

# S94608E Magnetron

## Large Power Magnetron - For Industrial Applications

- Ceramic-Metal Construction
- 90 kW CW at 915 MHz
- All Magnetron Support Equipment Available

The BURLE S94608E is a fixed-tuned, magnetically-focused, air- and liquid-cooled, ceramic-metal magnetron designed for industrial processing applications. It can continuously generate 90 kilowatts of useful power at 915 MHz with very high efficiency.

Several accessories necessary for the safe installation and operation of the S94608E are available from BURLE INDUSTRIES, INC. See MAGNETRON SUPPORT EQUIPMENT.

Following the instructions contained in the following publications will help to assure longer tube life, safer operation, less downtime, and fewer tube handling accidents.

- TP-116 Application Guide for BURLE Large Power Magnetrons.
- TP-118 Applications Guide for Forced-Air Cooling of BURLE Power Tubes.
- TP-105 Application Guide for BURLE Power Tubes.

For copies of these publications, contact your BURLE representative or write BURLE INDUSTRIES, INC., Tube Products Division, 1000 New Holland Avenue, Lancaster, PA 17601-5688.

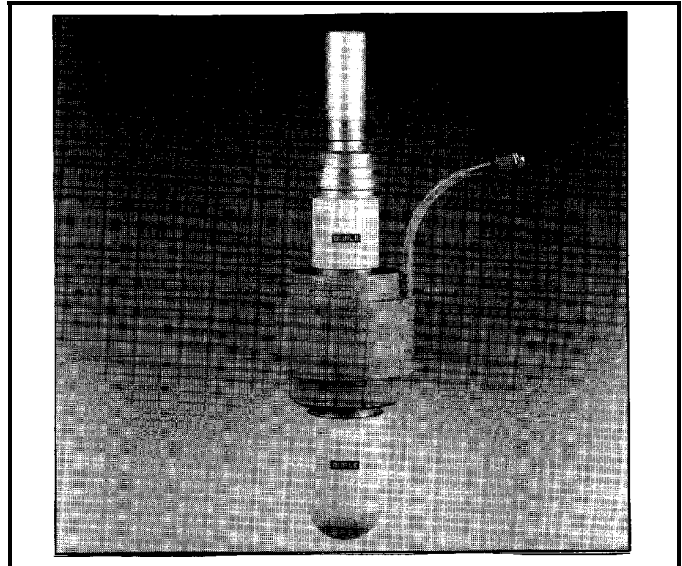
### CW Oscillator

#### Maximum Ratings; Absolute-Maximum Values

|                                     |      |       |
|-------------------------------------|------|-------|
| DC Anode Voltage <sup>1</sup> ..... | 22   | kV    |
| Anode Current .....                 | 6.5  | A     |
| Anode Dissipation .....             | 20   | kW    |
| Load VSWR <sup>2,3</sup> .....      |      | 3.0:1 |
| AC Filament Voltage .....           | 14.5 | V     |
| Filament Current <sup>4</sup> ..... | 115  | A     |

#### Typical Operation - 915 MHz

|   |      |    |
|---|------|----|
| DC Anode Voltage .....                      | 17.5 | kV |
| Anode Current.....                          | 6    | A  |
| DC Electromagnet Current <sup>5</sup> ..... | 4.1  | A  |
| Useful Power Output <sup>6</sup> .....      | 90   | kW |
| Efficiency .....                            | 85   | %  |



### General Data

#### Electrical

##### Filament:

|  |                                      |      |
|--|--------------------------------------|------|
| AC supply voltage .....                  | 14                                   | V    |
| Current at 14 volts <sup>4</sup> .....   | 110                                  | A    |
| Starting current.....                    | Must NEVER exceed 120 amperes        |      |
| Hot Resistance.....                      | 0.127                                | ohm  |
| Minimum Heating at Nominal Voltage ..... | 2                                    | min. |
| Center frequency.....                    | 915 ± 5                              | MHz  |
| Focusing <sup>5</sup> .....              | Electromagnet (AJ2194 or equivalent) |      |

#### Mechanical

|                                       |                         |                |
|---------------------------------------|-------------------------|----------------|
| Operating Position <sup>7</sup> ..... | Vertical, either end up |                |
| Maximum Overall Length .....          | 468.6                   | mm (18.45 in.) |
| Maximum Diameter.....                 | 125.0                   | mm (4.94 in.)  |
| Terminal Connections .....            | See Dimensional Outline |                |
| Weight .....                          | 7.5                     | kg (16.5 lb)   |

