

SPEECH SCRAMBLER / DESCRAMBLER KIT



Ramsey Electronics Model No. SS70A

Communicate in privacy over any audio path! Full duplex operation so this unit can scramble and descramble at the same time! E-Z hookup instructions for radio, or scanner.

- Uses “state of the art” digital electronic filtering for superior noise free sound! Speech inversion type system - similar to SSB.
- Decodes most cordless phones and basic 2-Way radio systems
- Loud, amplified speaker output - no need for an external amp!
- Super clean, low noise audio - excellent audio quality!
- Accepts mike, line, or speaker level inputs.
- Handy phono type input and output connections.
- Operates on 9 to 15 volts DC.
- Super easy hook-up with pushbutton “bypass” mode. Switch from scramble/descramble to feed through without moving wires!
- Informative manual answers questions on theory, hookups and uses - enhances resale value, too!
- Add our custom case and Knob set for a finished “Pro” look.



RAMSEY TRANSMITTER KITS

- FM100B Professional FM Stereo Transmitter
- FM25B Synthesized Stereo FM Transmitter
- MR6 Model Rocket Tracking Transmitter
- TV6 Television Transmitter

RAMSEY RECEIVER KITS

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



RAMSEY HOBBY KITS

- SG7 Personal Speed Radar
- SS70A Speech Scrambler
- BS1 "Bullshooter" Digital Voice Storage Unit
- AVS10 Automatic Sequential Video Switcher
- ECG1 Heart Monitor
- WCT20 Cable Wizard Cable Tracer
- LABC1 Lead Acid Battery Charger
- LC1 Inductance-Capacitance Meter

RAMSEY AMATEUR RADIO KITS

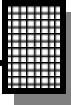
- DDF1 Doppler Direction Finder
- HR Series HF All Mode Receivers
- QRP Series HF CW Transmitters
- CW7 CW Keyer
- CPO3 Code Practice Oscillator
- QRP Power Amplifiers

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.

SS70A SPEECH SCRAMBLER KIT INSTRUCTION MANUAL
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KIT ASSEMBLY AND INSTRUCTION MANUAL FOR

SPEECH SCRAMBLER / DESCRAMBLER KIT

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INTRODUCTION

The Ramsey SS70A is a complete two-way speech scrambler/descrambler with suitable inputs and outputs for scanner, two-way radio, cordless telephone, or tape recorder operation. It is designed to help the user secure total privacy for communications or recorded memos. Just as its scrambling, technically called "speech inversion", can be decoded by knowledgeable users of similar equipment, the SS70A in turn can be used experimentally to descramble some public service communications, cordless phones and other systems where low cost scrambling is employed.

Similar to the regulations affecting the use of mobile VHF scanners, it is the responsibility of the user of this equipment to know and observe any applicable laws regarding the interception and descrambling of transmissions employing speech inversion.

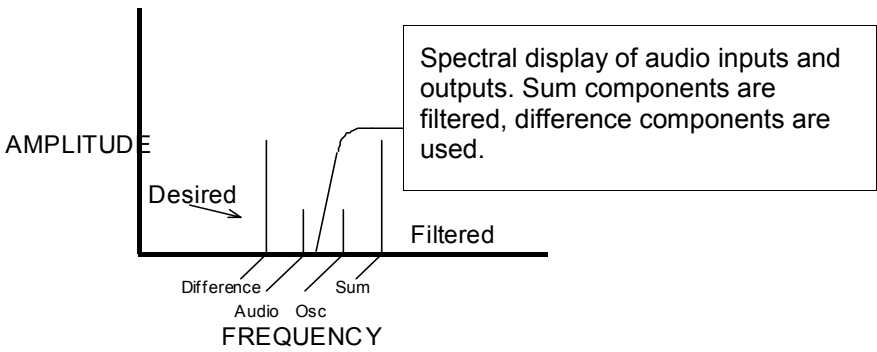
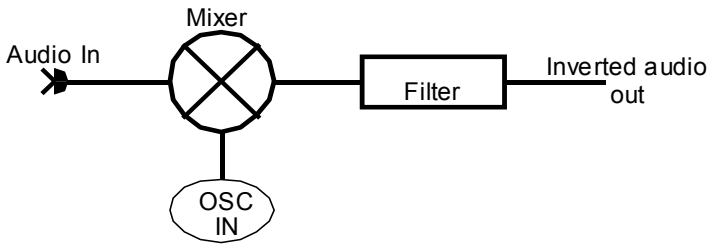
"Speech inversion" is a process that interchanges high and low speech frequencies by removing the carrier frequency and transmission of only one sideband in a communications link. This renders the speech unintelligible unless received by a device capable of replacing the carrier frequency exactly. The single inversion scrambling technique used in the SS70A is adequate to minimize casual eavesdropping or ambulance chasing. Greater security is possible, using precision audio filters, and by inverting more than one audio range simultaneously.

