

# ML-2C39WA

Ruggedized structure. General purpose application.

## DESCRIPTION

The **ML-2C39WA** is a ruggedized high-mu triode of planar-electrode type designed specifically for use as an oscillator, frequency multiplier or power amplifier in radio transmitting service at frequencies up to 2500 Mc.

The **ML-2C39WA** is interchangeable with the **ML-2C39A**. This tube retains the desirable high mu, high transconductance characteristics of the **ML-2C39A** together with

its low interelectrode capacitances and compact, rugged ring-seal construction.

The **ML-2C39WA** is the result of an intensive development program with respect to the proper selection and processing of tube materials, particularly with regard to the cathode, to provide improved life, reliability and stability of operation. This tube is manufactured and tested to close tolerances to insure consistent and uniform tube performance.

## GENERAL CHARACTERISTICS

### Electrical

|                                                           |        |            |
|-----------------------------------------------------------|--------|------------|
| Heater Voltage .....                                      | 6.0    | Volts†     |
| Heater Current (AC or DC) at 6.0 Volts .....              | 1.0    | Amp        |
| Heater Heating Time, minimum .....                        | 60     | secs       |
| Amplification Factor .....                                | 100    |            |
| Transconductance<br>( $I_b = 70$ mA, $E_b = 600$ v) ..... | 25,000 | $\mu$ mhos |
| Interelectrode Capacitances (without heater voltage)      |        |            |
| Grid-Plate .....                                          | 2.0    | $\mu$ f    |
| Grid-Cathode .....                                        | 6.60   | $\mu$ f    |
| Plate-Cathode, maximum .....                              | 0.035  | $\mu$ f    |
| Frequency for Maximum Ratings .....                       | 2500   | Mc         |

### Mechanical

|                                 |             |
|---------------------------------|-------------|
| Mounting Position .....         | Optional    |
| Type of Cooling .....           | Forced Air* |
| Maximum Anode Temperature ..... | 200 °C      |
| Net Weight .....                | 2.0 oz.     |

†See Application Note, page 16, for optimum heater voltage.

\*See Application Notes, page 16 and also air cooling curves, page 83.

## MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

## R-F Power Amplifier and Oscillator

Key-down conditions per tube without amplitude modulation‡

## Maximum Ratings, Absolute Values

|                                               |      |       |
|-----------------------------------------------|------|-------|
| D-C Plate Voltage .....                       | 1000 | volts |
| D-C Grid Voltage .....                        | —150 | volts |
| D-C Cathode Current .....                     | 125  | mA    |
| D-C Grid Current§ .....                       | 50   | mA    |
| Peak Positive R-F Grid-Cathode Voltage .....  | 30   | volts |
| Peak Negative R-F Grid-Cathode Voltage .....  | —400 | volts |
| Plate Dissipation† (Forced-air Cooling) ..... | 100  | watts |
| Grid Dissipation .....                        | 2    | watts |

## Typical Operation

## Power Amplifier, Grid Separation Circuit — 500 Mc

|                                     |     |       |
|-------------------------------------|-----|-------|
| D-C Plate Voltage .....             | 900 | volts |
| D-C Grid Voltage .....              | —40 | volts |
| D-C Plate Current .....             | 90  | mA    |
| D-C Grid Current, Approximate ..... | 30  | mA    |
| Driving Power, Approximate .....    | 6   | watts |
| Useful Power Output .....           | 40  | watts |

## R-F Oscillator — 2500 Mc

|                                     |     |       |
|-------------------------------------|-----|-------|
| D-C Plate Voltage .....             | 900 | volts |
| D-C Grid Voltage, Approximate ..... | —22 | volts |
| D-C Plate Current .....             | 90  | mA    |
| D-C Grid Current .....              | 10  | mA    |
| Useful Power Output .....           | 17  | watts |

Plate Modulated R-F Power Amplifier  
Class C Telephony

Carrier conditions per tube for use with a maximum modulation factor of 1.0.

