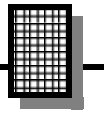
"TONE GRABBER" DTMF DECODER KIT

Ramsey Electronics Model No. TG-1

Ever wonder what numbers were being dialed on the phone or radio? Do you need to see what DTMF codes have been used during the day on the local repeater? Well, this is the kit for you! Using the power of a microprocessor this kit can record 256 numbers, and EEPROM memory stores the number even after power is removed!

- **Full microprocessor control for simple, but comprehensive features.**
- **256 memory locations - EEPROM holds up to 256 digits for over 100 years!**
- **Automatically places dashes between sets of numbers for easy reading of codes!**
- **Eight LED displays, see any 8 digits at any time.**
- **Able to scroll through memory while unit is operating to see all 256 memory locations.**
- **Decodes all sixteen DTMF codes - Fast 10 digits/second!**
- **Highly sensitive audio input for pick-up of "weak" signals!**
- **Wide range of supply voltage of 7-15VDC.**
- **Informative manual answers questions on theory, hook-ups and uses - enhances resale value, too!**

RAMSEY



PARTIAL LIST OF AVAILABLE KITS:

RAMSEY TRANSMITTER KITS

- **FM-10 FM Stereo Transmitter**
- **FM-1,2,3,4 FM Wireless Microphones**
- **PB-1 Telephone Transmitter**
- **AM-1 AM Broadcast Transmitter**

RAMSEY RECEIVER KITS

- **FR-1 FM Broadcast Receiver**
- **AR-1 Aircraft Band Receiver**
- **SR-1 Shortwave Receiver**
- **AA-7 Active Antenna**
- **SC-1 Shortwave Converter**

RAMSEY HOBBY KITS

- **SG-7 Personal Speed Radar**
- **SS-70 Speech Scrambler**
- **SP-1 Speakerphone**
- **MD-3 Microwave Motion Detector**
- **PH-10 Peak hold Meter**
- **CB-1 Voice recorder**
- **LC-1 Inductance-Capacitance Meter**

RAMSEY AMATEUR RADIO KITS

- **FX Series VHF and UHF Transceivers**
- **HR Series HF All Mode Receivers**
- **QRP Series HF CW Transmitters**
- **CW-7 CW Keyer**
- **PA Series VHF and UHF Power Amplifiers**
- **Packet Computer Interfaces**
- **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.

TG-1"TONE GRABBER" INSTRUCTION MANUAL
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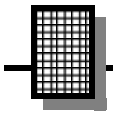


KIT ASSEMBLY
AND INSTRUCTION MANUAL FOR

TG-1 "TONE GRABBER" DTMF DECODER KIT

TABLE OF CONTENTS

RAMSEY

RAMSEY ELECTRONICS, INC.
793 Canning Parkway
Victor, New York 14564
Phone (716) 924-4560
Fax (716) 924-4555

TG-1 Tone Grabber Features:

- Eight digit display “window” allows you to see any eight digits out of the 256 memory locations.
- Fast decoding time (approx. .02 seconds per tone) for fast dialers.
- Sensitive audio input for weak or noisy tones.
- Accurate decoding, rejects dialtones and normal audio.
- Small size, runs on 7 to 15 VDC.
- Automatically places dashes between sets of numbers for easy reading of codes.
- Front panel left, right, and clear memory controls.
- Everything is included to get the unit up and running, all that is required is a power supply. Add our matching case and knob set for a finished "pro-look."
- Fully microprocessor controlled for ease of use.

INTRODUCTION TO THE TG-1

The Ramsey TG-1 is a dual tone multi-frequency (DTMF) decoder with memory. It decodes all sixteen characters represented in DTMF and stores them into 256 bytes of non volatile memory. It automatically places a dash between codes that have about 1½ seconds between them. This type of memory can store these codes with the power off to the unit for more than 100 years.

NOTE TO NEWCOMERS: If you are a first time kit builder you may find this manual easier to understand than you may have expected. Each part in the kit is checked-off as you go, while a detailed description of each part is given. If you follow each step of the manual in order, and practice good soldering and kit building skills, the kit is next to fail-safe. If a problem does occur, the manual will lead you through step-by-step in the troubleshooting guide until you find the problem and are able to correct it.

