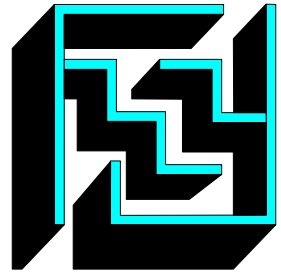


QUICK TONE CTCSS SUB - AUDIBLE TONE ENCODER DECODER



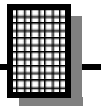
Ramsey Electronics Model No.

QT1

Caught in the maze of low frequency tones?

Looking for an easy way to update your rig with sub-audible frequency tones? Let the Ramsey Quick Tone do the job for you with digital accuracy!

- **Sharing a channel using (C)ontinuous (T)one (C)ontrolled (S)ub-audible (S)quelch or PL ? This is the complete circuit solution for you!**
- **Mini size quality circuit board designed to fit inside many transceivers.**
- **Add tone capability to access your favorite repeater with this easy to assemble kit.**
- **Encodes / decodes any of the 39 standard CTCSS tones with quartz accuracy - no "tweaking" required!**
- **Setup includes complete digital filtering of TX audio to eliminate "talk off" interference from normal speech audio components.**
- **Operates with any 5-15 VDC source - even includes an on-board voltage regulator for noise free operation.**
- **COMPLETE with hookup instructions and documentation to guide you to a finished project that works first time - every time!**
- **Easily bypassed for no-tone operation.**



PARTIAL LIST OF AVAILABLE KITS:

RAMSEY TRANSMITTER KITS

- FM10A, FM25B FM Stereo Transmitters
- AM1, AM25 Transmitter

RAMSEY RECEIVER KITS

- FR1 FM Broadcast Receiver
- AR1 Aircraft Band Receiver
- SR2 Shortwave Receiver
- AA7 Active Antenna
- SC1 Shortwave Converter

RAMSEY HOBBY KITS

- SG7 Personal Speed Radar
- SS70A Speech Scrambler/Descrambler
- TT1 Telephone Recorder
- SP1 Speakerphone
- MD3 Microwave Motion Detector
- WEB1 Walking Electronic Bug
- ECG1 Heart Monitor
- PG13 Plasma Generator
- TFM3 Tri-Field Meter

RAMSEY AMATEUR RADIO KITS

- HR Series HF All Mode Receivers
- DDF1 Doppler Direction Finder Kit
- QRP Series HF CW Transmitters
- CW7 CW Keyer
- QRP Power Amplifiers

RAMSEY MINI-KITS

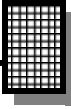
Many other kits are available for hobby, school, scouts and just plain FUN. New kits are always under development. Write or call for our free Ramsey catalog.

QUICK TONE CTCSS ENCODER / DECODER INSTRUCTION MANUAL

Ramsey Electronics publication No. QT1 Revision 1.0

First printing: 1994

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KIT ASSEMBLY AND INSTRUCTION MANUAL FOR

QUICK TONE CTCSS SUB - AUDIBLE TONE ENCODER DECODER

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INTRODUCTION

With today's ever shrinking radio frequency spectrum, it has become common place to "share" radio frequencies using a tone squelch arrangement.

By transmitting a low frequency audio tone (sub-audible to the radio and most of us) we can enable our transmitter to connect with receivers specifically listening for the particular tone one happens to use. This will eliminate much of the background "chatter" that may also be taking place on a desired frequency.

This "tone squelch" arrangement is commonly used on many repeaters to make them exclusive to the repeater club members only. The problem is that many of the more reasonably priced rigs do not include tone capabilities and that older equipment had no provision for this "modern" squelching arrangement.

There has been various ways to "update" older rigs for tone operations for years, but these solutions were primitive, usually encoding or decoding a single tone per unit and requiring extensive test equipment to align.

Enter MX-COM and one of their latest innovations in CTCSS technology. A single 24 pin Integrated Circuit capable of encoding or decoding any of the 39 standard tone frequencies available. That's the heart of the Quick Tone unit with some external setup and control parts.

QT1 THEORY OF OPERATION

You've probably already noticed that the QT1 kit doesn't contain a whole lot of components. The majority of the circuitry is contained inside the integrated circuit with only a few external components that actually do the "brute force" control of your transceiver.

The MX-COM IC is itself a testament to today's ever evolving digital circuitry (including modern day compact disc players and the like) so without getting too involved let's take a look at what is being accomplished inside the IC. Have a look at the schematic diagram (on page 10 of the instruction manual) and follow along.

