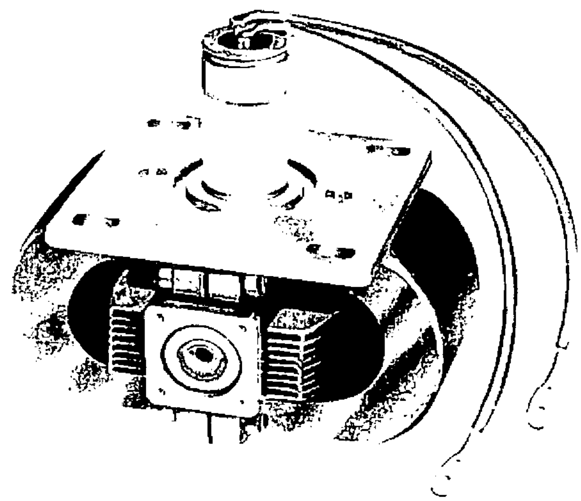
RAYTHEON **TECHNICAL INFORMATION**

Excellence in Electronics

TYPE RK6841

The RK6841 is a fixed frequency pulsed type oscillator operating in the region of 16,500 megacycles with a minimum peak power output of 50 kilowatts. It is an integral magnet waveguide output type requiring forced air cooling, designed for coupling to standard RG-91/u waveguide. The RK6841 is a ruggedized, very compact, light-weight magnetron well suited for use in portable and aircraft equipment.



GENERAL PRECAUTIONS

Reliable operation and maximum magnetron life can be achieved only if the over-all radar transmitter is designed with the magnetron characteristics and peculiarities clearly in mind. This technical data sheet, rather than the MIL-E-1B Government test specifications, should be used as a guide to equipment designers.

There are many problems peculiar to magnetrons in general which must be given special consideration in system design. These problems are discussed in detail on the following pages. If for any reason it is desirable to operate the RK6841 under conditions other than those recommended in this technical data sheet, the manufacturer should be consulted. Operation of magnetrons at or near maximum ratings is not conducive to long life, economy, and reliability.

GENERAL CHARACTERISTICS

ELECTRICAL

Heater

Heater Voltage — Preheat	4.0 V ± 5%
Heater Current @ 4.0 V	10.5 A
Minimum Preheat Time	3 minutes

Maximum Ratings

The values specified below must not be exceeded under any service conditions. The ratings are limiting values above which the serviceability of any tube may be impaired. It does not necessarily follow that combinations of absolute maximum ratings can be attained simultaneously.

Heater Voltage	4.25 V
Peak Anode Voltage	19 kv
Peak Anode Current	16 A
Peak Anode Power Input	290 kw
Average Anode Power Input	290 W
Anode Temperature	125° C
Pulse Duration	3.5 us
Duty Cycle	.001
Frequency change due to change of steady state temperature	—0.4 Mc/°C
VSWR	1.5
Pulling @ VSWR = 1.5	15 Mc

Typical Operation

Oscillation 1

Current pulse duration	0.3 μs
Duty cycle	.0009
Voltage pulse rise time	0.09 μs
Heater voltage start	4.0 V
Heater voltage operate	2.0 V
Frequency	16,500 Mc approx.
Peak anode voltage	16.5 kv
Peak power output (Min.)	50 kw
Average power output (Min.)	45 W
Peak current	14 A

Oscillation 2

Current pulse duration	3.0 μs
Duty cycle	.0009
Voltage pulse rise time	0.2 μs
Heater voltage start	4.0 V
Heater voltage operate	2.0 V
Frequency	16,500 Mc. approx.
Peak anode voltage	16.5 kv
Average power output (Min.)	45 W
Peak current	14 A

MECHANICAL

Mounting position	Cathode vertical
Over-all dimensions	See outline drawing
Net weight	5¾ lbs., approx.
Cooling	Forced air
Output cooling	See outline drawing

DETAILED ELECTRICAL INFORMATION

HEATER

The cathode must be preheated at Ef = 4.0 V ± 5% for a period of at least 3 minutes prior to the application of anode pulse voltage. Immediately after the application of anode pulse voltage, the heater voltage must be reduced to 2.0 V. Excessive heater current surges must be avoided. For operation at conditions differing from those under typical operation, the manufacturer should be consulted for the recommended value of heater voltage.

