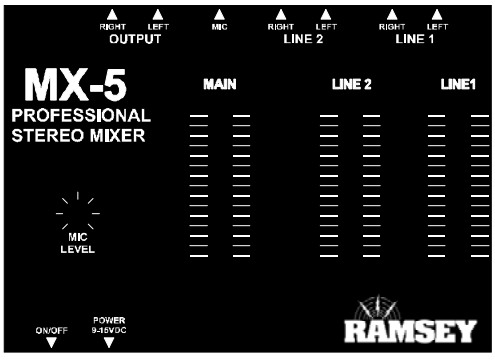
STEREO THREE CHANNEL MIXER

Ramsey Electronics Model No. MX-5

Now here's the simple easy to use mixer for all of you home brew DJs out there! This mixer has two line inputs and one microphone so that you can hook up all of your audio sources to any transmitter or audio amplifier. Perfect for mixing those car tapes before the big trip!

- **2 Line inputs and one mic input, all most people will ever need!**
- **Overload protection on the microphone input to "soften" distortion**
- **Requires regulated 9 to 15VDC supply or battery.**
- **Line output for driving amplifiers or transmitters such as the FM-10a**
- **Long slider pots for accurate mixes every time!**
- **Nice small extruded case for portability and space saving**



RAMSEY

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MX-5 STEREO MIXER INSTRUCTION MANUAL
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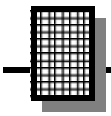

KIT ASSEMBLY
AND INSTRUCTION MANUAL FOR

MX-5 STEREO THREE INPUT MIXER

TABLE OF CONTENTS

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INTRODUCTION TO THE MX-5

Upon designing a more complex version of this kit, the MX-10, we determined that not everyone needed all of the features in the world, so we came up with this simple design. This is a high quality low-noise mixer capable of handling two stereo line inputs and one mono microphone input. This gives most users all the inputs that they will ever need for making car tapes, DJing for a wedding, using with our stereo transmitter kits etc.

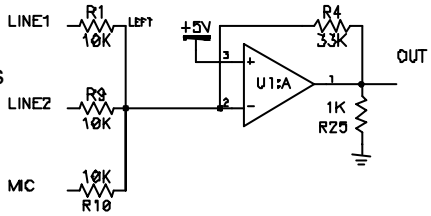
Mixers are used in all sorts of audio applications such as rock concerts, DJ booths in bars, radio stations, recording studios and so on. If you've ever looked at a mixer board for a concert, you would notice that they have upwards of fifty or so channels, and seven or more controls for each channel. Each channel has reverb, tone controls, delay, and more. Our MX-5 has only two inputs for the line level which may include a CD player and a tape deck. The MX-5 does not have any tonal controls for each channel, but almost all users of this project will want a flat response anyhow. If they do not, they will run the output of the mixer directly into an equalizer to custom-tailor their sound. For example when a person makes a car tape, they may want to boost the bass to get over road noise.

The MX-5 was designed for simplicity, low noise, and low cost. Its small size makes it easy to carry around and store. Its long travel on the controls make it easy to mix audio signals smoothly and accurately. We hope you enjoy building and using the MX-5, we sure did at Ramsey!

MX-5 CIRCUIT DESCRIPTION

We will use the schematic diagram to step through the circuit and find out what makes it "tick". As you can see, there is only one IC in the entire circuit, but there are four individual operational amplifiers in the one IC. U1:A and U1:B are the main components of the mixer. They are set up in what is called a summing amplifier.

If we were to look at the left channel only, we can see what one of the summing amplifiers looks like. The three inputs to this amplifier are seen as R1, R9, and R10. These resistors determine how much gain each of the inputs has, in this case they are all equal. To find the gain of each branch, there is a simple equation:



$$A_{branch} = \frac{R_f}{R_{in}}$$

RF = R4 and Rin is any one of the three branch resistors. In this case the gain is 33K/10K = 3.3. To find the output level with a given input level such as 1V P/P, multiply the input voltage by the gain so 1*3.3 = 3.3V P/P out.

R3 and R13 determine how much line level signal is actually sent to each branch of the summing amplifier by using slider control potentiometers. So for the circuit up to this point to have a gain of one, the control will be set at 1/3 of its full scale setting.