SS70A CIRCUIT DESCRIPTION

Radio amateurs will notice some similarity between the SS70A and a basic sideband transmitter. However, in the speech scrambler's case, the audio input is mixed with a local oscillator running right in the audio range (3.3 KHz) rather than an RF oscillator, and it is precisely that modulation of such a low frequency that results in speech inversion. Let's look more closely at what happens in the circuit. Have a glance at your schematic and follow along.

At the heart of the speech scrambler circuitry is the MX128 full-duplex frequency inversion scrambler IC. This chip contains a balanced modulator and several digital audio filters for both transmit and receive audio paths. In addition, the 3.3 KHz injection frequency is generated within the MX128. J3 provides selection of either a 10.24 MHz or 3.58 MHz crystal.

Notice the similarity between the transmit (TX) and receive (RX) circuit paths. Both inputs are "limited" by the overload protection diodes D1,2,3, and 4. An additional "voltage divider" (R1,R3) is used to reduce the RX input level when speaker level input path is selected. The TX path is designed for microphone level inputs/outputs.



The audio input is amplified and filtered by the IC, then "mixed" with the carrier to produce both the sum and difference frequencies. For example, a 500 Hz input mixed with the 3 KHz carrier will produce signals at both 2500 Hz and 3500 Hz and a 1KHz signal will produce a 2 KHz and 4 KHz result. The outputs are now low pass filtered to remove the unwanted signals above 3 KHz. Final result; the low 500 Hz and slightly higher 1 KHz inputs produce 2500 Hz and 2 KHz outputs respectively. Voila, inverted audio!

The inverted audio is then amplified by either Q1 or Q2, depending on the path. On the RX path, J4 jumper position selects either speaker level audio from the LM-380 2 watt audio amplifier or line level audio output.

Front panel controls include power on/off switch S1, scramble/bypass switch S2, and RX input level select switch S3 which allows the SS70A to be used with either line or speaker level inputs. Potentiometer R11 controls audio level when speaker level output is selected.

RAMSEY Learn-As-You-Build KIT ASSEMBLY

There are numerous solder connections on the SS70A printed circuit board. Therefore, PLEASE take us seriously when we say that good soldering is essential to the proper operation of your scrambler! Following, are a few quick tips to make the assembly process a bit more enjoyable.

- Use a 25-50 watt soldering pencil with a clean, sharp tip. Wipe the tip often on a damp sponge to keep it clean for easier soldering.
- Use only rosin-core solder intended for electronics use.
- Use bright lighting. A magnifying lamp or bench-style magnifier may be helpful.
- Keep an eye open for similar components. Hmmm, is that a 1K ohm or 10K ohm resistor?
- Do your work in stages, taking breaks to check your work. Carefully brush away wire cuttings so they don't lodge between components.

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.

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, 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 IC's, and so forth.)
4. Solder all connections unless directed otherwise. Use enough heat and solder for clean, shiny, completed connections. Don't be afraid of any pen-style soldering iron having enough heat to damage a component.
5. Trim or "nip" the excess component lead wire after soldering.