HOW THE TG-1 WORKS

Take a look at the TG-1's Schematic Diagram as we walk through the circuit. As you can see there is not much to the tone grabber, most of the work is internal to the IC's.

The real heart of the circuit is U4 the tone decoder IC. This chip has the task of actually decoding the tones into a digital fashion which a microprocessor can understand. Internally this chip has a set of counters that latch different outputs depending on the tones. The internal counters are referenced to a television colorburst crystal operating at 3.579 Mhz. Some of this reference frequency is taken from pin 10 of U4 and is also used to operate U3, the microprocessor.

U3 is a 68HC705K1 microprocessor. This IC contains the code required to update the displays, read and write to memory, and take the tone data from U4 and process it in a useful fashion. It also monitors user action such as pressing a button, and takes action accordingly.

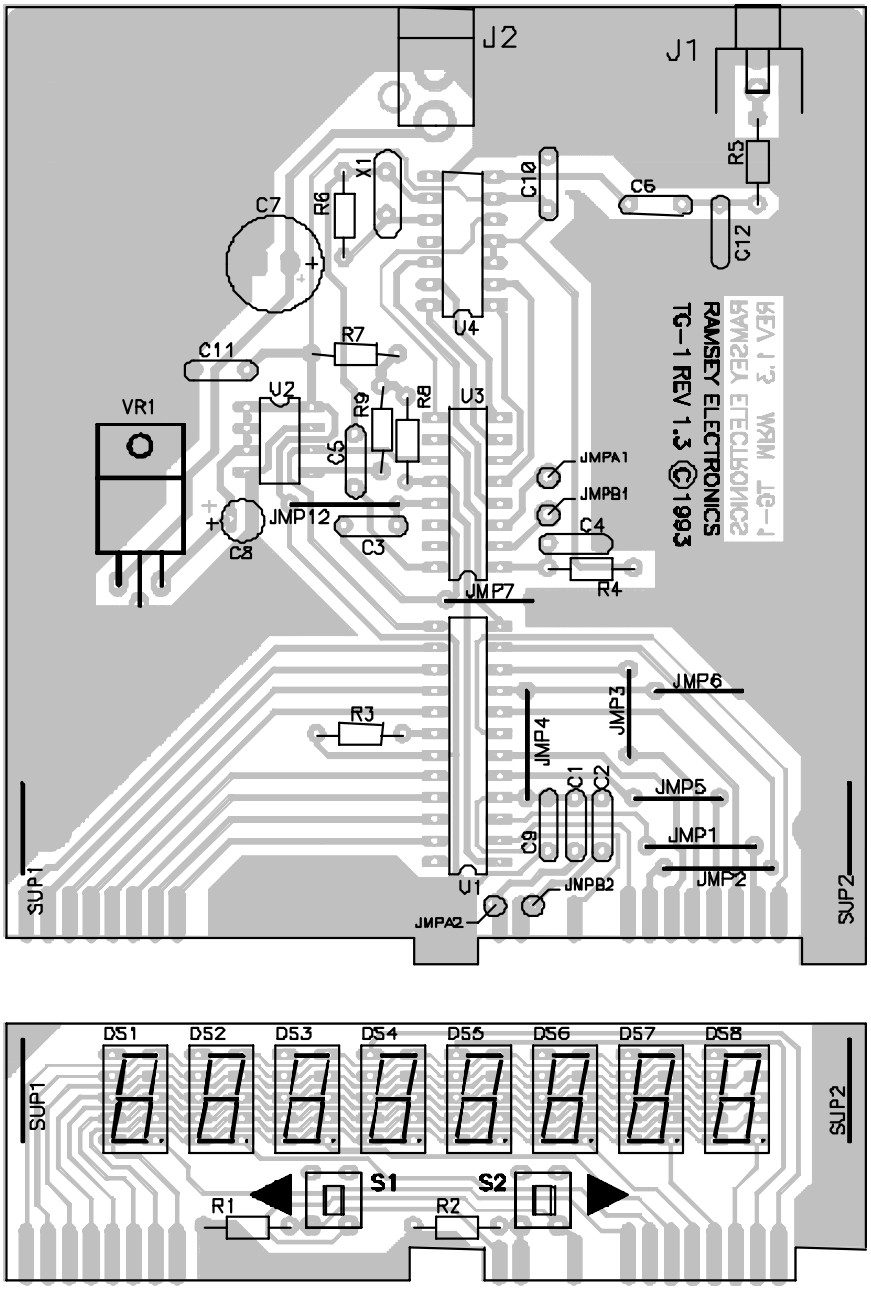
U2 is a serially accessed NOVRAM or EEPROM as some may call it. It can store a piece of information for more than 100 years without any power applied at all. However, it is limited to about 500,000 write cycles, or in the case of this kit, 128 million individual decoded tones or digits! That is a heckuvallot, of tones and in most, if not all, cases would be more tones than a person could handle in a lifetime.