In the received audio path the radio's audio is routed to the tone decoder input of the chip. Depending on the sub-audible tone frequency selected (using the programming inputs), as well as if that particular tone frequency is present in the audio input, the RX decode output (pin 15) will go to a logic level one for a valid tone decode. This output is then re-routed to the IC, inverted, and used to drive an open collector muting circuit that "grounds" the

received audio until the sub-audible tone is detected. When that occurs, transistor Q1 is turned off and the audio signal is free to drive a speaker or headset output.

Another receive audio path is directly through the MX-COM. IC. The received audio is routed through an internal high pass filter which digitally filters out any low frequency CTCSS component in the received audio. Another advantage to this internal audio route is that the tone squelch function can be easily overridden by simply switching the Push-To-Listen (abbreviated PTL) pin of the IC to a logic 1 condition. In this way it is easy to check the radio receivers frequency for traffic that is not using your tone squelch setup.

The tone generation function is straightforward. When the Push-To-Talk line (abbreviated PTT) is grounded, the IC generates the programmed sub-audible tone. This audio signal is fed out pin 16, where a level adjustment potentiometer is located. This low frequency audio component is available to be added to the modulation input to the transmitter.

The TX audio path through the IC also makes use of the high pass filter to remove any stray low frequency components of the audio to eliminate any intermodulation product which could cause a “talk off” condition when transmitting.

This previously mentioned “programming” is easily accomplished using jumper blocks and we’ll discuss them in more detail when we’re actually ready to select our tone frequencies. The same goes for the TX/RX audio inputs and outputs, so lets get the “feel” of the circuit by building it before we discuss actual hook ups and adding unnecessary confusion.

QT1 PARTS LIST

Please check the boxes after the components have been identified, and it is also handy at this time to “sort” the like components into groups or bins (an egg carton does nicely) to avoid using the wrong component during assembly.

RESISTORS

- 3 10K ohm resistors [brown-black-orange] (R1,5,6)
- 1 470K ohm resistor [yellow-violet-yellow] (R2)
- 1 820K ohm resistor [grey-red-yellow] (R3)
- 1 1Meg ohm resistor [brown-black-green] (R4)
- 1 5K ohm trimmer potentiometer [black color marked 502] (R7)

CAPACITORS

- 1 33pF disc capacitor [marked 33] (C10)
- 1 68 pF disc capacitor {marked 68} (C8)
- 1 .01 uF disc capacitor [marked .01 or 103 or 10nF] (C11)
- 1 .1 uF disc capacitor [marked .1 or 104] (C9)
- 8 1 uF electrolytic capacitors (C1,2,3,4,5,6,7,12)

SEMICONDUCTORS AND INTEGRATED CIRCUITS

- 1 1N4148 diode [glass case with black band] (D2)
- 1 1N4002 diode [epoxy case marked 1N4002] (D1)
- 1 NPN small signal transistor [marked 2N3904] (Q1)
- 1 78L05 voltage regulator [marked 78L05] (VR1)
- 1 MX-COM MX165CP 24 pin IC (U1)

MISCELLANEOUS PARTS

- 1 Mini 1 MHz crystal [marked 1000J] (Y1)
- 1 12 pin jumper block
- 6 Pre formed jumper blocks (P0 - P5)
- 1 12” length of black, red, and white hookup wire
- 1 24 pin IC socket

RAMSEY Learn-As-You-Build KIT ASSEMBLY

There are numerous solder connections on the QT1 printed circuit board. Therefore, PLEASE take us seriously when we say that good soldering is essential to the proper operation of your kit!

- Use a 25-watt soldering pencil with a clean, sharp tip.
- Use only rosin-core solder intended for electronics use.
- Use bright lighting; a magnifying lamp or bench-style magnifier may be helpful.
- Do your work in stages, taking breaks to check your work. Carefully brush away wire cuttings so they don't lodge between solder connections.

It is also important at this time to be honest about your kit building ability. Even though we have made every attempt to make this kit and manual as straight forward as possible, this kit may be too complex in a couple of ways.

- In our attempt to make this unit small enough to fit *inside* many types of transceivers, component spacing was "squeezed" considerably, making this kit more difficult to assemble than many of our other hobby kits.
- This unit, when completed, needs to be interfaced with another piece of electronic equipment. We at Ramsey cannot be held accountable for the literally hundreds of individual radios and hookups necessary for proper interface to them.