NOTE: Save some of the longer wire scraps nipped from resistors and capacitors. These will be used to form wire jumpers (JMP1, etc.) to be soldered in just like parts during these construction steps.

Now, let's get building!

SS70A PARTS LIST

Sort and “check off” the components in the boxes provided. It’s also helpful to sort the parts into separate containers to avoid confusion while assembling.

RESISTORS AND POTENTIOMETERS

- 1 2 ohm resistor [red-black-gold] (R13)
- 1 10 ohm resistor [brown-black-black] (R6)
- 1 100 ohm resistor [brown-black-brown] (R1)
- 4 470 ohm resistors [yellow-violet-brown] (R3,5,9,14)
- 2 1K ohm resistors [brown-black-red] (R7,12)
- 1 10K ohm resistor [brown-black-orange] (R16)
- 4 100K ohm resistors [brown-black-yellow] (R2,4,10,15)
- 1 1 Meg ohm resistor [brown-black-green] (R8)
- 1 10K ohm variable potentiometer (R11)

CAPACITORS

- 2 22 pF disc capacitors [marked 22 or 22K] (C6,7)
- 2 100 pF disc capacitors [marked 100 or 101] (C2,11)
- 1 .01 uF disc capacitor [marked .01 or 103 or 10nF] (C14)
- 3 .1 uF disc capacitors [marked .1 or 104] (C3,13,16)
- 5 10 uF electrolytic capacitors (C1,5,9,12,18)
- 1 100 to 220 uF electrolytic capacitor (C10)
- 2 1000 uF electrolytic capacitors (C15,C17)

SEMICONDUCTORS

- 4 1N4148 diode [orange glass body with black band] (D1,2,3,4)
- 2 2N3904 NPN transistors (Q1,2)
- 1 MX128 scrambler IC chip (U1)
- 1 LM380 audio amplifier IC (U2)
- 1 7805 voltage regulator (VR1)

MISCELLANEOUS PARTS AND HARDWARE

- 1 3.58 MHz or 10.24 MHz crystal (Y1)
- 4 PC mount 3.5 mm phone jacks (J1,2,6,7)
- 1 .5 mm center pin type power jack (J5)
- 3 DPDT PC mount switch (S1,S2,S3)
- 1 3 pin vertical header strip
- 1 SS70A circuit board

REQUIRED, NOT SUPPLIED

- 9 to 15 volt battery or power supply
- Speaker or earphones
- 3.5 mm plugs or adapters (2 to 4 depending on application)
- Optional Ramsey CSS70A enclosure set

SS70A ASSEMBLY INSTRUCTIONS

- ❑ 1. First, install switches S1, S2, and S3. Be sure that all legs fit through the circuit board before soldering. Solder all the pins.
- ❑ 2. Install the volume control pot, R11. Solder the three component connections as well as the mounting pins.
- ❑ 3. Moving to the back of the PC board, install connector J5, the power connector. Be careful to insert all three of the connection tabs through the PC board.
- ❑ 4. Install the four 3.5 mm phone jacks J1, 2, 6, and 7.
- ❑ 5. Install R1, 100 ohm (brown-black-brown).
- ❑ 6. Install R3, 470 ohm (yellow-violet-brown).
- ❑ 7. Install R6, 10 ohm (brown-black-black).
- ❑ 8. Install the 1N4148 diode D1 (red/orange glass component with a black band). The black line around one end of the component denotes the "cathode" and must be oriented as shown in the parts diagram.
- ❑ 9. Install diode D2, another 1N4148. Observe the correct polarity!
- ❑ 10. Install jumper JMP3. From a scrap component lead, form this jumper and install as you would a resistor. Jumpers act like small "bridges" to route traces to the top side of the board and over obstacles (other traces.) You will notice that jumpers are normally not found on the schematic but are necessary for proper circuit operation.
- ❑ 11. Install C3, a .1 uF disc capacitor (marked .1 or 104).
- ❑ 12. Install R14, 470 ohm (yellow-violet-brown). It's located over by jacks J1 and J6.
- ❑ 13. Install the remaining 1N4148 diodes, D3 and D4 (red/orange glass body with black band). Make sure the bands are oriented as shown in the parts diagram.
- ❑ 14. Install C16, a .1 uF disc capacitor (marked .1 or 104).

