

The CVF80 is a VFO module for use with the CTX80 transmitter and many other applications where a VFO is required for the 80M band. The tuning range of the VFO can be easily modified for other frequency ranges if desired. IRT facilities are built in for offsetting the frequency of the VFO when using the CVF80 to drive a receiver as well as a transmitter. The CVF80 can be FM modulated if required.

BRIEF SPECIFICATION:

Tuning range: 3 to 4.5MHz - will tune approx 300kHz segment with 50pF tuning capacitor.

IRT range: typically 4kHz total variation, at least +/- 1.5kHz.

Outputs: Two independently buffered outputs. Load Z >1k ohm. approx 3V P-P.

Modulation input. High impedance, frequency response flat from 60Hz to 6kHz.

Supply voltage: 10 to 15V (frequency change <100Hz over this voltage range).

FSK is possible by keying IRT switching circuit.

TOOLS REQUIRED:

Soldering iron about 30W (with a fine pointed tip). Small side cutters, long-nosed pliers, and a trimming tool for L1.

BUILDING THE KIT.

The CVF80 has a fairly compact circuit board to enable it to be mounted in a small screened box inside other equipment without taking up a disproportionate amount of space. Because of this the parts, and hence the circuit tracks, are quite close together. It is essential that care is taken when soldering not to "bridge" solder across the tracks causing them to be shorted together.

Start by reading all the paperwork through at least once BEFORE you plug in the soldering iron. When you have done this, start construction by fitting the resistors. Refer to the parts list and select R1. Bend its leads as shown in the picture and insert it into the circuit board.



The leads can now be soldered to the tracks, and then cut off close to the joint. Now fit R2 in the same way and work your way down the parts list until all the resistors have been fitted. Next fit the capacitors as detailed in the parts list. The next parts to fit are the semiconductors. MAKE SURE YOU FIT THESE THE RIGHT WAY ROUND. The outline of the shape of the transistors is printed on the board, so this is quite easy. The diodes all have a band at one end of them, this indicates the lead that goes to the hole marked with a "+" sign on the circuit board.

Use an off-cut component lead to make the wire link shown by a dotted line on the circuit board, near C3. The link should connect from the hole closest to C3 to the hole nearest to this along the dotted line.

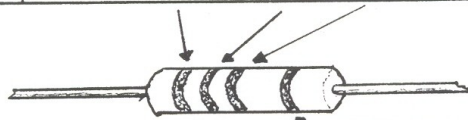
You should now be left with just the coil, L1, to fit. Take care as you push this into the mounting hole on the board that you do not snap the former as this is a little fragile. Only press it in far enough just to hold it firmly in place. Now solder the leads to the holes as indicated by the letters marked on the board - these correspond with the lettered leads in the parts list picture.

Your CVF80 module should now be finished and ready for checking. Please do not rush into wiring the board up to a power supply, give all the solder joints a thorough inspection and check all the parts are in the right places first. It is a good idea to hold the board up to a bright light so that you are looking at the tracks in silhouette. Check that there are no splashes of solder, or bridges across the tracks. If you can see daylight through a joint, resolder it!

You are now ready to wire up the CVF80 module on the test bench and check that it works OK. Refer to the wiring diagram sheet for this. Do make sure you connect the power the right way round! Negative earth.

RESISTORS

Part No.	Value	Description	Fitted	Checked
R1	47R	Yellow Violet Black		
R2	1k0	Brown Black Red		
R3	1k0	Brown Black Red		
R4	1k0	Brown Black Red		
R5	47k	Yellow Violet Orange		
R6	47k	Yellow Violet Orange		
R7	100k	Brown Black Yellow		
R8	27R	Red Violet Black		
R9	100k	Brown Black Yellow		
R10	10k	Brown Black Orange		
R11	100k	Brown Black Yellow		
R12	27R	Red Violet Black		
R13	47R	Yellow Violet Black		
R14	10k	Brown Black Orange		
R15	1k0	Brown Black Red		
R16	82k	Grey Red Orange		
R17	10k	Brown Black Orange		
R18	47k	Yellow Violet Orange		
R19	82k	Grey Red Orange		
R20	56k	Green Blue Orange		
R21	47k	Yellow Violet Orange		
R22	47k	Yellow Violet Orange		
R23	56k	Green Blue Orange		
R24	470R	Yellow Violet Brown		
R25	1k0	Brown Black Red		
R26	1k0	Brown Black Red		
R27	1k0	Brown Black Red		
R28	1k0	Brown Black Red		



