# TJ2A HANDHELD SSB/CW TRANSCEIVER

# TJ2A High Performance Handheld SSB/CW Transceiver

Light in weight, small in size, low power consumption, this 2-band handheld transceiver is suitable for field operation. TJ2A uses the high performance wide tuning range VXO as LO, each band covering 80 – 150kHz. After 5 minute-warming up, the VXO frequency will not drift. With 9 built-in NH AA 2300 mAh batteries, you can enjoy more than 18 hours of listening.

TJ2A is used with the dual gate MOSFET as the mixer, featuring low noise and high sensitivity. The high LO injection insures high dynamic range.

**Features**

High performance AGC

High Performance wide tuning range VXO

Built-in NH AA size rechargeable batteries

Built-in Automatic Battery Charging System

Battery Level Indicator

**Specifications**

Frequency coverage:

Band 1: 7.020 – 7.085 (optional 7.090 – 7.165)

Band 2: 14.175 – 14.325MHz (optional 14.000 – 14.150MHz)

Operating Power: 10.8 – 13.6 V

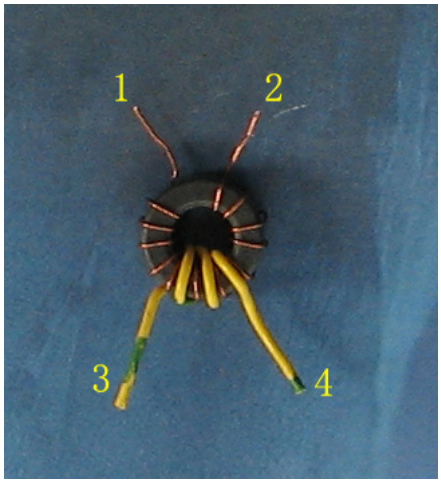
Current Drain (receiving mode): 80mA

Sensitivity: 0.3 uV

Output Power: 4W

## 1 Construction

### 1.1 Winding Coils

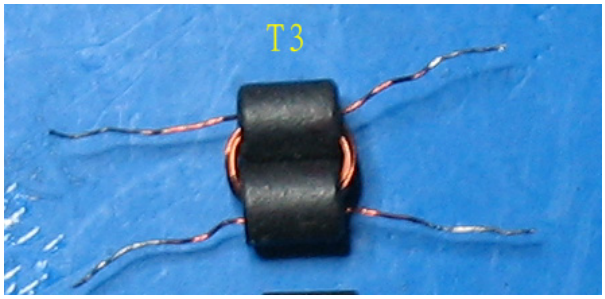


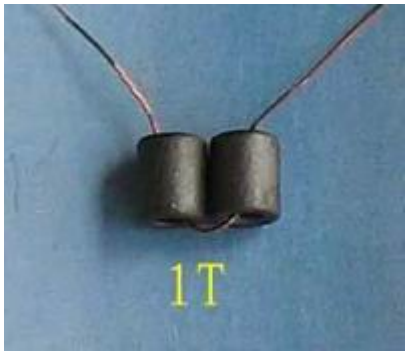

**T1**： Broadband transformer, 3-turn primary, 12-turn secondary, 0.31 enameled wire on FB-43-2402 core. The 3-turn primary is wound on middle part the secondary. For clearer instruction, the yellow wire is used as the primary. The photo shows the actual turns. Remove about 5 mm enamel from the leads, and tin. Cut 19.5 cm length of enameled wire for the 12-turn secondary, leaving about 1 cm for each lead. The length is the exact length for 12 turns with about 1 cm lead on each end. You wouldn't

wind the wrong turns, because you don't have extra length of wire to wind more turns. Remove about 5 mm enamel from the leads, and tin.

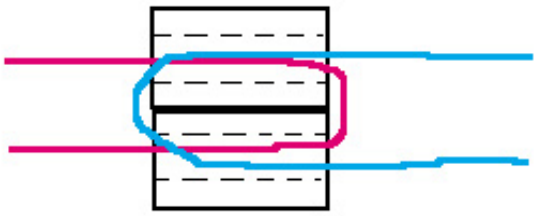
**T2**：9MHz can IF transformer.

**T3:** Broadband transformer, 3-turn primary, 9-turn secondary, 0.31 enameled wire threading through the binocular core made up of 2 small sleeves. A length of 7.5 cm wire is the exact length for 3 turns with about 1 cm on each end. A length of 20.2 cm wire is the exact length for 9 turns with about 1 cm on each end. Wind primary first. Remove about 5 mm enamel from the leads, and tin.

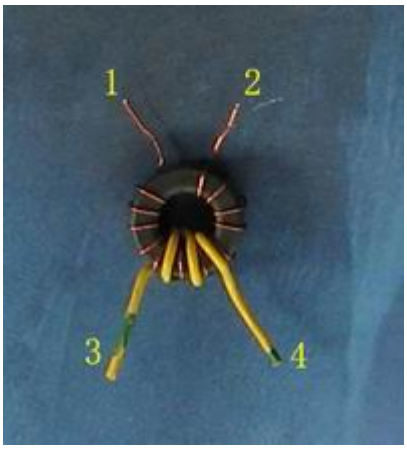


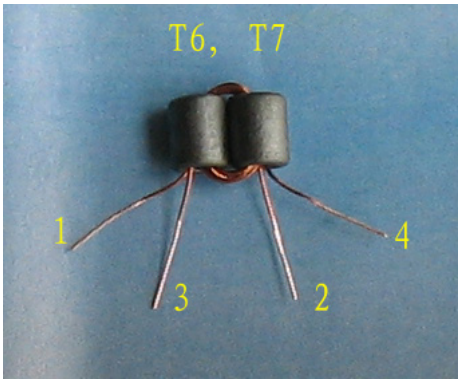

Red wire stands for the primary, blue for secondary. Mark the primary or the secondary with a mark pen to avoid getting confused.

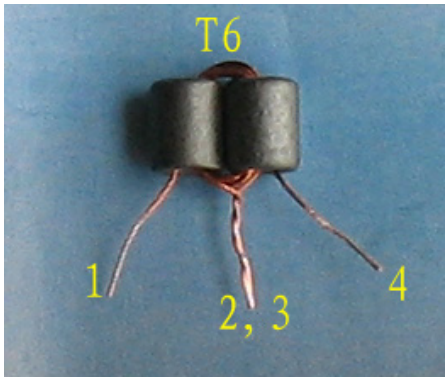


**T5:** Broadband transformer, 3-turn primary, 12-turn secondary, 0.31 enameled wire on FB-43-2402 core. The 3-turn primary is wound on middle part the secondary. Remove about 5 mm enamel from the leads, and tin.

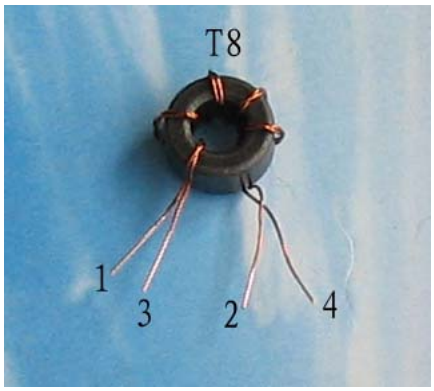


**T6, T7:** Broadband transformer, 5 bifilar turns 0.31 enameled wire on the binocular core made up of 2 small sleeves. Cut a pair of 12 cm long enameled wire, and thread through the core. Say Wire A is red, Wire B blue. Connect 2 (the finish of A) with 3 (the start of B) as the tap. You don't have to twist the wire. Leave about 1 cm for each lead. Remove about 5 mm enamel from the leads, and tin.


**T8:** Cut 10 cm long enameled wires. Say Wire A is red, Wire B blue. Twist the wires before winding. Connect 2 (the finish of A) with 3 (the start of B) as the tap. Leave about 1 cm for each lead. Remove about 5 mm enamel from the leads, and tin.




**L1:** BFO calibrating inductor, part number 3

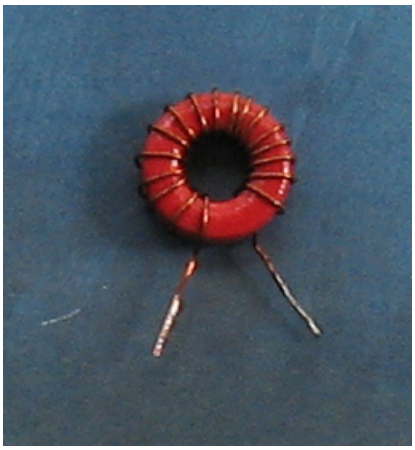
**L2:** 40m calibrating inductor, part number 5

**L4:** 20m calibrating inductor, part number 4

**L5, L6:** 40m BPF inductor, part number 2

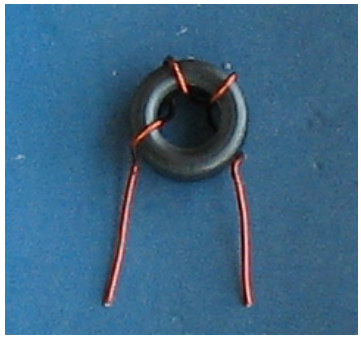
**L7, L8:** 20m BPF inductor, part number 1

**L9, L10:** 40m LPF inductor, 17 turns 0.47 enameled wire on T37-2 core. Cut 22 cm long enameled wire. Leave about 1 cm for each lead. Remove about 5 mm enamel from the leads, and tin.