The microphone amplifier is slightly different from what you may have expected. Not only does it have gain, but it also has two diodes in the feedback of one of the amplifiers. First we will talk about the gain of the circuit. A typical microphone when talked into will have an output of about 100mV, while line level audio has a level about 1V. To get the microphone signal up to line level, we will need an amplifier with a gain of 10. In our case we have chosen an non-inverting amplifier for the job. A non-inverting amplifier has the nice feature of a very high input impedance. This prevents loading on some high impedance microphones which causes poor sensitivity. To find the gain of a non-inverting amplifier, the equation is as follows:

$$A_{mic} = 1 + \frac{R_{23}}{R_{21}}$$

In our case we chose R23 at 220K ohms, so for a gain of 10, R21 needed to be about 1/10th of that value or 24.4K. Since that is not a standard value we used a 22K ohm resistor which is close enough. (A gain of 11)

The next stage of the microphone amplifier has two diodes in the feedback loop. What are these for? you may ask. Well they are called clipping diodes. Diodes have a property of needing about .7 volts across them before they turn on. On signals under .7V P/P, the gain of the second stage is determined by Ri of 10K (R18) and Rf of 10K (R16). This gives us a gain of 1. But if our signal

becomes greater than .7V P/P, then the diodes D1 and D2 begin to turn on. This brings R14 into the gain equation as well. Now you have an Rf = R14 in parallel with R16. This brings the overall gain down to less than .1, now the amplifier is working as an attenuator. The best part of the diodes is that they don't just "snap" on, they have some variance before they are on fully, so this creates what is called "soft clipping". This soft clipping is a close relative of distortion, but much more tolerable. This soft clipping circuit prevents a person from overloading amplifiers or speakers by preventing high volume levels from exiting the mixer.

The output from the microphone amplifier is then mixed in with the line level audio as well. Before exiting the MX-5 though, the output of U1:A and U1:B is controlled by the master level control, R6.

The power supply for the MX-5 is simple enough, it consists of a 9-18VDC input or battery, and a voltage divider to provide for a split supply. The spilt supply is necessary to operate op-amps as we have done. C9 is used to filter out most of the noises that may be present in your power supply since they can infiltrate the audio.

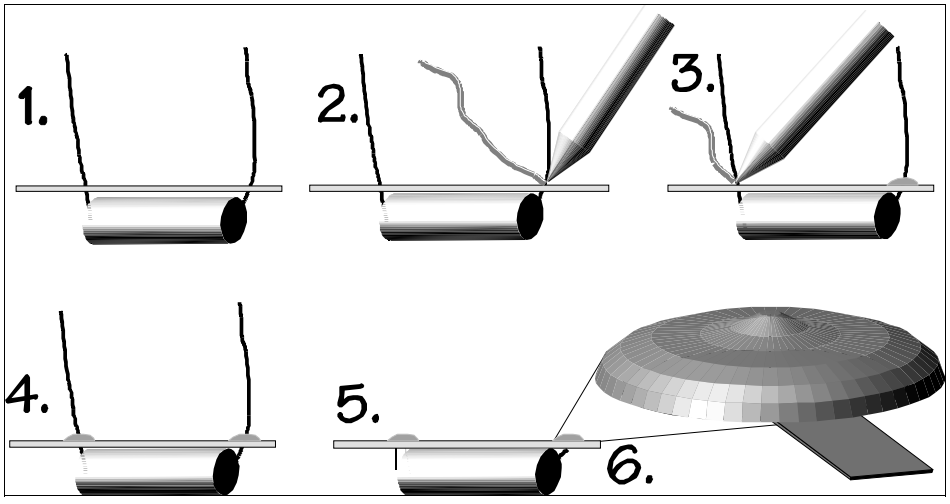
RAMSEY "LEARN-AS-YOU-BUILD" ASSEMBLY STRATEGY

Be sure to read through all of the steps, and check the boxes as you go to be sure you didn't miss any important steps. Although you may be in a hurry to see results, before you switch on the power check all wiring and capacitors for proper orientation. Also check the board for any possible solder shorts, and/or cold solder joints. All of these mistakes could have detrimental effects on your kit - not to mention your ego!

