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LOW-PASS FILTER
35S-1

COLLINS®

DESCRIPTIVE SPECIFICATIONS

 COLLINS RADIO COMPANY

Cedar Rapids, Iowa

261 Madison Ave.
NEW YORK 16

1930 Hi-Line Drive,
DALLAS 2

2700 W. Olive Avenue,
BURBANK

LOW-PASS FILTER 35S-1

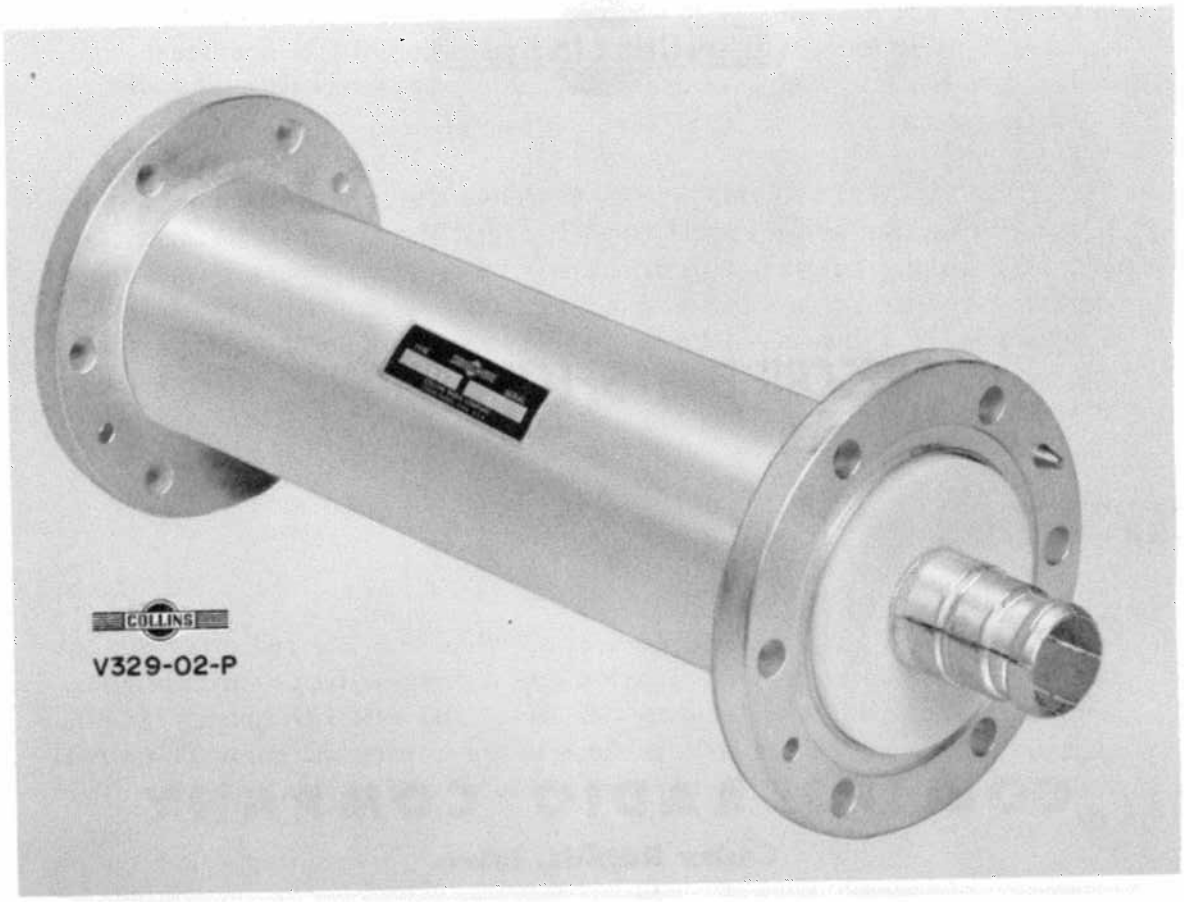

Figure 1. Low-Pass Filter 35S-1.

