

**EITEL-McCULLOUGH, INC.**  
SAN CARLOS, CALIFORNIA

**OBJECTIVE DATA**

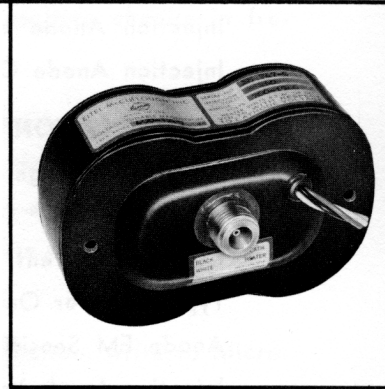
**X-1091**  
S-BAND  
PACKAGED  
VOLTAGE  
TUNABLE  
MAGNETRON

The Eimac X-1091 is a ruggedized, ceramic and metal packaged voltage-tunable magnetron capable of delivering a minimum output power of 35 watts into a 50 ohm termination over the frequency range of 2.2 to 2.3 Kmc.

The electron injection design incorporated in this magnetron minimizes back-bombardment of the indirectly heated EMA cathode with resultant long life. This design also reduces output power variation across the tuning range by limiting the cathode current variation resulting from anode voltage changes.

The extremely linear tuning characteristic of this magnetron simplifies programming the frequency sweep, by eliminating the complicated compensating networks required by other voltage tunable oscillators.

The X-1091 Circuit Assembly has been designed for use with this tube to cover the specified frequency range and includes the permanent magnet and rf circuitry. Electrical connections to the tube are completed by means of flexible leads.



**GENERAL CHARACTERISTICS**

**ELECTRICAL**

Cathode: Unipotential, Matrix	
Warm-up Time	60 seconds
Heater: Voltage (AC or DC)	6.3 volts
Current	1.0 ampere
Minimum Output Power	35 watts
Frequency Range	2200 to 2300 megacycles

**MECHANICAL**

Operating Position	Any
Cooling	Forced Air
Electrical Connections	Flexible leads
RF Output Coupling	Type N or TNC Female
Net weight, including magnet and circuit	3.2 pounds
Shipping Weight	10 pounds
Maximum Overall Dimensions (Magnet and Circuit):	
Height	3 inches
Width	2 5/16 inches
Length	4 1/2 inches



**MAXIMUM RATINGS**

Anode Voltage*	- - - - -	2500 volts
Cathode Current	- - - - -	60 milliamperes
Injection Anode Voltage*	- - - - -	600 volts
Injection Anode Current	- - - - -	1 milliampere

**TYPICAL OPERATION (In X-1091 Circuit Assembly, Load VSWR=1.15:1)**

Frequency Range	- - - - -	2200-2300 megacycles
Anode Voltage* (Note 1)	- - - - -	1800-1940 volts
Cathode Current	- - - - -	35 - 40 milliamperes
Typical Power Output	- - - - -	35 - 35 watts
Anode FM Sensitivity	- - - - -	1.4 Mc/volt
Injection Anode Voltage	- - - - -	300 volts
Injection Anode Current	- - - - -	0.5 milliampere
Heater Voltage (AC)	- - - - -	6.3 volts
Heater Current	- - - - -	0.8 amperes

\*All voltages referred to the cathode.

Note 1. The operating frequency is determined by the anode voltage.

**APPLICATION**

**Cooling:** The X-1091 is designed to be cooled by forced air. To insure normal operation over long periods, sufficient cooling is required to maintain the magnet temperature below 70°C.

**Anode:** The operating frequency is determined by the anode voltage. The anode is mounted in direct electrical contact with the external circuit. Therefore, it is often convenient to operate the anode at chassis potential, with the cathode and injection anode at appropriate negative potentials.

**Cathode:** The cathode and one leg of the heater are internally connected. Therefore, the heater supply must be insulated for the maximum tuning voltage.

The heater voltage should be maintained within  $\pm 5\%$  of the rated value of 6.3 volts if variations in performance are to be minimized and the best tube life obtained. Either alternating or direct current may be used to energize the X-1091 heater in most applications as a result of the advanced counter-wound helical heater package. In applications where residual FM at the power supply frequency must be held to an absolute minimum, it is recommended that direct current be used for the heater.

**Proximity of Ferrous Materials:** To minimize variations in performance, ferrous materials should be kept at least 6 inches from the magnetron package. Modulation of the tube may be produced by rotating ferrous materials and such parts as fans, shafts and couplings should be placed as far from the magnetron package as possible. Transformers and chokes should not be placed in such close proximity to the tube that their stray magnetic fields will interfere with the magnetron operation.

**Temperature Stability:** The permanent magnet for the X-1091 has been temperature stabilized to minimize

frequency changes caused by variations in the ambient temperature. The temperature/frequency coefficient for the X-1091 package is typically .008% of the operating frequency per degree Centigrade. Thus, for an operating frequency of 2250 megacycles, the temperature/frequency coefficient is typically 180 kilocycles per degree Centigrade. A positive change in temperature will always produce a positive change in frequency.

**Linearity:** The voltage/magnetic-field/frequency relationship of a magnetron is theoretically linear and this linearity is observed in practical tubes. The frequency versus tuning voltage curve for the X-1091 is a straight line with a positive slope and may be easily programmed for the desired frequency sweep. Tests of the fine grain linearity curve show a deviation from a straight line of approximately 3-5 parts per thousand over a 20 megacycle bandwidth.

**Special Applications:** For any additional information concerning this tube or its application, write to Microwave Product Manager, Eitel-McCullough, Inc., San Carlos, California, telephone LYtell 1-1451.

Cable: EIMAC.