## Maximum Ratings, Absolute Values

|                                               |      |       |
|-----------------------------------------------|------|-------|
| D-C Plate Voltage* .....                      | 600  | volts |
| D-C Grid Voltage .....                        | —150 | volts |
| D-C Cathode Current .....                     | 100  | mA    |
| D-C Grid Current§ .....                       | 50   | mA    |
| Peak Positive R-F Grid Voltage .....          | 30   | volts |
| Peak Negative R-F Grid Voltage .....          | —400 | volts |
| Plate Dissipation† (Forced-air Cooling) ..... | 70   | watts |
| Grid Dissipation .....                        | 2    | watts |

## Characteristic Range Values for Equipment Design

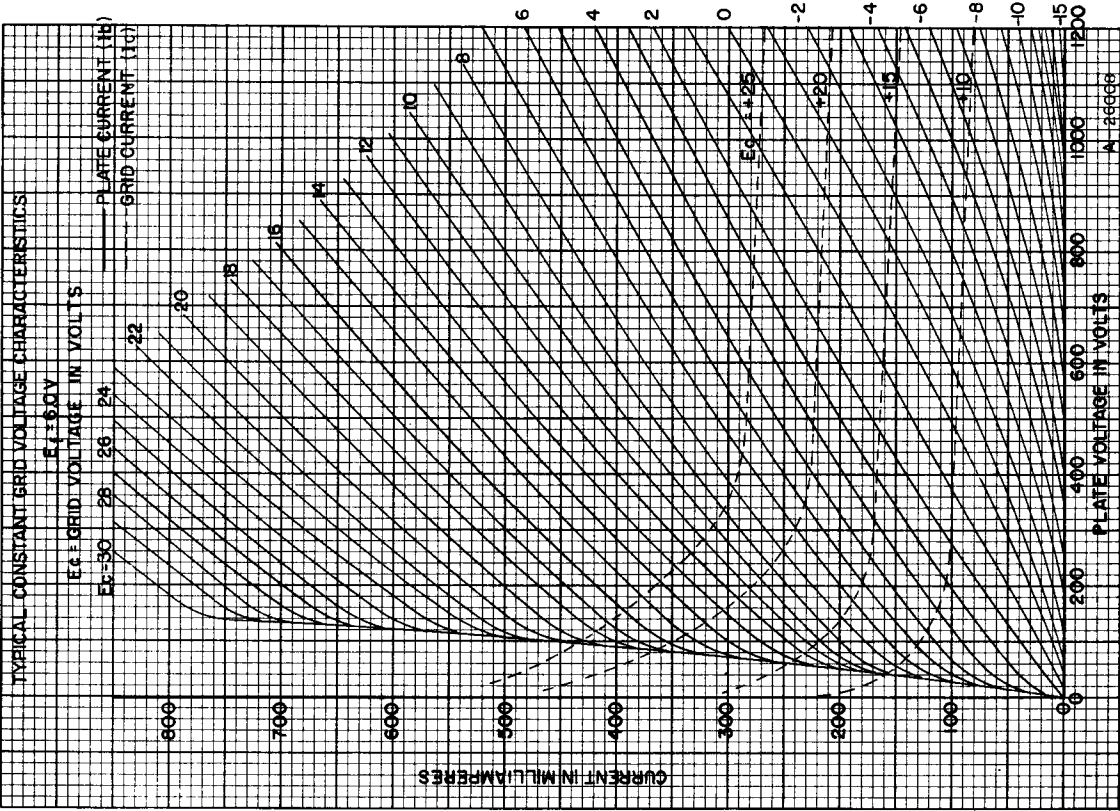
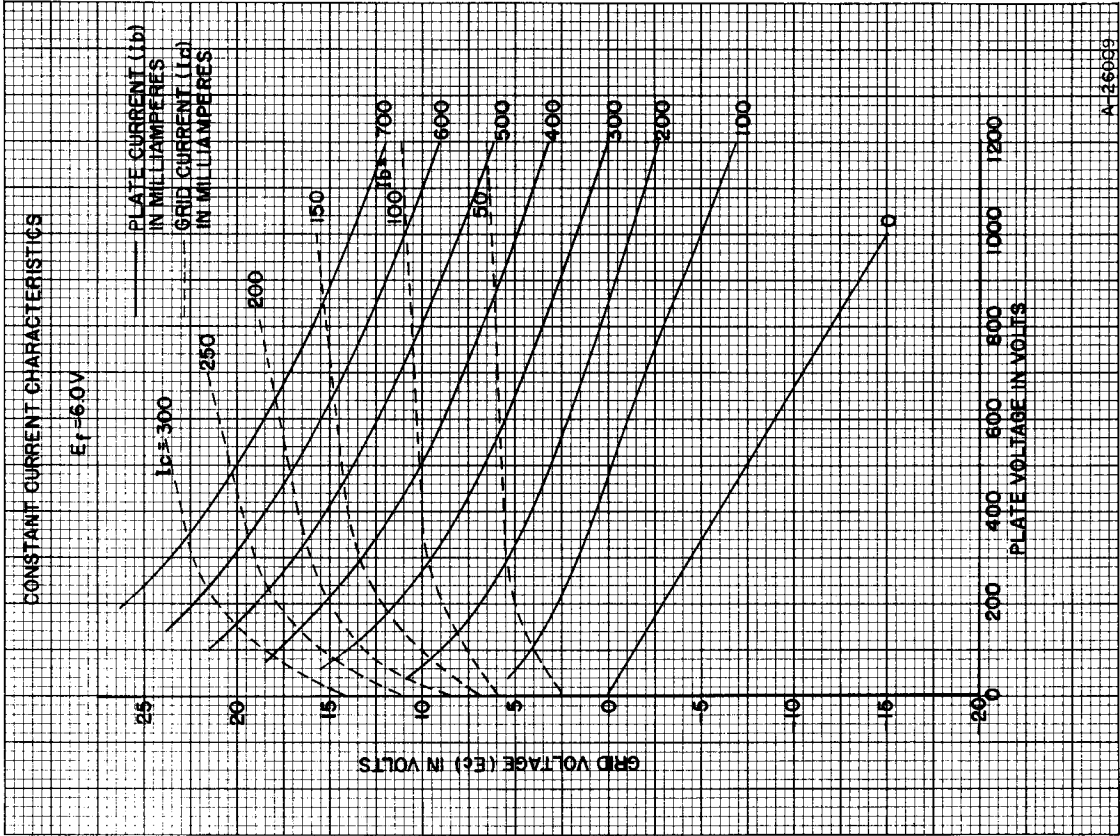
|                                                                              | Min. | Max. |       |
|------------------------------------------------------------------------------|------|------|-------|
| Filament Current at 6.0 volts .....                                          | 0.90 | 1.05 | amps  |
| Cut-off bias (Note 1) .....                                                  | —    | —15  | volts |
| Grid-Plate Capacitance (Note 2) .....                                        | 1.86 | 2.16 | μμf   |
| Grid-Cathode Capacitance (Note 2) .....                                      | 5.60 | 7.60 | μμf   |
| Note 1 — Measured at 1 mA of plate current and a plate voltage of 600 volts. |      |      |       |
| Note 2 — Capacitance measurements are with the tube cold.                    |      |      |       |