STARTING NEW TUBE

"Aging" of the RK6841 is rarely necessary. If, however, some instability is observed in a new magnetron, it is recommended that it be "seasoned" under the prevailing conditions of oscillations until stable operation is attained.

PULSE CHARACTERISTICS

The smooth peak of a pulse is defined as the maximum value of a smooth curve through the average of the fluctuation over the top portion of the pulse. The pulse width is the time interval between the two points on the current pulse at which the instantaneous current is 50% of the smooth peak. (True only for approximately rectangular waveshapes.) The rise time is the time interval between points 20 and 85% of the smooth peak. Figure 1 shows graphically the definitions mentioned.

The voltage rise time should not be greater than 0.22 μs or less than 0.18μs on the 3.0 μs pulse and not greater than 0.1 μs or less than 0.08μs on the 0.3 μs pulse. Too fast a rise time will lead to moding or arcing. The ripple on the top of the current pulse must be kept to a minimum to avoid pushing effects which will tend to widen the spectrum. The decay time of the trailing edge of the voltage pulse must be as short as possible to obtain optimum performance and high operating efficiencies. Backswing should not exceed 20% of the applied pulse.

For optimum pulse shaping, the magnetron pulse transformer and pulse line must be treated as a unit. Careful tailoring of the pulse line in any application is recommended.

