

CPD-106

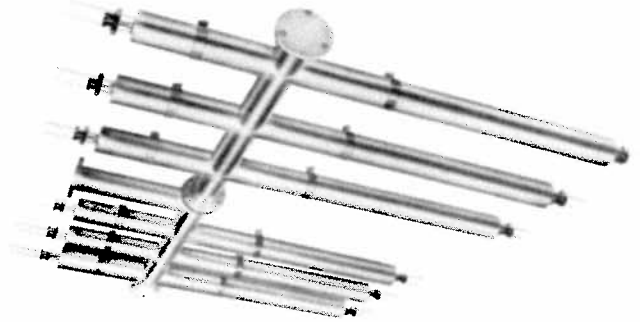
6 DECEMBER 1957

UHF COAXIAL BRANCHING FILTER 35R-1

DESCRIPTION AND APPLICATION

Collins UHF Coaxial Branching Filter 35R-1 is commonly used in uhf communications systems to isolate the receiver input from the transmitter output when one antenna is used for simultaneous transmission and reception. It is essentially a passive T-R device which employs frequency-sensitive elements rather than gas diodes to produce a short circuit on the line at a given frequency.

The 35R-1 consists of two filter sections constructed of 50-ohm rigid coaxial line connected to a common coaxial "T" junction. Both sections are of the band-rejection type and consist of three rejection stubs separated by 3/4-wave length line sections. Opposite each rejection stub is a compensating stub which allows adjustment to a passband vswr of less than 1.1:1 at the pass frequency. The filter, fabricated from copper and copper alloys, is tuned by a movable short in each stub attached to long pushrods which may be clamped in position for locking. One filter section is designated "High Pass - Low Reject" and is tunable to reject at 7-mc band in the 755 to 885-mc range and pass such a band in the 855 to 985-mc range. The other, designated "Low Pass - High Reject," is



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tunable to reject a 7-mc band in the 855 to 985-mc range and to pass it in the 755 to 885-mc range.

Since the 3-1/8-inch coaxial line is operated at a rated power level of 10 kilowatts, current built up in the filter must be kept at a minimum. Thus the rejection stubs are ordinarily tuned to 3/2 wave lengths and a 100 to 120-mc spacing is maintained between receiver and transmitter frequencies. A smaller difference in frequencies may be employed with a reduced power rating.

SPECIFICATION SUMMARY

FREQUENCY RANGE: 755 - 985 mc.

FREQUENCY STABILITY: Less than 30 ppm per degree centigrade temperature change.

POWER RATING: 10 kw maximum with load mismatch of 1.75:1.

PASSBAND: Bandwidth - 7 mc maximum with 120-mc spacing between transmit and receive.

Insertion Loss - 0.2 db maximum.
VSWR - 1.1:1 maximum.

REJECTION BAND: Bandwidth - 7 mc minimum.
Attenuation - 50 db minimum.

SIZE: 66 x 75 x 5 inches.

WEIGHT: Approximately 160 pounds.

CONNECTIONS: Standard 3-1/8-inch OD rigid coaxial line flanges and "bullets."

ASSOCIATED EQUIPMENT: For complete filter diplexers service, Collins UHF Coaxial Band-pass Filter 35Q-1 is also used.

OPERATING PRINCIPLES

A schematic representation of the UHF Coaxial Branching Filter 35R-1 is shown. Open wire lines represent the coaxial transmission lines actually used. Receiver and transmitter terminals could be reversed if the transmitter frequency were lower than the receiver frequency.

Assuming a transmitter frequency f_1 higher than the receiver frequency f_2 , filter operation is, as follows:

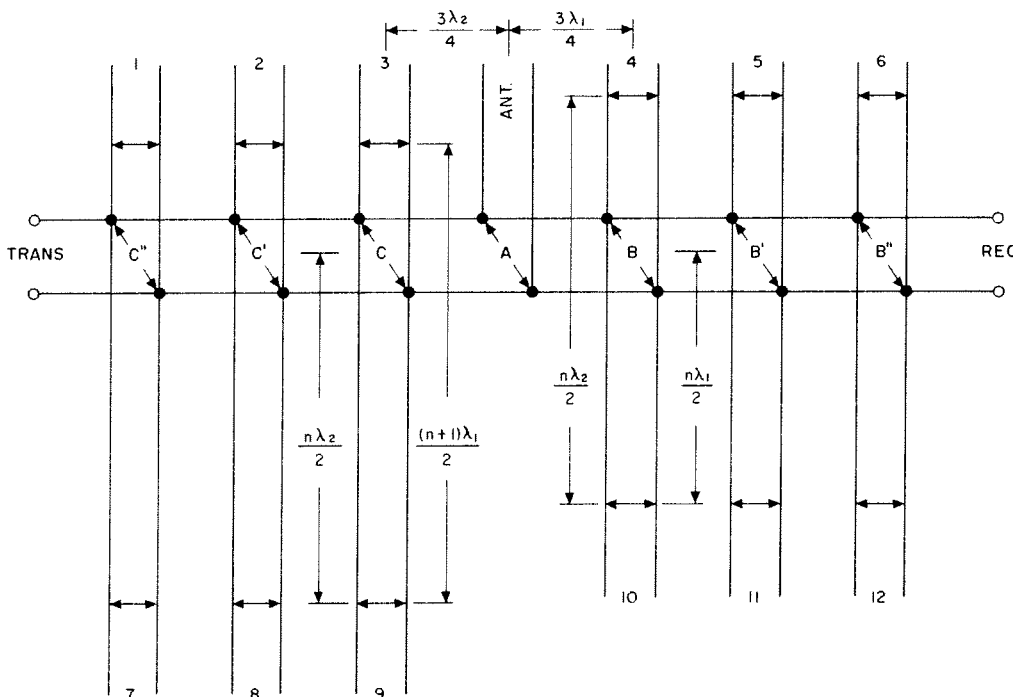
With a short as indicated on Line 10, a virtual short appears at B for the transmitter frequency. This virtual short then is translated to an open circuit at point A and effectively decouples the receiver line from the antenna at the transmitter frequency. Similarly, the short circuit shown in Line 9 appearing at point C decouples the transmitter line at the

receiver frequency. To obtain sufficient bandwidth in the rejection notch, additional stubs are required at B', B'', C', and C''. Stubs 1 through 6 are compensating stubs which tune out any susceptance appearing at the junctions at the pass frequency.

The movable shorts in each stub and their spring fingers are silver plated, and the surfaces on which the shorting plungers slide are gold plated to prevent poor contact when retuning even after a considerable lapse of time. Ordinarily the exterior surfaces are finished with a flash of gold to prevent corrosion of the copper.

Fittings are all standard 3-1/8 inch OD flanges with locating pins, and the center conductor is a standard "bullet" for 50-ohm 3-1/8 inch OD coaxial line. The end used for receiving may be fitted with adapters to reduce to 1-5/8 inch rigid coaxial line or RG-8/U.

SCHEMATIC DIAGRAM



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