‡Modulation essentially negative may be used if the positive peak of the envelope does not exceed 115 per cent of the carrier conditions.

§See "Application Notes" on "Determination of Proper Grid Drive".

†Refer to "Cooling" under "Application Notes".

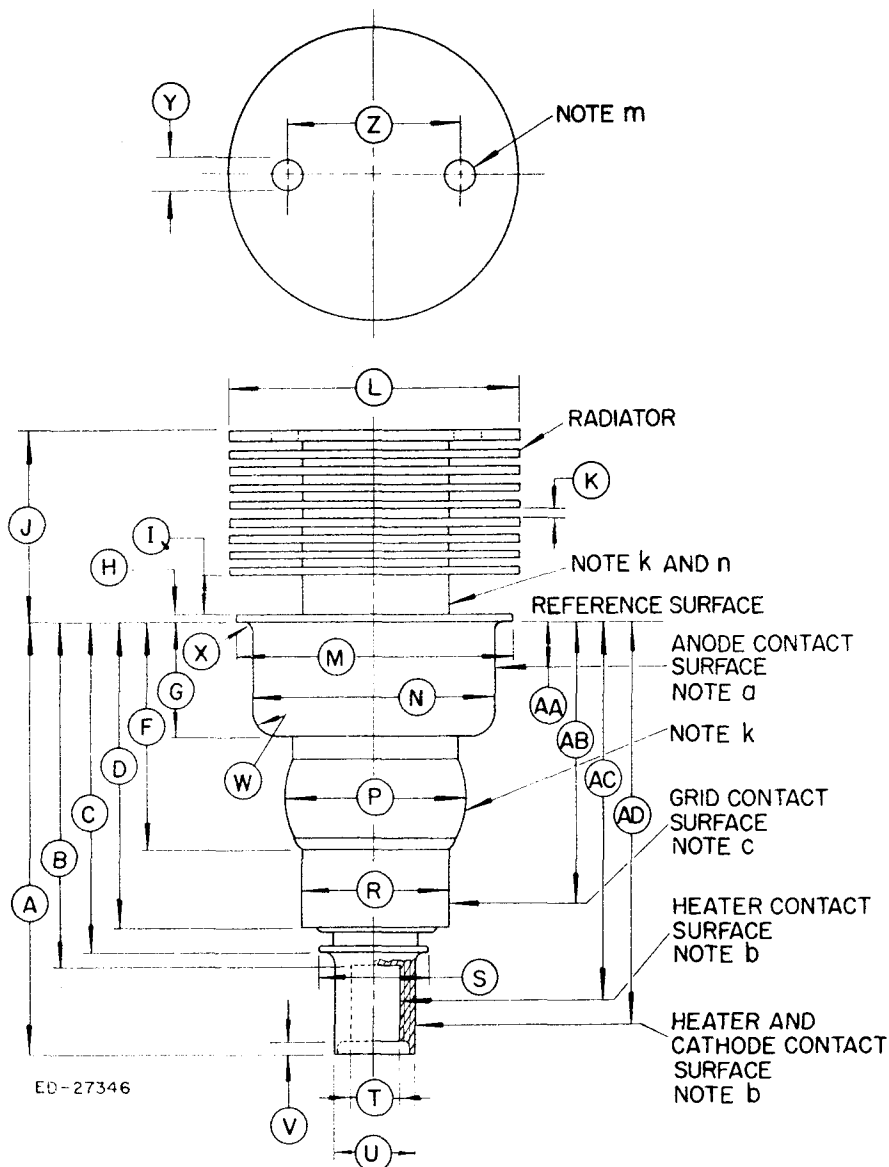
\*For modulation factors less than 1.0, a higher d-c plate voltage may be used if the sum of the peak audio voltage and the d-c plate voltage does not exceed 1200 volts.