**L11, L12:** 20m LPF inductor, 12 t, 0.47 enameled wire on T37-2 core. Cut 16 cm long enameled wire. Leave about 1 cm for each lead. Remove about 5 mm enamel from the leads, and tin.

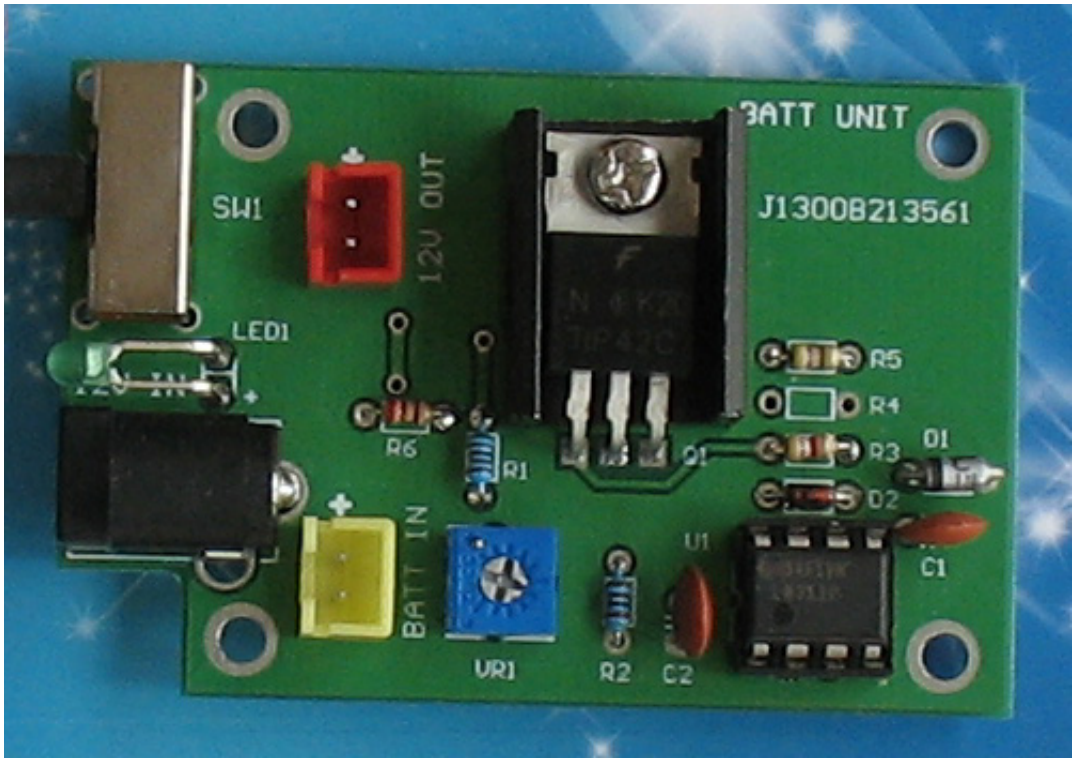
**RFC6， RFC7**：RF chokes, 3 turns 0.47 enameled wire on the RFC core. The RFC core is smaller and thinner than FB43-2402 core. See pictures bellow.

### 1.2 Installing Components

#### 1.2.1 Battery Board

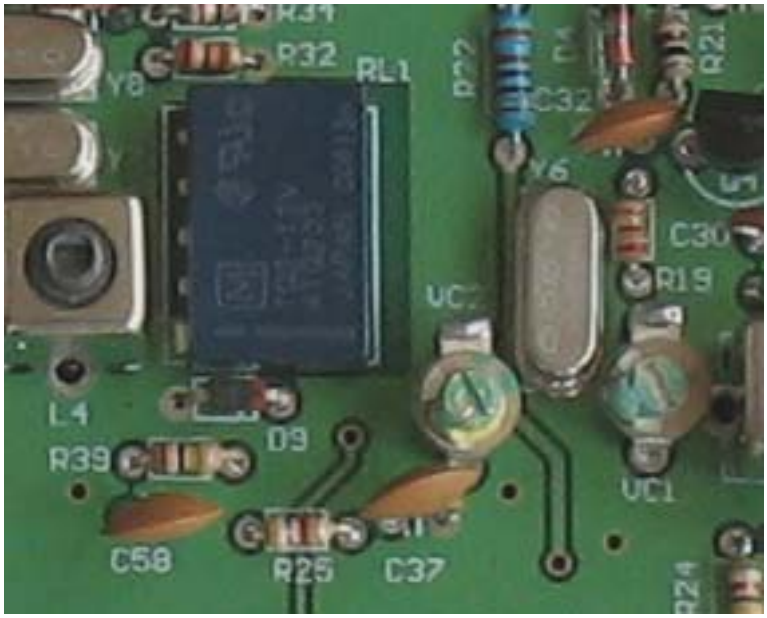
Let's start from the simpler part – battery board as a warm-up. Adjust the LED lead length




and height so that it aligns the indicator opening on the case side. Use the red connector for power output. Use the yellow connector for battery input. Q1 is hot at start of charging, so a heat sink is needed. R6 is the LED current limiting resistor. Value ranging from 1k – 5.6k is fine.

R4 is the trickle charging resistor. Do not install it now. We deal with it later.

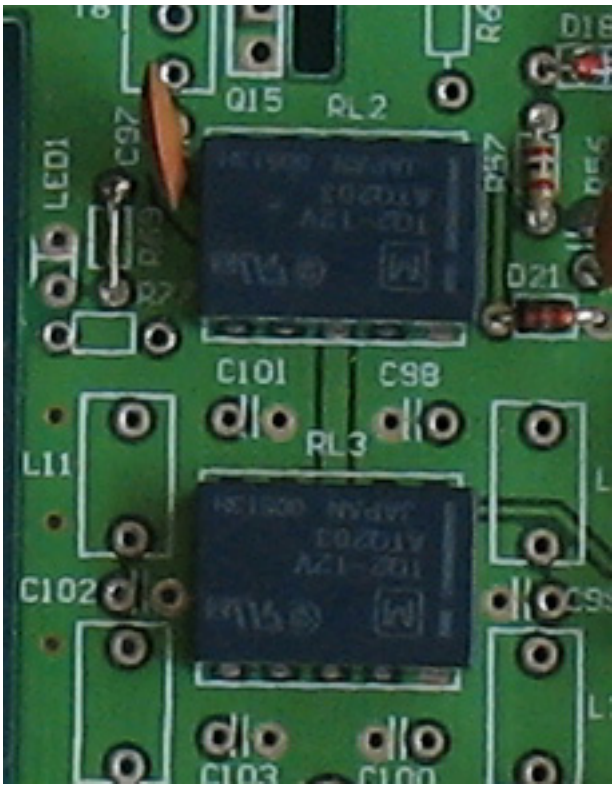
#### 1.2.2 Main Board




Install the relays. Notice the bar on the relay case and the white bar on the PCB. Do not install them upside down.

Install D9, the variable cap diode. It is a sensitive component, and should be clear from the PCB, i.e. leave as much space as possible between the diode

and the PCB. Do not cut the diode leads short. Bend the leads to suit the pads and solder.




Install the variable caps VC1 (Red or green) and VC2 (Green).

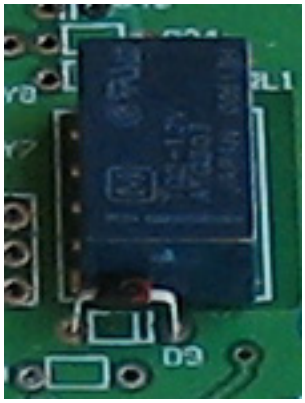
Notice that there is an unlabeled cap beside R27 (Pin 2 of U3). Do not install a cap here. Leave the pads empty.

Use the larger size resistor for R16, R22, and R68.

Use blue 3-pin connector for AF GAIN, red 3-pin for TUNE, black 2-pin for SP, white 5-pin for CN2.

CN1 has no connector. Use the grey shielding cable to connect it with the pads labeled GND and MIC beside CN2. The red wire is soldered to the round pads (MIC signal pads), the white wire connected to the square pads. The screen of the cable is suggested to ground at one end. The screen is solder to the square pad of CN1 (The white wire is also soldered here).


D9 is clear from PCB.



Solder a 10k ohm resistor across CN1 on the back to reduce MIC noise. 4.7k – 10k is fine.

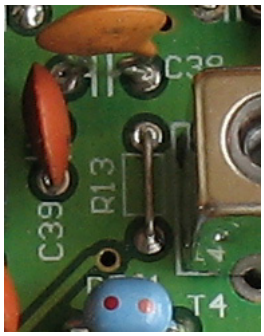
12V IN has no connector because of the limited space. Solder the blue mark twin wire to the pads underside. Install the red 2-pin female connector to the other end of the wire

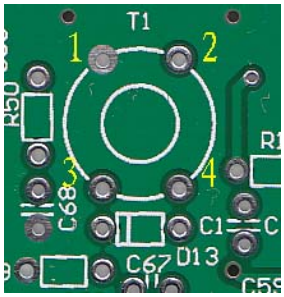

Solder a 104 cap across 12V IN pads.