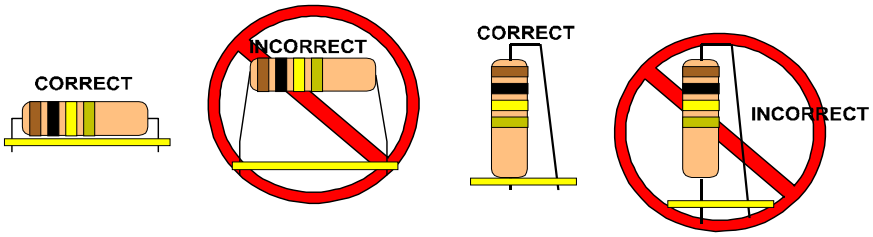
Kit building tips:

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

The boards for the MX series of kit have components on both sides of the board, but there is a top side that we put most of the components on. This is the side that has little or no traces on it, but is covered with mostly copper. 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 (1). The part is then soldered securely to the board (2-4), and the remaining lead length is then clipped off (5). Notice how the solder joint looks on close up, clean and smooth with no holes or sharp points (6).



As with all Ramsey kits, we want to mount the parts AS LOW AS POSSIBLE to the board. A 1/4” lead length on a resistor not mounted close to the board can act as an inductor or an antenna, causing all sorts of problems in your circuit. Be aware though that if there are stand up components in your circuit, they don’t need to be squished to the board. Keep the portion of the resistor closest to the board mounted right on the board.



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, making sure the part is mounted flush to the PC board unless otherwise noted.
- ❒ 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 flow for clean, shiny, completed connections.

Keeping this in mind, lets begin by sorting out our components and cross-checking them against the parts list to make sure we have received everything.

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 in 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.

RAMSEY MX-5 PARTS LIST

Semiconductors

- ❒ 1 LF347 Dual operational amplifier (U1)
- ❒ 2 1N4148 type switching diode (D1,2)
- ❒ 1 1N4002 type diode (D3)

Resistors

- ❒ 10 10K ohm resistors (brown-black-orange) (R1,2,9,10,11,12,15,16,17,18)
- ❒ 1 22K ohm resistor (red-red-orange) (R21).
- ❒ 2 33K ohm resistors (R4,7)
- ❒ 1 220K ohm resistor (red-red-yellow) (R23).
- ❒ 5 1K ohm resistors (brown-black-red) (R14,22,24,25,26).
- ❒ 2 1M ohm resistors (brown-black-green)(R19,28).
- ❒ 1 47K ohm resistor (yellow-violet-orange)(R27).

Capacitors

- ❒ 11 10uF electrolytic capacitors (C1,2,3,4,5,6,7,10,11,12,13)
- ❒ 1 470uF electrolytic capacitor (C9)
- ❒ 1 .1uF ceramic capacitor (C8)

Controls

- ❒ 3 10K ohm slider potentiometers (R3,6,13)
- ❒ 1 10K ohm top mount potentiometer (R20)

Miscellaneous

- ❒ 1 Microphone jack (3/8”) (J8)
- ❒ 1 2.1mm Power jack (J7)
- ❒ 6 RCA style jacks (J1,2,3,4,5,6)
- ❒ 1 9 volt battery clip
- ❒ 1 9 volt battery connector
- ❒ 1 DPDT PB switch (S1)

ASSEMBLY OF THE MX-5

Now we are getting to the good stuff-assembling the MX-5. We will begin by mounting first the low parts, beginning with the parts on the side of the board without the traces. When we are finished with that side, we will begin to install parts on the trace side of the board. This side is where all of the controls go, and will be the side of the board facing the top of the case.

- ❒ 1. Install R1, a 10K ohm resistor (brown-black-orange).
- ❒ 2. Install R9, another 10K ohm resistor (brown-black-orange).
- ❒ 3. Install R2, a 10K ohm resistor (brown-black-orange).
- ❒ 4. Install R11, another 10K ohm resistor (brown-black-orange).
- ❒ 5. Install R25, a 1K ohm resistor (brown-black-red).
- ❒ 6. Install R4, a 33K ohm resistor (orange-orange-orange).
- ❒ 7. Install R10, a 10K ohm resistor (brown-black-orange).
- ❒ 8. Install R12 a 10K ohm resistor (brown-black-orange).
- ❒ 9. Install R22, a 1K ohm resistor (brown-black-red).
- ❒ 10. Install R16, a 10K ohm resistor (brown-black-orange).
- ❒ 11. Install R14, a 1K ohm resistor (brown-black-red).
- ❒ 12. Install D1, a 1N4148 type small signal diode (orange glass body with black stripe on one end). Notice the direction of the diode. Make sure the end with the line on it (cathode) is pointing in the same direction as shown in the parts layout diagram.
- ❒ 13. Install D2, the other 1N4148 type small signal diode (orange glass body with black stripe on one end). Again make sure the striped end is pointing in the correct direction.
- ❒ 14. Install R24, a 1K ohm resistor (brown-black-red).
- ❒ 15. Install R23, a 220K ohm resistor (red-red-yellow).
- ❒ 16. Install R21, a 22K ohm resistor (red-red-orange).
- ❒ 17. Install R18, a 10K ohm resistor (brown-black-orange).
- ❒ 18. Install R7, a 33K ohm resistor (orange-orange-orange).
- ❒ 19. Install R26, a 1K ohm resistor (brown-black-red).