Gold Band

CAPACITORS

Part No.	Value	Description	Fitted	Checked
C1	.01uF	Marked 103		
C2	.1uF	" 104k		
C3	5.6pF	" 5.6 or 5p6		
C4	1nF	" .001 or 102		
C5	180pF	" 180 2.5%		
C6	-	Not fitted to CVF80		
C7	.1uF	Marked 104k		
C8	22pF	" 22		
C9	.1uF	" 104k		
C10	.01uF	" 103		
C11	1nF	Marked .001 or 102		
C12	1nF	" .001 or 102		
C13	.1uF	" 104k		
C14	.1uF	" 104k		
C15	.01uF	" 103		

CONTINUED NEXT SHEET.

CAPACITORS (CONTINUED)

Part No.	Value	Description	Fitted	Checked
C16	.01uF	Marked 103		
C17	.1uF	" 104k		
C18	.01uF	" 103		
C19	.01uF	" 103		

SEMICONDUCTORS - TAKE CARE TO PUT THESE IN THE RIGHT WAY ROUND

The transistors (Tr1 etc.), should be put in the board as the outline printed on the board indicates.

TR1, TR5, TR6, TR7, TR8 & TR9 are all BC183A devices and have their type numbers marked on them. Sometimes we may supply BC237 devices instead of the BC183A types.

TR2 is a BC307 and has its type number printed on it.
TR3 and TR4 are 2N3819 devices and are marked as such.



The diodes all have a band at one end that indicates the lead that must go to the hole marked with a "+" sign on the circuit board.

D1 is a 1N4004 and has its type number marked on it. It has a black body.

D2 is a 1N4148. These tend to come with various markings. Sometimes they have their part number printed on them (very small print!), sometimes they are a plain orange colour with a black band at one end marking the "+" lead. Some 1N4148s have multi-coloured bands on them, the wide band indicates the "+" lead.

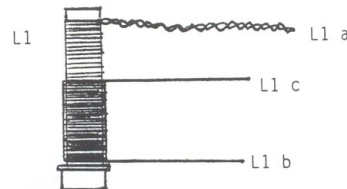
D3 is a BZY88 and has its type number marked on it.



Diode

L1

Fit this to the board as shown in the diagram. Be carefull not to break the rather fragile former when you push it into the circuit board.

NOTES ON SOLDERING

To solder properly, you must use the correct type of iron and the right quality of solder. Use a small tipped iron which has a bit that is almost pointed at the end. The iron should be about 30 Watts (if it is not thermostatically controlled). Only use electronic type multi-cored solder. NEVER use any extra flux.

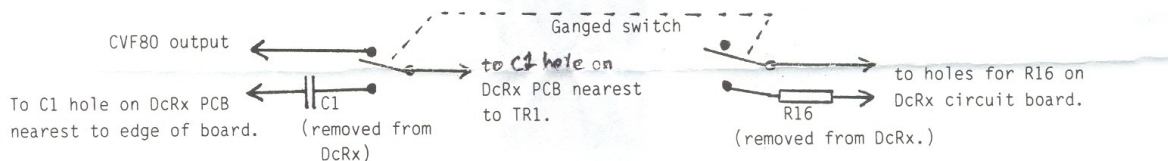
You should hold the hot iron in contact with both the lead and track for about a second or so to heat them up. Then, keeping the iron in place, touch the solder onto the junction of lead and track and wait a further second or so for the solder to flow along the lead and track to form a good joint. Now remove the iron. The iron should have been in contact with the work peice for a total time of about 4 seconds in all. It is a good idea to drag the tip of the iron up the component lead as you remove it from the joint, this helps to pull any excess solder up with it and encourages good flow along the component lead.