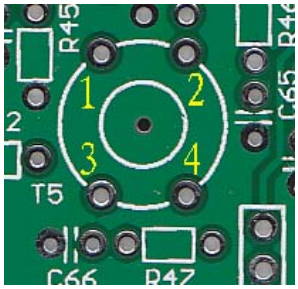
Use a component lead to bridge R13 and R69.

**Important!** C3 is 101, the resonant cap of T2. Never use 103. C17 is also 101.

Install T1 and T5 as indicated:

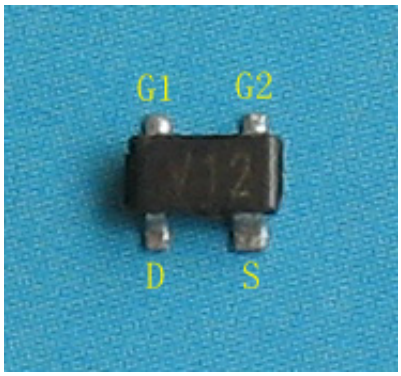



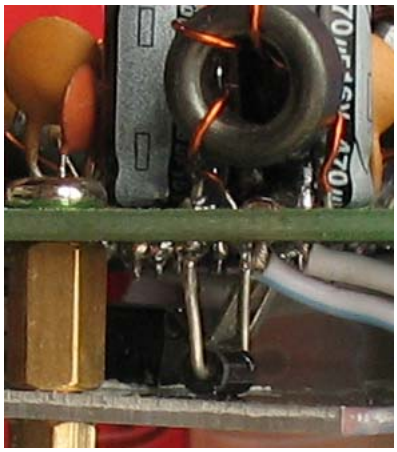



Install the MOSFETS. The leads of the MOSFET are labeled in the picture.

Install the rest of the SMD transistors on the back.



Install D20 underside. The height is 8 mm, so that it contacts the aluminum sheeting.

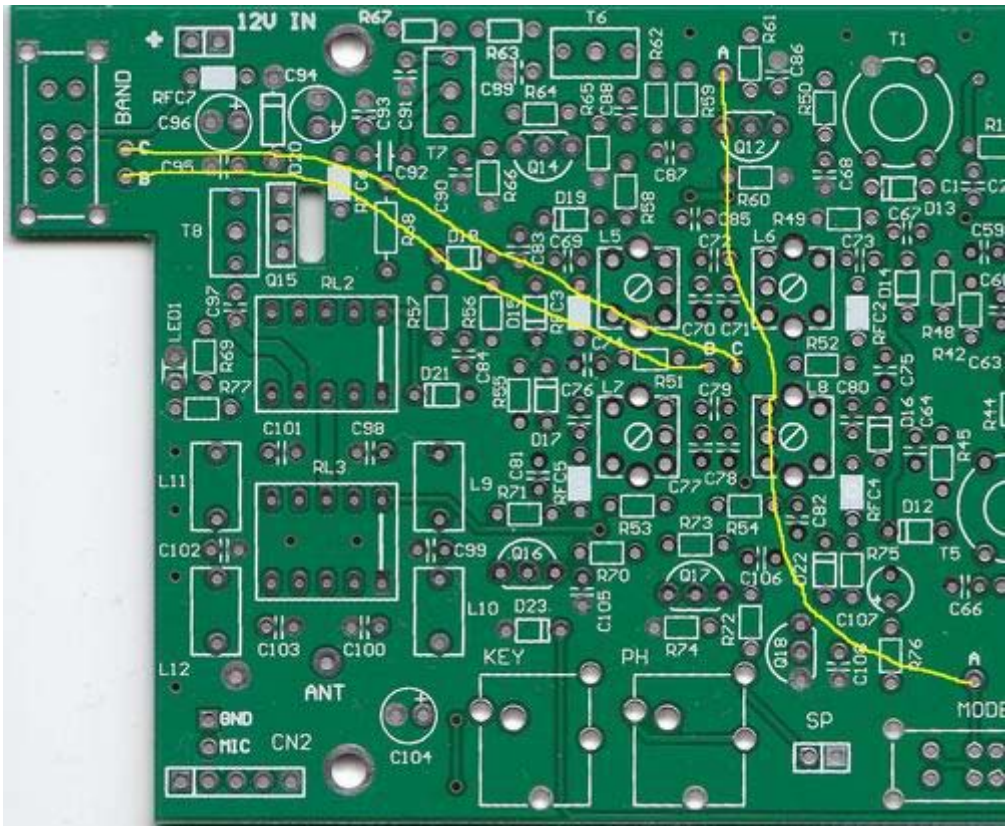
In 40m LPF, two 470P caps are used in parallel for C99. Install the other 470P on the back of the PCB.

There are 2 Q7's on the PCB back. They are all J6 or L6 (9014).

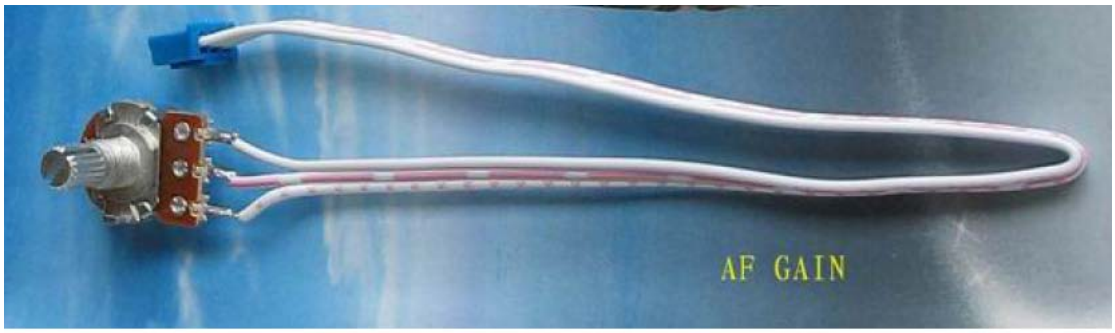
There are 2 D3's. The one by U1 is 7V5; the other (by C23) is 1N4148.

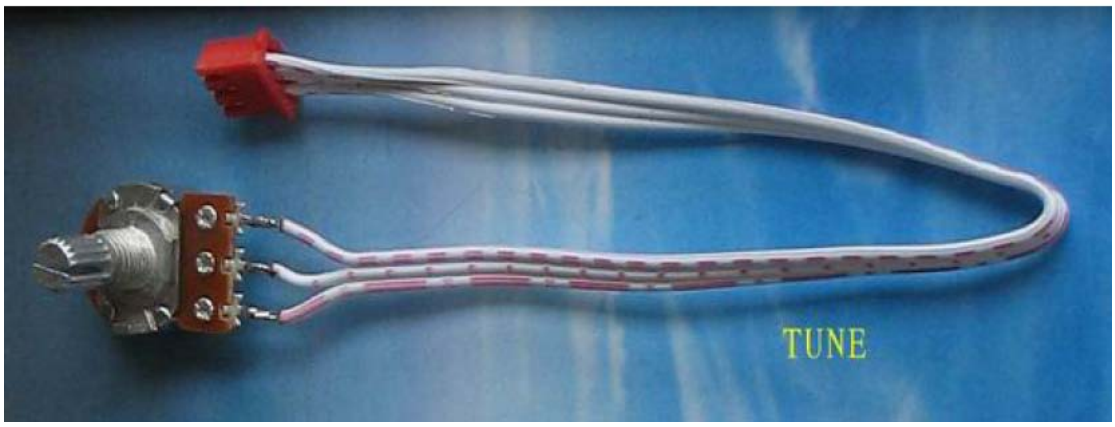
There are two C58's. They are all 103 caps.

With all the components installed, connect 3 jumps: A to A, B to B, C to C. They could be connected underside.




Connect the pots of TUNE and AF GAIN. The GND arm of the pot (labeled GND in the picture) should be connected to the square pad. Otherwise the tuning or the AF GAIN direction would be reversed. Never short-circuit the right side arm of TUNE pot to the ground. This would damage U4.