- ❒ 20. Now it is time to install U1, the LF347 quad opamp. Notice how on one end of the IC there is a notch, dimple or dot indicating pin one of the IC. You will need to align it with the notch as shown in the parts layout diagram. Make sure all 14 pins are through the board before soldering, and that none are bent under the IC.

- ❒ 21. Install R19, a 1M ohm resistor (watch out! 1,000,000 ohms!) (brown-black-green).

- ❒ 22. Install R28, a 1M ohm resistor (brown-black-green).

- ❒ 23. For R27, you will need to decide what type of microphone you wish to use. If you plan on using a store bought microphone, you do not need to install this resistor. If you are planning on making your own microphone as shown later in this manual, the resistor is used to power an electorate microphone. If in doubt, install it anyway, it will case no harm to a microphone and it doesn't reduce sound quality. R27 is a 47K ohm resistor (yellow-violet-orange).

- ❒ 24. Install JMP1 using a scrap piece of component lead. Jumpers act as "bridges" over other circuit paths so that signal lengths on the board are as short as possible.

- ❒ 25. Install JMP2 using another scrap piece of component lead.

- ❒ 26. Install R15, a 10K ohm resistor (brown-black-orange).

- ❒ 27. Install R17, a 10K ohm resistor (brown-black-orange).

We are done installing the low profile components and are moving on to the high profile components. Be aware of orientation of the parts when installing them, many do not like being installed backwards and will prevent you from having an operational kit when you are done. Before continuing though we want to check all of your solder joints up to this point for cold solder joints or solder bridges. If in doubt, re-heat the solder joint adding a little more new solder.

- ❒ 28. Install C1, a 10uF electrolytic capacitor. Notice this is the first capacitor of this type. You want to be sure that you pay close attention to the polarity markings on this part. In most cases the negative (-) side is marked on the capacitor, while the positive side (+) is marked on the parts layout. If you fail to mount this component correctly, the part can fail as well as prevent proper operation of your project. We will be installing many more of these later in the project so be sure and remember this!

- ❒ 29. Install C4, a 10uF electrolytic capacitor. Again note polarity!

- ❒ 30. Install C2, another 10uF electrolytic capacitor.

- ❒ 31. Install C6, a 10uF electrolytic capacitor. (Polarity!)
- ❒ 32. Install C7, a 10uF electrolytic capacitor.
- ❒ 33. Install C3, even another 10uF electrolytic capacitor. (Need we remind us about polarity)
- ❒ 34. Install C5, another 10uF electrolytic capacitor.
- ❒ 35. Install C8, just to throw you off, it's a .1uF ceramic capacitor. This is the only capacitor where orientation does not matter.
- ❒ 36. Install C10, a 10uF electrolytic capacitor. (Orientation!)
- ❒ 37. Install C12, even another 10uF electrolytic. This is getting a little dull isn't it? Well don't let boredom mess you up, make sure to check polarity of all your electrolytics up to and beyond this point.
- ❒ 38. Install C9, a 470uF electrolytic. This one is particularly important to install correctly.
- ❒ 39. Install C11, a 10uF electrolytic capacitor.
- ❒ 40. Install C13, the LAST 10uF electrolytic capacitor. If we have to remind you to check polarity again, then... Hmmm, I guess you know the consequences!
- ❒ 41. Install D3, a 1N4002 type diode (black body with white stripe on one end). This diode prevents you from inadvertently connecting external power to the MX-5 while there is a battery installed, and trying to recharge a battery. If this diode wasn't there, you would very quickly have a ruined kit.

Now we will begin installing jacks, switches and plugs. Check your work up to this point and make sure it is up to your critical standards. Check all solder joints for cold connections or solder bridges. Especially check between the leads of the capacitors for stray bits of solder shorting the pins together. Also go back and check the orientation of all the parts in your kit up to this point.

