sion, a 'Roofing filter' has been used at 10.7MHz for initial selectivity. This has been the main advantage of reducing adjacent channel signals before further amplification, minimising the risks of 'bleedover' or adjacent channel interference. F1 is a two pole monolithic crystal filter with a bandwidth of 15kHz, and a skirt rejection of 18dB at +/− 25kHz — this adjacent channel rejection can then be added to that of the main filter at 455kHz.

Nearly all the remainder of the functions except audio power amplification are carried out by IC1, a ULN 3859 (or MC3359 which is equivalent) intregrated circuit. This has on-board an oscillator, detector, I.F, amplification and squelch circuitry. It also has an output designed for use with a scanner, but this is unused here, as is the AFC function. Possibly the only function that IC1 does not provide is an S-Meter. However, for FM use these are not a great deal of use anyway — once you are fully limited that's it as far as perceived signal strength goes!

Conversion to 455kHz requires another local oscillator at 10.245MHz, and uses IC1 for this, with X1 (pins 1 and 2 of IC1 with output on pin 3) — this latter pin also has the correct impedance to match straight into F2, a 12kHz (−3dB) bandwidth ceramic filter, which provides the main selectivity prior to detection (narrower bandwidths than this will cause distortion of the received signal). Limiting amplification then follows, and quadrature detection with T4 as the quadrature coil. Low level audio output is then brought up to around the 1 watt level for driving a speaker by IC2, an LM380N.

For the squelch function, the high frequency noise present when there is no signal is filtered through an active bandpass filter, using an internal opamp in IC1, and the frequency component outside of the normal audio range is used to drive the squelch circuit. The level at which the receiver mutes is controlled by RV1.

Construction

The receiver is built on one double sided printed circuit board, with the top plane used as an earth foil for good stability. Although the component layout is fairly compact, you should have no difficulty in building this providing you follow the instructions. These instructions are comprehensive for the beginner, you can of course ignore them if you feel the need! You will need a soldering iron (tip size ⅛" maximum), multi-core solder (NEVER use anything else for this type of work!), and a pair of side-cutters as a basic minimum.

A few words on mounting the components for newcomers. Resistors mount either vertically or horizontally, using 10mm spacing for horizontal. Where one end is marked with a cross on the layout, this indicates that that end is soldered to the top foil where it goes through the hole, AND to the track underneath — this is important as some earth connections are made via tracks underneath and these components provide the link from one side to the other (this means some components may not appear earthed because they are not soldered to the top). In the case of vertical mounting resistors it is also important that the body of the resistor is in the position shown — this helps prevent signal radiation or pickup on the component.

Down To Specifics

With capacitors, keep them as close to the PCB as possible. Where one end is earthed with a cross, again it should be soldered both sides with the underneath of the capacitor body about 3mm above the PCB top surface. DON'T mount components more than 3-5mm above the PCB anyway as it can lead to all sorts of problems. Correct polarity of aluminium electrolytic and tantalum types must also be observed.

1. Insert and solder the 17 1mm dia. connection pins. If the receiver only is being built, and the case layout to be given next month is not to be used, then see instruction 9 below before putting them in. These are pushed in from the underside of the board (some force is needed to get them right in). Some of them are soldered both sides.

2. Solder in the following components — these will help locate the others and minimise problems with soldering iron access later. T1, T2, T3, T4, IC1, IC2, IC3, F1. Each of T1/24 has the can soldered to the top foil where shown. T3 has the side with a short shoulder located near the left hand side of R7. IC1 has one pin soldered to the top foil, and IC2 has 7 likewise. Always solder ALL pins on the underside of the PCB. IC3 has its centre pin earthed to the top. F1 can go in either way round.

3. Now solder in the small gold plated cage jacks — these are used as sockets for the HC25/U crystals (X2-X7) which will be used for channel selection. It is easiest to do this by pushing a pair onto a surplus crystal then putting this through the PCB holes, soldering into place with the tops of the jacks resting against the PCB.

4. Solder in the trimmers CT2 — CT7 — one of the outermost leads on each is soldered to the top foil — be very careful when doing this so as not to melt the plastic body.

5. Solder in L1 (either way round), followed by C1,2,3,4,5,6,10,19, 32,33,34,35,36, then R1,2,3,5,6, 7,8,16,18 — 25, soldering earthed leads on *both* sides of the PCB where needed.

6. Now put a miniature ferrite bead on Q1 Drain lead where shown (the tab on the case should be positioned as drawn). Push the device down onto the bead, against the PCB, before soldering — again, one lead (Source) is soldered both sides. Repeat with Q2 (which doesn't have leads soldered to the top). Then push Q3 (getting the flat on the transistor case on the correct side) to within 3mm of the PCB, then solder. Now, add a ferrite bead to the collector lead of Q4, insert into the PCB and solder.

Helical Filter

7. Put the helical filter (HF1) into the PCB (it will only go in one way round), solder all pins on the underside, and then solder the case to the top foil where shown. This needs a hot iron and it helps if you tip the PCB so that the solder runs against the case.

8. This leaves the right hand side of the PCB to finish. Start at the top and work down with each component, noting correct polarity of D1 and the electrolytic capacitors. C16 and C17 should be in before the filter F2.

9. If you are only building the receiver, it is possible to mount the two potentiometers directly onto the PCB in the holes provided-instead of using connection pins when they are mounted remotely. If this is done, the earthed pin should be soldered both sides of the board.

With everything in place, *double check* that you have all the ic's and other orientation critical components correct (it saves heartache later), and that you haven't introduced any