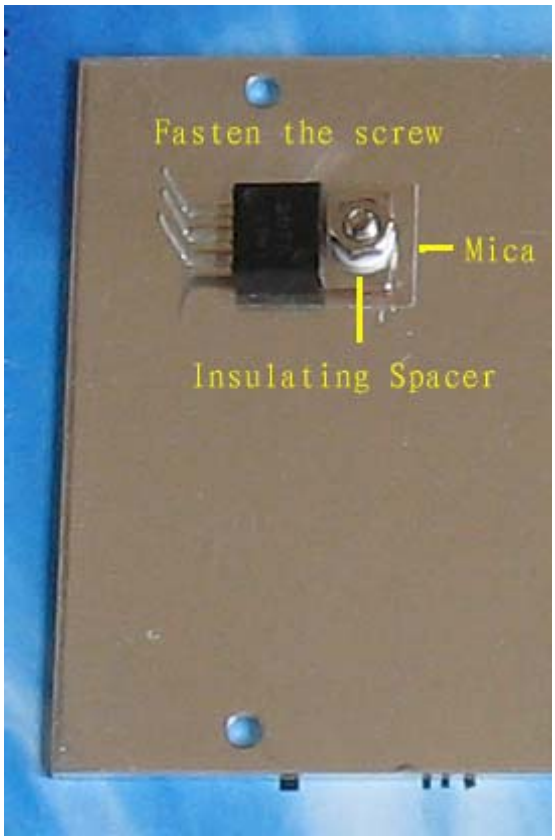



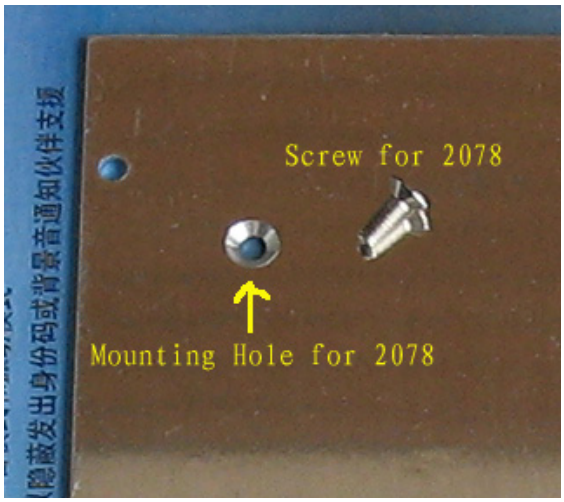

**1.2.3 Aluminum Plate Assembly**

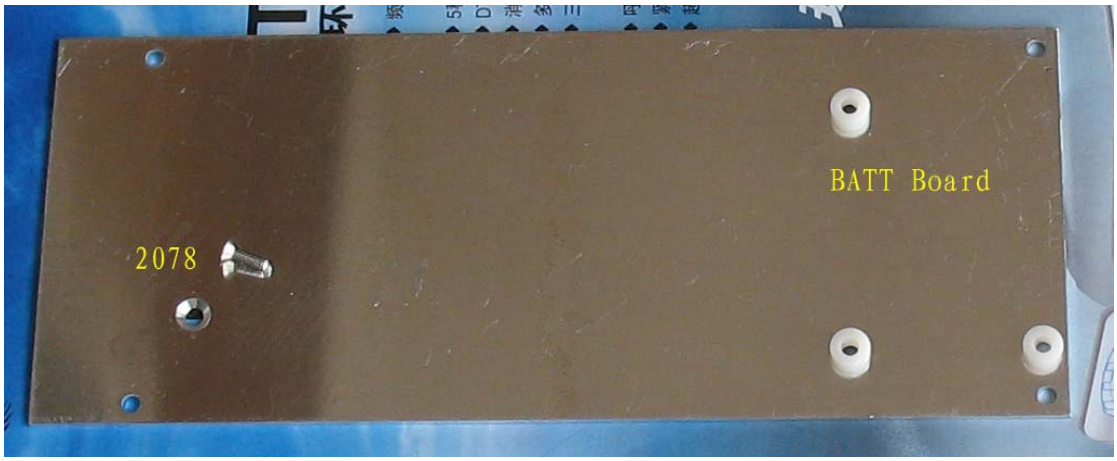
Install 2078 as indicated. Bend the leads of 2078 to suit the PCB pads. Place the mica insulator, then the plastic insulator, and fasten the transistor with the flat head screw. Apply thin coating of silicon grease for better heat transfer if you have some. Use ohm meter to check the insulation between the heat sink of 2078 and the aluminum sheeting.

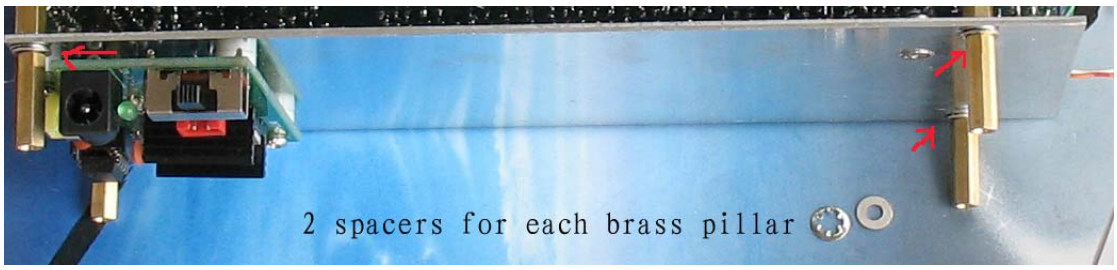
Install the battery board to the aluminum sheeting. Insert 3 pieces of plastic spacers between the battery board and the aluminum sheeting.

Use 8 mm brass pillars between the main board and the aluminum sheeting. Assemble the battery board and main board as the illustrations. The 2078's leads go through the pad holes.



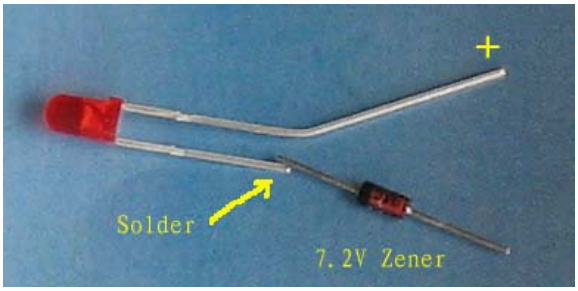




Place two spring washers to raise the height of the 4 pillars to 17 mm. If four thicker spring washers are supplied, place one washer for each pillar.

Install the yellow 2-pin battery connecter. Pay attention to the polarity.

Install the power level indicator. Cut the LED's (-) lead and leave about 1 cm. Solder a 7.5V Zener to extend the lead. This extended lead is soldered to the ground pad. Adjust the LED leads so that it aligns the 2.5 mm LED opening on the front face. Without the Zener, the LED only serves as power indicator. With the Zener inserted, the LED works as power level indicator. Half brilliance indicates low power, 10.8V. However, in this case TJ2A can still work for quite a long time. When the LED flicks or goes off, the battery is around 9V. Stop using and charge the battery.




**1.2.4 Definition of Connectors**

**Main Board**

CN1: MIC input. The round pad is the input pad, the square pad GND.

CN2: 8-PIN aviation plug Connector. The 5 pins are defined (starting from left) as MIC GND, MIC INPUT, DATA OUT (for PSK service), PTT, GND.

VOL: AF gain control connector.

SP: Louder speaker connector.

TUNE: Tuning control connector.

12V IN: Power input connector.

KEY: CW key connector.

PH: Earphone connector. The speaker is disconnected when the phone is plugged in.

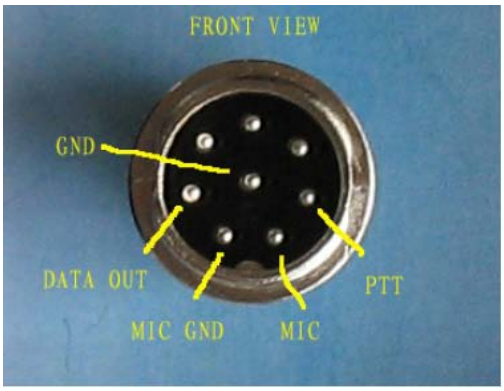
**Battery Charging Board**

BATT IN: Battery input connector

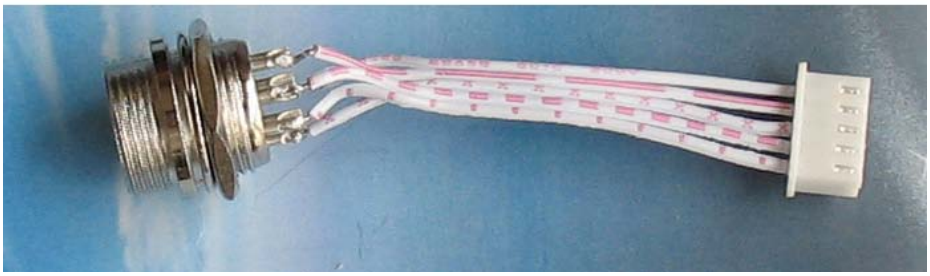
12V OUT：Switched power output connector. When the switch is in OFF or CHG the connector has no power.

12V IN：External power input connector. When external power is plugged in, battery power is cut off.

### 1.2.5 Definition of Aviation Connector







Solder the aviation plug pins to the 5-line cord according to the definition. It is suggested the cord be kept as short as possible (the original length is fine). Plug this 5-pin connector to CN2 of the main board. Do not run the 5-line cable too close to L10 and L12. Keep the cable to the case side.

## 2 Alignment

The rig could be aligned without the casing. With the aluminum plate assembled to the main PCB and the battery board, we can start the alignment.