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INTRODUCTION

✪ GENERATION AND AMPLIFICATION of harmonic signals in the final power amplifier of a radio transmitter has always presented a problem to transmitter and system design engineers. With the present crowding of the entire radio frequency spectrum, the radiation of this spurious energy has become even less desirable than in the early days of radio communications.

In the LF, HF, and VHF bands, harmonic filter circuits have often been incorporated into the final amplifier tank circuit. UHF transmitting generally employs resonant cavities, however, which have multiple resonant frequencies that may or may not be harmonically related. For such a transmitter, a low-pass filter which will reject all frequencies above the cutoff is more practical than the harmonic "traps" sometimes used at lower frequencies.

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DESCRIPTION

✪ THE LOW-PASS FILTER 35S-1 is a typical disc-on-rod structure, as shown in figure 2, using transmission line discontinuities to simulate the lump reactances of lower frequency filters. The cutoff frequency (-3 db) is approximately 1050 mc and the slope of the attenuation curve is approximately -8 db/100 mc to 1500 mc where it levels off at about -40 db.

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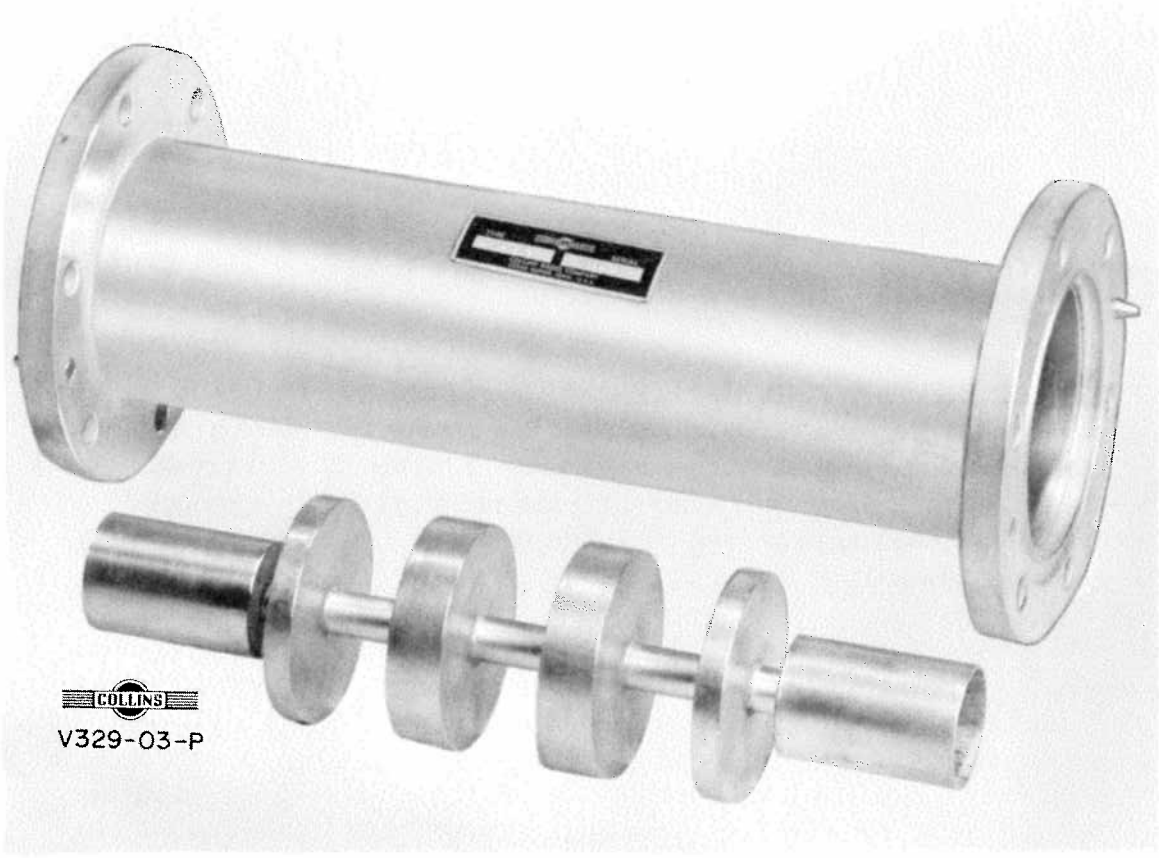

Figure 2. Low-Pass Filter 35S-1, Disassembled.