# OUTLINE AND DIMENSIONS

## DIMENSIONS A ML-2C39A, ML-2C39WA, ML-2C41, ML-322, ML-7209, and ML-7210

### DIMENSIONS B ML-322



DIMENSIONS FOR OUTLINE (INCHES)

| Ref. | DIMENSIONS A |       | DIMENSIONS B |       |
|------|--------------|-------|--------------|-------|
|      | Min.         | Max.  | Min.         | Max.  |
| A    | 1.815        | 1.875 | 1.788        | 1.858 |
| B    | —            | 1.534 | —            | 1.517 |
| C    | —            | 1.475 | —            | 1.458 |
| D    | 1.289        | 1.329 | 1.252        | 1.292 |
| F    | —            | 0.980 | —            | 1.000 |
| G    | 0.462        | .477  | .459         | .479  |
| H    | —            | .040  | —            | .040  |
| I    | .125         | .185  | .125         | —     |
| J    | .766         | .826  | .736         | .826  |
| K    | .025         | .046  | .015         | —     |
| L    | 1.234        | 1.264 | 1.235        | 1.265 |
| M    | 1.180        | 1.195 | 1.788        | 1.199 |
| N    | 1.025        | 1.035 | 1.021        | 1.039 |
| P    | —            | 0.812 | —            | .812  |
| R    | 0.655        | 0.665 | .652         | .668  |
| S    | —            | .545  | —            | .545  |
| T    | 0.213        | .223  | .213         | .223  |
| U    | .315         | .325  | .312         | .328  |
| V    | —            | .086  | —            | .086  |
| W    | —            | .100  | —            | .100  |
| X    | —            | .035  | .105         | .145  |
| Y    | .105         | .145  | .650         | .850  |
| Z    | .650         | .850  |              |       |

DIMENSIONS FOR ELECTRODE CONTACT AREA (INCHES)

| DIMENSIONS A |                   |         |
|--------------|-------------------|---------|
| Ref.         | Dimensions        | Contact |
| AA           | $0.198 \pm 0.163$ | Anode   |
| AB           | $1.225 \pm .040$  | Grid    |
| AC           | $1.631 \pm .097$  | Heater  |
| AD           | $1.645 \pm .170$  | Cathode |

DIMENSIONS B

| Ref. | Dimension        | Contact          |
|------|------------------|------------------|
| AA   | $0.195 \pm .163$ | Anode            |
| AB   | $1.210 \pm .040$ | Cathode & Heater |
| AC   | $1.610 \pm .092$ | Heater           |
| AD   | $1.623 \pm .165$ | Cathode & Heater |

#### NOTES

- The total indicated runout of the anode contact surface with respect to the cathode contact surface will not exceed 0.020 inch, except ML-322; 0.030 inch, ML-322.
- The total indicated runout of the cathode contact surface with respect to the heater contact surface will not exceed 0.012 inch, except ML-322; 0.018 inch, ML-322.
- The total indicated runout of the grid contact surface with respect to the cathode contact surface will not exceed 0.020 inch. Does not apply to ML-322.
- Do not clamp or locate on this surface.
- Hole provided for tube extractor through top fin only.
- Measure anode shank temperature here.