We will, of course, provide you with the best ideas for general hookups, but the rest will be up to you. We regret that we cannot offer exact hook-up info for the rig of your choice.

We have a two-fold "strategy" for the order of the following kit assembly steps. First, we install parts in physical relationship to each other, so there's minimal chance of inserting wires into wrong holes. Second, whenever possible, we install in an order that fits our "Learn-As-You Build" Kit building philosophy. This entails describing the circuit that you are building, instead of just blindly installing components. We hope that this will not only make assembly of our kits easier, but also help you to understand the circuit you're constructing.

For each part, our word "Install" always means these steps:

1. Pick the correct part value to start with.

2. Insert it into the correct PC board location.

3. Orient it correctly and follow the PC board drawing and the written directions for all parts - especially when there's a right way and a wrong way to solder it in. (Diode bands, electrolytic capacitor polarity, transistor shapes, dotted or notched ends of ICs, and so forth.)

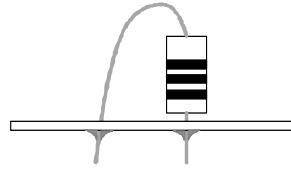
4. Solder all connections unless directed otherwise. Use enough heat and solder flow for clean, shiny, completed connections.

Now, let's get building!

Since you may appreciate some “warm-up” soldering practice as well as a chance to put some “landmarks” on the PC board, we'll first install some less crowded components. This will also help us to get acquainted with the up - down, left - right orientation of the circuit board. Remember that the components will be mounted on the “component” side of the circuit board and soldered on the “solder” side of the circuit board, the side with the printed circuit traces.

- ❑ 1. Install C7, 1 uF electrolytic capacitor. Electrolytic capacitors are polarized with a (+) and a (-) lead and must be installed in the correct orientation. Ordinarily, only the negative side is marked on the capacitor body with a dark band and the (-) sign clearly shown, while PC boards will usually show the (+) hole location. Use care to ensure proper polarity. See the parts diagram for proper placement. The capacitor should fit snugly down to the PC board.
- ❑ 2. In the same manner, install electrolytic capacitors C2, 5 and 6, all 1 uF in value. Watch the polarity of each! Notice how all the caps are facing in the same direction to avoid confusion while installing. These components act as “DC blocks”; that is, they allow the audio signal through them, but will not allow any DC voltage to reach the MX165CP IC.
- ❑ 3. Now the fun part! Install the 24 pin IC socket in the U1 position. Notice that one end of the socket is marked with a notch; orient it as shown in the parts layout as to help when installing the IC. Solder one pin at a time and take extra caution as not to “bridge” solder between two or more pins. Now, identify the 24 pin IC (labeled MX165CP). Notice that one end of the chip is also marked with a dot, notch, or band. Be sure to orient this end as shown in the parts diagram. Gently insert this IC into the socket. Be careful not to bend any of the leads underneath the socket while installing this part.
- ❑ 4. Identify and install disc capacitor C11, a .01 uF disc (marked .01 or 103 or 10nF). Be sure to push this part snug to the PC board.

- ❑ 5. Identify R2, 470K ohm (yellow-violet-yellow). Notice how this component will be mounted “standing up”. To mount this component properly, you’ll need to form the leads as shown. Then slip the leads through the circuit board, and solder.



