VHF to HF Transverter

By David Johnson BA(Hons), G4DHF

The high performance VHF transceiver is fairly ubiquitous among the amateur population, and it has always seemed to the author such a waste to use such performance for one band only. The author possesses an *IC202S* which over the past 18 months has been constantly modified to achieve the lowest possible noise figure in order to better realise the VHF DX potential of the system. Once this had been achieved, a means of communicating on the 20 metre VHF net was required in order to arrange schedules. The author's bank account, not being in a particularly healthy state, ruled out one of those £500 plus HF transceivers described in the glossy advertisements.

With this problem in mind, the down-transverter to be described was developed during Winter 1982. Not only was it possible to transvert from 2 metres to 20 metres, but 15 metres and 10 metres were also possible, due to the nature of the mixer and preselector components. The problem with multi-band transceiver design, one of band switching (usually requiring multi-way wafer switches and yards of coaxial cable) is largely eliminated in this design. The unit is also totally independent of the VHF prime-mover. No modifications are necessary. Simply plug in your transceiver, select the band, peak the signal and you are on the HF bands for an outlay of around £70. This should make it one of the most cost-effective systems available. The performance of this little unit exceeded all expectations, and with a power output of only 3 watts, the first evening of operation provided contacts throughout Europe, including SMO, EA, EA6, F, I, YU, DJ, CT1, OH, OK and LA. This was even more satisfying given the makeshift nature of the indoor antenna, erected in the loft-space only minutes prior to testing! The performance of the receiver is excellent on all bands, and would certainly perform better under strong-signal conditions than some commercial transceivers due to the high-level mixing system. Conversion gain is such that, even on 10 metres, noise can be peaked on a 50ohm resistor across the input.

Fig. 1 shows the block diagram of the system. The design is based around a low-cost bi-directional mixer, the *SBL1*. Here the VHF signal is mixed on both transmit and receive with a diode switched local oscillator producing the required output frequency. During transmit it is important that the *SBL1* is driven with the correct amount of power of 5mW, and is terminated into a 50ohm load. Powers much in excess of this will cause saturation of the mixing diodes resulting in numerous spurious products being generated during conversion. Relays RLY1 and RLY2 switch in a resistive 'T' attenuator network to provide around 28dB attenuation for a 3 watt source. A 30dB pad was used in the prototype as the author's transceiver (as are most) is conservatively rated. Both the *IC202* and *FT290* have performed well using this system. If other power levels are envisaged, then the attenuator network must be adjusted accordingly. Further information can be found in the ARRL Handbook and the December 1982 edition of *Radio Communication*.

In order to reduce the amount of unwanted products generated in the mixing system, it is important to have a stable, low-noise, low-harmonic oscillator capable of producing an output of approximately 0.7V RMS correctly terminated at the input port of the mixer. Band switching is achieved by switching HT between one of three identical oscil-

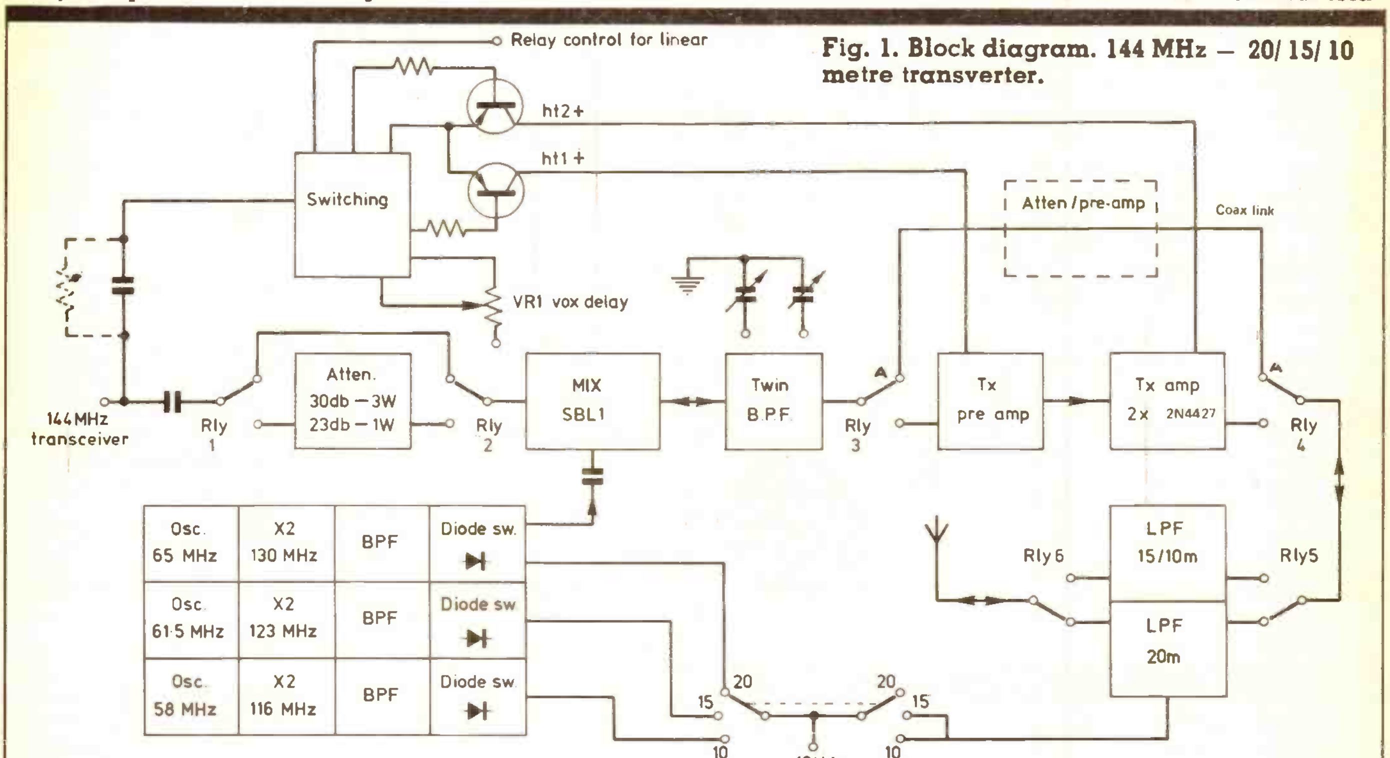

Fig. 1. Block diagram. 144 MHz – 20/15/10 metre transverter.