EITEL-McCULLOUGH, INC.
SAN CARLOS, CALIFORNIA

# 8242
# 3W5000A3

**MEDIUM-MU POWER TRIODE**

The Eimac 8242/3W5000A3 is a water-cooled, medium-mu power triode intended for amplier, oscillator or modulator service. It has a maximum plate dissipation rating of 5000 watts and is capable of high output at relatively low plate voltages. A single 3W5000A3 will deliver a radio frequency plate power-output of 7500 watts at a plate voltage of 4000 volts.

*NOTE: The 8242/3W5000A3 is a water-cooled version of the air-cooled 8161/3X25000A3.*

The 8242/3W5000A3 should be used where water cooling is preferred and for industrial applications or installations where reserve anode dissipation is desired.


## GENERAL CHARACTERISTICS

### ELECTRICAL

| | Min. | Nom. | Max. | |
|---|---|---|---|---|
| Filament: Thoriated tungsten | | | | |
| Voltage | | 7.5 | | volts |
| Current | 49 | | 54 | amperes |
| Amplification Factor (Average) | | 20 | | |
| Direct Interelectrode Capacitances (Average) | | | | |
| Grid-Plate | 17.8 | | 24.2 | μμf |
| Grid-Filament | 29.2 | | 40.2 | μμf |
| Plate-Filament | 0.60 | | 1.20 | μμf |
| Transconductance ($I_b$=830 ma, $E_b$=3000v) | | 20,000 | | μmhos |
| Frequency for Maximum Ratings | | | 75 | mc |

### MECHANICAL

| | |
|---|---|
| Base | see drawing |
| Mounting | vertical, base down or up |
| Maximum Over-All Dimensions: | |
| Length | 12.56 inches |
| Diameter | 3.63 inches |
| Net Weight | 4.8 pounds |
| Cooling | Water and forced air |

## RADIO FREQUENCY POWER AMPLIFIER OR OSCILLATOR

(Frequencies below 75 Mc.)
Class-C FM or Telegraphy
(Key-down conditions, per tube)

MAXIMUM RATINGS

| | |
|---|---|
| D-C PLATE VOLTAGE | 6000 MAX. VOLTS |
| D-C PLATE CURRENT | 2.5 MAX. AMPS |
| PLATE DISSIPATION | 5000 MAX. WATTS |
| GRID DISSIPATION | 150 MAX. WATTS |

TYPICAL OPERATION
(Frequencies below 75 Mc., per tube)

| | | | | |
|---|---|---|---|---|
| D C Plate Voltage | 4000 | 5000 | 6000 | volts |
| D-C Plate Current | 2.5 | 2.5 | 2.08 | amps |
| D-C Grid Voltage | —300 | —450 | —500 | volts |
| D-C Grid Current | 245 | 265 | 180 | ma |
| Peak R-F Grid Input Voltage | 580 | 750 | 765 | volts |
| Driving Power (approx.) | 142 | 197 | 136 | watts |
| Grid Dissipation | 68 | 78 | 46 | watts |
| Plate Power Input | 10,000 | 12,500 | 12,500 | watts |
| Plate Dissipation | 2500 | 2500 | 2500 | watts |
| Plate Power Output | 7500 | 10,000 | 10,000 | watts |

## PLATE MODULATED RADIO FREQUENCY AMPLIFIER

(Frequencies below 75 Mc.)
Class-C Telephony
(Carrier conditions, per tube)

MAXIMUM RATINGS

| | |
|---|---|
| D-C PLATE VOLTAGE | 5000 MAX. VOLTS |
| D-C PLATE CURRENT | 2.0 MAX. AMPS |
| PLATE DISSIPATION | 3350 MAX. WATTS |
| GRID DISSIPATION | 150 MAX. WATTS |

TYPICAL OPERATION
(Frequencies below 75 Mc., per tube)

| | | | | |
|---|---|---|---|---|
| D C Plate Voltage | 4000 | 4500 | 5000 | volts |
| D-C Plate Current | 1.67 | 1.55 | 1.45 | amps |
| Total Bias Voltage | —450 | —500 | —550 | volts |
| Fixed Bias Voltage | —230 | —325 | —410 | volts |
| Grid Resistor | 1500 | 1500 | 1400 | ohms |
| D-C Grid Current | 150 | 120 | 100 | ma |
| Peak R-F Grid Input Voltage | 680 | 720 | 760 | volts |
| Driving Power (approx.) | 102 | 86 | 76 | watts |
| Grid Dissipation | 35 | 26 | 21 | watts |
| Plate Power Input | 6670 | 6970 | 7250 | watts |
| Plate Dissipation | 1670 | 1670 | 1670 | watts |
| Plate Power Output | 5000 | 5300 | 5580 | watts |