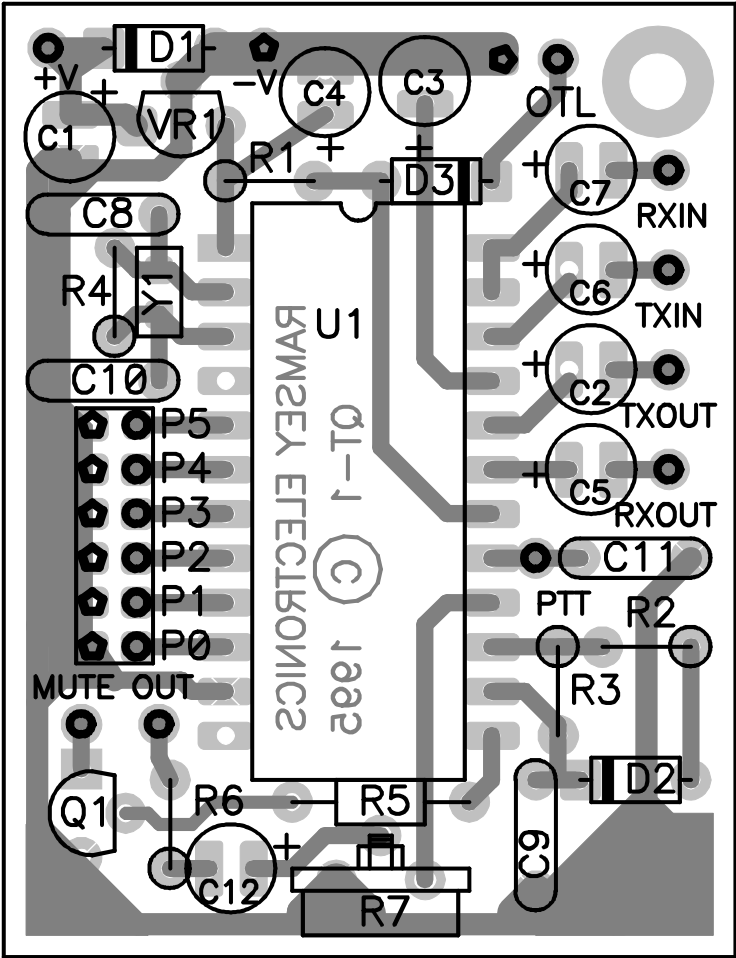
- ❑ 6. Install R3, 820K ohm (grey-red-yellow). Notice that this component is also mounted “standing”. By mounting the components this way they occupy less room on the PC board, making our finished project as small as possible.
- ❑ 7. Install D2, a 1N4148 type diode. Notice that one end of this component is marked with a band. Diodes are “polarized”; that is, like a battery, they have a positive (+) and negative (-) side. Be sure to follow the parts diagram carefully and orient the banded end as shown. Use caution when forming the leads of the component as not to fracture the glass component.
- ❑ 8. Install C9, .1uF disc (marked .1 or 104). Remember to push the component as close as mechanically possible before soldering.
- ❑ 9. Install R5, 10K ohm (brown-black-orange).
- ❑ 10. Install R7, the 5K ohm trimmer potentiometer (black color, marked 502M). Gently rock it into place on the PC board and solder securely.
- ❑ 11. Install C12, 1uF electrolytic capacitor. Watch that polarity! See the parts diagram for correct placement.
- ❑ 12. Install R6, 10K ohm (brown-black-orange). Notice that this component is mounted “standing up”.
- ❑ 13. Identify Q1, a 2N3904 NPN transistor (marked 3904). When installing Q1, observe correct placement of the flat side. Press the transistor snugly into the PC board so that only a minimum amount of wire lead is exposed above the board. In soldering, do not be afraid of using enough heat to make a good solid connection.

Hang in there, only a few parts to go. Check your solder connections up to now and repair any “less than perfect” connections.

- ❑ 14. Install the jumper pin block, P0-P5. This will be used as the “programming” input to your MX165CP IC. Carefully solder each connection and watch out for solder bridges.
- ❑ 15. Install C10, 33pF disc capacitor (marked 33 or 33K).
- ❑ 16. Form and install R4, a “stand up” 1 Meg ohm (brown-black-green).
- ❑ 17. Identify the crystal in the rectangular blue case marked 1000J. Install in the Y1 position. You don’t have to worry about polarity; this component will work either way.

- ❑ 18. Install C8, 68pF disc capacitor (marked 68 or 68K).
- ❑ 19. Install C1, 1uF electrolytic capacitor. Ensure proper polarity.
- ❑ 20. Identify and install diode D1, 1N4002 (epoxy bodied component with stripe, marked 4002). Be sure to face the band as shown in the parts diagram. Mount it “standing up”, using care to ensure proper polarity.

QT1 PARTS LAYOUT DIAGRAM



- ❑ 21. Install R1, 10K ohm (brown-black-orange). Notice again that this part is “standing up”.
- ❑ 22. Identify VR1, the 78L05 voltage regulator (marked 7805). This device produces a stable 5 volt reference for the circuit. Notice that this component has a “flat” side with the writing imprinted on it. Be sure to place the part as shown in the parts diagram.
- ❑ 23. Install C4, 1uF electrolytic. Watch that polarity!
- ❑ 24. Install C3, the last 1 uF electrolytic. Again be sure to orient the part as shown in the parts diagram.