### 2.1 Adjusting Battery Board

Unplug the red connector. Do not connect the battery pack. Connect a 470uF or 1000uF /16V capacitor. Plug in 13.6 V power, and switch to CHG. The LED flashes and goes off, indicating full charge. Measure the voltage across the capacitor. The reading should be around 12.6V - 13V. The full charge voltage of a NH battery is 1.4 V, so 9 × 1.4 = 12.6V. Adjust VR1 to meet the requirement. You have to switch the switch to OFF, and then to CHG for each adjustment. Watch the volt meter reading. When this step is done, remove the 1000uF capacitor. Install R4, the trickle-charge resistor. In actual use, VR1 might need re-adjusted to meet the full charge set value. R3 determines the charging current rate. With 4K7, the charging current rate is about230mA.

Plug in the yellow battery connector and the red power connector.

**2.2 Adjusting main Board**

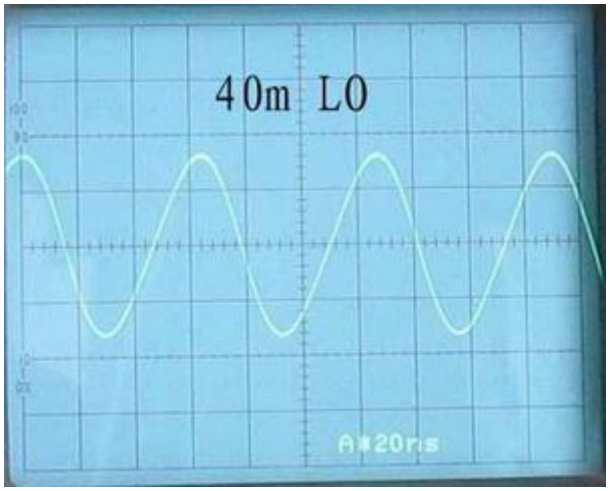
**2.2.1 Calibrating BFO**

Turn on the power. Let the rig warm up for 5 minutes. Connect the frequency counter to the emitter of Q4. If the input of your frequency is of low impedance, insert a resistor of 470 ohms between the frequency counter probe and the emitter of Q4 to reduce the pulling. Switch the mode to LSB. Adjust L1, until the frequency is around 8.9980 - 8.99812MHz. Switch the mode to USB. Adjust VC1, until the frequency is about 3KHz higher than LSB frequency, i.e. 9.0010 - 9.00112MHz.

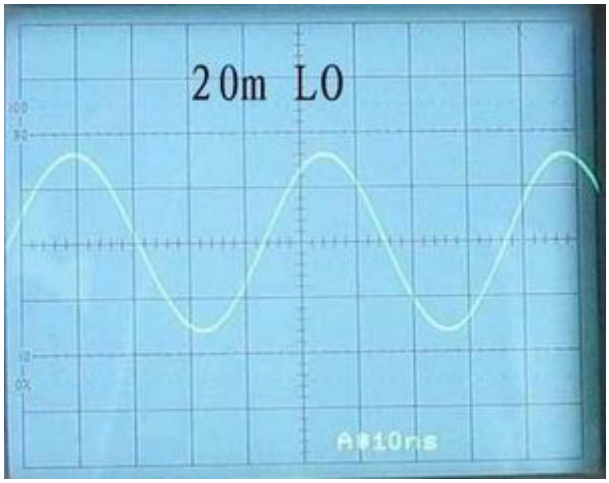
Switch the mode to CW. Set the band switch to the middle position (BPF stops working). Short-circuit KEY with a screw driver. Adjust VC2, until BFO frequency is about 650Hz lower than USB frequency, 9.00035 - 9.00047MHz. Remove the screw driver, BFO works at USB again. VC2 adjusting could affect USB. You have to trim VC1 and VC2, repeat the process until the requirement is met.

**2.2.2 Calibrating VXO**

The best, no warming-up starting frequency of BAND 1 is 7.018, BAND 2 14.175. This frequency is strongly recommended. No frequency drift is noticed. Calibrate the VXO 5 minutes after the kit power is turned on (VXO needs about 5 minutes to warm up. Drift might be noticed in the warming up period.). Connect the frequency counter to the joint of L2 and C54. Switch the band to "1". Turn TUNE to the end counter-clockwise. Adjust L3, until the reading is about 16.018MHz. Turn clockwise to the end. The reading is around 16.087MHz. Sacrificing the lower segment frequency would increase the upper frequency a few kilohertz. The frequency counter input probe might pull the VXO. Be sure to insert a resistor of 470 ohms - 1K between the counter probe and C54 to minimize the pulling. If you have an oscilloscope, remove the frequency counter and connect the probe to the joint of L2 and C54. Around 3 V p-p could be measured. The wave is not very perfect since 40m VXO shares the pi-network with 20m. However, this would not affect the performance. Switch the band to "2". Connect the frequency counter to the joint of L2 and C54. Turn TUNE to he reading is about 23.175MHz. Turn clockwise to to the end. The reading is around 23.325MHz. Now, BAND 2 works from 14.175 – 14.325. Sacrificing the lower segment frequency would increase the upper frequency a few kilohertz. If you have an oscilloscope, remove the frequency counter and connect the probe to the joint of L2 and C54. Around 3 V p-p could be measured. The wave is perfect. Note: RL1 and D9 are



sensitive components. DO NOT run the MIC cable and AF GAIN cable over these two components. The vibration of the cable would shift the frequency. Run the cables along the edge of the PCB, e.g. over the MODE switch




Wider coverage would cause possible slight VXO frequency pulling from receiving to transmission in 20m by the load. Reduce the value of C1 would cure this pulling. Use 4.3P – 5.6P cap in case of the pulling.

**2.2.3 Adjusting Receiving Section**

Touch the middle arm of AF GAIN pot, strong hum can be heard, indicating AF AMP works. Do not connect the antenna. Use a digital volt meter to measure the voltage of pins 4 and 6 of U1. Adjust VR1 until voltage of pin 4 is around 1.19V, pin 6 around 0.65, or V4-V6 = 0.5V. Now the chip works and AGC works properly. Never short-circuit pins 2 and 3. This would damage the IC.

Another simple way to adjust U1 is to listen carefully with the maximum volume, and adjust VR1, until you hear a relatively louder hiss sound. Adjust T4. Listen the carefully. Turn the slug to peak the weak hiss sound until you hear a relatively louder hiss sound. Notice the position of the slug of T4. The slug is about half way inside the shielding case (about 2 mm inside the can).

Adjust T2 to peak the hiss sound. Now the IF section works. The slug is about half way inside the shielding case (about 2 mm inside the can).

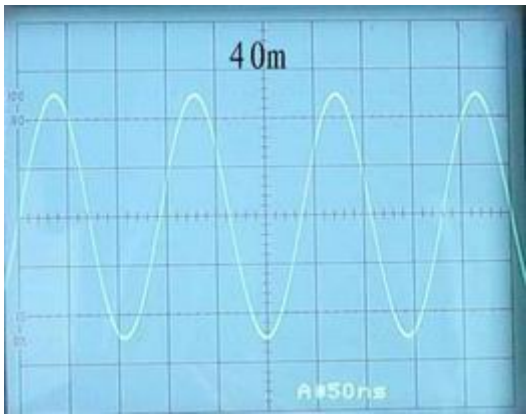
Connect the antenna. Switch to Band 1. Set the slugs of L5 and L6 about 1.5 – 2 mm above the can. Turn the TUNE knob to get a signal or the noise of 40m. Trim L5 and L6 to peak the received signals. Adjust the inductors one by one. After peaking L5, adjust L6 to peak. Then adjust L5 to peak again.

Switch to Band 2. Set the slugs of L7 and L8 about 1.5 mm above the can. Turn the TUNE knob to get a signal or the noise of 20m. Trim t L7 and L8 to peak the received signals.

The diode switch in TJ2A adopts “hard conduct” method, i.e., larger current is used. However, if you want to save some energy, R50 could be increased to 1K; R51 and R53 could be increased to 220 ohms.

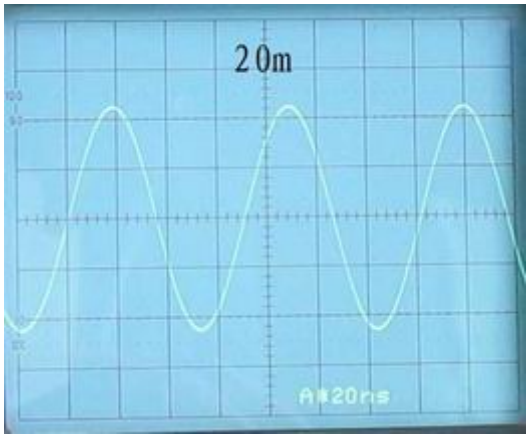
### 2.2.4 Adjusting Transmitting Section

BFO, VXO, and BPFs are the common sections shared by receiving and transmitting. With these sections adjusted, you do not have much work left.



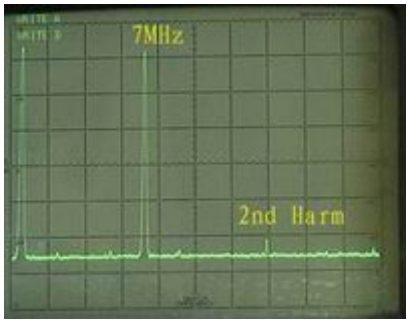

Connect a 50-ohm dummy load to the antenna. If you do not have the dummy load, you can make a substitute dummy load using two 100- ohm / 2W resistors in parallel.