#### Thermal

|                                     |     |         |
|-------------------------------------|-----|---------|
| Ceramic Insulator Temperature ..... | 150 | max. °C |
| Metal Surface Temperature .....     | 150 | max. °C |

##### Air cooling:

Tube requires uniform, forced-air cooling of output ceramic dome and of filament-terminal stem. Air flow must start before application of filament voltage and, preferably, continue for several minutes after voltage removal, interlock filament power supply with air flow to prevent tube damage due to inadequate air flow.

Output Dome Cooling (with AJ2192): 0.012 meters<sup>3</sup>/sec. (25 cfm) at 100 mm (4 inches) of water.

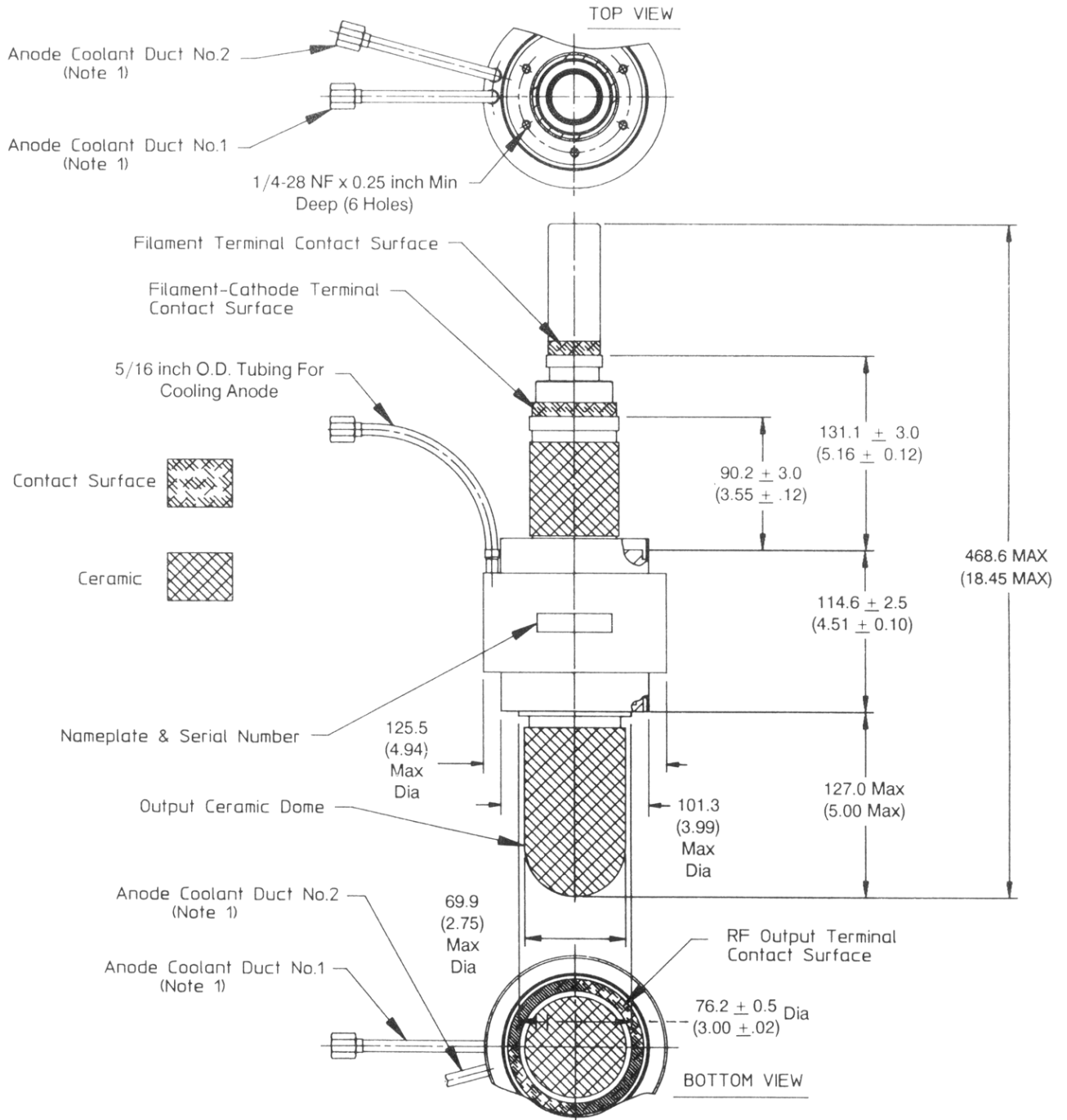
Filament Terminal Cooling (AJ2137V1): 0.0048 meters<sup>3</sup>/sec. (10 cfm) at 203 mm (8 inches) of water.

