

CPD-105

6 DECEMBER 1957

UHF COAXIAL BANDPASS FILTER 35Q-1

DESCRIPTION AND APPLICATION

Collins UHF Coaxial Bandpass Filter 35Q-1 prevents adjacent transmitter interference with signals received in the 755 to 985-mc range when a single antenna is used for simultaneous transmission and reception. The use of two or more equipments on a common antenna is often advisable in uhf and microwave communications systems. The 35Q-1 serves under continuous unattended operation as a preselector for the receiver input circuit for any selected and preset frequency in the above range.

In one complete system of diplexing, the 35Q-1 is used in conjunction with Collins UHF Coaxial Branching Filter 35R-1. The latter is designed to reduce the transmitted signal to a level which will not damage the receiver input circuits. The 35Q-1 may be employed singly if the power at the antenna terminal is not more than 250 watts.

The filter assembly consists of four tunable coaxial cavities coupled by short lengths of 5/8-inch rigid coaxial line. The capacity loaded cavities, each approximately 1/4-wave length, are clamped in a line on a rigid base plate. Tuning is provided by threaded tuning slugs at the top of each cavity. Actual band-



V328-02-P

width (3 db) may be 15 megacycles or greater. Coupling is obtained by tapping the center conductor of each cavity at the proper distance from the shorted end. Action of the filter is fixed by the exact location of this contact.

The filter cavities are formed from copper sheet and gold plated to prevent oxidation. The brass connecting lines and tuning slugs are also gold plated. Base plate and other hardware are finished in gray enamel.

SPECIFICATION SUMMARY

FREQUENCY RANGE: 755 - 985 mc.

POWER RATING: 250 watts.

INPUT IMPEDANCE: 50 ohms.

OUTPUT IMPEDANCE: 50 ohms.

PASSBAND: Bandwidth - 15 mc at 3 db.
 Insertion Loss - Less than 0.5 db over
 7-mc passband.
 VSWR - Less than 1.15, 7-mc passband.
 Less than 1.10, 4-mc passband.

REJECTION: 50 db at frequencies 60 mc or more removed from center of passband.

SIZE: 39-1/2 x 6-1/2 x 6 inches.

WEIGHT: 26 pounds.

ASSOCIATED EQUIPMENT: For complete filter diplexer service, Collins UHF Coaxial Bandpass Filter 35R-1 is also used.



OPERATING PRINCIPLES

The four cavities of the UHF Coaxial Bandpass Filter 35Q-1 are high Q resonant circuits coupled together in such a manner as to produce a Butterworth bandpass response. This "maximally flat" response characteristic is obtained by varying the loaded Q of each cavity according to the relation:

$$Q_n = Q_T \sin \frac{(2n-1)\pi}{2N} = Q_T \sin \frac{(2n-1)\pi}{8}$$

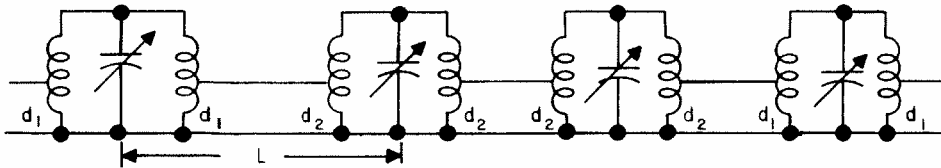
This loaded Q_n is determined by the position of the tap on the center conductor (inductor) of the tuned cavity. This is shown as "d" in the equivalent circuit.

When each cavity is tuned to resonance, a high impedance is presented across the transmission line

connecting the cavities. At frequencies off resonance, the low impedance of the tapped section approaches zero, causing high reflections on the line and preventing transmission of a signal through the filter. Assuming that the power reflected by each cavity is 97 per cent of the incident power, the total attenuation would be approximately 60 db (or 4 x 15 db). This is approximately the response of the filter at ± 50 mc from the center of the passband.

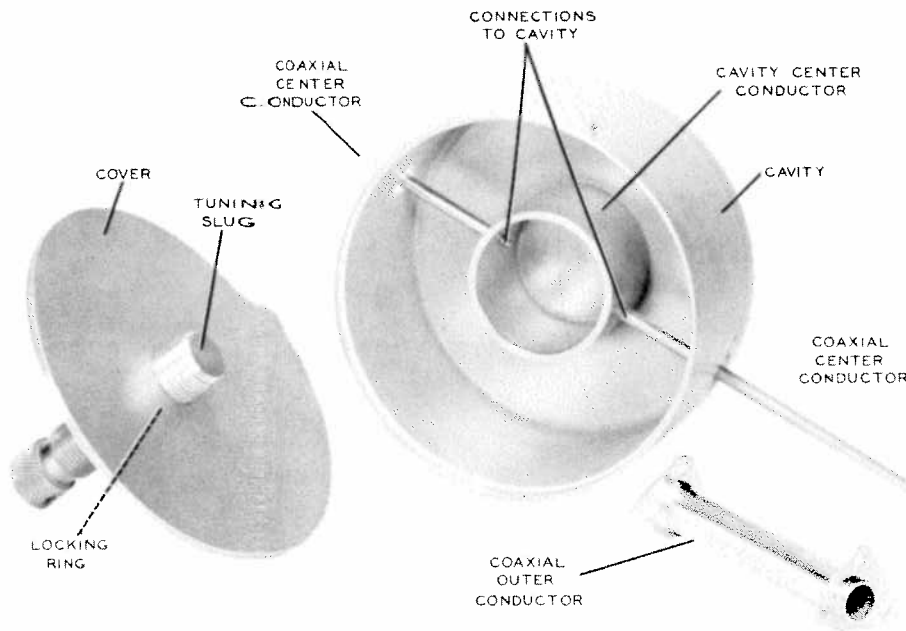
Since the currents within the cavities are much higher than the line currents, power is dissipated within the cavities as well as in the lines. This amounts to approximately 0.3 db over most of the band. Length "L" between cavities is approximately 3/4-wave length and will determine the range of tunability.

EQUIVALENT CIRCUIT



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ONE CAVITY, DISASSEMBLED



C186-03-P

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