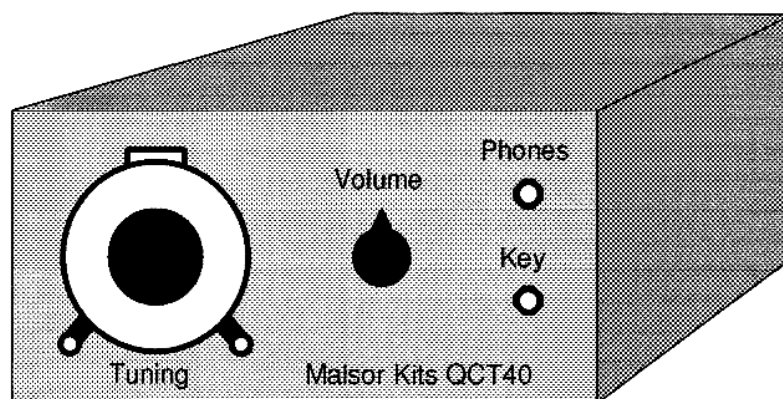


QCT40T

40m QRP CW Transmitter



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INTRODUCTION

The QCT40R is a 40m low power (2W) CW transmitter designed to work with the companion QCT40R superhet receiver. The transmitter makes use of the VFO on the receiver board and so cannot be used on its own. The transmitter features all solid-state transmit/receive changeover, semi break-in, and true 'transmit signal sidetone'. This last feature means that during transmit periods you actually monitor your transmitted signal in the receiver.

HOW IT WORKS (Refer to the Circuit Diagram)

When the keying line (pin K) is connected to ground, the output of IC7 (pin 3) goes high, applying power to IC6 where a sample of the receiver VFO (input on pin G) is mixed with a 10.240 MHz signal from the internal crystal oscillator. The 40m output from IC6 is selected by the bandpass filter C51 - C55, T4, L8, and amplified by TR6, TR7 and the Power Amplifier stage TR8. The PA output is low-pass filtered by L5 - L6, C66 - C68 before feeding the antenna. When pin 3 of IC7 goes high, diodes D12 and D13 are reverse biased and reduce the level of transmitted signal reaching the receiver.

Transmitter keying is achieved by keying the power to TR6 and TR7 via TR9. The shape of the keyed envelope is controlled by C56 which limits the rise and fall rates of TR9's collector current. Zener diode D10 provides some protection to the PA transistor by limiting the collector voltage in the event that mismatched loads are encountered.

A short time after keying ceases, the output of IC7 goes low, disabling the transmitter and forward biasing D12 and D13 - thereby connecting the antenna (pin I) to the receiver input (pin J).

CONSTRUCTION

As you carry out each step in the assembly:-

- a. Refer to the component layout diagram to see where on the PCB to place the component. Where a component lead is marked with a "blob", the lead is soldered to the groundplane on top of the board
- b. If the assembly instruction mentions a particular 'style', refer to the component style diagram in the QCT40R manual to see how to shape the component leads. Be careful not to bend the leads too close to the body of the component ... you may crack it.
- c. After you have soldered the component in place, cut off any excess lead length.
- d. Tick off the step in the box provided.

1. TERMINAL PINS

[] Solder 6 terminal pins at positions G H I J K and L. Solder the pins on the track side and cut off any excess length on the underside of the board.

[] Solder 4 through-board links at the positions marked with a "blob" (these are situated near R52, T8, L8 and T4). Solder the wire on the track side and the top side of the board. Cut off any excess length on both sides of the board.

2. INTEGRATED CIRCUITS

CAUTION There is very little clearance between the groundplane and the pins of IC6 and IC7. If necessary, mount these circuits slightly higher above the groundplane than normal, in order to avoid pins shorting to ground.

[] Solder the NE612 at IC6, taking care to orientate it correctly. Solder pin 3 on the top side of the board. Note that an NE602 may be supplied in place of the NE612.

[] Solder the 555 timer at IC7, taking care to orientate it correctly. Solder pin 1 on the top side of the board.

3. RESISTORS

[] Solder the 1K8 resistor (Brown-Grey-Red) style 1 at R37.

