Hands Electronics
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RTX VFO55

Thank you for purchasing one of our kits.
We hope it will give you many hours of service once built. Our aim is to provide satisfaction and service. If you have any problems with the construction or use of the equipment, please ring, or write to us. We will do all we can to help.If you are new to construction we suggest you read carefully the about part identity and soldering contained in the tools and construction section.

Sheldon Hands

Tools and Construction Practice

We recommend the following tools to make your HANDS kit

15/25w soldering iron
small electrical screwdriver
4 inch phillips screwdriver
small side cutters
electricians pliers
snipe nosed pliers
small half round file
multimeter

Below are some notes on construction practice with a heavy emphasis on soldering. You must use solder with a non-corrosive flux. Acid cored solder MUST NOT be used. A 60/40 type will be ideal. The secret of good soldering is to have the correct temperature at the joint. Make sure the tip of the iron is clean, if necessary clean it on a damp sponge. Do not carry solder on the iron to the joint, by the time you get it there the flux will have burnt or vaporised. Although it seems to contradict the above, do lightly tin the iron before making a joint. This will aid the heat transfer and lessen the chance of damage to the track or component through prolonged application of the iron.When you are ready to make the joint, apply the iron and the solder at the same time. Do not apply too much solder, a thin gauge helps in this respect. Humps of solder on a joint either means you did not leave the iron on the joint long enough or you used too much solder.

Try to get a medium coating over the track and the component lead. If you use too much heat you may damage the track or the component. We suggest you try some test joint on scrap wire, you will find it inspires confidence! When the board is complete check for solder bridges and dry joints, an Ohmmeter can be used for checks.

Most large parts in the kit are readily identifiable, but value identification systems are varied and may pose a problem. For wire ended resistors (ie not SMD) a colour code chart is included at the back of the manual. Most supplies of resistors are coded with 3 bands for the value ,i.e. 1st fig, 2nd fig, 3rd multiplier. But we increasingly receive resistors with a 4 band code this then becomes 1st fig, 2nd fig, 3rd fig, 4th multiplier e.g 1k5 = brown, green, black, brown = 1 5 0 0 .

Capacitor identification for electrolytics is straight forward but ceramic caps may pose a problem. Where n values are used n10 = 100pf and 1n = 1000pf, those with just a 3 digit number use the first 2 numbers as figures and the 3rd indicating the number of zeros, i.e. 102 = 1000pf. For those with a 3 digit number followed by letters treat as a 3 digit number, where only 2 digits and a letter are used this indicates the value is less then 100pf i.e. 82J = 82pf and 4.7C = 4.7pf. The polystyrene capacitors up to 999pf have only the numeric value , above this value N values are used ie 1200pf = 1.2n

Inductor value systems are as varied as capacitors but generally there are two

ION 2

common types for the low current ones. The first uses coloured bands with the same colour values as resistors, the inductors are the same length as a 0.25w resistor but much thicker with flat ends where the lead exits the body. If checked with an ohmmeter they will show very low resistance values. The second type have the value marked on them with an alpha-numeric code in uh e.g. 2R2K = 2.2uh and 220J = 22uh. For the high current inductors the an idenitity code is printed on the top.To avoid confusion the parts list has the value and the code for each component.

We suggest prior to construction you identify the resistors and capacitors (not the semiconductors) and stick them into a polystyrene tile.

CIRCUIT DESCRIPTION

TR1 together with VC1,C1 and L1 form a Colpitts VFO, a capacitve divider C3/4 connected from TR1 source to gate provides feedback. CT2 is a 1.5 to 5pf trimmer to allow calibration of the vfo. The vfo inductor L1 is wound type 6 core material, which has been selected for its thermal stability. D1 limits the change in TR1 junction capacitance, TR1 drain voltage is regulated at 8v by IC3. The vfo is lightly coupled to buffer amplifier TR2 by C8, again the drain voltage is regulated, and the buffer output is taken from the source via C11/12. The varicap diode D2 provides an RIT facilty, its effect on the tuned circuit may be adjusted by changing the value of the coulpling capacitor C15. Higher values cause a larger swing.

C2,3,4 may be made up from two values of different pitch, so allowing mixed dielectrics for temperature compensation. C1a,b,c may also be used for this purpose but the pitch is fixed at 5mm.

VFO CONSTRUCTION

- Install the pcb pins as listed below. Insert pins from the track side and press home with a hot iron. Always support the pcb around the circumference of the pin on an old cotton or solder reel during this operation. Finally solder the pins to the pad.
- PCB Pins VC1a, VC1b, VFO OUT TX, VFO OUT RX, +12V, GND, RIT.
- Fit and solder R1-7
- Fit and solder C1-15
- Fit and solder D1,2 be carefull to observe the correct polarity idicated by the coloured band on the diode, which matches the band on the board ledgend outline.
- Fit and solder TR1/2. These are static sensitive devices, but in practice are quite robust. However its wise to adopt the standard precautions. Dont wear nylon clothing. Discharge any body static electricity by touching a water or a central heating pipe. Use an insulated soldering iron or fit a ground wire back to the pcb ground track. Dont wave the device about or handle the leads directly. Use insulated pliers to spread the leads. When fiting make sure the transistor outline matches the board ledgend.
- Fit and solder IC1, again making sure the outlines match.
- Fit and solder the blue trimmer at TC2

- Fit and solder RFC1,2

- Make up L1 on the yellow core, but do not install

We suggest that the completed VFO is contained in its own box within the main enclosure of your equipment. The FX1115 ferrite bead should be threaded over the +ve supply lead where it exits the VFO box.