The only chip left to talk about is U1, a serially loaded seven segment display driver. This chip can be fully configured from software, including brightness, testing of the display, low power mode, and decode modes. It is a really versatile IC, but due to the lack of code space in U3, many of the features of this IC are left out.

VR1 and the surrounding parts form a simple voltage regulator to supply a steady 5 VDC to the ICs in this circuit. By using this scheme, we can have a wide range of supply voltages, from 7 volts to 15 volts DC.

If you are wondering what R7, R8, and R9 are for, here is the answer: The data bus on this kit is a bidirectional, serial bus. This means that all of the information is sent back and forth on the same line. In order for the chips to do this, the data line pins have to switch from inputs to outputs and back again. If the data line was connected straight through when two of the pins were outputs, any differences in their states would damage one or the other. By putting these resistors in, damage is prevented from occurring.

TG-1 PARTS LAYOUT DIAGRAM



RAMSEY TG-1 "TONE GRABBER" PARTS LIST:

SEMICONDUCTORS

- ❒ 1 7805 5 volt power regulator (VR1)
- ❒ 1 145436 (or MC145436) 14 pin DIP DTMF decoder IC (U4)
- ❒ 1 68HC705K1 16 pin DIP pre-programmed microcontroller (white sticker marked TG-1) (U3)
- ❒ 1 16 pin socket for U3
- ❒ 1 MAX7219 24 pin DIP 8 digit display driver (U1)
- ❒ 1 X2402 8 pin DIP 256 byte EEPROM (U2)
- ❒ 8 Seven Segment LED displays (DS1,2,3,4,5,6,7,8)

CAPACITORS

- ❒ 8 .01uF disk ceramic capacitors (marked .01 or 103 or 10 nF) (C1,2,3,6,9,10,11,12)
- ❒ 1 .1uF disk ceramic capacitor (marked .1 or 104) (C4)
- ❒ 1 470pF disk ceramic capacitor (marked 470 or 471) (C5)
- ❒ 1 100uF to 220uF electrolytic capacitor (C7)
- ❒ 1 10uF electrolytic capacitor (C8)

RESISTORS

- ❒ 5 10K ohm (brown-black-orange) (R1,2,3,4,7)
- ❒ 1 47K ohm (yellow-violet-orange) (R5)
- ❒ 1 1M ohm (brown-black-green) (R6)
- ❒ 2 330 ohm (orange-orange-brown) (R8,9)

HARDWARE AND MISCELLANEOUS

- ❒ 1 3.579 Mhz crystal (Marked 3.579 or 3.579545)
- ❒ 2 Push button switches
- ❒ 1 Set hardware for regulator (1 screw and 1 nut)
- ❒ 1 RCA jack (J1)
- ❒ 1 DC power jack (J2)
- ❒ 1 length (approx. 5") of insulated hookup wire
- ❒ 1 length of bus wire (approx. 12")

"The Ramsey Learn As You Build Assembly Strategy"

Take a look at the Parts Layout Diagram; there is quite a lot to the construction of the TG-1. It's easier than it seems once you get going, after you have placed a few of the "landmark" components. Once these "landmark" components are placed, other part positions are referenced to them, and construction goes quite smoothly. This will help for relating one part to another what specific holes a part may require on the board, and the part's orientation. In addition, we will discuss the purpose of most components or groups of components as we go along. This is the Ramsey Learn-As-You-Build kit assembly philosophy.

