



# LOW PASS FILTER

## design file

MODEL 250-20  
MODEL 250-35

52 OHM  
72 OHM

### INSTALLATION AND OPERATING INSTRUCTIONS

A low pass filter consisting of four full sections capable of handling more than 1000 watts RF, amplitude modulated or 5,000 watts peak SSB. Cut-off frequency is 45 mcs. with "M" derived and sections adjusted to provide maximum attenuation at 57 mcs. the center of TV channel 2. Attenuation of harmonic and spurious frequencies above 54 mcs. is 75 DB or more. Insertion loss is less than .25 DB.

Characteristic impedance of the filter is 52 ohms. When properly terminated, the maximum voltage developed across capacitors is nominal, even at 1 KW average power. In designing the JOHNSON Low Pass Filter, consideration was given the fact that the RF voltage could rise to extremely high values if the load were accidentally removed. Therefore, to enable the user to service the unit, the interior of the filter case has been made readily accessible and fixed capacitors have replaceable insulation.

Standard SO-239 coaxial connectors are used for input and output terminals. The unit is completely assembled, pre-tuned and equipped with convenient mounting hardware.

The 250-20 JOHNSON Low Pass Filter is intended for use with a 52 ohm coaxial transmission line at modulated power levels up to 1,000 watts. The standing wave ratio on the line should be as near unity as possible and not greater than  $1\frac{1}{2}$  to 1. With higher standing wave ratios, power handling capability is reduced. If the antenna system in use is fed with 52 ohm coaxial cable, the filter is merely inserted in the line, the connectors serving to ground the case to the outside shield of the coax. At frequencies below cutoff, the filter will introduce negligible discontinuity into the line.

It is assumed that the transmitter, with which the filter is being used, has been previously shielded and equipped with a power line filter. The transmission line should be bonded to the transmitter shield at the point where it emerges, otherwise, due to stray coupling there may be RF current flowing on the outside of the transmission line. Harmonics contained in this RF current will flow around and not be attenuated by the low pass filter. Use of an SO-239 connector at this point provides a convenient means of bringing out power while keeping shielding intact.

With many amateur transmitters using low impedance links to couple to balanced antenna systems some type of antenna coupler is required. However, use of a fixed impedance filter does not unduly complicate antenna loading. The antenna coupling system shown below is simple and quite flexible.

Tuning of the coupler can be made quite broad by making the L/C ratio as high as possible (low "Q") while still permitting the desired loading. Inductive reactance of the links may make it impossible to reduce the SWR of the transmission line to or below  $1\frac{1}{2}$  to 1. If so, both link circuits can be made series resonant by adding capacitors C/1 and C/2 as shown below.



The sections of coaxial line between the transmitter output and the low pass filter and between the low pass filter and antenna tuner should be as short as possible. Electrical quarter waves or multiples should be avoided. A directional coupler, such as the Johnson 250-37, will prove invaluable both for initial set-up and for operational checks.

#### HELPFUL REFERENCES:

- "Coupling the Transmitter to the Line", pp. 313-318 ARRL Handbook, 1955.
- George Grammer, "Eliminating TVI with Low Pass Filters" QST, February - March, 1950.

#### NOTICE

The JOHNSON 250.20 Low Pass Filter has been carefully tuned at the factory using precise measuring equipment. The adjustable elements are sealed with gyltal and will require no further adjustment unless capacitor dielectric discs are changed.



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