

QK174C – FM CW Magnetron



This is a quite rare Raytheon CW magnetron, FM modulable. The operating principle of FM magnetrons based upon tuning by electron beams directed in the resonators was first described in *Microwave Magnetron*, MIT Radiation Lab Series, chapter 15 by W.V. Smith, and in *Proceedings of the IRE*, July 1947. We find some U.S. patents on FM modulated CW magnetrons, as the 2781476 assigned to L.P. Smith, RCA, the patent 2490008, referred structural improvements, and the 2534503, referring to further improvements. In these magnetrons FM modulation is obtained by injection of modulated electron beams in one or more of the resonating cavities but other ways were proposed to modulate the frequency of a magnetron. Percy Spencer of Raytheon wrote a sort of introductory article about a device defined as ‘Grid-Controlled Magnetron’ in *Electronics*, May 1953.. According to the article, a magnetron could use grids placed between tips of the vanes to obtain the FM modulation. Such a magnetron, almost certainly a further variant of QK174 by its shape, was proposed for microwave audio and video relays, with 70 W average output power.

Few information available on QK174 which shape resembles that of the 4J60 to 4J65 family of CW radar jammers by the same manufacturer. We find for the first time an ad of a QK174A in *Electronics*, February 1949, no picture. But one month later an article in the March issue shows that Raytheon in its microwave link equipment used a QK117/4J65, just one of the CW magnetrons intended for radar jammers.

QK174C was presumably introduced by Raytheon in 1953. We find its first ad in *Electronics*, March 1953, showing a couple of images. The shape looks quite different from the available sample, in particular for the flanged output coaxial connector. Not known the differences with the early version. Summary data for this type are given in a Raytheon short form catalog. Pinout and operating parameters were made available by Danial Stocks.

- Heater of magnetron cathode operates at 4.5 V, 3.0 A. Must be operated at 4.5 V for three minutes and then raised to 8 V for two minutes before applying anode voltage. Heaters of halo cathodes operate at 5.0 V, 4.36 A.
- 1990 to 2110 MHz tuning range.
- 2.2 kV and 180 mA input maximum ratings. 1750 to 2000 V operating voltage.
- Tuning voltage -250 V max. Max tuning current 200 mA. The more negative the voltage, the lower is the frequency.
- Typical operation 198 W input, 1850 V at 150 mA
- 70 W output power

Connections:

- 1, 2 Heater (Common to magnetron cathode)
- 3 Modulator cathode
- 4 Anode (ground)
- 5, 6 Modulator heater
- 7 Magnetron cathode
- 8 Magnetron heater

The sample in the collection is a QK174C. Integral magnet, coaxial output, octal base. Top screw for mechanical tuning. Mount for protective thermal switch. Presumably there are six halo cathodes hosted in the six cups protruding from the bottom. A detail is visible in the above image in the third photo.

As in the photo below, three wires are visible from the base to glass fed-throughs under the anode block, one of them partially shielded could be the grid connection.

The available sample is missing its magnet.