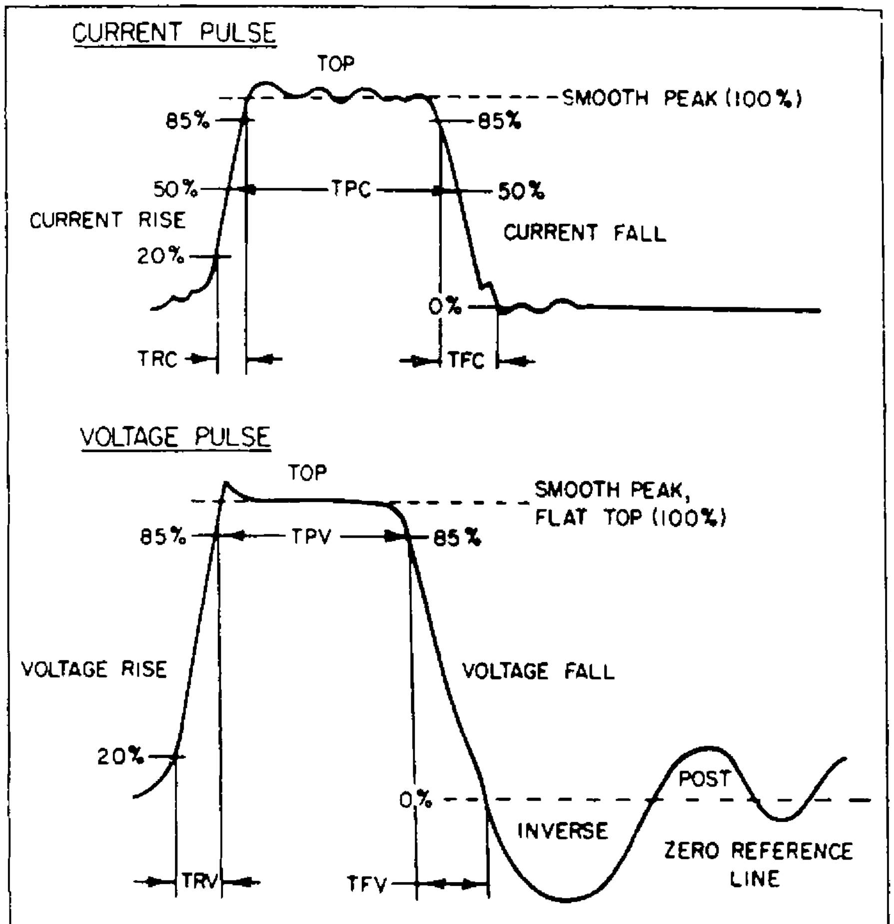
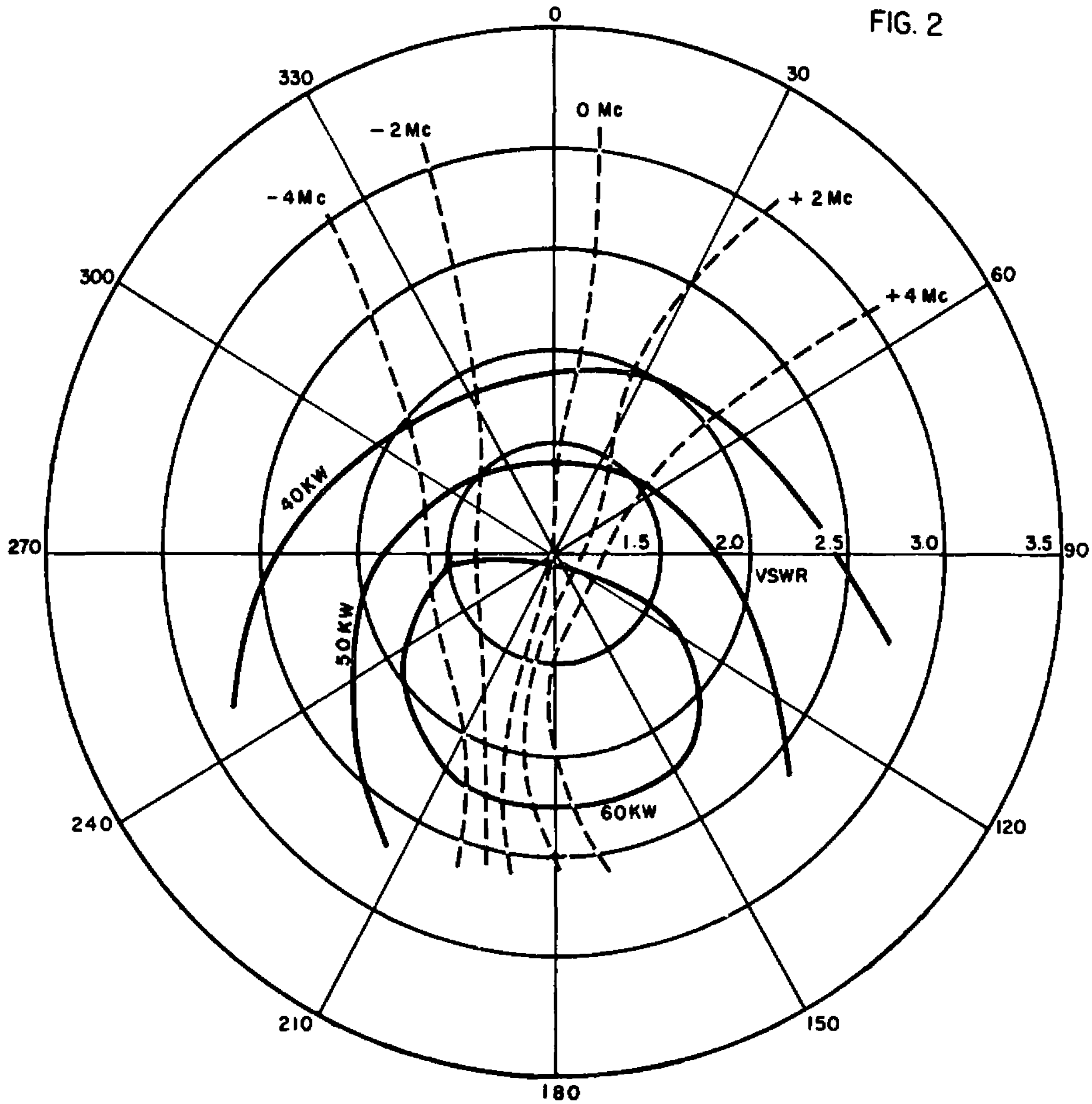


FIG. 1

LOAD DIAGRAM

Figure 2 is a load diagram of a typical RK6841 magnetron. The contours of constant power output and frequency change are related to voltage standing wave ratios introduced by mismatched loads at various phase positions. Values of VSWR as high as 3:1 are plotted, but operation with ratios greater than 1.5:1 is not recommended.