## AUDIO FREQUENCY POWER AMPLIFIER AND MODULATOR

Class B (Sinusoidal wave, two tubes unless otherwise specified)

MAXIMUM RATINGS

| | |
|---|---|
| D C PLATE VOLTAGE | 6000 MAX. VOLTS |
| MAX-SIGNAL D C PLATE CURRENT, PER TUBE | 2.5 MAX. AMPS |
| PLATE DISSIPATION, PER TUBE | 5000 MAX. WATTS |

TYPICAL OPERATION (Sinusoidal wave, two tubes unless noted)

| | | | | |
|---|---|---|---|---|
| D C Plate Voltage | 4000 | 5000 | 6000 | volts |
| D C Grid Voltage[1] | —150 | —190 | —240 | volts |
| Zero-Signal D C Plate Current | 0.6 | 0.5 | 0.4 | amps |
| Max-Signal D C Plate Current | 4.0 | 3.2 | 3.0 | amps |
| Effective Load, Plate to Plate | 2200 | 3600 | 4650 | ohms |
| Peak A-F Grid Input Voltage (per tube)* | 340 | 360 | 390 | volts |
| Max-Signal Peak Driving Power* | 340 | 230 | 225 | watts |
| Max-Signal Nominal Driving Power* | 170 | 115 | 113 | watts |
| Max-Signal Plate Output Power | 11,000 | 11,000 | 13,000 | watts |

*Approximate values.

[1]Adjust to give listed zero-signal plate current.

TYPICAL OPERATION CLASS $AB_2$ (Two Tubes)

Modulator service for 4000 and 5000 volt operation, to modulate one or two tubes, as shown under "Plate Modulated Radio Frequency Amplifier" (Page 1)

| | | | | | |
|---|---|---|---|---|---|
| D C Plate Voltage | 4000 | 5000 | 4000 | 5000 | volts |
| D C Grid Voltage (approx.)* | —155 | —200 | —145 | —190 | volts |
| Zero-Signal D C Plate Current | 0.4 | 0.4 | 0.6 | 0.5 | amps |
| Max-Signal D C Plate Current | 1.35 | 1.13 | 2.70 | 2.26 | amps |
| Effective Load, Plate to Plate | 6600 | 10,000 | 3300 | 5000 | ohms |
| Peak A-F Grid Input Voltage (per tube) | 240 | 275 | 285 | 310 | volts |
| Max-Signal Peak Driving Power | 42 | 40 | 134 | 118 | watts |
| Max-Signal Nominal Driving Power (approx.) | 21 | 20 | 67 | 59 | watts |
| Max-Signal Plate Power Output | 3700 | 4000 | 7400 | 8000 | watts |
| Will Modulate one Tube R F Final Input of | 6670 | 7250 | | | watts |
| Will Modulate two tubes R F Final Input of | | | 13,340 | 14,500 | watts |

*Adjust to give stated zero-signal plate current.

IF IT IS DESIRED TO OPERATE THIS TUBE UNDER CONDITIONS WIDELY DIFFERENT FROM THOSE GIVEN UNDER "TYPICAL OPERATION," POSSIBLY EXCEEDING THE MAXIMUM RATINGS GIVEN FOR CW SERVICE, WRITE EITEL-McCULLOUGH, INC., FOR INFORMATON AND RECOMMENDATIONS

# APPLICATION

**Cooling**— Minimum recommended water-flow rate and pressure drop values for different water-inlet temperatures and plate dissipations are tabulated on the opposite page. The outlet water temperature must not exceed a maximum of 70° C under any conditions. The inlet water pressure must not exceed a maximum of 60 pounds per square inch.

The grid-terminal contact surface and adjacent glass must be cooled by forced air. The quantity, velocity and direction must be adjusted to limit the maximum seal temperature to 175° C.