Be sure to read through all the steps, and check the boxes as you go to be sure you didn't miss any important steps. Most of the problems we find here at the factory are due to faulty assembly - no matter how experienced the builder may be - it's especially tough to tell a 30 year experienced ham that he goofed! Before you run the circuit, check all diodes and polarized capacitors for proper orientation.

Tips and Notes:

Use a good soldering technique - let your soldering iron tip gently heat the traces to which you are soldering, heat both wires and pads simultaneously. Apply the solder on to the lead of the part and the pad when they are hot enough to melt the solder. The finished joint should look like a drop of water on paper, somewhat soaked in.

Parts are mounted on the top (component) side of the board, that is the side that has no traces or pads on it. The leads of the parts are pushed through their respective holes, and soldered to the circuit side (bottom), which has the metal plated traces.

IC sockets - A good practice, but not necessary in digital or low frequency circuits such as this. This prevents the horror of desoldering a bad or incorrectly placed IC.

Part orientation - All parts in the kit are mounted at 90 degree angles to each other, meaning that all parts are either parallel or perpendicular to the board.

Part installation - when parts are installed, the part is placed flat to the board, and the leads are bent on the backside of the board to prevent the part from falling out before soldering. The part is then soldered securely to the board, and the remaining lead length is then trimmed. Some parts may have body paint on their leads, preventing the solder from making a firm bond. In this case, lightly scrap the paint away to allow the solder to make contact with the wire.

ASSEMBLY INSTRUCTIONS

The first thing we will do with this kit is check all of our parts and pieces to make sure we have them all. Use the Parts List to do this. If there are any differences, make sure the Schematic agrees with what you have. Also be aware of the tolerances parts have in a kit. Non-critical parts can vary quite a bit with almost no effect on kit operation. For example you may get 1µF capacitors in place of 10µF capacitors, or a 3.579 crystal in place of a 3.579545 crystal. No harm done as these will make no difference in kit operation. Note there are two boards in this kit, as we will start with the larger main board in our assembly.

[ ] 1. Orient the larger circuit board as shown in the Parts Layout Diagram.

[ ] 2. Install J1, the RCA type jack. This will be your "landmark" component from which to reference all other parts.

[ ] 3. Install C6, a .01µF ceramic capacitor (marked .01, 10nF, or 103). This capacitor serves the function of preventing large levels of DC from damaging U4, the tone decoding IC.

[ ] 4. Install C10, another .01µF ceramic capacitor.

At this point you may wish to make the decision of whether or not to use IC sockets to mount your ICs. Though they will add to the cost of your kit (they have not been included), they will prevent the horror of soldering ICs in the wrong direction, or the inability to easily replace a bad IC yourself. If you are a confident good kit builder, you will not have to worry about this.

[ ] 5. Install U4 the 14 pin DIP tone decoder chip marked MC145436. Make absolutely sure it is mounted in the proper direction. The small semi-circle or dimple on the IC represents pin 1 and should be mounted in the same direction as in the Parts Layout Diagram. Not all ICs in this kit are mounted in the same direction as this one so be aware of that.

[ ] 6. Install X1, the 3.579 Mhz crystal (silver metallic can marked 3.579). Make sure it is flush to the board before soldering.

[ ] 7. Install R6, a 1M ohm resistor (brown-black-green).

[ ] 8. Install J2, the power jack.

Congratulations! you have just finished the entire circuit needed to decode tones into a digital format. Just think of how much circuitry this portion of your kit would require if it was ten years ago! (For you youngsters we're talking about one chip replacing a whole PC board with hundreds of parts.)

[ ] 9. Install C11, a .01µF ceramic capacitor (marked .01, 10nF, or 103).

