ALL MODE TRANSCEIVER Project

PROJECT

OMEGA

Part 5

Project Omega grows month by month – this time its the SSB Generator, designed by Frank Ogden, G4JST, and Tony Bailey, G3WPO.

There is nothing particularly out of the ordinary about the Omega SSB generator. It provides the following facilities: 1. SSB generation at 10.7MHz in the transmit mode for injection into the CIFPU double balanced mixer; 2. processed mic audio for both the SSB generator and the AM/FM signal boards (to be described in a future article); 3. VOX control and anti-VOX sensing; and 4. carrier insertion for SSB receive.

Speech Processor

The majority of microphone signal conditioning is carried out by a single chip, IC1. This comprises a low noise VOGAD (voltage operated gain adjusting device) a limiter and a couple of buffer amplifiers. The functional blocks of IC1, a KB4417, are shown in **Fig. 1**.

The VOGAD nature of the microphone pre-amplifier block produces a virtually constant AF output for widely varying signal input levels. In practical terms the pre-amp produces the same level of output regardless of the type of mic in use and the way the operator uses it. The speed at which the amplifier can respond to changes in input level depends on the values of C40 and R39. Note that this part of the circuit provides linear control of the signal. Speech clipping, the mechanism central to speech processing, is handled by subsequent parts of the circuit.

In baseband (i.e. not RF carrier) types of speech processor, the most important contribution to their effectiveness is made by ensuring tight control of the input frequency content to the limiter to within the band 300 to 3000Hz. The reason for this is simple. Chopping off lumps of the speech envelope introduces intermodulation distortion, the classic overprocessed sound of Italian and Russian stations. The incidence of in-band and so audible distortion products is a function of the spectral content of the input signal. Thus high-level speech components at 4 and 5kHz mix together in a simple limiter to generate distortion products at 1kHz which are just as horrible as those of components at 2 and 3kHz.

IC2 and IC3 provide the all-important band-pass function. These two chips are fed with constant amplitude mic signals which are then frequency conditioned and passed to the limiter block within IC1. The precise amount of speech processing on the output signal is controlled by RV3. Out-of-band distortion products produced by IC1 limiter circuitry are removed from the output signal by the active filter configured between pins 9 and 7 of the same chip. Pin 7 also provides processed and filtered AF takeoff for the AM and FM modulator circuitry via the Tx audio buffer (point J).

As an aside, the Omega speech processor and VOX section can operate 'stand alone' for use with other transceiver systems.

SSB Generator

Q1 and Q2 provide carrier generation (for Tx) and carrier insertion (for Rx) on both upper and lower

Omega Tx/Rx SSB adaptor – drilling detail