Active SSB/CW

PROJECT

This switch selectable active audio filter not only forms part of the *Project Ω* transceiver, but can be used to improve many other rigs as well.

Those of you who have built the *DSB80* transceiver featured in the March issue will hopefully have a neat little transceiver with excellent sensitivity for double sideband and CW use. The one area where an improvement can be made is with the selectivity. Being direct conversion, the receiver bandwidth is that of the audio stages — around ±6kHz. On a sparsely populated band this is not a major problem, but after dark the level of activity, both commercial and amateur requires a means of reducing the bandwidth to improve copy.

The answer for a direct conversion receiver, where constructing a variable frequency crystal filter is something of an insurmountable problem, is an audio filter. To take advantage of modern technology an active design, rather than passive, was chosen. This has the constructional advantage of not requiring any inductors, just Rs and Cs and a few op-amps, so that size is kept to a minimum. It requires no alignment, and with this design, you can switch just the bandwidths most suited for your applications, or have all the selectivity options switch selectable.

The filter can be used with the *DSB80,* or any other direct conversion receiver, and is designed to be placed immediately before the AF power amplifier stage of the RX, or some other suitable low-level AF point. There is no reason why a single IC AF amplifier could not be added for driving a low impedance speaker making the unit self contained. It operates off +12V DC and consumes about 15mA.

This project is also intended to be used in conjunction with the HF transceiver design started in this issue, and will provide the main CW selectivity for the basic transceiver. As with the transceiver, a kit of parts the PCB will be made available to constructors. The assembly is not difficult and the project is suitable for all levels of contructor.

Circuit

The design is split into two basic sections — that for SSB and that for CW use.

For SSB, a bandpass characteristic is required, with a low cut-off point around 300Hz, below which received audio contributes nothing to the intelligibility of the signal, and a high cut-off between 1.5 and 3kHz. If greater than 3kHz you are receiving unwanted interference and no enhancement of the signal, while below 1.5kHz the intelligibility suffers.

Unfortunately it is not possible to design an active filter circuit which can accommodate both these high and low pass bandpass requirements in one circuit while still maintaining a flat passband. Hence it is necessary to split the filtering into separate high- and low-pass sections.

Before the active filters, a buffer amplifier IC1 is used to isolate the filter input proper (IC2 on) from the AF input, as varying loading on the input to IC2 would affect the response characteristics. A 741 op-amp is used as an inverting amplifier, with R6 setting the overall gain.

For most applications a unity gain configuration would be needed in which case R6 would be 2k2. If some additional gain is required in the system, the value of this can be increased to suit. For the *DSB80,* this can usefully be increased to 15k. This will be found especially helpful during the daytime when signals tend to be weaker. Point C allows direct connection to the buffer amp output if needed without any filtering having been introduced.

C1 provides DC isolation from the audio circuitry being used.

Supply rails

To avoid the need for both positive and negative supply rails, where the non-inverting inputs would be taken to the negative rail, the non-inverting inputs to all op-amps are biased to half the positive supply rail voltage via a resistive divider (R2/4 for IC1), creating a virtual zero voltage at +6V, and allowing signals to swing either side of this as though

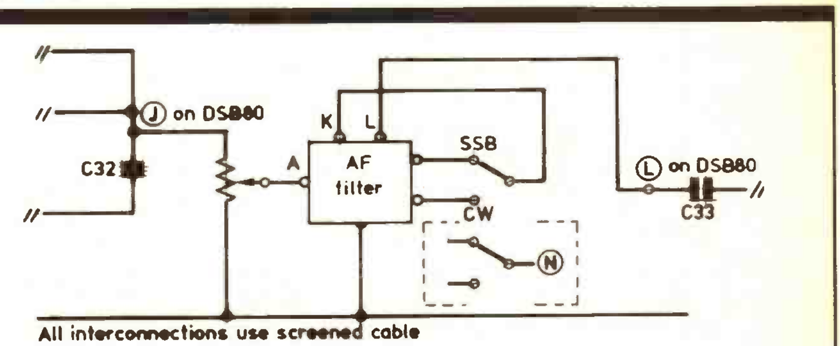

Fig. 1 Wiring the filter into the SDB80