[ ] 10. Install C7, a 100µF to 220µF electrolytic capacitor. Electrolytic capacitors are polarized and must be installed correctly. They are usually marked with a black stripe and a (-) indicating their negative lead, while PC boards or the Parts Layout Diagram will usually indicate the opposite (+) hole.

[ ] 11. Install R7, a 10K ohm resistor (brown-black-orange).

[ ] 12.b Install U2, 8 pin DIP EEPROM marked X2402. Pay close attention to the orientation of this chip as the circuit will not operate as desired with it in the wrong way, and may even destroy the chip. Make sure the dimple is on the same side as pin one in the Parts Layout Diagram.

[ ] 13. Install C5, a 470pF ceramic capacitor (marked 470, or 471).

[ ] 14. Install R9, a 330 ohm resistor (orange-orange-brown).

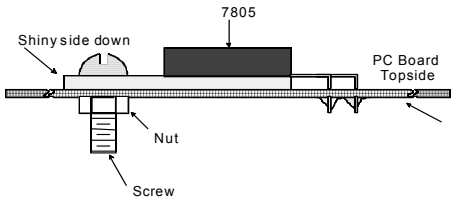
[ ] 15. Install R8, another 330 ohm resistor (orange-orange-brown).

[ ] 16. Using a piece of scrap component lead or bus wire, install JMP12. Jumpers like this one provide paths for signals to cross over other conductors like a bridge. By using these it keeps the cost down from having to use double sided boards.

[ ] 17. Install C3, a .01µF ceramic capacitor (marked .01, 10nF, or 103).

[ ] 18. Install C8, a 10µF electrolytic capacitor. Again pay close attention to this electrolytic's orientation.

[ ] 19. Install VR1, the five volt regulator. To install this, first insert the pins in the proper holes, with the silver side of the regulator facing the END of the board with the jacks in it. Don't solder the pins yet! Gently bend the regulator over so the hole on the PC board lines up with the hole on the regulator. Make sure the silver side of the regulator is flush with the PC board, and use the provided hardware to securely screw down the regulator (see the following diagram).



[ ] 20. a Install the 16 pin socket for U3. The orientation of this socket doesn't matter, but be sure and place IC U3 as shown on the board.

[ ] 20. b Install U3, the 16 pin DIP marked 68HC705K1 (or stickered TG-1). This is the microprocessor that controls all of the actions performed in this kit. Pay close attention to the orientation of this part, and make sure it is installed in the same direction that the Parts Layout Diagram shows it.

[ ] 21. Install R4, a 10K resistor (brown-black-orange). This resistor along with C4 provides the reset level needed when the unit is powered up for the first time.

[ ] 22. Install C4 a .1µF ceramic capacitor (marked .1, or 104).

For the next seven steps, use pieces of scrap leads or bus wire. These jumpers serve to rearrange the order of the display outputs of U1, so the order is sequential from 1 to 8. If you are against jumpers, think of them as zero ohm resistors (silver-silver-silver).

[ ] 23. Install JMP7.

[ ] 24. Install JMP4.

[ ] 25. Install JMP3.

[ ] 26. Install JMP6.

[ ] 27. Install JMP5.

[ ] 28. Install JMP1.

[ ] 29. Install JMP2.

[ ] 30. Install C9, a .01 µF ceramic capacitor (marked .01, 10nF, or 103).

[ ] 31. Install C1, another .01µF ceramic capacitor.

[ ] 32. Guess what, you get to install another .01µF ceramic capacitor for C2.

[ ] 33. Install U1, the 24 pin DIP marked MAX7219. This is the display driver chip that runs the eight displays on the display board. Be careful soldering this part as it is easy to forget a pin or solder a pin to a nearby lead. Also make sure and check it's orientation in comparison to the Parts Layout Diagram before soldering.

[ ] 34. Install R3, a 10K ohm resistor (brown-black-orange).

[ ] 35. Install R5, a 47K ohm resistor (yellow-violet-orange).

[ ] 36. Install C12, a .01µF ceramic capacitor (marked .01, 103 or 10nF).

