Frequency display

There are two ways of monitoring the receiver (or transmit) frequency of the VFO/LO module. The most convenient is to measure directly the LO output frequency, remove the IF offset, and display the result on a digital readout. This is the option offered for Project Omega constructors. The other is to calibrate a slow motion dial on the reference VFO (cheaper, but mechanically more taxing). The display module is described further on in this article.

In use

We haven't had a chance to place the unit on a decent spectrum analyser yet but first indications are that it has to be a *decent* spectrum analyser to make a realistic measurement of the noise sidebands at all!

In practice, the purity of the LO signal makes itself very evident. When used in conjunction with the Omega CIFPU board, some CW transmissions have a sweetness of note which is not evident on the synthesised commercial HF gear. Furthermore, 40m at night is a revelation. Without exaggerating, both G3WPO and G4JST have heard weak DX amateur traffic which we've never heard before. The VFO/LO module may not offer banks of memories and A/B frequencies but it does offer staggeringly good RF performance.

Other than Omega

The VFO/LO system could also be used to augment existing commerical equipment as well as the wide range of single board IF SSB systems of which G4CLF is an example. The precise IF offset is determined by the selection of crystal frequencies. It could be used to great advantage in both the PW Helford transceiver design, and the latest Radcom project by G3OGQ.

Construction

The PLL Synthesised VFO is without doubt the most complex of the OMEGA modules in terms of component count and assembly time, but providing the assembly details and modular testing procedure are followed, there should not be too much difficulty. This is one module where some test equipment will come in very handy — a frequency counter covering up to 40MHz, and an oscilloscope will be very useful. A diode probe is almost essential, and you can easily make one from the diagram given on p.36 of the JULY issue.

If you don't have a counter, the companion Digital Frequency Display could be used in its place, in which case this should be constructed prior to assembling the VFO units. It does however subtract 10.7MHz from the input frequency which will have to be allowed for. If all sections work first time the need for a scope is unlikely, but it is a helpful instrument to have — its about the only way to actually "see" RF energy.

The VFO unit is built in two separate units — the 1-2 MHz reference VFO as a self contained module, and the remainder of the circuit comprising the VCO's, crystal oscillators, Loop mixer, phase detector, and loop filter. The reference VFO is built first.

As with the CIFPU unit, the instructions are detailed for the relative beginner, experienced constructors allow for things that probably seem obvious.

Reference VFO

This module is the basic frequency determining section and care in its electrical and physical construction will pay dividends in terms of final stability. It must be enclosed in a screened enclosure, and a suitable diecast box together with drilling detail is given. Other boxes may be used, but the mechanical strength needs to be good, and the size should be similar if the front panel

PCB assembly

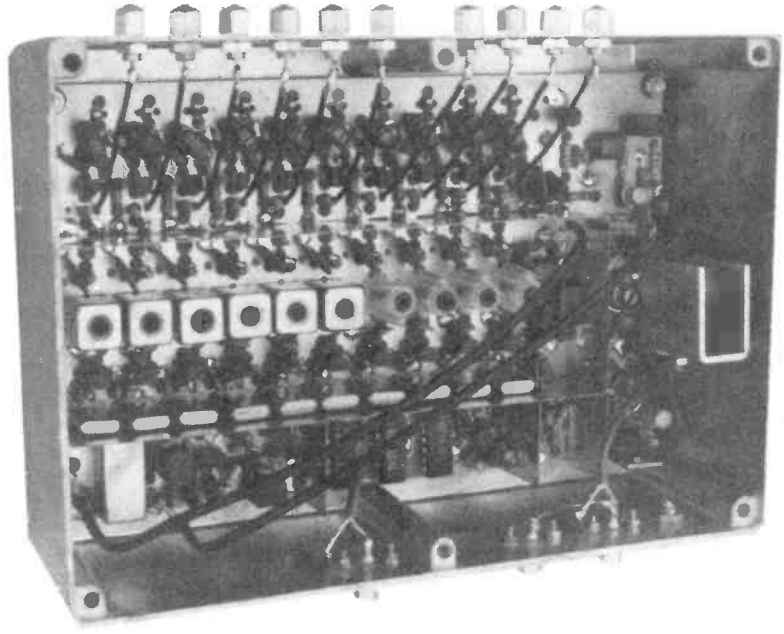
The VFO circuit is built on a small single sided pcb, which sits by the side of the air spaced dual tuning capacitor. Building this pcb is very straightforward, as follows.

1. Insert the 9 connection pins where shown and solder.

2. Insert and solder all resistors and fixed capacitors, observing polarity of capacitors where needed. Keep all components as close to the board as possible.

3. Insert and solder VC1 and VC3, RFC1/2, and D1, making sure the latter is the correct way round.

4. Insert and solder L1, and the 3 transistors, leaving not more than 3mm of the latter's leads above the



Main synthesiser module