- ❒ 42. Install J1, an RCA type jack.
- ❒ 43. Install J2, another RCA jack.
- ❒ 44. Install J4, an RCA jack.
- ❒ 45. Install J6, even another RCA jack.
- ❒ 46. Install J8, the 3/8" microphone jack.

- ❒ 47. Install J3, another RCA jack.
- ❒ 48. Install J5, the last of the RCA jacks.
- ❒ 49. Install J7, the 2.1mm power jack.
- ❒ 50. Install S1, the DPDT switch. Make sure the part is flush to the board before soldering.
- ❒ 51. Install the battery power clip. Make sure the red wire is installed in the hole marked (+), and the black wire is installed in the hole marked (-).
- ❒ 52. Using a piece of scrap component lead, mount the battery holder to the PC board under where the battery is to go. Note the two holes provided for this task.

Now we are going to flip the PC board over and install the remaining controls. Make sure and follow the steps closely from here on out. Mounting parts on this side of the board is not conventional, but it is necessary for assembly purposes.

- ❒ 53. First things first. If we were to try and install the slider pots without what we are going to do next, you would be very frustrated when you discover that you would have to desolder the sliders out, then put these back in. If you look at the Control Side Layout diagram, you will see under each of the sliders that there are jumpers, each end marked with a circle. We will be installing these jumpers, but only soldering the end with the circle into place before installing the sliders. The center leads of the sliders will be sharing the larger of the two holes, so you don't want to clog the hole with solder yet.
- ❒ 54. Install the two jumpers for R6 as shown using scrap component leads. Make sure not to solder the uncircled end yet. Make sure the jumper is mounted flat to the board so that it doesn't have the possibility of shorting out the underside of the slider.
- ❒ 55. Install two more jumpers for R13 as shown. Use the same procedure as in the previous step.
- ❒ 56. Install the last two jumpers for R3 as shown. Again make sure you do not solder the circled ends of the slider.
- ❒ 57. Install R6, the 10K ohm MAIN slider pot. Notice how you will be soldering on the same side of the board where the part is mounted. Make sure all the slider's pins are through the board before soldering. This may be a little tricky, so it is best to use a fine tip soldering iron to make the job go smoothly. Make sure and solder all four mounting lugs as well as the two pairs of connections on each end. Then flip the board over and solder

the jumpers to the pins of the slider.

❒ 58. Install R13, the 10K ohm LINE2 pot the same as described in step 57.

❒ 59. Install R3, the 10K ohm LINE1 slider pot in the same way as shown in step 57.

❒ 60. Install R20, a 10K ohm surface mounted pot, the last board mounted part. Make sure to solder all three connections and the two solder lugs.

Wow! we are already finished putting together the kit! Lets go celebrate and grab a soda or other drink of choice, get an eyeball break and come back in a few minutes.

Now that you are back, we need to check over the circuit board again for any misplaced parts. Especially check for diodes in backwards, ICs in the wrong direction, and capacitors with their polarity backwards. Then check for cold solder joints and possible solder bridges.

INITIAL TESTING THE MX-5

For this portion of the kit building experience you will need the following items:

- ❍ Line level source such as a tape deck, signal generator or CD player.
- ❍ A destination such as an audio amp, transmitter or earphone amplifier (Ramsey SHA-1).
- ❍ A microphone if you are planning on using one.

[1] Connect the line level source to the LINE1 input jacks.

[2] Connect the destination up to the OUTPUT jacks.

[3] Connect a 9 volt battery to the battery jack, making sure the power is off. If you do not have a battery, use a regulated power supply rated for at least 100mA.

[4] Turn the power on and verify that the destination is receiving your sound. Vary the levels of the MAIN pot and the LINE1 pot to do this.

[5] Plug the line level source into the LINE2 input jacks.

[6] Vary MAIN and LINE2 pots to verify they work also.

[7] Plug your microphone into the microphone jack. Vary MAIN and L.MIC to make sure it is operational as well.

TROUBLESHOOTING GUIDE

Well, we sincerely hope you get to skip this portion of the manual, but this is here to help in the event of an emergency. Remember the detrimental effects an incorrectly installed component may have on your circuit. Keep this in mind as you troubleshoot your circuit for possible assembly errors.