YAHOO! you're done with the assembly of the main board and now you are ready to move on to the next portion of the kit. But first it is time to check all of your solder joints for good connections and lack of damaging solder bridges. Make sure and check IC pins for good solid connections.

[ ] 37. Orient your display board in the same fashion as shown in the Parts Layout Diagram.

[ ] 38. Install R1, a 10K ohm resistor (brown-black-orange).

[ ] 39. Install R2, another 10K resistor (brown-black-orange).

[ ] 40. Locate the insulated hookup wire provided in your kit and cut it in half. Strip both ends of each wire back approximately ¼", twist and seperately "tin" (melt solder on) all four ends to hold the loose strands together.

[ ] 41. Using one of the wires, jumper between the holes marked JMPA1 and JMPA2 together.

[ ] 42. With the other piece of wire,jumper between the holes marked JMPB1 and JMPB2 together.

Now here comes the fun! Take your time on the next stages as they can make or break your kit. Don't be a bozo and rush assembly to get it done, hook it up, and then destroy it. Play it smart and have patience and your kit will make you proud when it works the first time!

[ ] 43. Install DS1, one of the seven segment displays. Pay very close attention to where the decimal point is in reference to the notches on

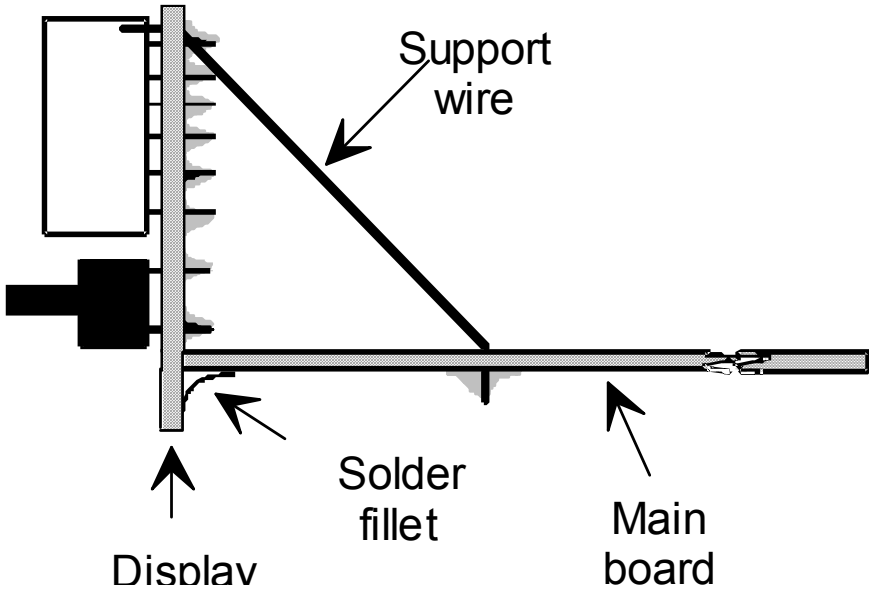
the board. Check and double check orientation before soldering, since desoldering on these fine traces will absolutely destroy them. Make sure the display is flush to the board before soldering, you can bend a few leads slightly over to assist in holding it there while you solder. Use your specialized soldering skills that you learned earlier in this kit, and make sure that there are no solder bridges between pins and other traces on the board. Also make sure you still heat the joints hot enough for a good solid connection.

[ ] 44. Hope you had an OK time doing the first display, now you get to do it seven more times! Install DS2 - DS8 using the same technique as above. Start with DS2 and proceed in order, ending with DS8. This prevents finger squeezing and much ranting and raving.

[ ] 45. Install S1, one of the push button switches. Notice that this part only fits comfortably in one direction. Mount this switch flush to the board.