[] Solder three 2K2 resistors (Red-Red-Red) style 1 at R38, R39, and R46.

[] Solder the 4K7 resistor (Yellow-Mauve-Red) style 1 at R40.

[] Solder two 560R resistors (Green-Blue-Brown) style 1 at R41 and R47.

[] Solder the 1K5 resistor (Brown-Green-Red) style 2 at R42.

[] Solder one 4R7 resistor (Yellow-Mauve-Gold) style 1 at R43.

[] Solder one 4R7 resistor (Yellow-Mauve-Gold) style 1 at R49. Solder the lead nearest to T7 to the groundplane.

[] Solder the 270R resistor (Red-Mauve-Brown) style 2 at R44.

[] Solder the 470R resistor (Yellow-Mauve-Brown) style 2 at R48.

[] Solder the 10R resistor (Brown-Black-Black) style 1 at R50.

[] Solder the 100K resistor (Brown-Black-Yellow) style 1 at R51.

[] Solder the 4K7 potentiometer at R52.

[] Solder three 1K resistors (Brown-Black-Red) style 1 at R53, R55 and R56.

[] Solder one 1K resistor (Brown-Black-Red) style 2 at R54.

Solder the 22R resistor (Red-Red-Black) style 1 at R45.

4. DIODES

Solder the 36v zener diode style 2 at D10 taking care to orientate it correctly.

Solder four 1N4148 diodes style 1 at D11, D12, D13 and D14 taking care to orientate them correctly.

5. TRANSISTORS

Solder the 2N2222A transistor at TR6 taking care to orientate it as shown.

Solder the 2N3866 transistor at TR7 taking care to orientate it as shown.

Solder the 2N3553 transistor at TR8 taking care to orientate it as shown. Solder the emitter (lead nearest the tag) to the groundplane.

Solder the 2N2907 transistor at TR9 taking care to orientate it as shown.

6. CAPACITORS

Solder two 47p capacitors style 4 at C47 and C78.

Solder one 47p capacitor style 3 at C48.

Solder eight 0.01u capacitors style 4 at C49, C50, C59, C60, C63, C69, C77 and C79.

Solder eight 0.01u capacitors style 3 at C57, C58, C61, C62, C64, C65, C71 and C72.

Solder three 40p trimmer capacitors at C46, C51 and C55. Solder the leads connected to the moving vanes to the groundplane in each case.

Solder the two 220p capacitors style 4 at C52 and C54.

Solder the 8p2 capacitor style 3 at C53.

Solder the 22u capacitor style 6 at C56 taking care to orientate it as shown.

Solder the two 470p capacitors style 4 at C66 and C68.

Solder the 1000p capacitor style 4 at C67.

Solder the 100u capacitor style 6 at C70 taking care to orientate it as shown.

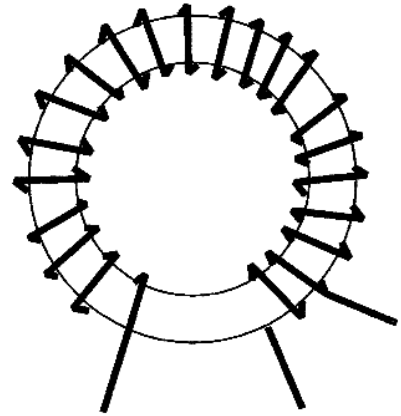
[] Solder the 4u7 capacitor style 6 at C74 taking care to orientate it as shown.

[] Solder the 0.1u capacitor style 4 at C75.

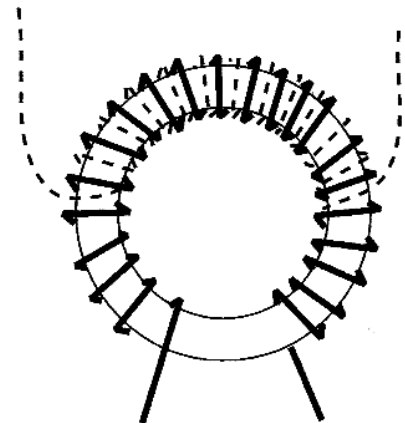
[] Solder the 1u capacitor style 6 at C67 taking care to orientate it as shown.