FIG. 2



RK6841 TYPICAL LOAD DIAGRAM

COOLING

The RK6841 requires forced air for cooling. The ambient temperature will dictate the flow rate necessary to maintain the anode temperature below the maximum specified 115°C. Figure 3 is a plot of anode temperature and pressure drop as a function of air flow.

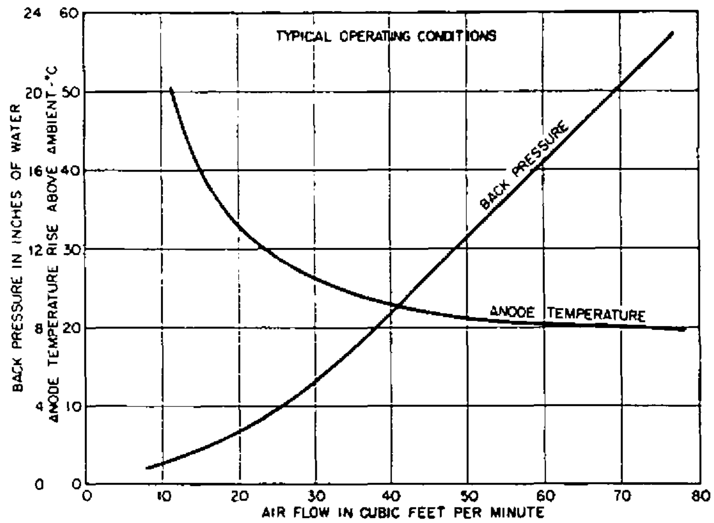
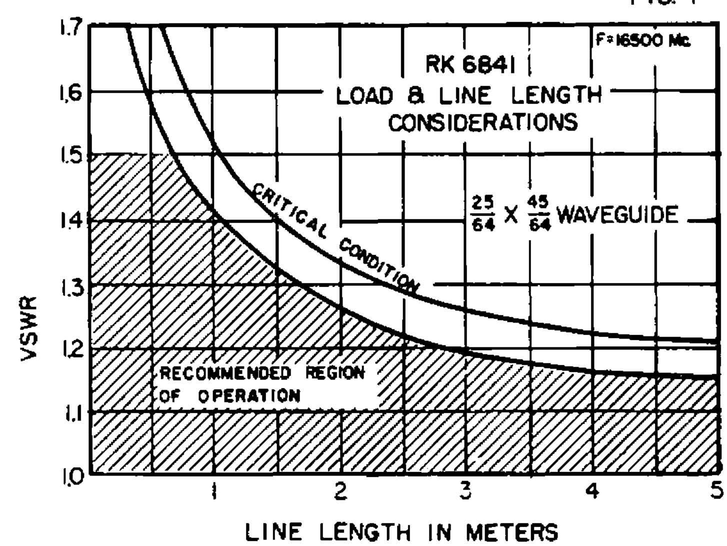


FIG. 4



FREQUENCY DRIFT

After operation of the RK6841 is initiated, its temperature rises with time until thermal equilibrium is obtained. During this transient period, the geometry of the tube changes slightly and is attended by a slight frequency change or drift. If the tube temperature changes after thermal equilibrium has been established, the operating frequency will also change until thermal equilibrium is again attained. The frequency change between two equilibrium positions will not exceed —0.4 Mc/°C.