- ❑ 25. Install a short length of red hookup wire to the +V connection.
- ❑ 26. Install a short length of black hookup wire to the -V connection.

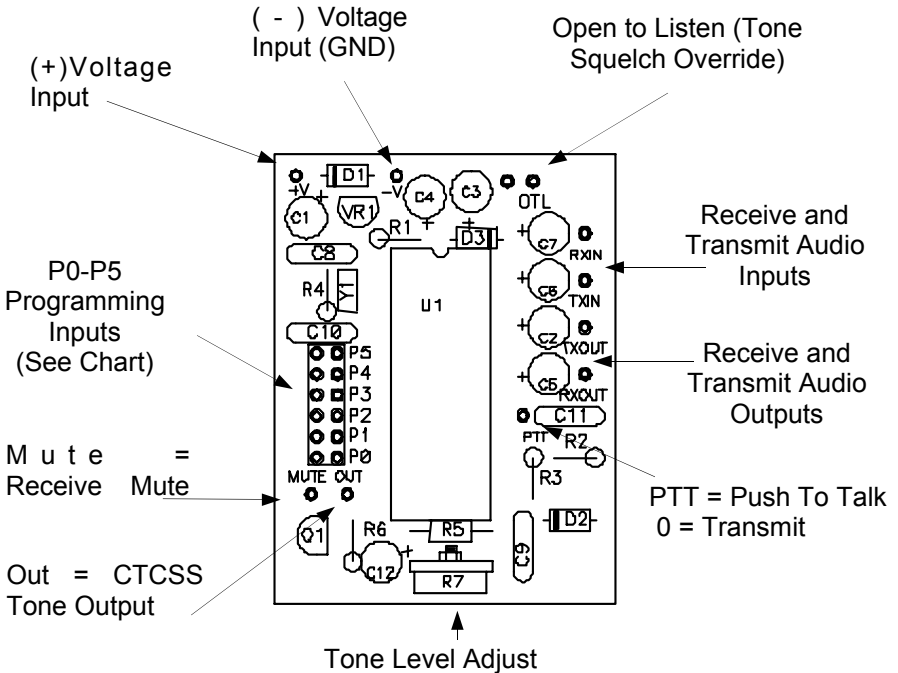
CONGRATULATIONS

You have just completed your QT1 Sub Audible Tone Encoder/Decoder. Take a well deserved break now. Give your eyes a rest. When you return, be sure to check over your work on the entire circuit board. Energizing the circuit board with solder “bridges” or misplaced components can damage your kit. A few well spent minutes now can save hours of troubleshooting and dollars in replacements for burned out parts.

INITIAL HOOK UP AND TESTING

While we know that you’re probably anxious to “fire up” your kit, first we’ll have to program a tone frequency for the unit to generate and decode. We’ll also need to connect our circuit to the “outside world” to test.

Hopefully, the following board description will help in deciphering the abbreviations that were used on the circuit board.



QT1 TONE FREQUENCY PROGRAMMING

Finally, it's time to set the tone frequency on the Ramsey Quick Tone. The following chart describes the combinations of jumpers for the various tone frequencies. An '0' indicates that a jumper block is *not* present, while an 'X' indicates that there is a jumper across the pins.

0 = No Jumper
X = Install Jumper

TONE FREQ (Hz)	P5	P4	P3	P2	P1	P0
67.0	0	0	0	0	0	0
69.3	0	0	0	X	X	0
71.9	X	0	0	0	0	0
74.4	0	0	0	0	0	X
77.0	X	X	0	0	0	0
79.7	0	0	0	0	X	0
82.5	X	0	0	0	0	X
85.4	0	0	0	0	X	X
88.5	X	X	0	0	0	X
91.5	0	0	0	X	0	0
94.8	X	0	0	0	X	0
97.4	0	0	0	X	0	X
100.0	X	X	0	0	X	0
103.5	X	0	0	0	X	X
107.2	X	X	0	0	X	X
110.9	X	0	0	X	0	0
114.8	X	X	0	X	0	0
118.8	X	0	0	X	0	X
123.0	X	X	0	X	0	X
127.3	X	0	0	X	X	0
131.8	X	X	0	X	X	0
136.5	X	0	0	X	X	X