Switch MODE to CW. Short-circuit KEY, 4W could be measured. If you have an oscilloscope, connect the probe to the dummy load. 40V p-p could be measured at the dummy load. Trim L5 and L6 to peak. Switch MODE to LSB. Talk to MIC, 40V p-p could be measured.




Switch the band to Band 2. Switch MODE to CW. Short-circuit KEY, about 4W could be measured. 38 - 40V p-p could be measured at the dummy load. Trim L7 and L8 to peak. Switch MODE to LSB. Talk to MIC, 38 - 40V p-p could be measured.

R62 affects the gain of Q12, the resistor value ranging from 1k – 220 ohms. The higher the value, the higher the gain. Higher gain increases the output power. However, everything has two sides: too much gain would over drive 2078, causing harmonics and instability. To most 3355's, 680 ohm works nicely. But some cases, 470 ohm, even 220 should be used for R62 to reduce the gain. How to determine R62 then? Use 680 ohm for R62 (Don't cut the resistor too short. Leave about 5 mm leads). Set MODE to LSB. Press PTT, but do not talk to MIC. If power appears, R62 should be reduced. You don't have to remove the resistor. Simply parallel a 1K resistor to R62. Press PTT again. If power still appears, remove the 1K, resistor and parallel a 470 ohm to R62. Now, the problem usually is solved.





TJ2A complies with the FCC spectral purity requirement. The output spurious signals are 43dB below the carrier.

In reality, L5, L6, L7 and L8 could be adjusted in this stage.

You may notice a very short interval of relay working when switching from USB to CW. Do not worry. This is caused by the internal structure of the mode switch.

When the key is up, there is a short delay to come back to receiving mode. This is normal. Disconnect the dummy load. Connect the antenna. You can use TJ2A to receive signals on 40m and 20m. You can even try to call CQ. Trim BFO frequency to obtain the best sound quality. If everything is fine, put the assembly into the case.

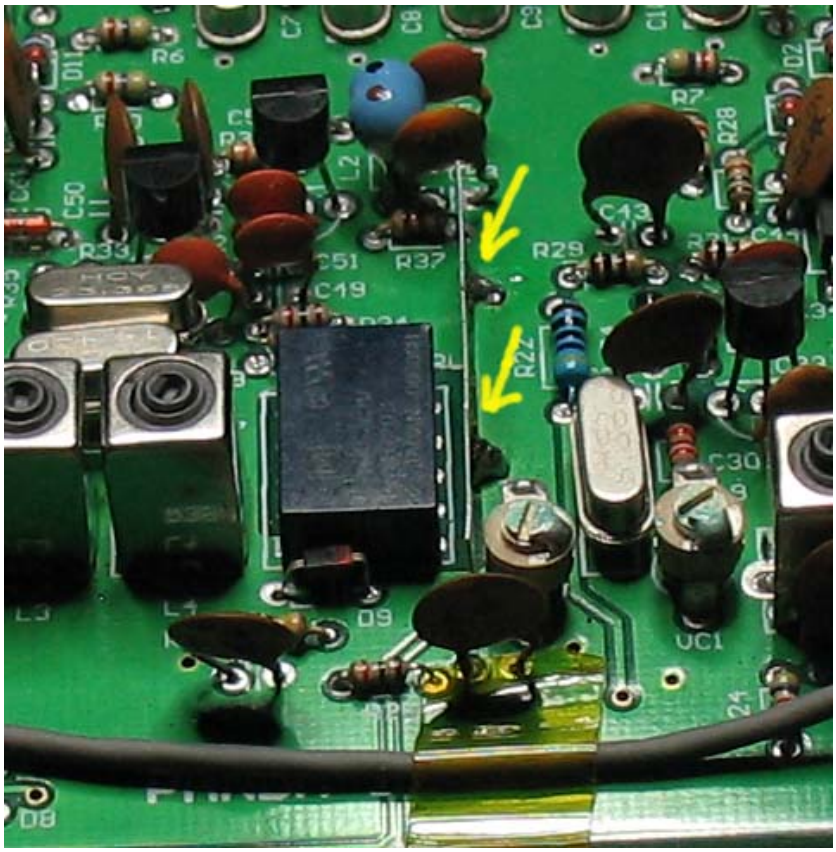
When the assembly is in the case, calibrate VXO again. Try to make a chart to help you remember the frequency.

R68 is 2078's bias resistor, ranging from 1.5k – 1.8k. Resistors of 1.5k and 1.8k are supplied with the kit. Use 1.5k first. With 1.5k, 2078 works in the best condition. However, not all the transistors are identical. If 2078 becomes very hot and the power drops, use 1.8k.

C107 (1uF) and R76 (100k) determine the QSK time. If "full break in" without a delay is preferred, C107 is not needed. Alternatively, R76 can be reduced to 10k – 22k to shorten or get rid of QSK time. Never reduce R76 to a value smaller than 4.7K.

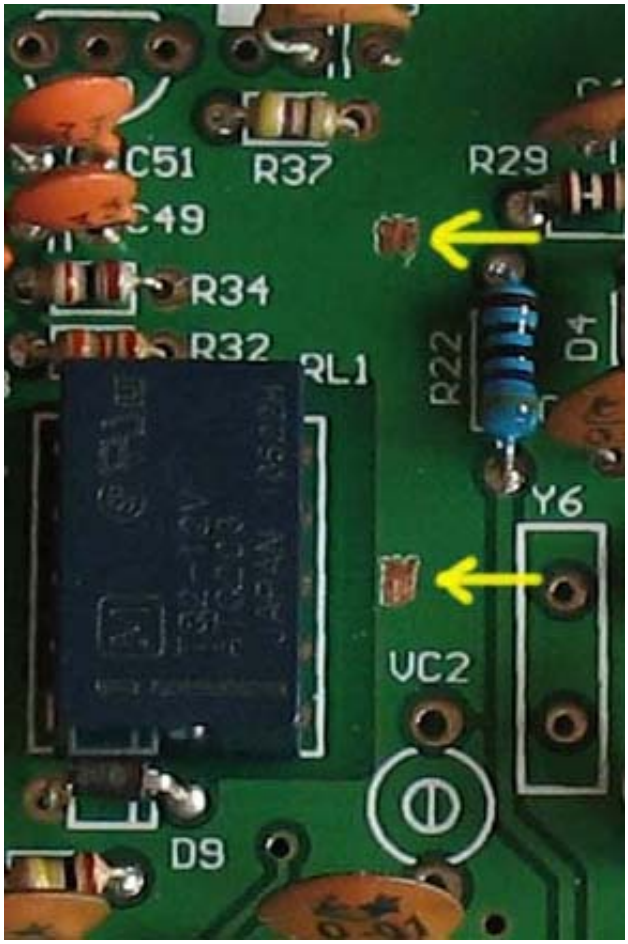
## 3 Adding Screen for Better Performance

TJ2A is a small rig and the PCB space is limited. VC2 is placed very close to the band switching relay RL1. In USB and CW modes, VC2 introduces some BFO energy to RL1, routing to the LO output port, causing some interference to the mixer and affecting the AGC function of U1. It is suggested to place a screen between RL1 and VC1 so that they would not see each other.

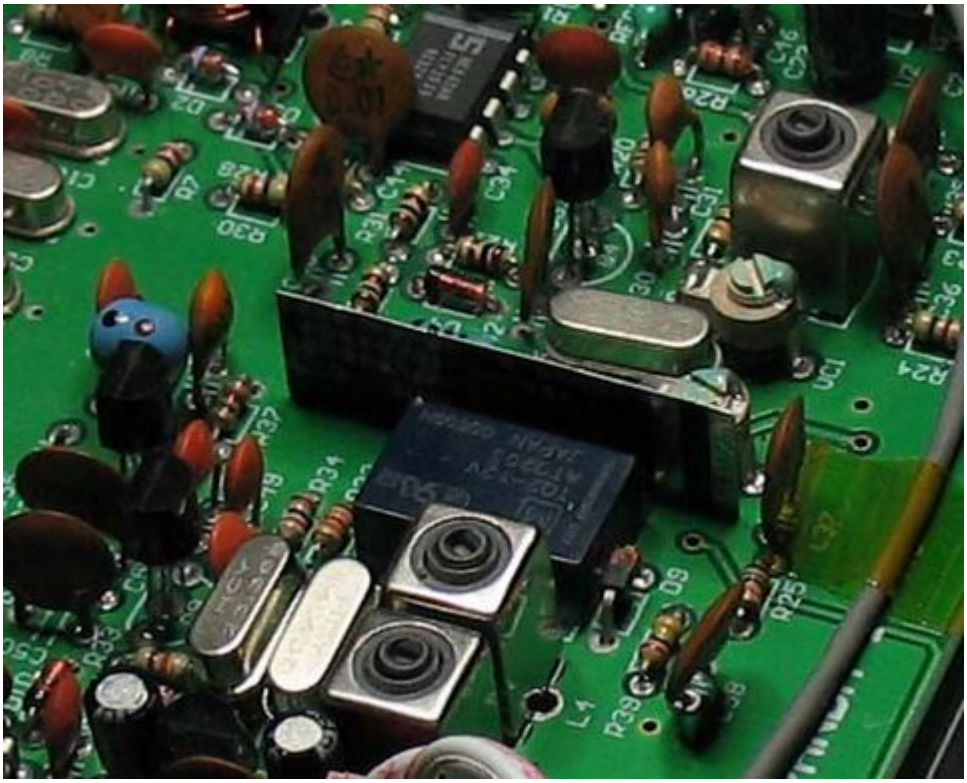



Cut a piece of metal strip measuring 28 × 10mm (this could be obtained from the canned food casing). Place it between RL1 and VC2. Do not place the metal strip too close against RL1 or VC1. Place it along the copper line beside RL1 (i.e., to leave some clearance from either RL1 or VC1) and solder (see picture below). You have to remove a little green

