ALL MODE TRANSCEIVER Project

When Tony and I originally dreamt up the Project Omega transceiver concept, we didn't really think that an RF pre-amp ahead of the mixer circuit would be necessary. Anyway, here it is!

Let us explain a bit more. Omega, as it stands, reached our design expectations of 0.5uV useable sensitivity together with more than 105dB of dynamic range. More than this, the performance is real. Genuinely low local oscillator noise means that this wide signal handling ability is available close in. Other (synthesised) receiver systems claim massive signal handling range but only where the strong, interfering signal is spaced 100's of kHz away from where you are trying to listen. The real world isn't like that. The massively powerful SW broadcasting stations are more often than not just a few kHz away and, as designed, Omega copes with this situation very effectively.

Compromise

You don't willingly compromise this kind of attribute which is why we weren't too keen to add an unnecessary amplifier. The sensitivity may not have been as high as that found in many commercial units but, providing that the aerial system in use is large, then the received atmospheric noise from the aerial would be the limiting factor in determining the weakest signal that can be resolved by the overall systems. Adding further amplification to the set is of no value under these circumstances. It would merely serve to reduce the strong signal handling abilities of the transceiver. However, not everbody is using Omega with a high performance aerial system. Small beams and trapped verticals have been found not to provide enough signal-to-noise to limit the system. A high quality amplifier is very useful here. In practice it causes little deterioration, even with large aerials used on 40m at night.

PROJECT OMEGA

Part 7

The broadband receive amplifier

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Broadband amplifier

Omega provides wide HF coverage and any amplifier system has to match this. The design chosen uses a pair of J310 JFETs run in push-pull configuration. Like its hi-fi equivalent, distortion products generated on one side of the circuit tend to cancel on the other. Ideally, the two transistors used should be matched electrically. In practice, this is not too important. The common source resistor R2 tends to balance out electrical imperfections in the circuit.

Transistors Q1 and Q2 are run at around 20mA standing current each (40mA total) placing the operating point on a very linear portion of the slope. The heavy negative feedback provided by R1 and L1 from output to input terminal, combined with the high internal gain of the amplifier unit, largely removes any residual distortion products. The negative feedback circuit, which is of the virtual earth type, also defines the input impedance of the amplifier, but without adding the noise penalty of a resistor connected directly across the input transformer. It is worth noting that the amplifier input only represents a 50 ohm match while its output is terminated into a 50 ohm load. Choke L1 compensates for capacitative phase shift at high frequencies while C1 and C2 provide neutralisation. R3 and R4

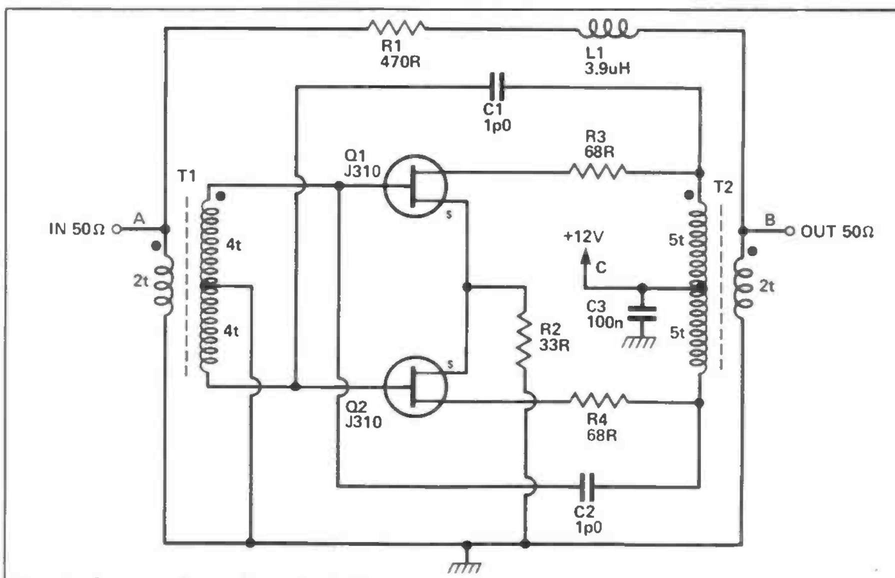

Fig. 1. Omega Broadband HF Preamplifier