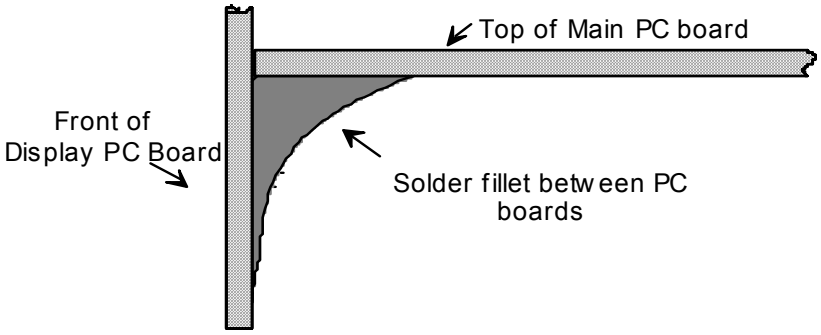
[ ] 46. Install S2 in the same fashion, making sure that it to is flush to the board.

Now here comes some more fun! First check over all of your connections on



the display board as well as the main board, you sure wouldn't want to come this far to miss a mistake! Now it's time to join the two boards together.

[ ] 47. Notice the holes in the main board and the display board where SUP1 and SUP2 are located. Using two pieces of stiff bus wire or spare component leads, install the jumpers to hold the main board and the display boards at 90 degree angles to each other. Note how the



display board is mounted with the solder side toward the the main board.

[ ] 48. The display board mounts at a right angle to the main board with solder pads providing both mechanical support and electrical connection between the two boards. The display board is placed against the main board so that the solder pads on the display board line up with the solder pads on the main board. Solder the display board pads flush with the main board pads. Check to be sure the two boards are perpendicular and not tilted, then solder all remaining pads. Use enough solder to provide a good mechanical connection, but don't cause any solder bridges between adjacent pads.

INITIAL TESTING:

To begin our initial tests, you will need a few additional items...

- ❍ An audio source (radio, DTMF dialer, or a DTMF telephone) with an audio tap, (see the section on building an audio tap).
- ❍ Suitable connectors for power and for the audio.
- ❍ A 7-15 volt DC power supply or battery.

[ ] 1. Verify that all parts are mounted and soldered in the correct places, and there are no solder bridges or cold solder joints.

[ ] 2. Connect the audio source with the DTMF tones to J1 of your kit.

[ ] 3. Carefully, plug in the power to your kit making sure the center pin is positive and quickly note the displays. On first time power up the memory should be all zeros, so in this case a bunch of d's (since the DTMF decoder chip indicates the digit “D” by a zero output code) should be displayed all across the led display. If nothing lights, quickly unplug the power and consult the trouble shooting section of the manual. If all of the displays light in some fashion, then you’re OK for now.

[ ] 4. Press and hold both buttons at the same time. This procedure sets all of the memories to dashes, which verifies operation. Note that this takes about a second or more to do when operating correctly.

[ ] 5. Press and hold the left button, and then the right to verify that the decimal point moves in the proper directions. These buttons scroll the “window” across the available 256 memory locations.

[ ] 6. Generate some tones into your tone grabber with the decimal point lit on the right most display. You should see the appropriate numbers and characters light on the display and scroll to the left.

[ ] 7. Generate a series of eights to verify that all of the segments of your displays are operating properly.

If you have made it this far with your kit and have had no problems, you’re all set to go! If not, consult the trouble shooting guide in the manual to determine the cause of the problem and how to go about solving it.

TROUBLESHOOTING TIPS:

PROBLEM: None of the displays light, VR1 regulator gets hot fast.
SOLUTION: You likely have a short across the power supply or you have a component placed in the incorrect orientation. Check all of your parts to make sure they correlate with those in the Parts Layout Diagram. Also check your power supply polarity to make sure that the center pin is positive.

PROBLEM: None of the displays light, but VR1 remains cool.
SOLUTION: Using an oscilloscope or a frequency counter, verify that there is a 3.579 Mhz signal on pin 10 of U4 and pin 16 of U3. It should be approximately .5 volts peak to peak or greater. If you cannot check this, check pin 4 of U4 for 5 volts DC. Also check pin 13 of U3 for 5 VDC. If not, check VR1 for 5 volts output with at least 7 volts input.