Now that wasn't so hard, was it? You've just completed the inputs for the transmit and receive paths and voltage divider for the speaker level input. Take a moment to recheck your work, looking closely for parts placement and orientation. Check your soldering job also, and "touch up" any connections that are less than perfect.

- ❑ 15. Locate and install Q2, a 2N3904 transistor. Transistors have three "legs" and must be mounted correctly. Notice that the part contains a "flat" side with the writing imprinted on it. Be sure to follow the parts diagram for correct placement. To install, slide the legs through the circuit board and push the component as close to the board as possible

without "straining" the leads. Solder all three connections securely.

- 16. Install R12, 1K ohm (brown-black-red).
- 17. Install R9, 470 ohm (what colors were those?!) (yellow-violet-brown).
- 18. Install C12, a 10 uF electrolytic capacitor. This component is "polarized" and must be oriented correctly before soldering. The positive or (+) points are clearly marked on the PC board layout diagram. Study the style and markings of the capacitors supplied in your kit. Generally, electrolytic capacitors indicate the negative, or (-) lead with a black edge strip or a (-) marking. Be alert about polarity throughout assembly!
- 19. Install Q1, a 2N3904 transistor. Be sure to face the flat side as shown in the diagram.
- 20. Install R7, 1K ohm resistor (brown-black-red).
- 21. Install C5, 10 uF electrolytic capacitor. Again, this component is polarized so check the parts layout for correct orientation.
- 22. Install jumper JMP2 (formed from a scrap component lead).
- 23. Install R5, 470 ohm (yellow-violet-brown).
- 24. Install C14, a .01 uF disc capacitor (marked .01 or 10 nf or 103).
- 25. Install U2 the LM380 audio amplifier IC. Notice that one end of the chip is marked with a notch, dot, or band. Check the parts diagram for correct placement. Before soldering, ensure all pins have made it through the board. (It's not much fun removing a chip because one pin is bent under!)
- 26. Install C15, a 1000 uF electrolytic capacitor. Be sure to orient it correctly, as electrolytic caps can explode if installed backwards! This capacitor acts to filter the supply voltage for noise free audio.
- 27. Install capacitor C10, the 100-220 uF electrolytic. Note the polarity on the parts placement diagram.
- 28. Install C13, a .1 uF disc capacitor (marked .1 or 104).
- 29. Install R13, 2 ohm (red-black-gold). Components C13 and R13 keep the audio output from becoming unstable with different speaker loads.
- 30. Install J4, the 3 pin header strip. Later we'll use a small jumper block to enable switching between line or speaker level audio output without having to remove and resolder jumpers.
- 31. Install jumper JMP4.

You've just completed the output paths for both the TX and RX portions of the circuit. Take a break and recheck your work. It's also a good time to take a look at the schematic diagram and follow through what we've done.

Moving on, we'll build the "heart" of your scrambler unit, containing the MX128 IC and associated components. Since the majority of the work is

done inside the chip, this should go fairly quickly.