TONE FREQ (Hz)	P5	P4	P3	P2	P1	P0
141.3	X	X	0	X	X	X
146.2	X	0	X	0	0	0
151.4	X	X	X	0	0	0
156.7	X	0	X	0	0	X
159.8	0	0	X	X	X	0
162.2	X	X	X	0	0	X
167.9	X	0	X	0	X	0
173.8	X	X	X	0	X	0
179.9	X	0	X	0	X	X
183.5	0	0	X	X	0	X
186.2	X	X	X	0	X	X
189.9	0	0	X	X	0	0
192.8	X	0	X	X	0	0
196.6	0	0	X	0	X	X
203.5	X	X	X	X	0	0
210.7	X	0	X	X	0	X
218.1	X	X	X	X	0	X
225.7	X	0	X	X	X	0
233.6	X	X	X	X	X	0
241.8	X	0	X	X	X	X
250.3	X	X	X	X	X	X

- Select and program the desired tone frequency (e.g. 100.0 Hz = 01101 = Jumper installed in P5, P4, and P1).
- Connect the unit to a suitable power source (5 - 15VDC).
- Connect the PTT line to circuit ground while observing the the “OUT” connection. You should be able to detect the tone output (using an oscilloscope) and vary its amplitude using R7.
- Disconnect the PTT line; ground the ‘OTL’ (Open To Listen) pin, and connect an audio signal generator (or equivalent) to the ‘RX IN’ audio input pin. While observing the decode output pin (pin 13 of the MX-COM 165CP) with a DC voltmeter you should see the output go low as the desired frequency is met. Note, however, that the chip’s filter is extremely sharp (probably more precise than your signal generator’s dial), so patiently swing the audio oscillator control near the desired frequency until you see it decode.

TYPICAL HOOKUP INSTRUCTIONS

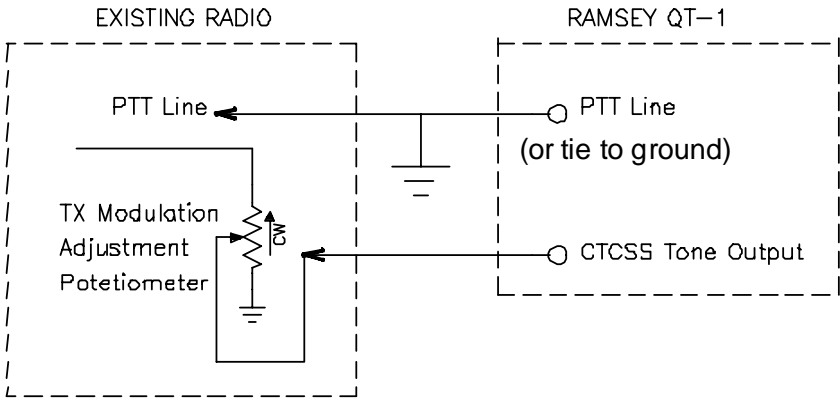
A word of caution to begin with: Now that your QT1 kit has been tested, you’re moving into maybe the most challenging part of the assembly, the interface of the tone detector with the radio. As a general rule we suggest that you have a copy of the schematic for the transceiver that you wish to interface with. If you’re not sure, call the radio’s manufacturer and request one. Please do not risk damage to your transceiver by haphazardly making connections to your radio. Be sure to unplug all power from the rig and double check each connection before applying power to either the radio or the QT1.

Here are some general hook-up block diagrams for most any rig. Don’t let this big chip scare you - remember, all we have to do is generate or detect the presence of a tone!

Hook-up #1: Transmit Tone Encode Only

This is the easiest way to get into your favorite repeater. After configuring your QT1 for the proper tone frequency, simply connect the CTCSS tone output to the modulation input of the transceiver.