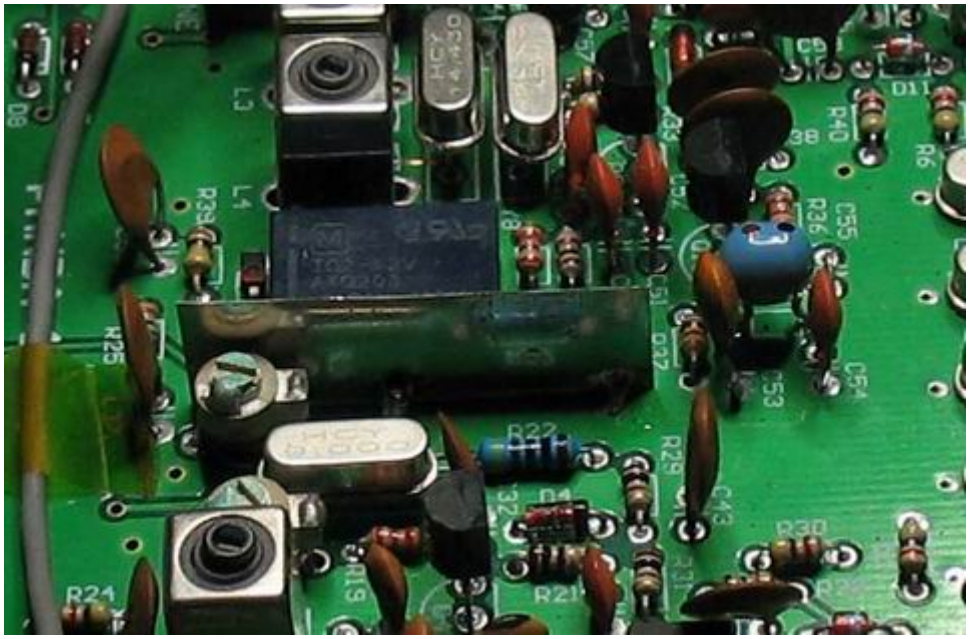
pain from the PCB and tin before soldering the screen.




Remove a little green paint from the PCB in suitable position as indicated, and tin the two points.

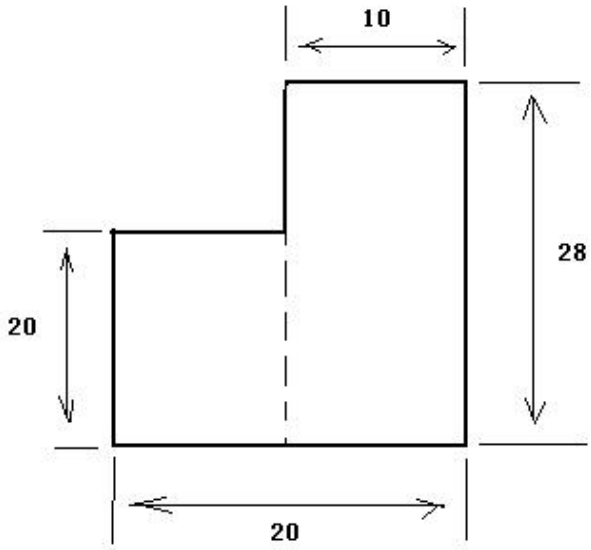


Place the metal strip in such a place as to separate VC2 from RL1.

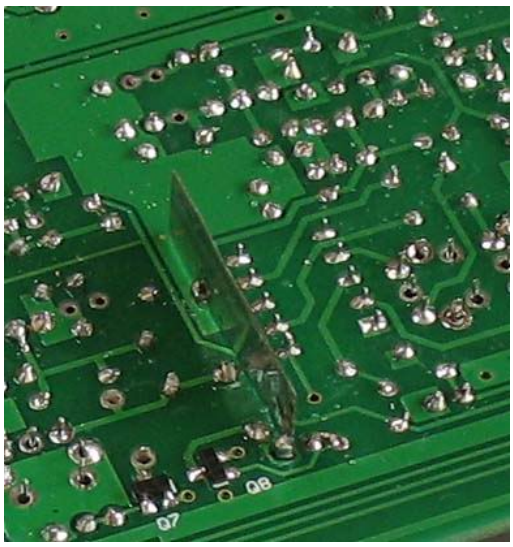


The above mentioned screen has solved the BFO leakage. However, a more luxurious screen could be placed.


Cut the metal strip into shape. Bent along the dotted line.



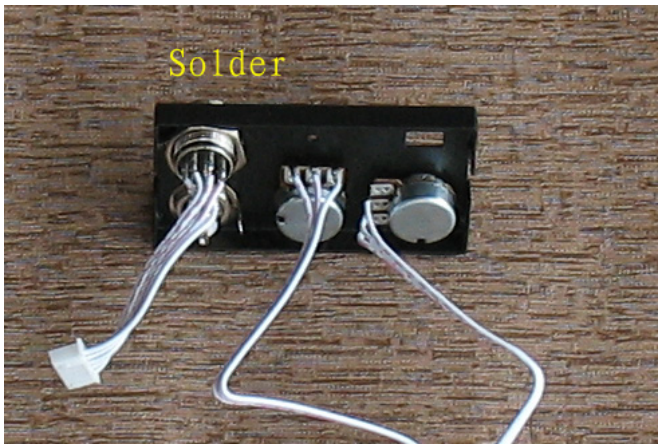
Even underside shield (6 × 25 mm) could be placed, with the end soldered on GND pad of C37. Leave a clearance of 0.5 mm between the shield and PCB, to prevent it from short-circuiting the track running below.



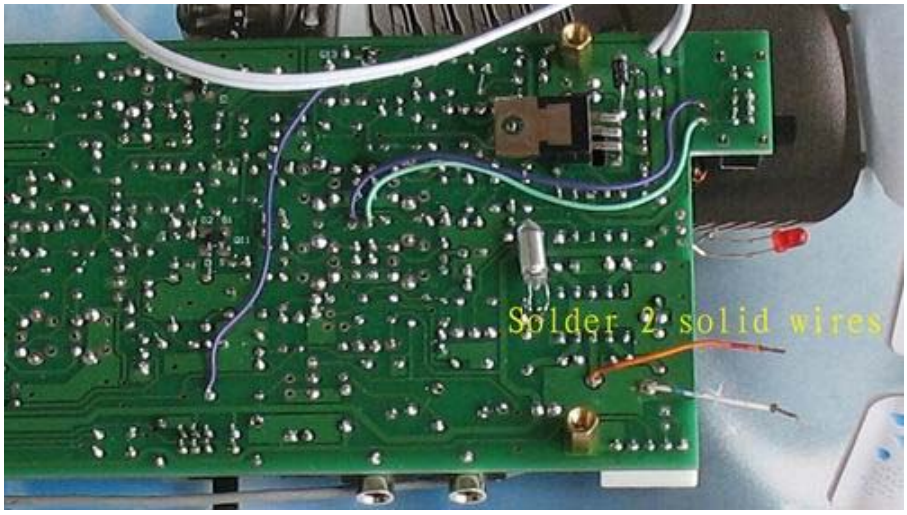
## 4 Assembling TJ2A

**Step 1:** Assemble the panel components and solder the cables. The cable for TUNE is too long. Cut it to the necessary length.

**Step 2:** Assemble TJ2A assembly to the back cover. Reside the battery beneath the aluminum plate. Align the power switch to the opening. Move the assembly until the 2 left side brass pillars are inside the casing edge. Now, slightly push the assembly to position. Fasten the assembly with 4 screws. Use a pad between the battery and the aluminum sheeting so that the battery would not move.