The filament stem structure also requires forced-air cooling. A minimum of 6 cubic feet per minute must be directed into the space between the inner and outer filament contacting surfaces.

Air and water flow must be started before filament power is applied and maintained for at least five minutes after the filament power has been removed.

**Filament Voltage**—The filament voltage, as measured directly at the tube, should be 7.5 volts with maximum allowable variations due to line fluctuation of from 7.12 to 7.87 volts.

**Bias Voltage**—There is little advantage in using bias voltages in excess of those given under "Typical Operation," except in certain very specialized applications. Where bias is obtained from a grid resistor, suitable protective means must be provided to prevent excessive plate dissipation in the event of loss of excitation.

**Plate Voltage** — The plate supply voltage for the 3W5000A3 should not exceed 6000 volts. In most cases there is little advantage in using plate-supply voltages higher than those given under "Typical Operation" for the power output desired.

In Class-C FM or Telegraphy service, a 0.1 henry choke, shunted by a spark gap, should be series connected between the plates of the amplifier tubes and the high voltage plate supply capacitor to offer protection from transients and surges. In plate modulated service, where a plate modulation transformer is used, the protective choke is not normally required.

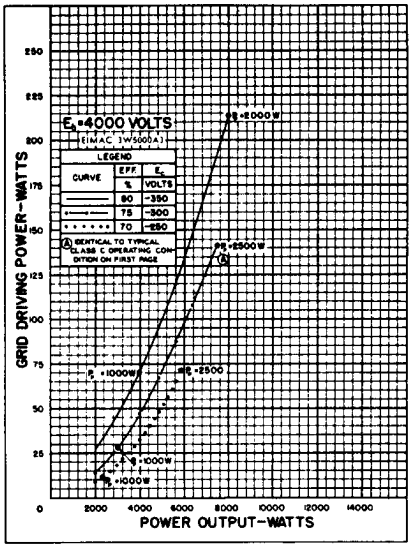
**Grid Dissipation**—The power dissipated by the grid of the 3W5000A3 must never exceed 150 watts. Grid dissipation may be calculated from the following expression

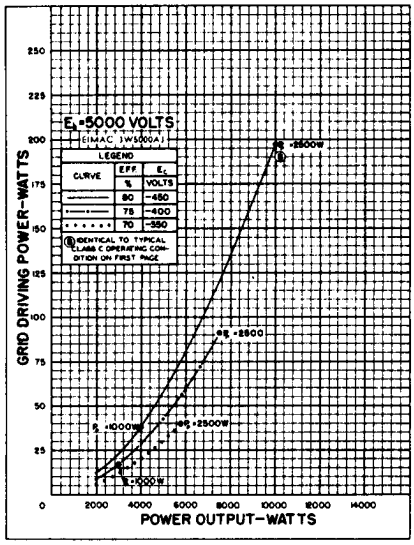
$$P_g = e_{cmp} I_c$$

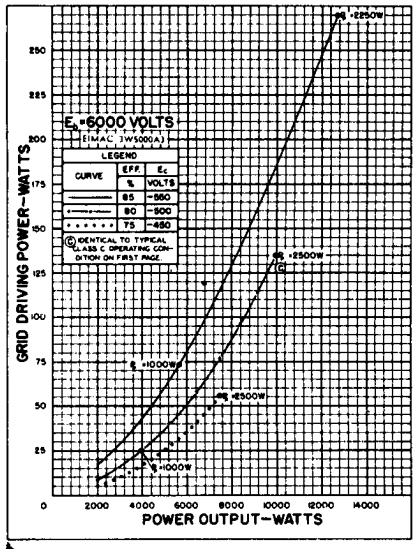
where $P_g$ = Grid dissipation,
$e_{cmp}$ = Peak positive grid voltage, and
$I_c$ = D-C grid current

$e_{cmp}$ may be measured by means of a suitable peak voltmeter connected between filament and grid. Any suitable peak v.t.v.m. circuit may be used.

In equipment in which the plate loading varies widely, such as oscillators used for radio-frequency heating, care should be taken to make certain that the grid dissipation does not exceed the maximum rating under any condition of loading.