7. MISCELLANEOUS

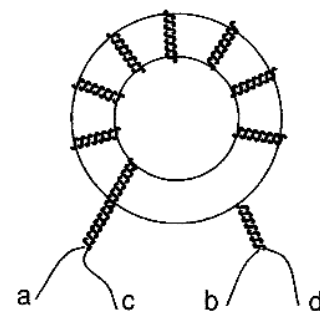
[] Wind 22 turns of 28 swg wire onto a T37-2 toroid (red 0.37" diam.) with a tap at the second turn as shown. Mount it vertically at L8. Make sure that the tap is 2 turns (not 20 turns) from the ground connection.



[] Wind 22 turns of 28 swg wire onto a T37-2 toroid (red 0.37" diam.). Wind a twelve turn link of insulating wire over the first winding as shown. Mount it horizontally at T4 keeping the insulated wires nearest IC6.



[] Prepare four transformers as follows. Twist together two lengths of 28 swg enamelled copper wire. Wind 8 turns of the twisted pair onto the Siemens ferrite toroid (black coloured). Scrape the enamel from the ends of the four wires and using an ohmmeter identify the starts and finishes - orientate the wires as shown. Mount the four transformers at T5, T6, T7, and T8. It is essential to orientate the windings correctly and easy to get it wrong !



Note: One winding starts at a and finishes at b. The other winding starts at c and finishes at d.

- Wind 30 turns of 28 swg wire onto a T37-2 toroid (red 0.37" diam.). Mount it vertically at L3.
- Wind 14 turns of 22 swg wire onto a T50-2 toroid (red 0.5" diam.). Mount it vertically at L5.
- Repeat the above step at L6.
- Solder the 100uH choke at L7.
- Solder the 10uH choke at L4.
- Solder the 10.240 MHz crystal at X6.

ASSEMBLY (Refer to Wiring Diagram)

If you have not already done so, assemble the receiver board as described in the QCT40R manual and align it.

- Mount a key jack on the front panel of the case.
- Fit heatsinks to TR7 and TR8.
- Bolt the QCT40T board into the metal case, being careful to use pillars to lift the board clear of the bottom of the case.
- Remove the coaxial lead from pin C of the receiver board and connect it to pin I of the transmitter board. Solder the braid to the groundplane.
- Solder a coaxial lead between pin J on the transmitter board and pin C of the receiver board. Solder the braids at each end to the groundplane.
- Solder a lead between the 12v supply socket and pin H on the transmitter board.
- Solder a coaxial lead between pin F on the receiver board and pin G on the transmitter board. Solder the braids at each end to the groundplane.
- Solder leads between pin K on the transmitter board, the groundplane of the transmitter board, and the front panel key jack as shown.
- Solder a lead between pin L on the transmitter board and pin E on the receiver board.

ALIGNMENT

[] Connect the transceiver to a 12v supply, switch on, and check that the receiver still functions as before. Tune the receiver to 7.02 MHz.

[] Connect the transceiver to a 50 Ohm dummy load via a power meter capable of measuring QRP power levels.

[] Turn R52 on the transmitter board fully counter-clockwise. Plug a morse key into the keying jack and depress the key. Slowly advance R52 until sidetone is just heard in the receiver. Alternately adjust C51 and C55 for maximum sidetone and maximum output signal.

[] Adjust C46 for a sidetone note of 600Hz.

[] Turn R52 fully counter-clockwise. Slowly advance R52 until the sidetone level no longer increases in volume. Back off R52 until there is a slight reduction in sidetone volume. Note: do not turn R52 too far clockwise otherwise the receiver AGC will be controlling the sidetone level.

