RTXIF

Hands Electronics

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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
4inch 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.

Inductor value systems are as varied as capacitors but generally there are two common types. 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.

Circuit Description

General

The RTXIF module is designed as a basic 9 or 10.7 mhz transceiver IF system. Diode switched RF input and outputs are available for connection to a companion RTXRF board and RTXVFO vfo system.

Receiver

For the receive system IF input at FL1 filter frequency is routed via D1 to the filter. R4 and R5 provide a resistive termination equal to impedance of the filter, whilst C3,4 isolate R3,6 which provide the dc return for the switching diodes D1,4.

IC1 an MC1350P is the IF amplifier and is matched to the filter with a broad band transformer T1. IF gain control is by RV1, which should be a front panel control, the system may be upgraded to AGC and the control voltage applied via D5.

Output from the IF amplifier is capacitive coupled to IC2 an NE602A which is used as a product detector. C54 couples the BFO injection voltage from the oscillators TR3 or TR4

IC3 an LM386 amplifies the AF voltage from the product detector. Link D can be cut and IC3 powered from a permeant 6 volt source for use as a sidetone amp for CW operation. In this case the OPT electrolytic must be fitted to replace C21.

Transmitter

Tr1 acts as a microphone amplifier and is well suited to high impedance microphones. C23 protects the input from rf. The stage is capacitive coupled to IC8 which provides the main tx af gain . For low impeadance and electret microphones the input ids dirrect to C27 which is reversed in polarity.

IC7 is an SL6270 VOGAD amplifier, it provides up to a 60dB agc range. This can be preset with R19 or RV3 may be fitted to allow variable control.

For conversion to dsb an SL1640 is used. This ic is inherently well balanced so no external potentiometers are provided. C53 and C34 couple the BFO and AF signals respectively onto the ic. TR2 a J310 fet amplifies the suppressed carrier signal before it is routed to the side band filter FL1. Signal diodes D2 and D3 route the signal through the filter to the TX OUT pin.

Two separate switched BFO's are provided on the board. The oscillators are switched by applying +9v from regulator IC9 to the relevant carrier select line, CS1 or CS2. The oscillators use a 2N2222A in a circuit, and are run at the lowest possible level to avoid carrier leakage. The oscillators occupy the centre of the pcb and may be screened is necessary, a silk screened box indicates the oscillator limits. TX/RX switching is via a simple PTT switch which grounds the earth side of RL1 coil. RL1 contacts then switch the 12v supply to the TX or Rx 12v line as required. IC9 is supplied from the unswitched supply to provide a permeant 8v for the carrier oscillators.

Construction

- *If a low impeadance <600Ω or electret microphone is used do not fit TR1,C24,R15,R16. Fit a pcb pin at TR1 drain pad . Make the mic socket connection to the pin. Install C23 between pin and groundplane. Install C27 REVERSED i.e. + to pin 4 of IC7*

- Install the pcb pins as listed below. Insert the pins from the track side of the pcb and push them home with a hot soldering iron. Always support the pcb around the circumference of the pin hole with an old cotton or solder reel during this operation. Finally solder the pin to the track.

- 13.8V, PTT, LS(2), RV2(2), RV1(3), AGC, TX OUT, RX IN, RV3(2), MIC, CS1, CS2, CS+9.

- Optionally you may add pins for switched 12volts on tx and rx for other boards at a max of 500ma from pins 12VR and 12VT.

- Fit and solder R1-R27. Check the appendix for the correct way to fit components. Where you see a ground legend on a resistor this end is soldered to the top foil of the pcb termed GROUNDPLANE. The groundplane acts as a large heat sink so always tin the pcb with solder around the area of the connection first. Cut the ground side resistor lead back to about 3mm before fitting. If the connections are too long and obstruct another pad angle the component to a free area of groundplane.

- Using a resistor offcut install a ground link as indicated adjacent to C21/C50

- Fit and solder diodes D1-6 make sure that the cathode band on the diode agrees with the band on the board component outline. Note that one side of D6 is soldered to the ground plane. Fit and solder the ceramic disc capacitors. Many of these capacitors are connected to the ground plane, use the same technique for installation as you did for the resistors.

- Fit and solder RFC1/2

- Fit and solder the electrolytic capacitors. Where the negative lead is made off to the groundplane, bend the lead at a right angle immediately under the body.

