ALL MODE TRANSCEIVER Project

PROJECT OMEGA Part 5

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The output filters perform a secondary function in a transmitter or transceiver system. Strictly speaking, they are not essential to the functioning of a transmitter but, if left out, can lead to a social problem with television-watching neighbours. They also serve to remove low harmonics of the original signal which can cause interference to users of the higher-bands, if allowed to each the station aerial.

The PI tank circuits used almost universally in the days of valves were reckoned to attenuate the 2nd harmonic of the transmitted signal by around 20dB or more, 3rd harmonics by at least 30dB and so on. The addition of a single 30MHz low pass filter after the tank circuit was generally acknowledged to be all that was required to reduce TVI to manageable proportions. We have followed this same yardstick with the *Omega* design. **Fig. 1** shows the position of the filter block in the *Omega* system.

The Design

Solid state push-pull broad-band PA stages produce rather different harmonic products than single ended valve designs. The latter generates very high levels of 2nd harmonic while the product of push-pull amplifiers is mainly 3rd, 5th and higher-odd order products, the even order ones (2nd, 4th, etc) tending to cancel each other out. This makes things easier for the filter designer. A well balanced P – P transistor output stage may have a 2nd harmonic content that starts out at least 20 to 30dB below the fundamental where the single ended version will yield only 10dB below fundamental. The odd order products from both types will be very similar. RF amp design has much in common with hi-fi audio gear!

While you can't ignore second harmonics, the output filter network needs to be most effective at the third harmonic and above.

The *Omega* filter comprises six cascaded sections to cover the nine HF bands. Each section has been designed from standard tables to exhibit a turnover frequency just above the highest working frequency of each band group. Thus the last section in the cascade has a cut-off of 30MHz and provides harmonic attenuation on both the 24 and 28MHz bands. The second section exhibits turnover at 22MHz and covers operation on 18 and 21 MHz. The remaining section turn-over frequencies are: 15 MHz (third section, for 10 and 14 MHz bands); 8 MHz (fourth); 4 MHz (fifth); and 2.5 MHz (sixth).

The *Omega* filter system is unusual, in that the sections are cascaded in a chain with a succession of single-pole change-over relays used to break the chain and enter the signal. Thus, a top-band transmission passes through not only the first (low frequency) filter but all successive sections as well. Similarly, a 20m transmission will enter the chain at the 4th section, the preceding sections being disconnected, and pass through remaining sections to the end. At 24 or 28 MHz, the signal passes

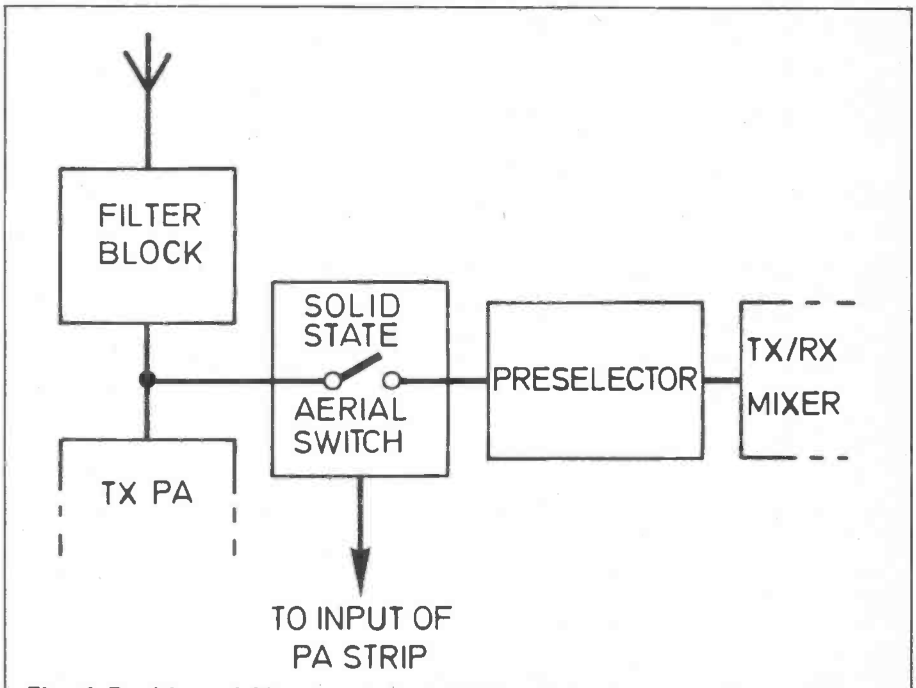

Fig. 1 Position of filter block in the Omega system.