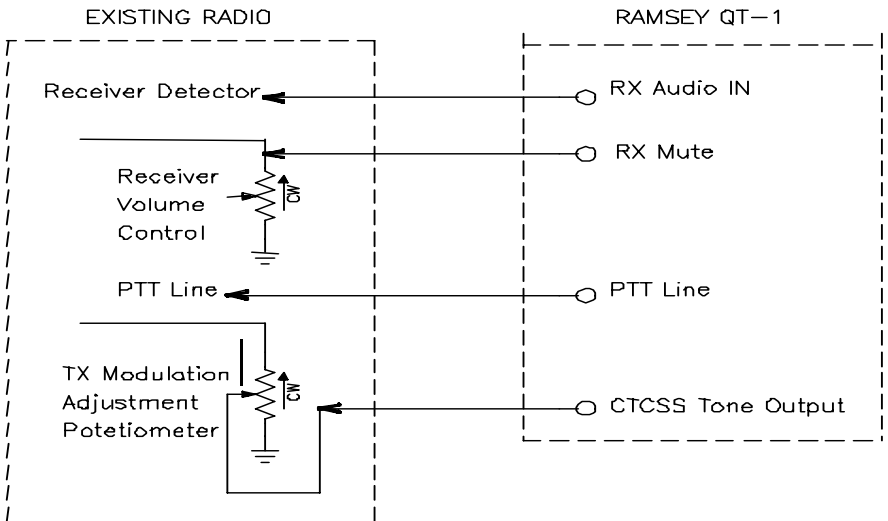
The PTT line of the QT1 should be connected to ground (for continuous tone generation) or to the radio’s PTT line (for tone generation only on transmit). If you are connecting to the PTT line, please note that it must go low, or switch to ground, when in transmit mode.



Hook-up #2: Tone Encode and Receive Decode

This hook-up allows muting of the receive audio until the proper tone is being received. The open collector “RX MUTE” is tied to the high side of the volume control pot. Following are a few “pro’s and con’s” concerning this type of configuration.

1. This interconnection requires no disabling of the original audio path inside the receiver to function. You can even hook-up the unit with ‘clip’ leads to check its functioning.
2. Be sure to ‘pick-off’ the audio just after the receiver detector - before the audio is limited to exclude low frequency signals.
3. The major disadvantage of this configuration is that the “OTL” line will not control the RX MUTE output. The only way to disable the tone squelch is to remove power from the entire circuit board.



The next diagram shows a more involved way of interfacing your kit. This configuration more fully utilizes the MX-COM. IC and its more advanced features.

1. This connection used the “built in” audio filtering provided by the MX-COM. chip for superior audio quality, both on receive and transmit.
2. In this configuration you may also trip the mic hanger in transmit mode to eliminate any unwanted “squelch tail” that is present.
3. The bad news is that you have to physically break the audio path at some point inside the transceiver. Although this is probably not too difficult, use extreme caution as with in any modification. Similarly, The TX audio should be routed to the TX IN connection. The TX OUT connection should then be connected to the modulation adjustment potentiometer inside the transmitter.

TROUBLESHOOTING INSTRUCTIONS

While we had hoped that it wouldn't come to this, if you are having trouble with your tone board, here are a few suggestions.

Use a methodical, logical troubleshooting technique. Most problems can be solved using common sense. A volt-ohm meter and a clear head are usually all that are needed to correct any problem.

With the majority of the circuit being controlled by a single chip, rest assured that it was double checked for quality here at the factory.

Here are some common voltage measurements to test for proper operation. The interconnections between various rigs and the tone board may cause some strange results to occur. Try to isolate the problem one stage at a time. Does the board encode *and* decode? Does the PTT line go to 0V on xmit? Usually a big problem boils down to one or two smaller, easier solved glitches.

Please understand that it is nearly impossible for us to “trouble-shoot” over the phone, especially with interfacing problems to the hundreds of rigs out there. We will give it our best shot, if you mail us a schematic and block diagram of your rig. Usually these type of problems can be solved bouncing around suggestions on your repeater with the local radio “guru”, so you may want to give that a try first.

CONCLUSION

We sincerely hope that you have enjoyed the construction and use of this Ramsey Kit. As always, we have tried to compose our manual in the easiest, most “user friendly” format that is possible. As our customers, we value your

opinions, comments, and additions that you would like to see in future publications. Please submit comments or ideas to:

Ramsey Electronics Inc.
Attn. Hobby Kit Department
590 Fishers Station Drive
Victor, NY 14564

And once again, thanks from the folks at Ramsey!

The Ramsey Kit Warranty

Please read carefully BEFORE calling or writing in about your kit. Most problems can be solved without contacting the factory.

Notice that this is not a "fine print" warranty. We want you to understand your rights and ours too! All Ramsey kits will work if assembled properly. The very fact that your kit includes this new manual is your assurance that a team of knowledgeable people have field-tested several "copies" of this kit straight from the Ramsey Inventory. If you need help, please read through your manual carefully, all information required to properly build and test your kit is contained within the pages!