THEORY OF OPERATION

✪ THE TYPICAL LUMP REACTANCE LOW-PASS FILTER consists of "tee" or "pi" sections with series inductance and shunt capacitance. See the diagram shown in figure 3. The cutoff frequency is determined by

the product of inductance and capacitance in each section. To simulate these reactive elements in the UHF region, allowance must be made for the distributed capacitance of the inductor and the inductance of the capacitor.

To simulate a series inductor, a section of coaxial line with a higher characteristic impedance than that of the normal line is used. Since such a line has a higher inductance and a lower capacitance per unit length, it will approximate a section of the normal line plus a series inductance. Both the line length and inductance are functions of the impedance ratio. In a similar manner, a length of line with a lower than normal characteristic impedance will represent a section of line with excessive shunt capacitance.

From these "excess" reactances and the line lengths involved, a periodic disc-on-rod structure can be analyzed and the cut-off frequency and response predicted with accuracy.

To maintain a low vswr and insertion loss throughout the pass band, the end sections were modified slightly from a normal half-section.

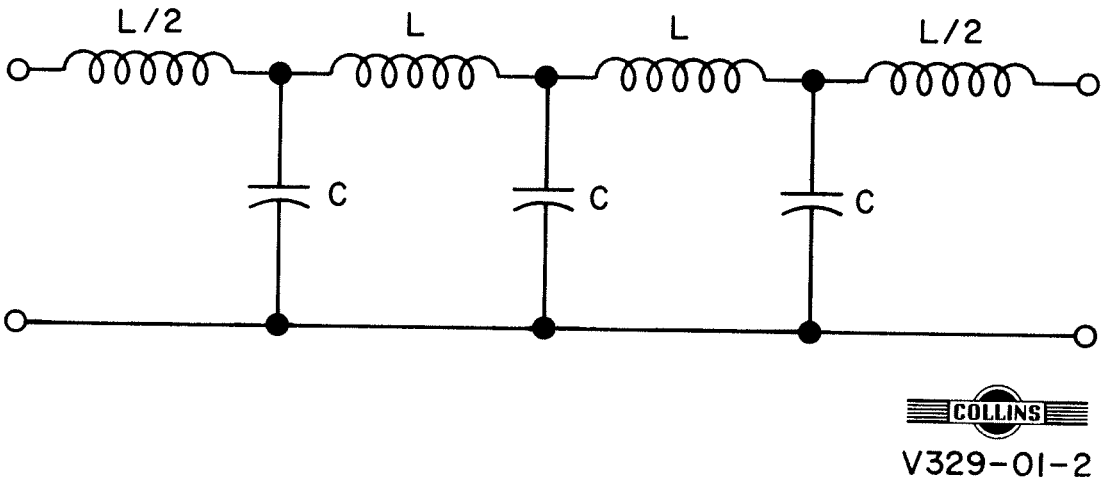

Figure 3. Low-Pass Filter 35S-1, Equivalent Circuit.

SPECIFICATIONS

- CUTOFF FREQUENCY: Approximately 1050 mc
- INSERTION LOSS: .3 db below 985 mc
  More than 35 db above 1400 mc
- VSWR: 1.20:1 or less below 985 mc
- MAXIMUM POWER RATING: 10 kw
- OVER-ALL LENGTH: 12-1/8 inches
- MAXIMUM DIAMETER: 5-1/4 inches
- CONNECTIONS: 50-ohm 3-1/8 inch coaxial line flanges and "bullets"
- WEIGHT: 8 pounds