- 32. Install C6, 22 pF disc capacitor (marked 22 or 22K).
- 33. Install C7, another 22 pF disc (marked 22 or 22K).
- 34. Install Y1, the 3.58 MHz or 10.24 MHz crystal. Make sure to mount the crystal in the proper holes.
- 35. Install R8, 1Meg ohm (brown-black-green).
- 36. Examine crystal Y1, if it is a 3.58 Mhz unit, install jumper JMP7, if your crystal is 10.24 Mhz, do not install JMP7. Due to a change in the PC board, the silkscreen may label this jumper as J3 or JMP7. This jumper (or lack of) tells the MX128 which crystal is being used.
- 37. Install U1, the MX128 16 pin DIP IC. Notice that one end of the chip is marked by a dot, notch, or band. This must be placed as shown in the parts diagram for proper operation. Gently insert all the pins through the circuit board, and solder. Be extra cautious as not to "bridge" solder between the pins, and don't worry about applying too much heat. Today's IC's are very rugged and can handle the heat that any pen type soldering iron can deliver.
- 38. Install C1, 10 uF electrolytic. Be sure to orient the part correctly.
- 39. Install C9, 10 uF electrolytic, observe polarity.
- 40. Install R16, 10K ohm resistor (brown-black-orange).
- 41. Install jumper JMP1.
- 42. Install R15, 100K ohm resistor (brown-black-yellow).
- 43. Install C11, 100 pF disc capacitor (marked 100 or 101).
- 44. Install R10, 100K ohm resistor (brown-black-yellow).
- 45. Install R2, 100K ohm resistor (brown-black-yellow).
- 46. Install C2, 100 pF disc capacitor (marked 100 or 101).
- 47. Install R4, 100K ohm resistor (brown-black-yellow).
- 48. Install jumper JMP5.
- 49. Install jumper JMP6. You might notice that these last two jumpers go from ground to ground. A solid ground connection is crucial in all audio, digital, and RF circuits to prevent unwanted problems.

We're almost there. The scrambling/descrambling portion of the circuit is done. The few remaining components comprise the power supply stage. Remember to follow along in the schematic and doublecheck your work as you go.

- 50. Install C17, a 1000 uF electrolytic capacitor. Be sure to orient it correctly as shown in the parts diagram.

- ❑ 51. Install C18, the last 10 uF. Watch that polarity!
- ❑ 52. Install VR1, the 7805 voltage regulator. Orient it as shown in the parts diagram, with the metal back facing edge of the PC board as shown. This component provides a stable source of 5 volts to the MX128 IC chip, and throughout the speech scrambler.

CONGRATULATIONS

You have just completed your SS70A speech scrambler/descrambler unit. 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.

TESTING THE SS70A

Before we dive into testing of the SS70A, let's review the various connections that can be made to the unit. When we're ready to actually test and hook-up the scrambler, we'll have to determine what configuration we need for our application.

The SS70A requires a clean source of power from 9 to 15 Volt DC which is connected to power input jack J5 (center pin is positive). Current requirements are typically 250-500mA, which means a decent battery set (C or D cells) or good quality power supply may be used. If you're going to use a cheap wall adapter, be sure it is good for the required current and is well filtered or you can expect lots of hum and noise.

Audio connections for the unit are made through the four 3.5 mm phone jacks. On the receive side, either line or speaker level inputs may be selected by S3. Output level is dependent upon J4 position. The transmit connections are intended for microphone level use.

Line level is commonly used for amplifier inputs, i.e. tape, aux "in" on your Hi-Fi or stereo tuner/amplifier. "Line level" is just a term that describes the un-amplified audio signal (typically 1 volt peak to peak). It is generally used for tape deck or earphone output circuit levels.

"Speaker level" is just what its name implies - an audio level sufficient to drive a speaker. Remember, the better the speaker connected to the SS70A, the better the sound quality.

Configuring the SS70A inputs:

LINE LEVEL INPUT

- Depress pushbutton switch S3 OUT to the LINE position.

SPEAKER LEVEL INPUT

- Set pushbutton switch S3 to the IN position to select SPEAKER level input.

Configuring the SS70A outputs:

LINE LEVEL OUTPUT

- Install the jumper block between the pins on J4 labeled “LINE”.

SPEAKER LEVEL OUTPUT

- Install the jumper block between the pins on J4 labeled “SPEAKER”.

Before doing any hasty or blind experimenting, it is useful to understand exactly what we are looking for in the operation of the SS70A Speech Scrambler.