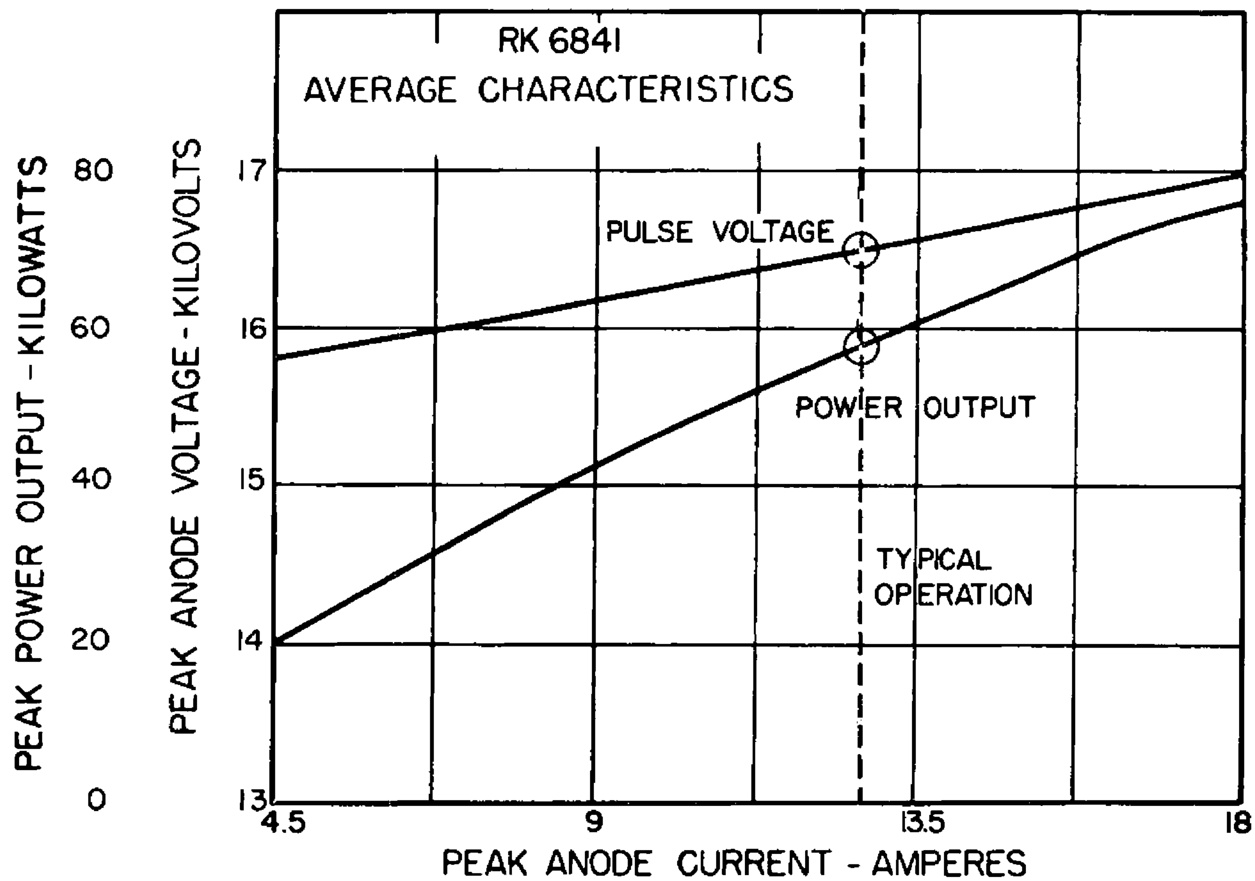
R.F. RADIATION FROM CATHODE

The RK6841 incorporates an R.F. choke in the cathode stem to minimize radiation from this end of the tube. It is not possible, however, to guarantee that the radiation will be negligible; and in particularly critical environments, shielding of the cathode stem may be necessary.

OPERATING CHARACTERISTICS

Figure 5 is a plot of peak power output and peak anode voltage as a function of anode current for a typical RK6841 magnetron.

