-C OUTPUT VOLTS TO FILTER	MAXIMUM D-C OUTPUT CURRENT AMPERES
1	3535 per tube	3180	2.5
2	4080 per leg	4780	3.75
3	7070 total	6360	2.5
4	4080 per leg	9570	3.75
5	4080 per leg	4780	7.5

[1] Max. peak inverse voltage of 10,000 volts.

BOTTOM VIEW OF SOCKET CONNECTIONS



PIN 1 - NO CONNECTION
PIN 2 - FILAMENT, CATHODE SHIELD
PIN 3 - NO CONNECTION
PIN 4 - FILAMENT
CAP - PLATE
• - GAS TYPE TUBE