- The TX path through the SS70A is used in two-way operation where we wish to scramble our outgoing or transmitter audio.
- The RX path through the SS70A is used for receiving and unscrambling the scrambled audio. If you are simply using the SS70A for connection to a scanner to decode some scrambled signals, this is the only path you need concern yourself with.
- Since the SS70A has the ability to operate duplex (both TX and RX paths simultaneously), the unit can be configured to “test itself” by sending audio through the unit - scrambling through the TX path and unscrambling through the RX path.

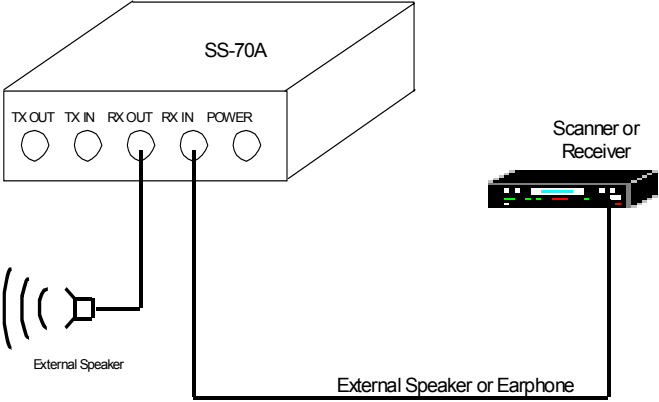
TYPICAL HOOK-UPS

RECEIVER OR SCANNER CONNECTION:

For most scanner hook-ups, we simply connect to the scanner’s external speaker or earphone jack and add another speaker to the output of the SS70A. We configure the SS70A for SPEAKER input and output:

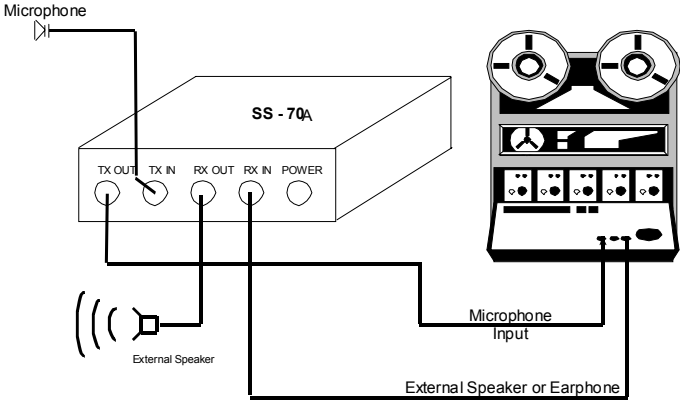
- ❑ Set pushbutton switch S3 to the IN position to select SPEAKER level input.
- ❑ Install the jumper block between the pins on J4 labeled “SPEAKER” to select speaker level output.

Connect the scanner’s audio output to J7, RX IN and connect your speaker to J6 RX OUT.



TAPE RECORDER CONNECTION

In hooking up a tape recorder, we’ll make use of the SS70A’s TX and RX paths. We’ll scramble the audio through the TX path and send it on to the recorder’s input to be recorded. We’ll use the SS70A’s RX path to take the recorder’s playback audio and unscramble.

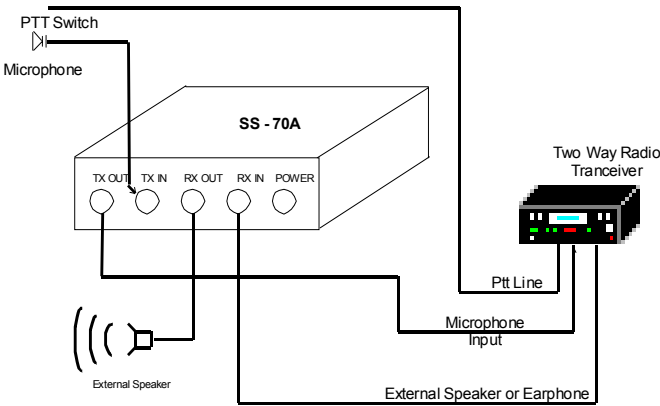


Once the wires are “hooked up”, energize the circuit and try taping a scrambled message. Then try to playback and descramble it! While playing

the message back, switch the power switch to “bypass” mode to hear the scrambled message.