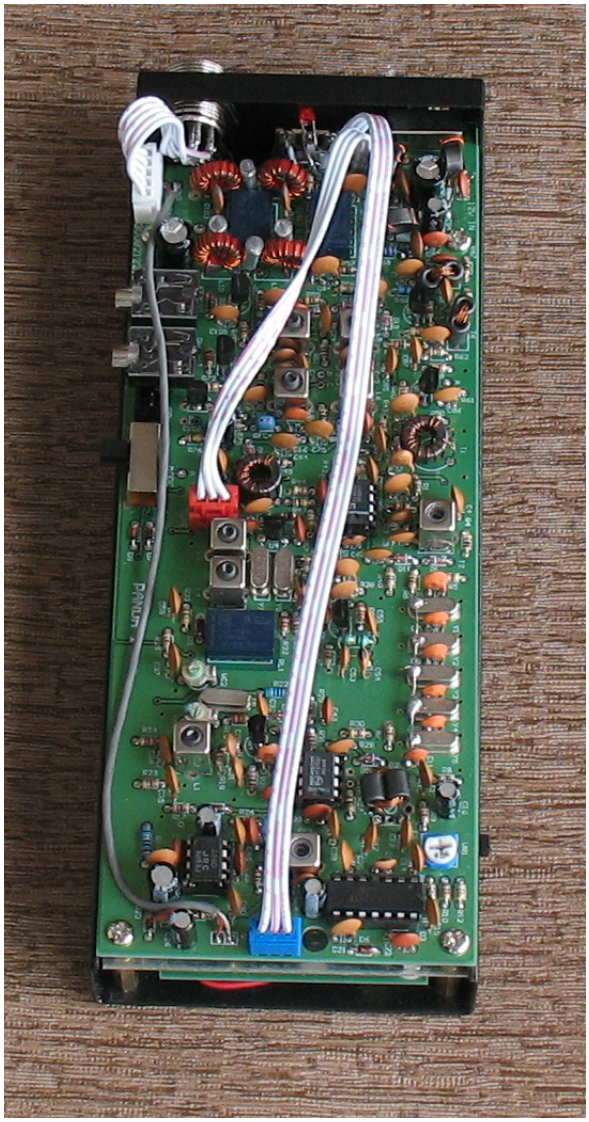



**Step 3:** Solid wires to the ANT pads. A length of 4 cm solid wire will do. Keep the 2 wires as short as possible. The GND wire is shorter.




**Step 4:** Assemble the panel and solder the 2 wires to BNC. Fasten the 2 side screws.

**Step 5:** Align LED to the 2.5 mm opening. Plug in the cables.



Before the top cover is placed, it is suggested to test the rig again. Receiving works? Transmission works? Calibrate the frequency. Everything is fine. Then we close the top cover.

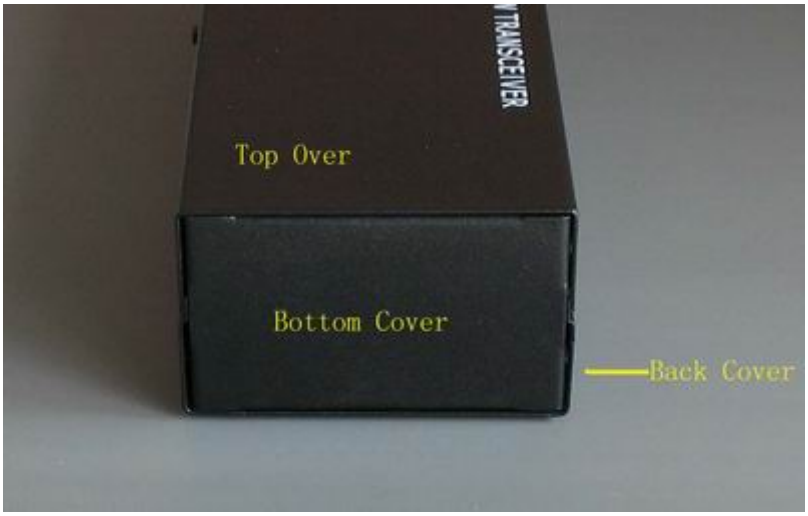
The speaker cable is too long, cut to the necessary length.

Tapes can be used to hold the cables in position.

**Step 6:** Cover the top cover. Align the MODE switch to the side openings. Pull the top cover edge slightly (Never pull too hard!).Push the top cover downward to position. Fasten the screws.

**Step 7:** Assemble the bottom cover. In reality, it is easier to cover the top cover without assembling the bottom cover.

You might ask: “How to remove the cover?” Carry out the opposite operation. Remove the bottom cover. Pull the right edge, and push the cover upward. Be careful. Do not push too hard. If the cover pops out too hard, the speaker cable might damage the speaker pads.



## 5 Using TJ2A

It is very easy to use TJ2A. Shift the power switch to ON, the power is on, and the panel power level LED lights. Now you can enjoy listening and QSOs. In the first 5 minutes of warming-up period after the power is turned on, the VXO drifts a little. After the warming-up period, the VXO is very stable. When the band is changed, 5 minute-warming-up is also needed.

Use the resonant antenna, such as Dipole, V-Dipole, long wire with tuner, Yagi, etc. Do not use a wire of a few meters as the antenna. Such an “antenna” lowers the receiving performance, and would damage the PA transistor if you try to transmit.

The panel red LED indicates the approximate battery level. Half brilliance indicates low power, lower than 11V. However, you can still work for quite a long time. When the LED flicks or goes off, the battery is around 9V. Stop using the rig. Charge the battery. When the battery is fully charged, the green LED goes off, charging stops and trickle-charge starts. Overcharging would not occur even you leave the external power connected.

Please disconnect TJ2A from the antenna when not in use, especially in the stormy weather, to prevent it from damage caused by the static charges accumulated on the antenna.

With optional crystals, TJ2A covers other segments. If you are not interested in other bands, and only want to work 40m, you could use a 16.110 and 16.165 crystal in TJ2A, so that it covers 7.000 – 7.155.

If you are not interested in other bands, and only want to work 20m, you could use a 23.165 and 23.350 crystal in TJ2A, so that it covers the whole 20m segments. However, only 2 positions are available in TJ2A. It is a 2 bander. For more information of working on other bands, please refer to the appendix.

# APPENDIX 1

## WORKING ON OTHER BANDS

TJ2A works on other bands (80 – 15m) by adapting the related components. However, to obtain the best performance, proper band combination is required.

### 1. Band Combination

Frequencies between 40m and 20m could be combined. However 60m（5.320 - 5.410）could also be combined with 40m. Frequencies higher than 20m, such as 17m, 15m, could be combined with 20m. For example, the 2 bands could be made up of 40m and 20m, 60m and 40m; 20m and 17m, 20m and 15m, 17m and 15m.

### 2. VXO Inductor

- With the supplied crystal package, No. 5 canned inductor could be used for 80m – 40m. No.3 canned inductor should be used for 17m and 15m. What you have to do is to trim the inductor to get the required, correct frequency coverage.
- For Frequency range above 20m, L2 should be modified to suit higher frequencies. Use 0.47 - 0.56uH inductor. Alternatively, use T37-2 toroid. Wind 12 turns on the core.

### 3. BPF Component

- 60m (5.320 - 5.410): Use 40m inductors and caps. Trim the slug to peak. For the best spectrum purity, it is suggested to use 300P – 330Pcaps as C70 and C71. Trim the slug to peak.
- 17m: 6 turns of 0.1 wire on 7×7 can former (wire spread in 3 slots). C76, C80 - 20P; C77, C78 - 180P; C79 - 2P.
- 15m: 6 turns of 0.1 wire on 7×7 can former (wire spread in 3 slots). C76, C80 - 18P; C77, C78 - 150P; C79 - 2P.

### 4. LPF Components

- 60m (5.32 - 5.410): Same with 40m.
- 15m: L11, L12 – 0.47 wire, 10 turns on T37-2 core. C101, C103 - 150P; C102 - 330P.
- 17m: Same with 15m.

### 5. VXO LPF Inductor

NOTE:

1. 16.110, 16.185 and 16.315 are 40m crystals, and could be substituted directly. NO need to change VXO inductor, BPF and LPF. What you have to do is to trim the VXO inductor to work in the required frequency coverage. Trim the BPF slugs to peak if necessary.
2. 23.170, 23.350 and 23.368 are 20m crystals, and could be substituted directly. NO need to

change VXO inductor, BPF and LPF. What you have to do is to trim the VXO inductor to work in the required frequency coverage. Trim the BPF slugs to peak if necessary.

# APPENDIX 2

## WORKING ON FREQUENCIES BELOW 40 METER

TJ2A works on other bands (80 – 15m, even 160m) by adapting the related components. However, to obtain the best performance, proper band combination is required.

**1. Band Combination**

Frequencies between 80m and 40m could be combined, including 60m (5.320 - 5.410). 160m could also be combined with 80m or 40m. For example, the 2 bands could be made up of 80m and 40m, 80m and 60m, 60m and 40m, 160m and 80m, 160m and 40m.

**2. VXO Crystal Inductor**

With the supplied crystal package, No. 5 canned inductor could be used for 80m – 40m (No. 5 canned inductor could be used for 160m). What you have to do is to trim the inductor to get the required, correct frequency coverage.

**3. BPF Components**

- 80m: Use No. 3 inductor. C70, C71 - 300P; C69, C73: 100P; C72: 4.3P
- 60m: See Appendix 1

**4. LPF Components**

- 80m: L9, L10 – 0.47 wire, 23 turns on T37-2 core. C98, C100 - 820P; C99 - 1500P (820P×2 ).
- 60m: See Appendix 1