- Fit and solder IC1-8, be careful to observe the correct orientation of the device. The cut out in the component legend indicates the pin 1 end, also pin 1 is further identified by a square pad on the track side.

- Fit and solder TR1/2. In practice these FET's are very robust but they are static sensitive devices, do not handle the leads directly and observe the normal precautions.i.e no nylon clothing, discharge your body static via a central heating and use a grounded soldering iron. Make sure the transistor shape agrees with the board outline.

- Fit and solder TR3/4. The can tab must agree with the tab on board outline.

- Fit and solder X1/2. Also solder the can corners to the groundplane.

- Fit and solder RL1.[if constructing the RTX CO/ board do not install RL1]

- Fit and solder TC1/2

- Make up T1 on the 6.3mm ferrite core. Cut 30cm of the copper 32swg .Wind 20 turns through the core centre, clean the wire ends of enamel and then tin them with solder. Cut another length of 16cm and wind 11 turns over the previous winding and again clean and tin the ends. Install the completed transformer with the 20t between C6 and ground and 11t between C5 and ground. [make sure winding tails cannot short to groundplane]

- Clean the connection pins of FL1 and bolt the filter to the pcb. Solder the connection pins to the track pads.

- Check the completed board for dry joints, solder splashes and bridged tracks and pads. If you suspect a dry joint check with an ohmmeter between the track and the component lead on the groundplane side of the pcb.

Test and Alignment

The method of testing will be dependant on the available equipment. A satisfactory scheme is to use a general coverage receiver to monitor the 9mhz transmit frequency and a RF signal generator to provide a 9 mhz source for the receiver section. Alternatively if the RTXRF board has also been constructed this may be used for most checks with an amateur band only receiver. It is important that when testing a collection of boards ie vfo,mixer and IF, that the boards are properly terminated and bonded together.

- Connect RV1/2, a microphone and a loudspeaker to the board. Temporarily solder a wire bridge from the +9v pin to either CS1 or 2 to active one of the carrier oscillators.

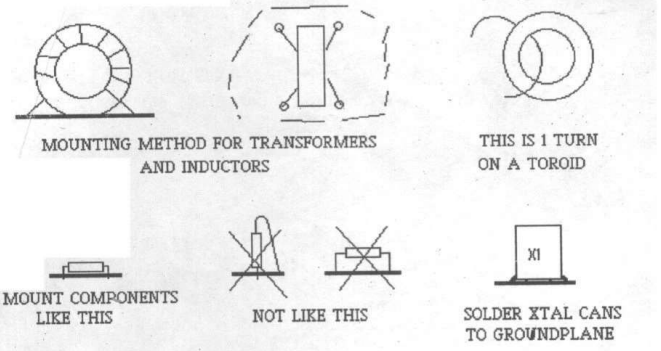
- Connect the board to a 13.8v supply via a multimeter on its current range, check that the current drawn is around 50ma. If the current is greatly in excess of this value check the board for possible faults. The three most likley possibles are, bridged tracks or pads, D1-4 installed wrong way round, IC or TR installed in correctly.

- Turn up the audio and IF gain controls and check for an increase in noise. Inject a 9 mhz test signal at RX IN or connect a mixer board to provide off-air signals and check for de-modulation. If a frequency counter is available adjust X1 or 2 to its correct frequency with the trimmer TC1 or 2, the counter is best connected to pin3 of IC6.

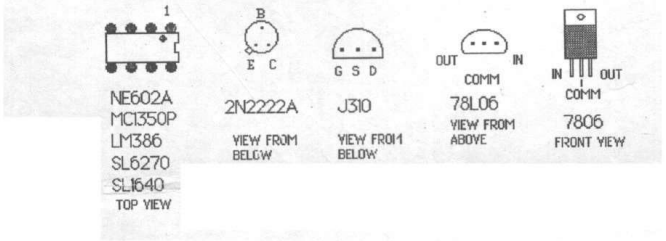
- If no counter is available use a strong off air signal and adjust for TC1/2 for the best audio/ filter response. Do not be too critical as the main adjustment is best made in transmit mode.

- If necessary re-connect the multimeter to monitor supply current and key the ptt line. Expect a reading of 90ma. If the current is greatly in excess of this check the transmit section for faults.

Component Mounting



Semiconductor Pinout



Component Layout