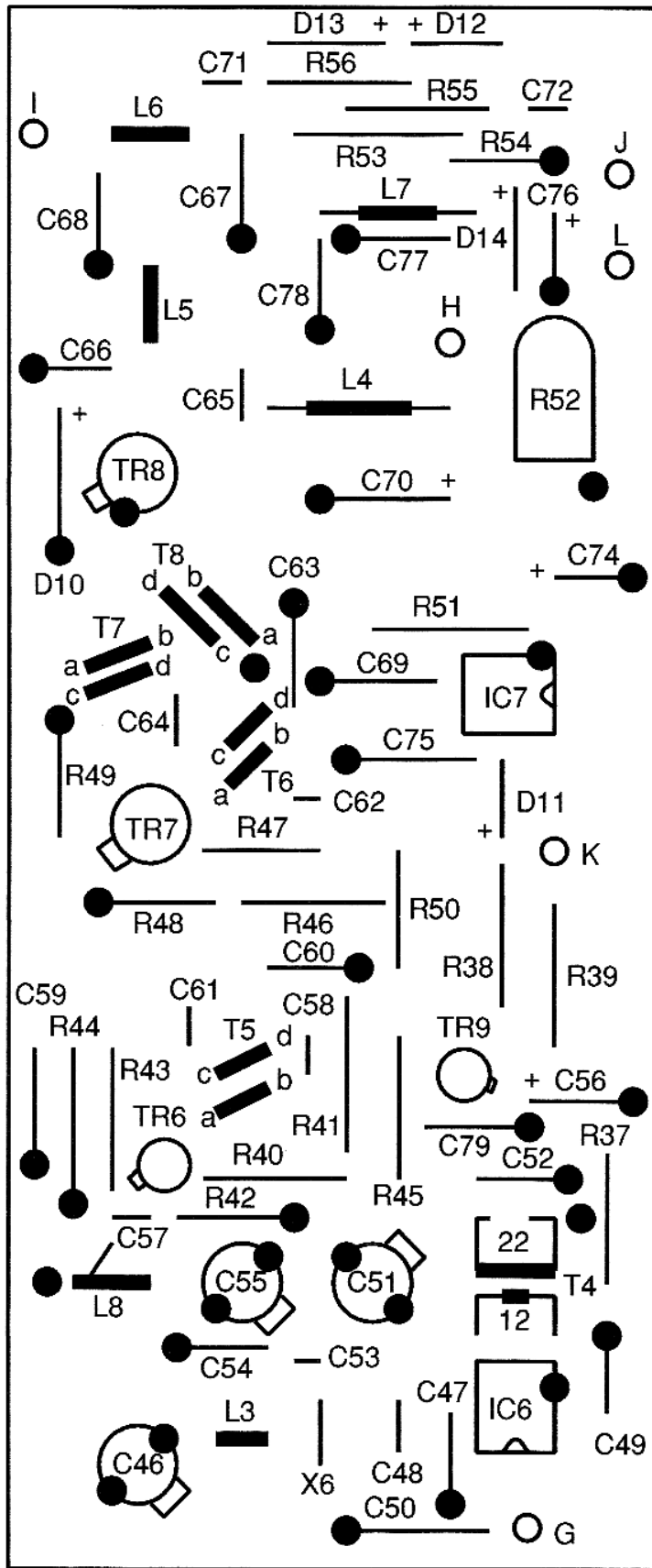
Your transceiver is now ready for use

Note: The transceiver automatically reverts to receive a short time after the key is released. This 'hold in' delay time can be varied by changing the value of C74.