Test and Alignment

Clean the enamel from L1 leads and tin them with solder , install L1 but solder the leads lightly to the track clear of the pad as a tempory connection.Check the pcb for solder splashes and dry joints. If you suspect a dry joint check it with a multimeter on its Ohms range between the component lead on the top side and the track on the under side. Connect VC1 fixed vanes to pin VC1a and the moving vanes to ground **[NOT VC1b]**

Attach a multimeter on its current range in the DC supply to the module and check that the current consumption is less than 20ma. If the current is not excessive connect normally to the supply. Connect a frequency meter to the vfo output at C11 or 12 and check for oscillation. In the absense of a counter use a general coverage receiver with a short wire as an aerial laid alonside the module. Check the range of frequency with VC1 fully meshed then unmesed, if the swing is too large VC1 may be connected to the board via TC1thru pin VC1b, this will reduce VC1 effective capacity. TC1 may be a small trimmer or a fixed value NP0 type. For best long term stability a trimmer should be replaced with an equivelent NP0 type capacitor.

Adjust TC2 for the required the required calibration point, if you are unable to obtain this frequeny you may remove some turns from L1 to increase the frequency or add extra capacity at C1a to lower the frequecy. Once you are satisfied with the coverage you may install L1 correctley lightly glueing the turns to the core with Balsa cement or similar. Place a small dab of glue on the pcb to hold the completed inductor.

Next check the range of RIT, apply +6 volts dc to the RIT pin and check that you move the frequency, dependant on the operating frequency of the VFO it may be necessary to adjust the value of C15 . Larger values will increase the swing while smaller values will reduce it.

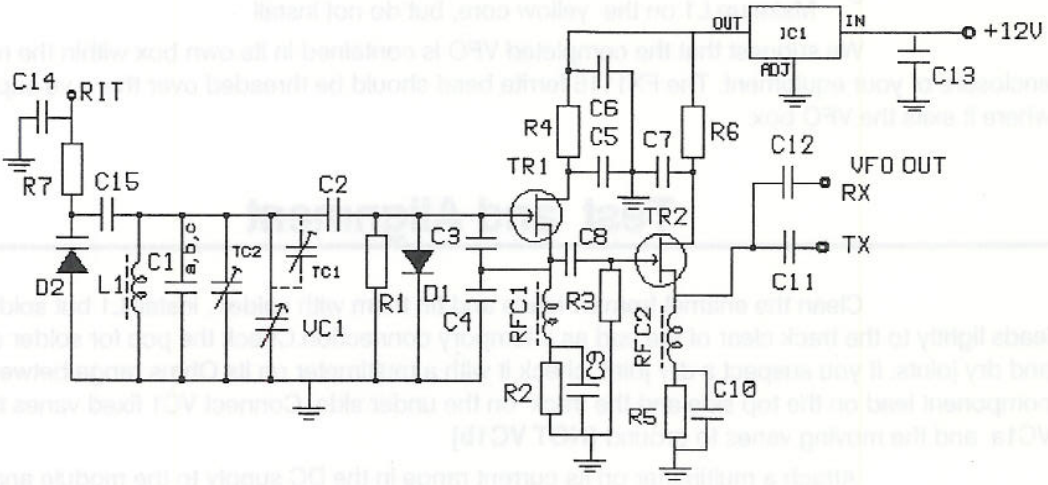
The vfo can now be boxed and mesurements made of any temperature drift. This may be minimised by fitting a correcting capacitor at C1A which is made of a dielectric material which has the opposite drift to the VFO. Generally silver mica types have a plus coefficent whilst polystyrene is neg. As C1A/B/C and TC2 are all in parallel across L1 the extra value fitted at C1A must be subtracted from the this combined value by adjusting the B or C capacitor.

Parts List

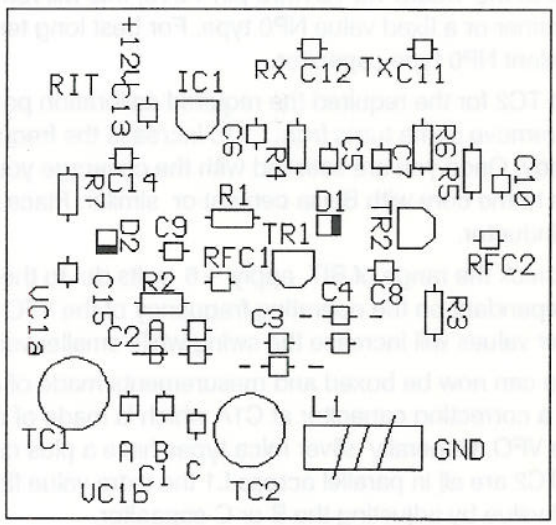
R1,3,7	100K	C8	47P
R4,6	100R	C11,12	1000P
R2,5	390R	C15	8P2
TC1 fit only if banspread req	60pf max	TR1,2	J310
TC2	5pf blue trimmer	D1	1N4148
C1A fit for freq/temp comp if req		D2	BB105
C1c	33P	IC1	78L05
C1b	39P	L1	T68-6[yellow]
C2a	220P		32 turns 26swg
C2b	220P	FB1	FX1115
C3	180P	VC1	50PF
C4	220P+220P	RFC 1,2	100uh[101J]
C5,6,7,9,10,13,14	100N		

$$3\overline{)10-6}$$

CIRCUIT DIAGRAM



PCB LAYOUT



Component Mounting