PROBLEM: Some displays and segments light, others do not.
SOLUTION: There are only two possibilities for this problem. First check with a magnifier to verify that there are no shorts or cold solder joints on the display board behind the displays. Also check the interface between the two boards to make sure everything has been done correctly. Second, you may have a faulty display. Since this is very unlikely, check all of your solder joints again to make sure they are OK. If everything is fine, then see the warranty section of the manual.

PROBLEM: Everything is OK, but no tones can be detected.
SOLUTION: Check around U4 and J1 for bad solder joints. Also check your audio connections to the unit.

PROBLEM: Memory clears fast, but remains d's always. No tones are received or unit locks up completely.
SOLUTION: Check the orientation of U2, and all connections surrounding it. These are symptoms of the unit not reading or writing to memory.

PROBLEM: The thing just doesn't work! It must be the engineer's fault!
SOLUTION: We make absolutely sure that our products work beyond expectations before the kits leave our doors. If you can't solve the problem, send in the kit, if it's our fault the fix charge is free! However, if it is not our fault, there will be a charge for the repair. Read the warranty information in the back of the manual for more information.

USING YOUR TG-1

Using the TG-1 is easy, just connect the TG-1 to any audio source with the DTMF codes you wish to detect. You can leave it running all day, and come back later to review the codes that were used. The unit automatically inserts dashes so that you can easily tell one code set from another. For example the display may read:

17169244555-17169244560-.

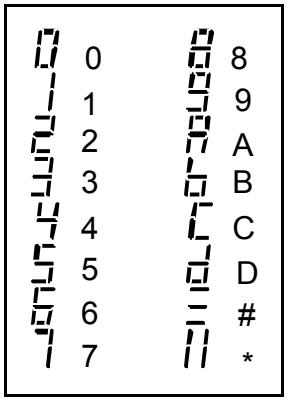
This code represents two phone numbers with long distance codes of Ramsey Electronics. The unit only inserts dashes where the time between detected digits is greater than 1½ seconds. This allows you to easily see each series of numbers dialed.

The functions of the switches are as follows:

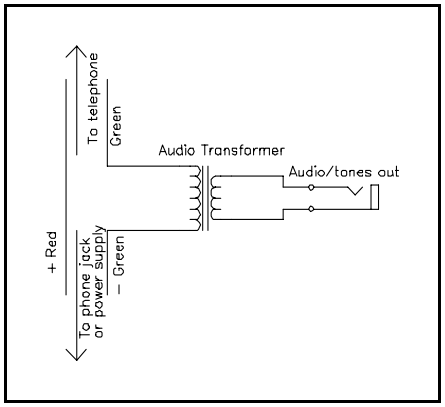
LEFT: Scrolls display to the left until key is released.
RIGHT: Scrolls display to the right until key is released.
BOTH LEFT and RIGHT: Clears memory for a fresh session.

Note that when the power is turned off, the last position for insertion is lost, and the unit resets to the first memory position. That is why the oldest received code is to the right of the decimal point. If you enjoyed this kit, we have lots more, ask for our free catalog, chock full of goodies!

Display conversions:



Audio tap connections to phone:



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 occasions 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 $18.00, 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 $36.00 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.

TG-1 "TONE GRABBER" DTMF DECODER
Quick Reference Page Guide

REQUIRED TOOLS

- Soldering Iron (Radio Shack #RS64-2072)
- Thin Rosin Core Solder (RS64-025)
- Needle Nose Pliers (RS64-1844)
- Small Diagonal Cutters (RS64-1845)
- <OR> Complete Soldering Tool Set (RS64-2801)

ADDITIONAL SUGGESTED ITEMS

- Soldering Iron Holder/Cleaner (RS-64-

TOTAL SOLDER POINTS
268

ESTIMATED ASSEMBLY TIME
Beginner ..... 6 hrs
Intermediate ..... 4 hrs
Advanced..... 2.5 hrs

Manual Price Only: $5.00
Ramsey Publication No. MTG-1

Assembly and Instruction manual for:
RAMSEY MODEL NO. TG-1 "TONE GRABBER" DTMF DECODER KIT

RAMSEY

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