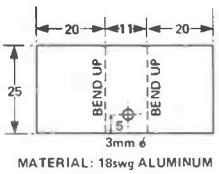
Make sure that the link between the upper and lower surfaces of the pcb is in place just to the right of the mixer. One end of C93 is soldered to a track on the top.

Q29 & Q30 both have one lead soldered to the top foil. Again, wind T6 (primary 31cm wire, secondary 10cm) with the primary leads longer than the secondary for identification. Be careful not to strip the insulation.

Operation of the loop mixer (which produces a difference frequency of 1-2MHz between the VCO and the crystal oscillator) can best be checked with an oscilloscope, after making the coax links to the inputs of the SBL-1 mixer. The output at C93 should be reasonably constant with the difference frequency inputs between 1 and 2MHz, and then drop off rapidly as the difference increases.



Tr26 heatsink detail

Alternatively, a counter connected to the output should read between 1 & 2MHz as the VCO is varied in frequency with the pot. Incidentally, the Frequency Display can't be used for this check.

Loop Filter

Carry on by inserting and soldering all the components associated with the loop filter (IC8). The latter has pin 4 soldered to the top foil including the small screen.

Check operation by transferring the wiper of the variable pot to the unconnected end of R86, and set the pot at the earthy end. Varying the voltage on the pot wiper from around 6v to 0v should result in the comparator output swinging from around 0v to about 11.5v.

When this is working OK, solder in the last of the small screens as close to C97 as possible and remove the pot connection — this is no longer required.

Phase comparator

The remaining components belonging to this section can now be soldered into place. R s 77 & 90 are mounted on the underside of the pcb, with the leads on the top cut off flush with the pcb. Make sure the IC s are the correct way round, and that all the pins marked with crosses are soldered to the top foil, or the tracks on the top where this is possible. One lead of Q31 is soldered to a track on the top, as is one end of R78.

Apply +12v and check that there is 5v +/− 0.2v present on pin 14 of IC6.

Remove +12v, and if you have removed them, reconnect the coax links to the input of the Loop Mixer. Connect a wire link over the top of the pcb between the two points marked A on the drawing.

Apply +12v and activate one of the VCO s. A meter attached to point A should read around 11.5v indicating that the comparator output has gone high. Remove +12v, and also the coax link to the loop filter input from point C. Now connect up the reference VFO to the input next to IC5.

Apply +12v to both modules and check that the comparator output has now gone near 0v. If both these checks work, then the system should be functioning correctly, and you are nearly there!

Problems

If things don't go as planned with the previous section, there are some checks you can carry out, assuming you don't have a scope available. Removing the Reference VFO input should make pin 2 of IC5 change level, and shorting pin 13 with a capacitor should make pin 12 change level (the normal voltage level should be about 2.5v). If this is not the case, the Schmidt triggers are not working correctly. A slight change to the values of R s 77 & 90 to a lower value (try 4k7) should solve this problem.

On IC5, pins 5&6 should be of opposite logic states, as should pins 9&10, when the reference VFO input is removed. Providing the input triggers are working correctly, there is no reason why the circuit shouldn't function and you should then look for components or soldering errors.

Final Setting Up

Now that the individual parts of the circuit are working correctly, remove all power and check that all inputs are correctly connected to the VCO unit, including the reference VFO.

Now apply +12v and select the 160M VCO by applying +12v to the appropriate pin. With a counter connected to the VCO output via C100 (390pF) (or you can use the display which will indicate the eventual receive frequency — a counter will show the actual VCO frequency which is 10.7MHz higher) adjust the reference VFO to its highest frequency.

Connect a multimeter to point A (varicap control voltage) and carefully adjust the VCO turns on the core until the correct highest frequency is shown on the display when the voltage is approx 10.3v +/− 0.2v. Providing everything is in lock (pin 5 of IC6 should be virtually 0v) the voltage will vary wildly as you play with the core initially, showing that the VCO is tracking. Only very slight adjustments are needed to get it right. The control voltage cannot exceed about 11.5v so if this reading is obtained then the VCO frequency is too low and the turns need opening slightly.

All this is far easier to do than describe!

Out with the epoxy...

Winding the VFO to the low end of its range should then cause the control voltage to drop until it reaches about 4-4.5v.

When you are satisifed with the 160M VCO coverage, get some rapid setting Araldite and smear it over the turns and the base of the core so it is locked to the pcb. It is advisable to leave one or two turns free at the top of the core for final adjustments when the module is cased, and to recheck the top frequency for 10.3v control voltage BEFORE the Araldite has set, as applying the adhesive will have almost certainly moved the turns a bit.

The process is then repeated with each VCO in turn.

Finally, terminate the VCO output with a 1N4148 diode (either way round) in series with a 47 or 56 ohm resistor, the latter connected to earth. Apply the diode probe to the junction of the two. With a bit of luck you should have a reading. Carefully note the position of the wiper on RV3, then turn it slowly an-