1. DEFECTIVE PARTS: It's always easy to blame a part for a problem in your kit, Before you conclude that a part may be bad, thoroughly check your work. Today's semiconductors and passive components have reached incredibly high reliability levels, and its sad to say that our human construction skills have not! But on rare occasion a sour component can slip through. All our kit parts carry the Ramsey Electronics Warranty that they are free from defects for a full ninety (90) days from the date of purchase. Defective parts will be replaced promptly at our expense. If you suspect any part to be defective, please mail it to our factory for testing and replacement. Please send only the defective part (s), not the entire kit. The part(s) MUST be returned to us in suitable condition for testing. Please be aware that testing can usually determine if the part was truly defective or damaged by assembly or usage. Don't be afraid of telling us that you 'blew-it', we're all human and in most cases, replacement parts are very reasonably priced.

2. MISSING PARTS: Before assuming a part value is incorrect, check the parts listing carefully to see if it is a critical value such as a specific coil or IC, or whether a RANGE of values is suitable (such as "100 to 500 uF"). Often times, common sense will solve a mysterious missing part problem. If you're missing five 10K ohm resistors and received five extra 1K resistors, you can pretty much be assured that the '1K ohm' resistors are actually the 'missing' 10 K parts ("Hum-m-m, I guess the 'red' band really does look orange!") Ramsey Electronics project kits are packed with pride in the USA. If you believe we packed an incorrect part or omitted a part clearly indicated in your assembly manual as supplied with the basic kit by Ramsey, please write or call us with information on the part you need and proof of kit purchase.

3. FACTORY REPAIR OF ASSEMBLED KITS:

To qualify for Ramsey Electronics factory repair, kits MUST:

1. NOT be assembled with acid core solder or flux.
2. NOT be modified in any manner.
3. BE returned in fully-assembled form, not partially assembled.
4. BE accompanied by the proper repair fee. No repair will be undertaken until we have received the MINIMUM repair fee (1/2 hour labor) of \$25.00, or authorization to charge it to your credit card account.
5. INCLUDE a description of the problem and legible return address. DO NOT send a separate letter; include all correspondence with the unit. Please do not include your own hardware such as non-Ramsey cabinets, knobs, cables, external battery packs and the like. Ramsey Electronics, Inc., reserves the right to refuse repair on ANY item in which we find excessive problems or damage due to construction methods. To assist customers in such situations, Ramsey Electronics, Inc., reserves the right to solve their needs on a case-by-case basis.

The repair is \$50.00 per hour, regardless of the cost of the kit. Please understand that our technicians are not volunteers and that set-up, testing, diagnosis, repair and repacking and paperwork can take nearly an hour of paid employee time on even a simple kit. Of course, if we find that a part was defective in manufacture, there will be no charge to repair your kit (But please realize that our technicians know the difference between a defective part and parts burned out or damaged through improper use or assembly).

4. REFUNDS: You are given ten (10) days to examine our products. If you are not satisfied, you may return your unassembled kit with all the parts and instructions and proof of purchase to the factory for a full refund. The return package should be packed securely. Insurance is recommended. Please do not cause needless delays, read all information carefully.

**Ramsey Quick Tone CTCSS TONE
ENCODER DECODER**

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REQUIRED TOOLS

- Soldering Iron Ramsey WLC100
- Thin Rosin Core Solder Ramsey RTS12
- Needle Nose Pliers Ramsey MPP4 or RTS05
- Small Diagonal Cutters Ramsey RTS04
- <OR> Technician's Tool Kit TK405

TOTAL SOLDER POINTS

100

**ESTIMATED ASSEMBLY
TIME**

Beginner..... 2.0 hrs
Intermediate..... 1.5 hrs
Advanced 1.0 hrs

ADDITIONAL SUGGESTED ITEMS

- Holder for PC Board/Parts Ramsey HH3
- Desoldering Braid Ramsey RTS08
- Digital Multimeter Ramsey M133

Price: \$5.00

Ramsey Publication No. MQT1

Assembly and Instruction manual for:

Quick Tone CTCSS Encoder / Decoder

RAMSEY MODEL NO. QT1



RAMSEY ELECTRONICS, INC.

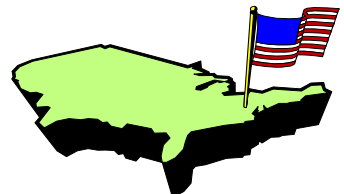
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This Quality Electronics
Kit was designed and
packed in the USA