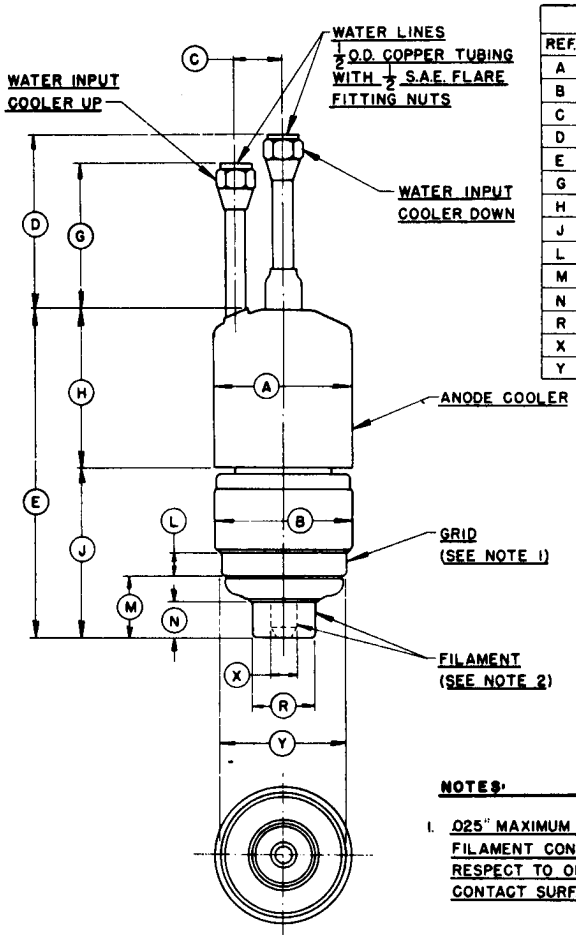




▶ Indicates change from sheet dated 10-21-59

▶ MINIMUM WATER COOLING REQUIREMENTS

| Water Inlet Temp. (°C) | Plate Dissipation | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2 KW | | 3 KW | | 4 KW | | 5 KW | |
| | Flow Rate GPM | Pressure Drop PSI | Flow Rate GPM | Pressure Drop PSI | Flow Rate GPM | Pressure Drop PSI | Flow Rate GPM | Pressure Drop PSI |
| 20 | 1.7 | 0.68 | 2.6 | 1.3 | 3.9 | 2.3 | 5.6 | 3.9 |
| 30 | 2.3 | 1.1 | 3.2 | 1.7 | 4.5 | 2.8 | 6.2 | 4.5 |
| 40 | 3.0 | 1.6 | 3.8 | 2.2 | 5.3 | 3.5 | 6.9 | 5.3 |
| 50 | 3.9 | 2.3 | 4.7 | 3.0 | 6.0 | 4.3 | 7.7 | 6.1 |