FIG.5



DETAILED MECHANICAL INFORMATION

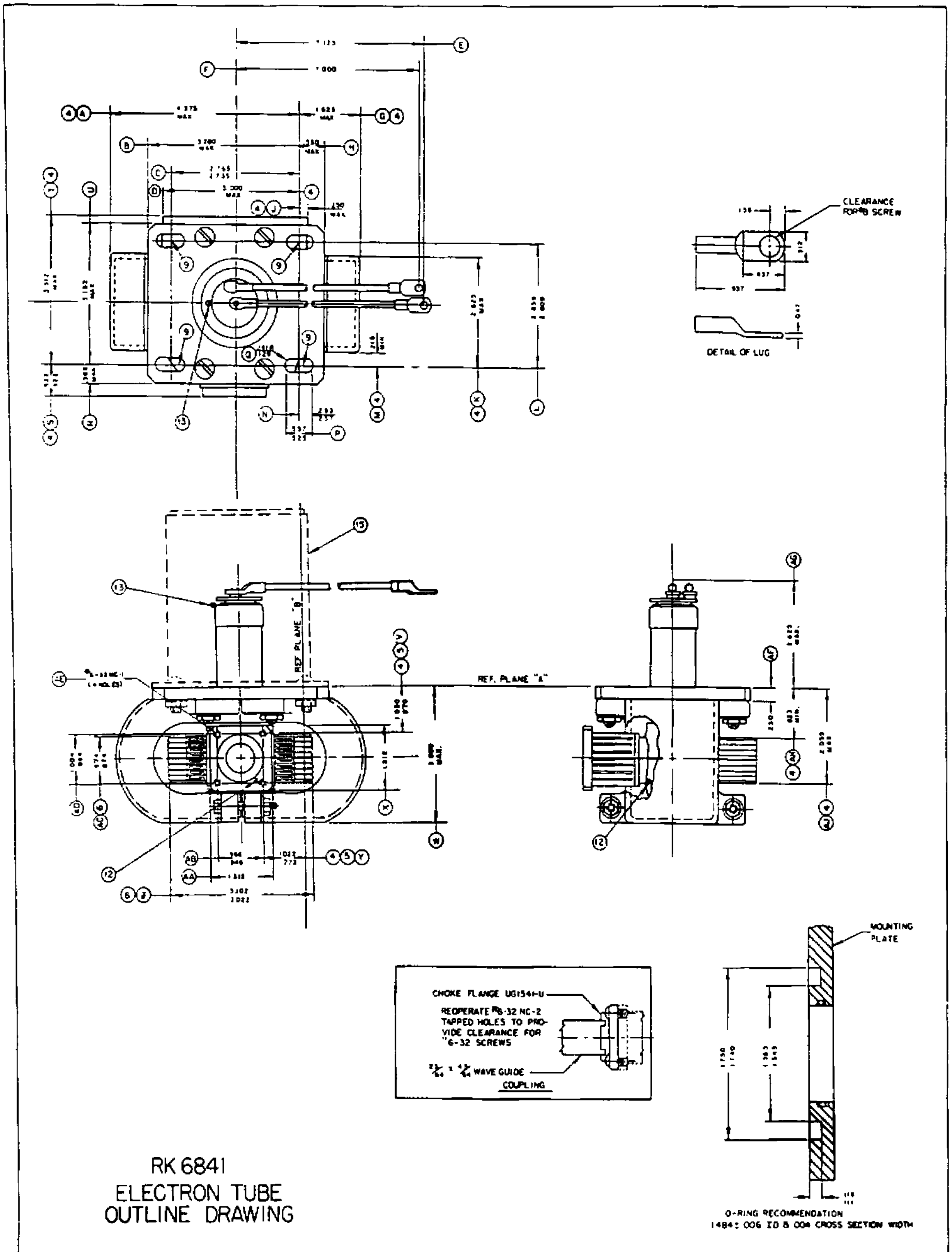
OUTLINE DRAWING

The detailed mechanical dimensions of the RK 6841 are given in figure 6. These dimensions should be used in designing the mechanical layout of an equipment rather than those of a sample tube.

INSTALLATION AND HANDLING PRECAUTIONS

No mechanical stress should be applied to the high voltage bushing or output flange in handling or mounting the magnetron. Care should be taken to keep ferromagnetic materials such as steel, iron, or magnets 2 inches away from the tube, since deterioration of the magnetic field results in low power and instability.

Unnecessary jarring of the tube must be avoided. Although a packaged magnetron appears to have great structural strength, the internal structure is delicate, and involves critical alignment of parts.


CLEARANCE FOR #8 SCREW
DETAIL OF LUG
REF. PLANE "A"
REF. PLANE "B"
CHOKE FLANGE UG1541-U
WAVE GUIDE COUPLING
MOUNTING PLATE
O-RING RECOMMENDATION
RK 6841
ELECTRON TUBE
OUTLINE DRAWING