##### Liquid Cooling:

Tube anode requires liquid cooling. Liquid flow must start before application of filament voltage and, preferably, continue for several minutes after removing voltage. Interlock filament power supply with liquid flow to prevent tube damage due to inadequate liquid flow. When liquid is water, use of distilled or filtered deionized water is essential.

|  |      |                  |
|--|------|------------------|
| Water Flow .... (15 kW anode dissipation)  | 20.4 | l/min. (5.5 gpm) |
| Pressure Drop at Water Flow.....           | 2.0  | bars (30 psi)    |
| Maximum Outlet Water Temperature .....     | 70   | °C               |
| Maximum Inlet Water Pressure (Gauge) ..... | 6.9  | bars (100 psi)   |





Dimensions in millimeters. Dimensions in parentheses are in inches.

**Note 1:** Recommended direction of anode current flow: Duct No.2 is "IN" and Duct No.1 is "OUT" when tube is operated with Output Ceramic Dome DOWN. With Output Ceramic Dome UP, the flow should be reversed

**Figure 1: Dimensional Outline**

1. The anode is normally grounded.
2. In operation, the S94608E must be protected against a mismatched load by a circulator between the load and the waveguide transition. The VSWR on the tube should not exceed 1.5:1.
3. Monitor the load VSWR using the signal detected to actuate an interlock system capable of removing anode voltage from the tube less than 10 milliseconds after a fault occurs.
4. The filament is subjected to back-bombardment during tube operation. Back-bombardment increases filament temperature and, if left uncorrected, shortens tube life. Therefore, during operation, filament current should be reduced to yield the same "hot filament resistance" as when no power is being generated.

Filament voltage and current characteristics differ slightly from tube to tube. Each magnetron is shipped with a data sheet giving the specific filament characteristics for that tube. Always adhere to this data for best tube life.

5. Turn the magnetic field "on" before application of anode voltage. Turn magnetic field "off" only after removal of anode voltage. See publication TP-116 for further details on interlocking and operation of magnetrons.
6. At a load VSWR not exceeding 1.1:1.
7. Mounting the magnetron with filament connector UP, output ceramic dome DOWN, permits convenient installation of the tube and helps to assure good RF contact between the tube's output terminal contact surface, the RF gasket, and the electromagnet. The tube will operate satisfactorily with the output ceramic dome UP but is less convenient to install in that position.

### Magnetron Support Equipment

For safe and satisfactory operation of the BURLE S94608E Magnetron, BURLE recommends the use of the following parts and assemblies:

| BURLE Type Number | Description                |
|-------------------|----------------------------|
| AJ2288            | Magnetic Pole Piece        |
| AJ2136V2          | Filament-Cathode Connector |
| AJ2137V1          | Filament Connector         |
| AJ2138            | RF Gasket                  |
| AJ2192            | Waveguide Transition       |
| AJ2194            | Electromagnet              |

One unit of each of the recommended parts and assemblies is required for the proper operation of a S94608E. All items except the RF gasket may be used in the subsequent installation of replacement tubes. Do NOT reuse RF gaskets. Keep several on hand for possible use in reinstalling tubes.

