(suitably fitted with heatsinks). Various gain compensation networks were tried during development, but the simplicity of the final network proved to be quite adequate.

The amplified signal passes through the LPF to further reduce harmonics and spurious products. Again in order to simplify band-switching the signal is diverted through one of two filters via relays RLY5 and RLY6. In the author's case, as 20 metres was the main conversion band in use, the unenergised filter pass contained the 20 metre section. During the switching of the voltages to the oscillator, the filter relays become energised when 15 metres and 10 metres are in use.

In order to make the unit totally independent of the transceiver, automatic switching is employed. A small amount of transmit power is sampled by C2 and is rectified by diodes D1 and D2. This voltage switches TR1 'on', causing TR2 to conduct which energises the relay line. Transistors TR3 and TR4 are also switched, providing HT for the amplifier chain. An adjustable delay time is provided via D3, C3 and VR1. Diode D3 allows C3 to be quickly charged when a voltage is present. Capacitor discharge is varied through VR1, R5 and R4, which holds TR1 'on' for as long as a voltage is present. In practice the unit is so sensitive that the initial burst of unbalanced carrier produced when the transmitter is activated is detected, sending the transverter into transmit mode. If the *FT290* is used, the voltage present during transmit can be used to activate the switching circuit (**Fig. 5**) providing full independent switching.

Construction on the double-sided circuit boards is straight forward and should present little difficulty, although the following points should be noted. Top quality, full spec. devices must be used if the high performance of this unit is to be realised. One of the prototypes used a 'branded' BSX20 of unknown manufacture. Although the unit did work, the required output voltage from the oscillator was only a fraction of the desired amount, and it was noted that the stability of the oscillator was not as good as those in previous units. A replacement BSX20 totally eliminated those problems. Vertically mounted components in contact with the signal path R10, R15, R17, R18, R25, R36, R37 and RFC5 should have the body of the device directly in contact with the signal line to prevent radiation through the component leads. The power output from the oscillators is quite high and so adequate screening must be provided, preferably using tin-plate, or failing this double-sided PCB. An 18swg aluminium screen is positioned between the two circuit boards, which also locates VC1. Screened wire should also be used to supply HT to the individual oscillators. When the unit was housed in a die-case box it was noted that the excellent spectrum output was made even cleaner due to the increased screening between stages. Care should be taken when winding the broad-band transformers, as space through the holes is rather limited. Keep the windings neat and tight. VC1 is connected to the main board with rigid 18swg wire.

When testing the oscillator circuit, wire the unit as shown in **Fig. 6**, and attach a digital frequency meter via a 6.8pF capacitor to the emitter of TR11. Applying

Coil data

L1, L2
10 turns of 30swg wire wound on a T50-6 toroid.

L1a, L2a
Wound on the toroid cores next to the main windings. Two turns 30swg

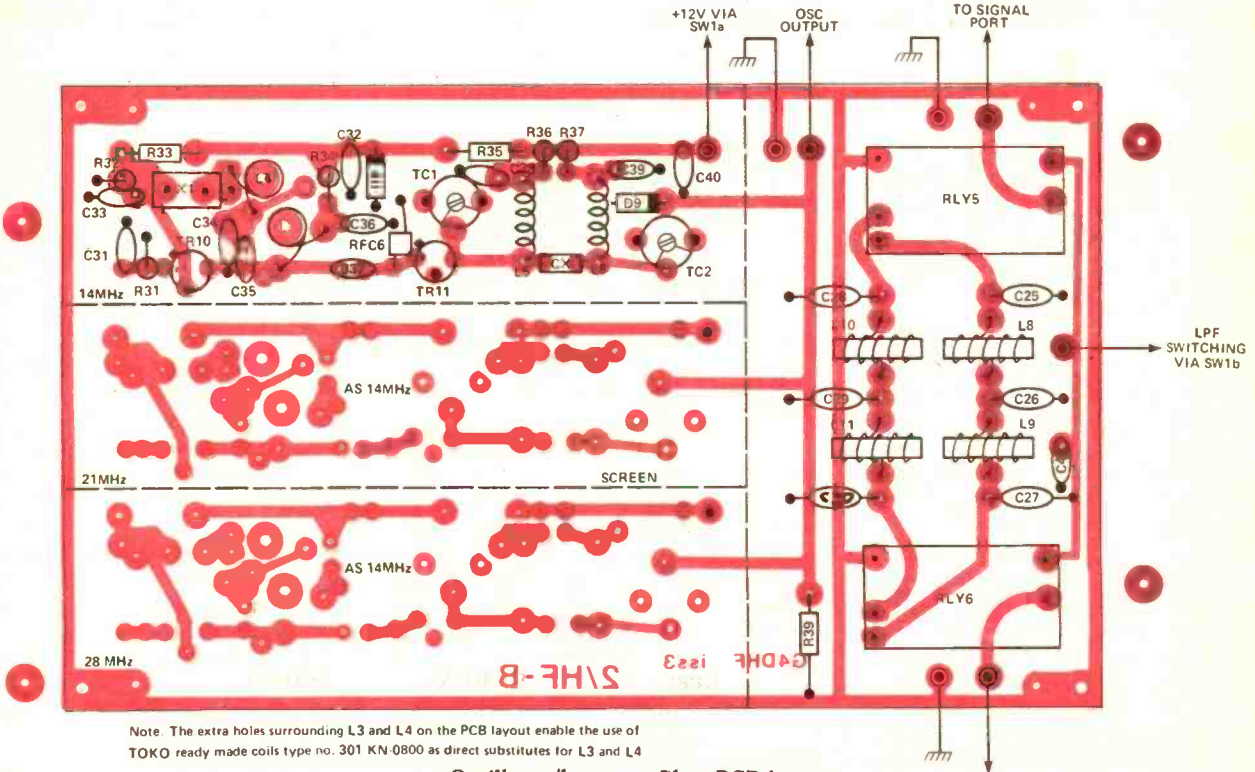
L3
Eight turns of 30swg wire on 6mm former fitted with tuning slug.

L4
Seven turns of 30swg wire on 6mm former fitted with tuning slug.

L5, 16
Six turns of 18swg wire wound on a 7/32 inch mandrill, self supporting approximately 1cm long. Diode tap on L6 1¼ turn from earthy end.

T1 to T5
All wound on 1cm square ferrite cores using 30swg wire. The wire is passed through the holes in the manner of a conventional transformer. Individual details as follows:
T1 Eight turns centre tapped
T2 Four turns primary, two turns secondary.
T3 Winding details as for T2
T4 Four turns primary, four turns secondary centre tapped
T5 Four turns primary centre-tapped Secondary four turns

Filter coils
L8, L9
12 turns of 22swg wire on T50-6 ferrite toroid core
L10, L11
Nine turns of 22swg wire on T50-6 toroid core



Note. The extra holes surrounding L3 and L4 on the PCB layout enable the use of TOKO ready made coils type no. 301 KN-0800 as direct substitutes for L3 and L4

Oscillator/low pass filter PCB layout