USING YOUR CVF80Use with CTX80.

Connect one output of the CVF80 (marked "op" on the board) via coax to the "B" input of the CTX80. The screen of the coax going to "E". Adjust L1 of the CTX80 for maximum output in the centre of the VFO tuning range (if you are not going to use crystal control on the CTX80). If you are going to use crystals and the VFO, then simply leave L1 of the CTX80 set as per the CTX80 instructions. With L1 aligned for crystal use, there will be a slight fall in drive to the TX at the LF end of the band, but this is not a problem in practice. Wire the "D" connection of the CVF80 via screened cable to the "+12" terminal on the CTX80. This terminal should only have power switched to it in TX mode. This disables the IRT on switching to transmit. Note that the CVF80 must run all the time, both when transmitting and receiving, to keep the output frequency stable. This can mean that when using a receiver other than the DcRx in transceive mode, that the oscillator can be heard whilst receiving, this is not a problem however because you simply use the CVF80s' IRT control to shift its frequency out of the receivers passband. The CVF80 will return to the correct transmit frequency automatically when terminal "D" goes to +12V, or thereabouts on transmit.

Use with DcRx receiver.

The VFO of the DcRx has to be disabled and the output of the CVF80 fed into it in its place. The simple way to do this is to remove C1 and R16 of the DcRx. Now feed one output (op) of the CVF80, via coax, to the connection for the removed C1 nearest to TR1. The outer of the coax goes to "E". The CVF80 will now drive the DcRx. If you wish to be able to switch from the DcRx VFO to the CVF80 external VFO (for split frequency working for example), then you will need to add a switch to the DcRx as shown:

Use for FM transmission.

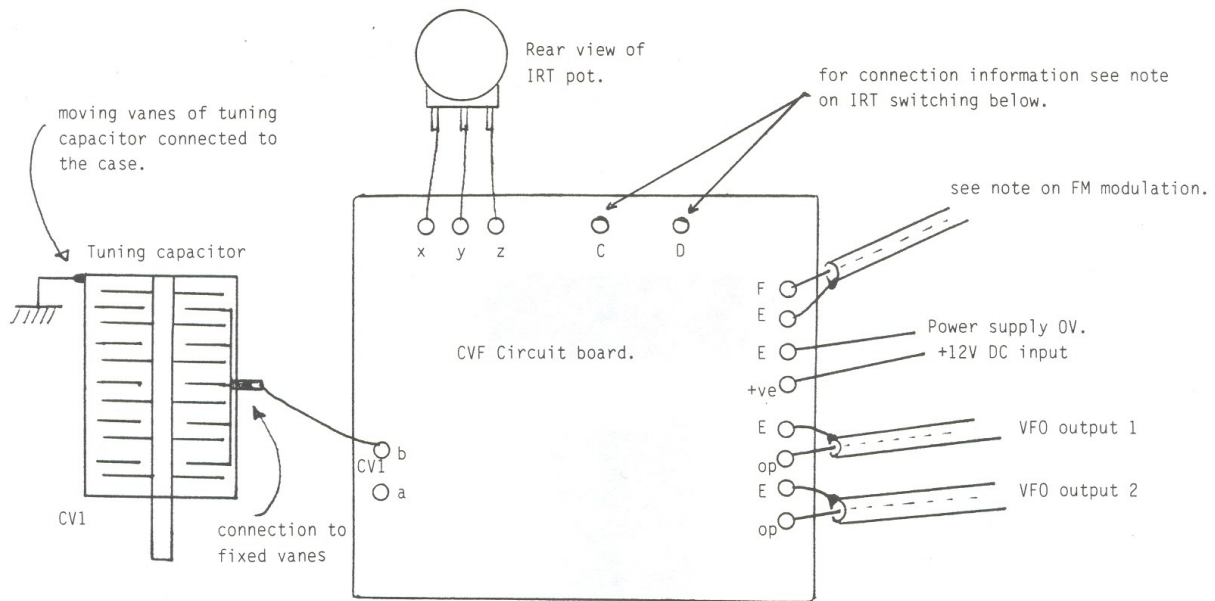
The CVF80 can be FM modulated. This facility is provided for when the CVF80 is modified for other frequencies, it is unlikely that you will wish to use FM on 80M ! However there is nothing in the UK Class A amateur license to say you can't! We will not encourage you though.