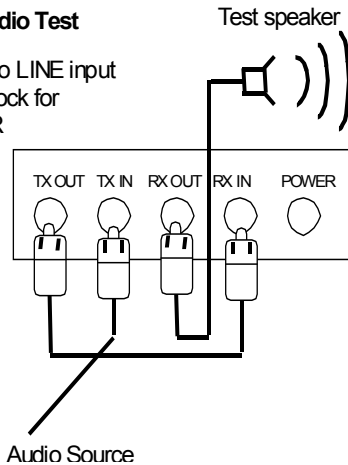
TYPICAL TWO-WAY RADIO HOOKUP: (SS70A required at each end)

The two-way radio hookup is complicated somewhat by having to pay attention to the PTT (Push To Talk) line of the radio transceiver. This line “keys” the transmitter when the button is depressed, and cannot be excluded from your wiring considerations. Our basic audio connections are very simple, we run our mike audio through the SS70A’s TX path and route the radio’s receive audio through the SS70A RX path. Due to the large number of types of keying circuits, it is best to contact the transceiver manufacturer concerning proper installation of this scrambler “in line” with your radio. Once again it should be stated that the end user of this equipment should familiarize themselves with any applicable laws concerning interception and descrambling of any transmission employing speech inversion.



"Loop-through" Audio Test

Set S3 Input switch to LINE input
Set J4 jumper block for SPEAKER



Audio Source
SS70A • 15

TROUBLESHOOTING INSTRUCTIONS

Since this circuit contains relatively few components, problems are usually due to mental errors rather than component failures. The most common errors are in assembly, especially with the IC chips. Check for solder bridges or splashes. Check your parts placement, “Hmmm... is that resistor in the correct holes?” Have the electrolytic capacitors been installed the right way? Check also for “cold” (dull or “bumpy” looking) solder connections. If you have looked it all over and cannot find the problem, another idea is to have a friend check it as well. We’ve all looked at a board with an obvious problem but seemed to have a “mental block” when we looked at our error over and over.

If you own some test equipment (such as a VOM or oscilloscope) use some good, logical trouble-shooting methods. Verify that the voltage regulator is working correctly and that power is supplied to all the power “busses” shown on the schematic. A scope can be used to trace the audio signals through the forward and reverse paths of the circuit. Loop the audio through the SS-70A, having it scramble and unscramble, compare to see where a problem lies.

It’s maddening to us all to have a kit not work initially. Please understand that, unfortunately, it is nearly impossible to troubleshoot over the phone, and the best solution is to work the step-by-step assembly instructions backwards to verify parts placement. This method usually solves the problem.

WHAT IF I CAN’T DESCRAMBLE SOMETHING I HEAR?

Although the SS-70A utilizes the most common form of scrambling, it won’t be able to decode all styles of scrambling. Let’s look at it realistically, do you really think an expensive, truly secure communications link would be so easily decoded - by a \$50 kit no less? Communications is scrambled for a reason, and that’s to keep other folks from listening in! In many cases, simple speech inversion (as used in the SS-70A) provides enough security to keep things private. When National security is at risk, only the most complex and expensive schemes will do. Your local police department may fall somewhere in between.

