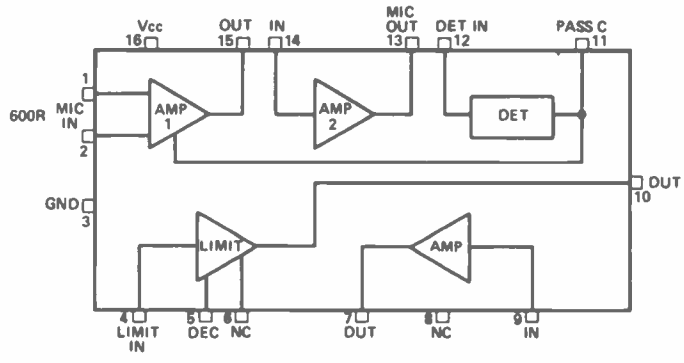

SPEC:
LIMITER THD 3% MAX
LIMITING 80% MIN
AMPLIFIER S/N RATIO: 55dB
MIC AMP DISTORTION: 1% TYP

OUTPUT AMP DISTORTION: 0.8% TYP
CURRENT CONSUMPTION 15mA TYP QUIESCENT
Vcc +16V MAX
P_{tot} 500mW MAX

KB4417 block diagram

sideband. Q3 acts as a buffer on receive and an isolation switch on transmit. Q5 provides carrier drive for the balanced modulator, T1, D1 and D2. The modulating signal is applied to the centre tap of T1 and the resulting double sideband modulation delivered to the SSB filter through the impedance matcher, Q6. SSB output from the filter is amplified and buffered by Q7. TR9 acts as a solid state relay in the supply rail to the generator circuitry.

Note that RF buffering to the CIF-PU circuitry is performed by transistor amplifier stages with collector load RF chokes. These offer high impedance current injection points (RF signal current that is) while imposing virtually no external circuit loading.

VOX Control

For optimum operating conditions on SSB, any modern rig requires the VOX (Voice operated Transmit/Receive) facility. In the past, many such circuits have had the distinct disadvantage from an operator's point of view that VOX control was always accompanied by much clanking away of the changeover relays. Consequently, many people won't use the facility!

VOX is a very helpful feature and gives the equivalent of CW break-in operation for phone – you can listen between words, or short sentences, and know when you are being blotted out by another station; and of course, it enables a more natural conversation to take place.

Not wanting to re-invent the wheel, we used VOX ciruitry that has been around a while, with a few changes to suit OMEGA. It uses only two ICs and a handful of other components, and gives all the usual features of VOX gain, delay, and anti-VOX – plus silent Tx-Rx operation by means of the CW break-in control circuit.

The input to the unit is paralleled with the microphone input to the audio processor chip, and amplified by op-amps IC4a and IC4b – RV4 controls the gain so that the sensitivity can be adjusted to the correct level for the microphone in use. Output is then rectified by the two germanium diodes to provide a DC voltage.

Anti-VOX

A similar amplifier using only one op-amp section (IC4c) also amplifies any signal coming from the Rx loudspeaker for the anti-VOX function. Why is Anti-VOX needed? Its purpose is to prevent loudspeaker signals from activating the mic amplifier circuit, otherwise you would have a nice oscillator which will switch from receive to transmit and back again on received signals. In use, the anti-VOX gain is adjusted so that the output from its rectifier circuit (which gives a DC voltage of opposite polarity to the mic circuit) is just slightly greater than the rectified voltage caused by amplification of signals from the speaker via the mic circuit.

These voltages are then summed by R64/65 and applied to the inverting input of IC4d. A small bias voltage (about 0.2V) is applied to the non-inverting input of IC4d, so that the output of the op-amp will remain high while there is no voltage present form the amplifier circuits. Once this latter voltage exceeds 0.2V, the op-amp output goes low. This will occur only when there is output from the mic amp, or the output from the mic amp exceeds that from the speaker amplifier. The VOX circuit will therefore only switch when you are actually talking into the microphone (or you shout at the dog or kids).

Interfacing

Now that we have a control voltage, this is applied to an NE555 timer, configured to provide an adjustable delay via a front panel control (RV6). Q10 resets the delay by discharging C68 while there is no speech present, giving a constant switching period after each pause in speech. The output of the timer on pin 3 goes high while active – this is then inverted by Q11, and used to activate the Tx/Rx control input on the logic switching unit, point E normally connected to the key for CW (the logic switching unit was described in the November issue).

Construction

The rest of this article describes the construction and testing of the above unit, plus details of the mode switch wiring which will now be required for CW/SSB switching.

The Tx/Rx SSB adaptor is built on two printed circuit boards and housed in a diecast box which also carried the VOX and Anti-Vox gain controls. These controls are normally required to be adjusted only once, and are not front panel mounted, but are accessible from under the lid of the case.

AF PCB

We suggest you start by building the audio processor board, which also has the Tx audio buffer (Q4) and DC switch (Q9) mounted on it. The PCB is single sided. Note that with both PCBs, the component density is rather higher than previous boards – by now you should be well practised in assembling these!

1. As usual, check the PCB for unwanted bridges etc. Then inset and solder the 9 connection pins.
2. Insert and solder all fixed resistors, plus RFC3 (this needs 10cm of wire for winding). Take care that the metal oxide precision resistors are used where needed in the filter, and not elsewhere.
3. Insert and solder all capacitors.