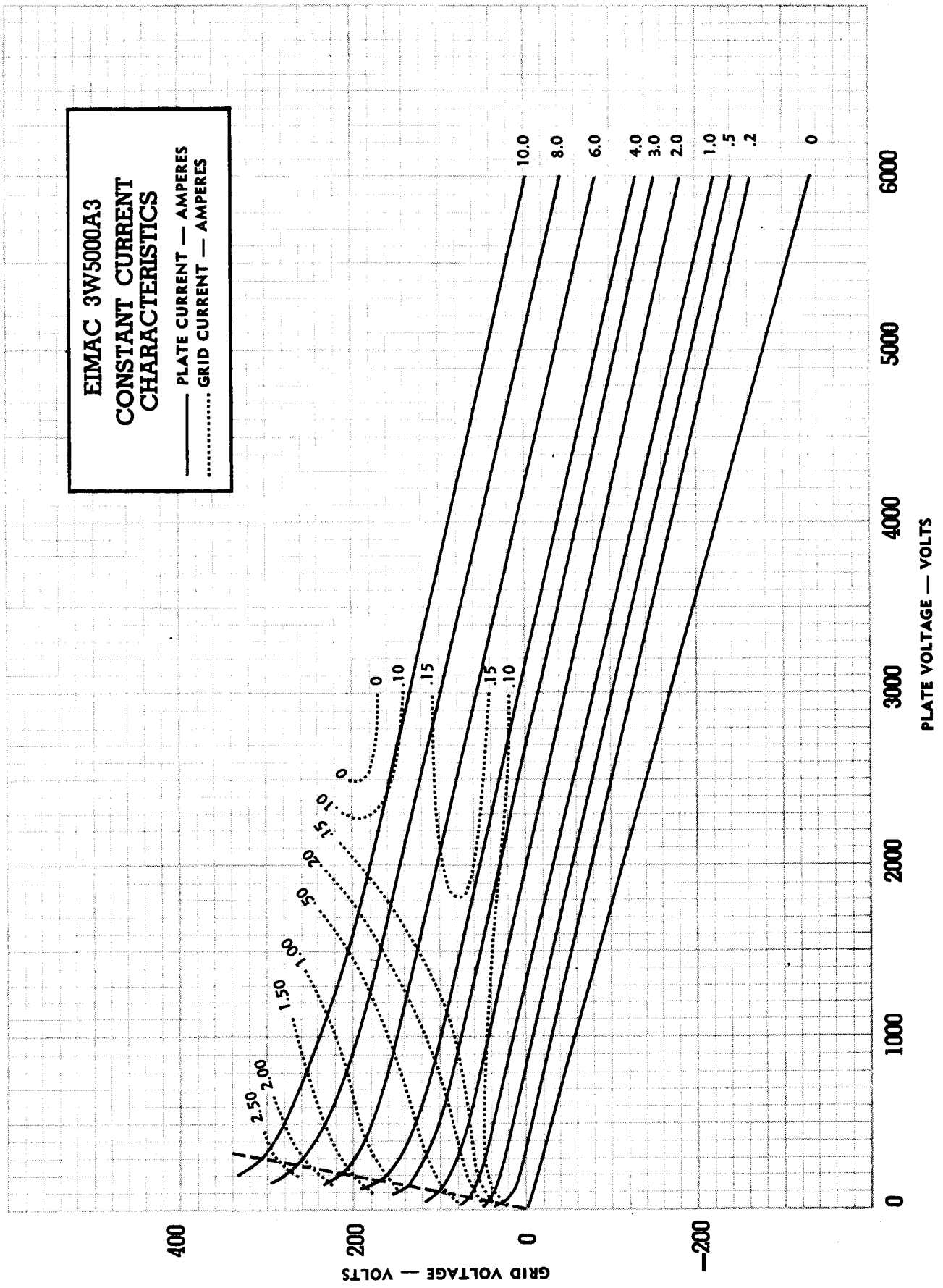

| DIMENSION DATA | | | |
|---|---|---|---|
| REF. | NOM. | MIN. | MAX. |
| A | | 3.234 | 3.266 |
| B | | | 3.625 |
| C | | 1.062 | 1.187 |
| D | | 4.000 | 4.500 |
| E | | 7.562 | 8.062 |
| G | | 3.250 | 3.750 |
| H | | 3.625 | 3.875 |
| J | | 3.937 | 4.187 |
| L | | .375 | .437 |
| M | | 1.437 | 1.562 |
| N | | .812 | .937 |
| R | | 1.490 | 1.510 |
| X | | .615 | .635 |
| Y | | 2.990 | 3.010 |

**NOTES:**

1. .025" MAXIMUM RUNOUT OF INNER FILAMENT CONTACT SURFACE WITH RESPECT TO OUTER FILAMENT CONTACT SURFACE.

## DRIVING POWER vs. POWER OUTPUT

The three charts on this page show the relationship of plate efficiency, power output and approximate grid driving power at plate voltages of 4000, 5000 and 6000 volts. These charts show combined grid and bias losses only. The driving-power and power-output figures do not include circuit losses. The plate dissipation in watts is indicated by Pp. Points A, B, and C are identical to the typical Class C operating conditions shown on the first page under 4000, 5000 and 6000 volts respectively.


EIMAC 3W5000A3
CONSTANT CURRENT CHARACTERISTICS
PLATE CURRENT — AMPERES
GRID CURRENT — AMPERES
10.0
8.0
6.0
4.0
3.0
2.0
1.0
.5
.2
0
2.50
2.00
1.50
1.00
.50
.20
.15
.10
0
.10
.15
.15
.10
0
400
200
0
—200
GRID VOLTAGE — VOLTS
0
1000
2000
3000
4000
5000
6000
PLATE VOLTAGE — VOLTS