The deviation is not very large with the value of C3 as supplied. However you can change C3 to 10pF and then the CVF80 will deviate rather more. You can use up to 8V P-P modulating audio, but linearity will not be too good. It is better to keep the modulating voltage to under 2V P-P, then the deviation should be reasonably linear. If larger amounts of deviation are required, then a change of diode (D1) to a varactor diode with a larger capacitance swing than a 1N4004 should do the trick. Any change of value for C3, or change of diode type, will require L1 to be reset to give correct tuning range.

Aligning The CVF80

This is a straightforward job and should be left until it is fully installed and connected up. Simply adjust the core of L1 (use the correct trimming tool please), so that you have the required tuning range. Check this with a calibrated receiver or frequency counter. This will normally be approx 3.5 to 3.8 MHz. with a 50pF tuning capacitor. You can now seal the core of L1 in place with a drop of "Copydex" rubber solution glue, or a drop of wax.

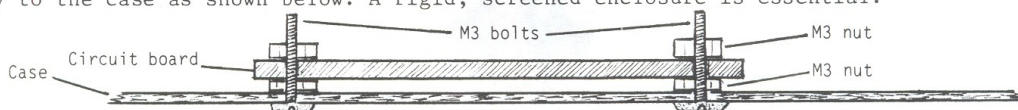
The other alignment job is to set the IRT pots' knob so that its pointer points straight up at the centre of the "dead spot". This is the segment of the pots rotation where the frequency does not change. This is the frequency to which the CVF80 returns when the IRT is switched off. Check for this by listening for the frequency change on a receiver or use a frequency counter. With the pointer set straight up in the centre of the "dead spot" it is easy to net onto a station. Simply set the IRT knob pointing straight up and tune CV1 for zero-beat with the incoming signal. You are now netted onto the incoming signal and can retune the IRT pot for the best note. The CVF80 will transmit on a frequency corresponding to the straight up position of the IRT knobs' pointer.



Notes on connecting the CVF80

Use miniature coax cable for all leads that are wired out to other equipment. If the IRT pot is not going to be enclosed in the same screened enclosure as the CVF80 board, wire this with screened cable as well.

You will note that we have not given a specification for frequency stability of the CVF80. The performance of this module is very good, but will be dependent on how good a job you make of installing it. Mechanical stability is a must. Use all four mounting holes and fix the board securely to the case as shown below. A rigid, screened enclosure is essential.



Keep all wiring away from the tuning capacitor, L1 and other components of the oscillator itself. Use stiff wire for the connection to CV1. You will find termination of the coax cables much easier if you fit terminal pins to the relevant holes on the PCB.

IRT switching. Either wire point "D" to a connection that has +12V on it on transmit (the +12V input of a CTX80 for example), or wire point "C" to a connection that has an earth on it on transmit. Either of these connections will switch off the IRT whilst transmitting.

FM Modulation. To FM modulate the CVF80, apply the modulating signal between "F" and earth ("E" via screened cable. Audio voltage level of about 2V P-P is recommended. IRT must be off on TX.

Driving a Frequency Counter. Because the VFO runs at signal frequency, all you have to do is hook up an ordinary frequency counter and you have full digital readout. Simply feed the counter from one of the outputs (in parallel with feed to CTX80 if using both outputs already), but use a resistor in series with the feed to help isolate any digital signals that may escape from the counter from causing problems with VFO purity. Use as high a value of series resistor (try 22k), that will still allow the counter to work.

Connecting a tuning capacitor of about 50pF to point "CV1 b" on the PCB will allow full band coverage of 80 Meters. If you only wish to tune a small section of the band then connection to "CV1 a" will reduce the tuning range by a factor of about 10. Other values of tuning capacitor can be used and connected to either point CV1a or CV1b to give the best tuning range for your purposes.