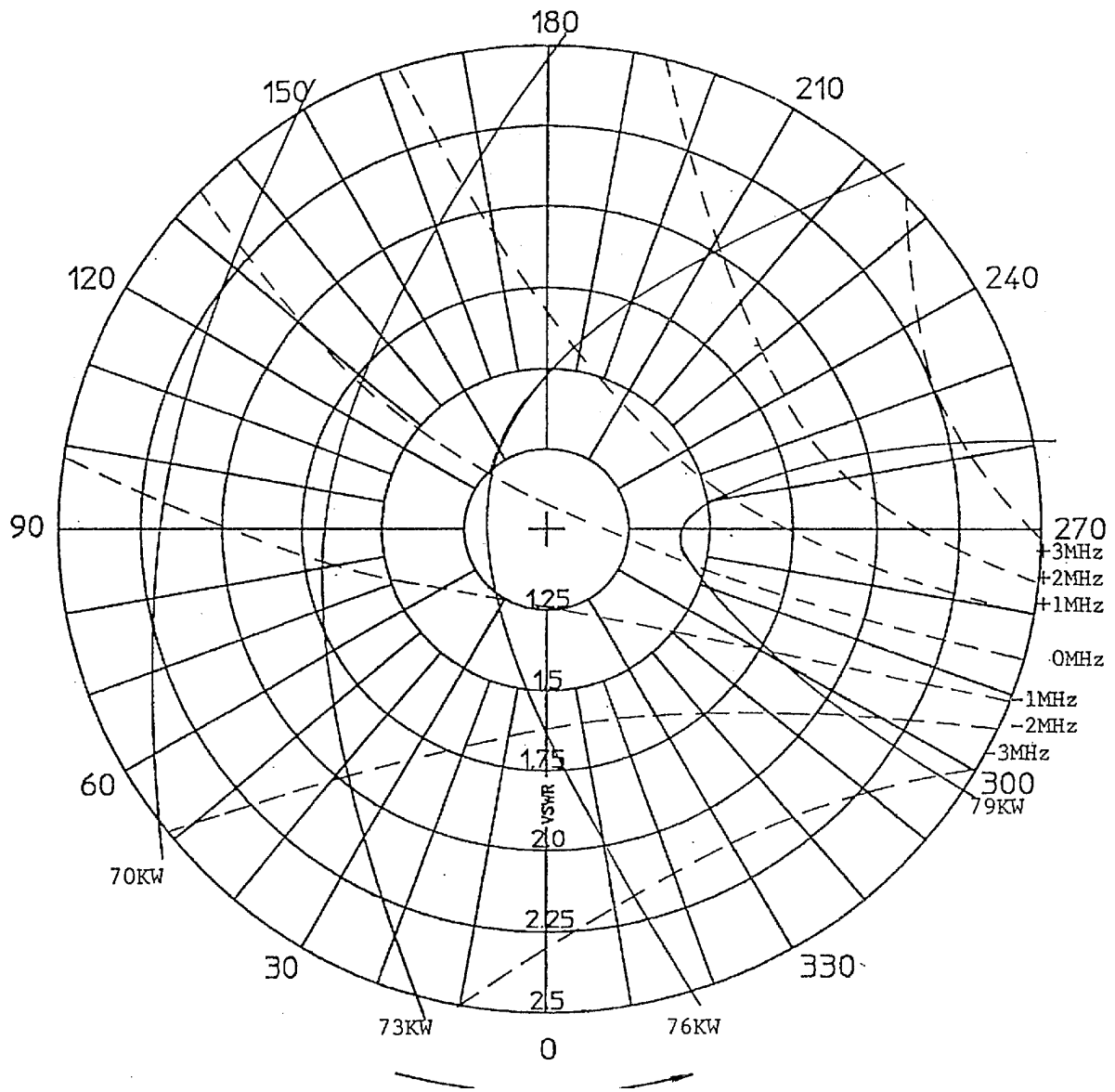
#### Warning - Personal Safety Hazards

**Radio Frequency Radiation** - This device, in operation, produces radio frequency radiation which may be harmful to persons.

**Thermal** - This device may have exposed surfaces heated to high temperatures during operation creating thermal hazards. Touching these surfaces during or immediately following operation can cause burns. Sufficient time for cool down should be allowed before handling.

**X-Ray Warning** - This device, in operation, can produce x-rays which may constitute a health hazard unless the device is adequately shielded for radiation.

**High Voltage** - Although the user of this product is normally protected from the high voltage hazard by the equipment design, the voltages applied to this unit in normal operation are hazardous. High voltage safety precautions must be followed. Equipment caution labels and safety features must not be disregarded.



TOWARD LOAD  
 Typical Rieke  
 Diagram

With Anode Input Constant

The zero degree reference point is located at the plane of the waveguide connector flange on the BURLE AJ2192 Waveguide Transition.