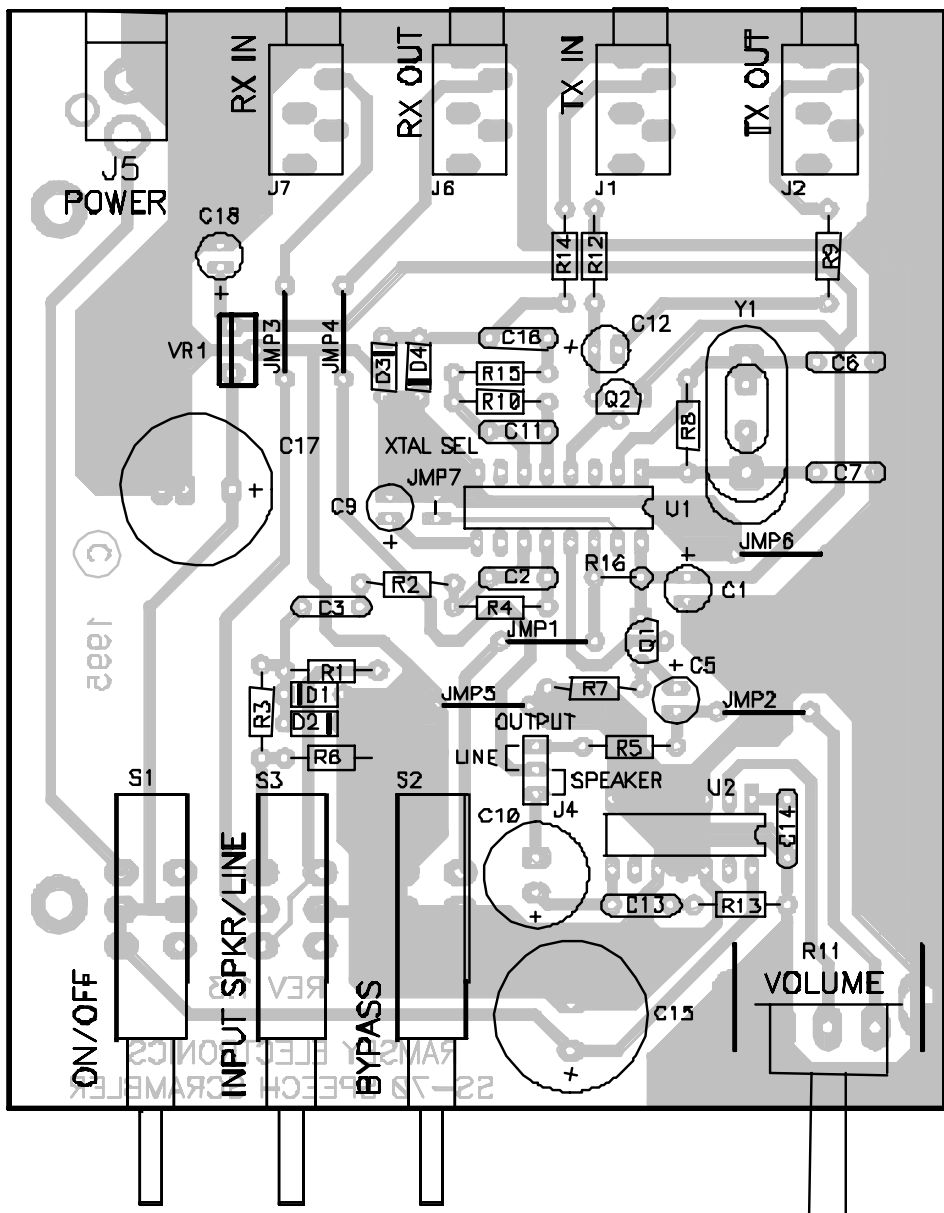
CONCLUSION

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.
590 Fishers Station Drive
Victor, NY 14564

And once again, thanks from the folks at Ramsey!

SS70A PARTS LAYOUT DIAGRAM



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 it's 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 \$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.

SPEECH SCRAMBLER SS70A
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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

ADDITIONAL SUGGESTED ITEMS

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

Price: \$5.00

Ramsey Publication No. MSS70A

Assembly and Instruction manual for:

RAMSEY MODEL NO. SS70A SPEECH INVERSION KIT



RAMSEY ELECTRONICS, INC.
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Victor, New York 14564
Phone (585) 924-4560
Fax (585) 924-4555
www.ramseykits.com

TOTAL SOLDER POINTS

162

ESTIMATED ASSEMBLY TIME

Beginner 5.0 hrs
Intermediate 2.8 hrs
Advanced 2.1 hrs