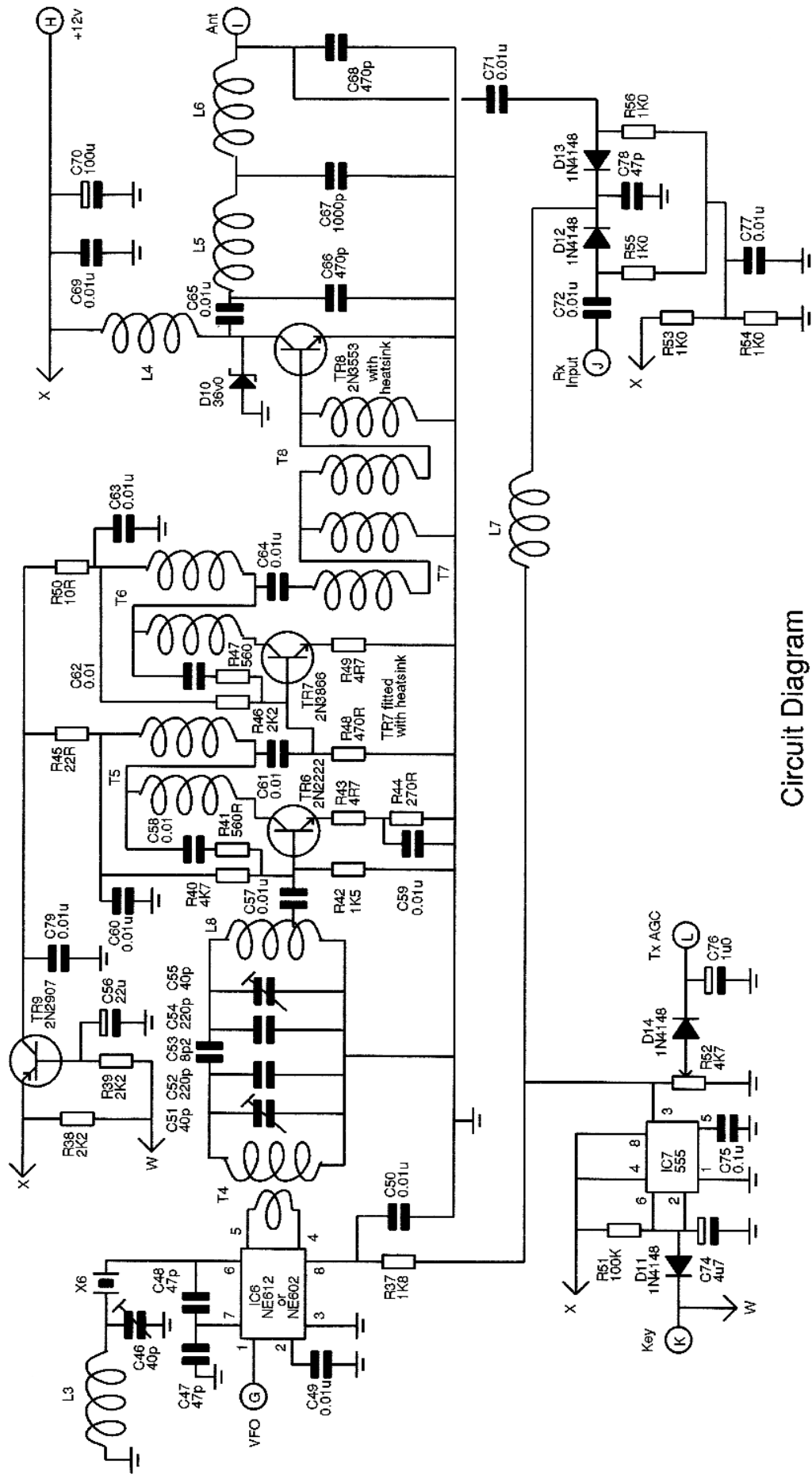
Component List

R37	1K8	R45	22R
R38, R39, R46	2K2	R48	470R
R40	4K7	R50	10R
R41, R47	560R	R51	100K
R42	1K5	R52	4K7 skeleton pot.
R43, R49	4R7	R53, R54, R55	1K0
R44	270R	R56	
C47, C48, C78	47p	C52, C54	220p
C49, C50, C57	0.01u	C53	8p2
C58, C59, C60		C56	22u
C61, C62, C63		C66, C68	470p
C64, C65, C69		C67	1000p
C71, C72, C77		C70	100u
C79		C74	4u7
C46, C51, C55	40p trimmer	C75	0.1u
C76	1u0		
L3	30 turns 28swg on T37-2 toroid		
L4	10uH choke		
L5, L6	14 turns 22swg on T50-2 toroid		
L7	100uH choke		
L8	22 turns 28swg on T37-2 toroid tapped at 2 turns		
T4	22 turns 28swg on T37-2 toroid, 12 turn secondary		
T5, T6, T7, T8	8 turns 28swg bifilar on Siemens B64290A37X830 toroid		
X6	10.240 MHz crystal		
D10	36v zener diode		
D11, D12, D13	1N4148		
D14			
TR6	2N2222A		
TR7	2N3866		
TR8	2N3553		
TR9	2N2907		
IC6	NE612 or NE602		
IC7	555 timer		

Misc: PCB, terminal pins, Instruction manual, heatsinks (2 off)



Component Layout



Circuit Diagram