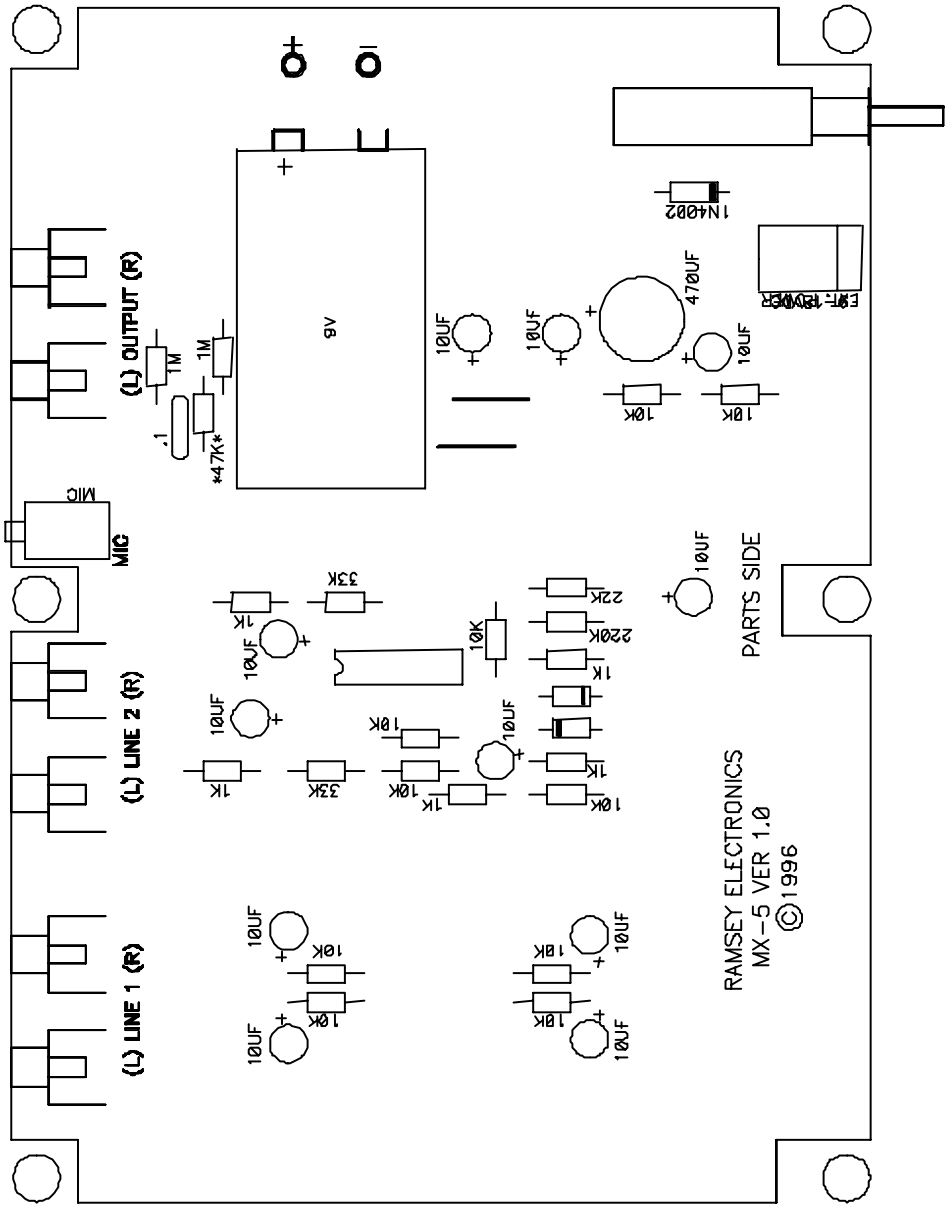
PROBLEM: Nothing at all on the output of the mixer.
SOLUTION: Check your power supply voltages to make sure you have at least 8 volts over all. Verify also that you have at least 4 volts between R15 and R17. If that is not it, check U1 for proper installation. Thereafter its a matter of testing your source signal and that your destination is connected properly.

PROBLEM: Left or right channel is out.
SOLUTION: This is a classic trouble shooting problem. Now is a great time to have a little fun and teach yourself some trouble shooting skills. Make sure a signal is present on both left and right inputs, then trace through the circuit using an oscilloscope or DMM set on AC to find where the signal stops. You will need to use the schematic and the board layout to assist in finding the signal path.

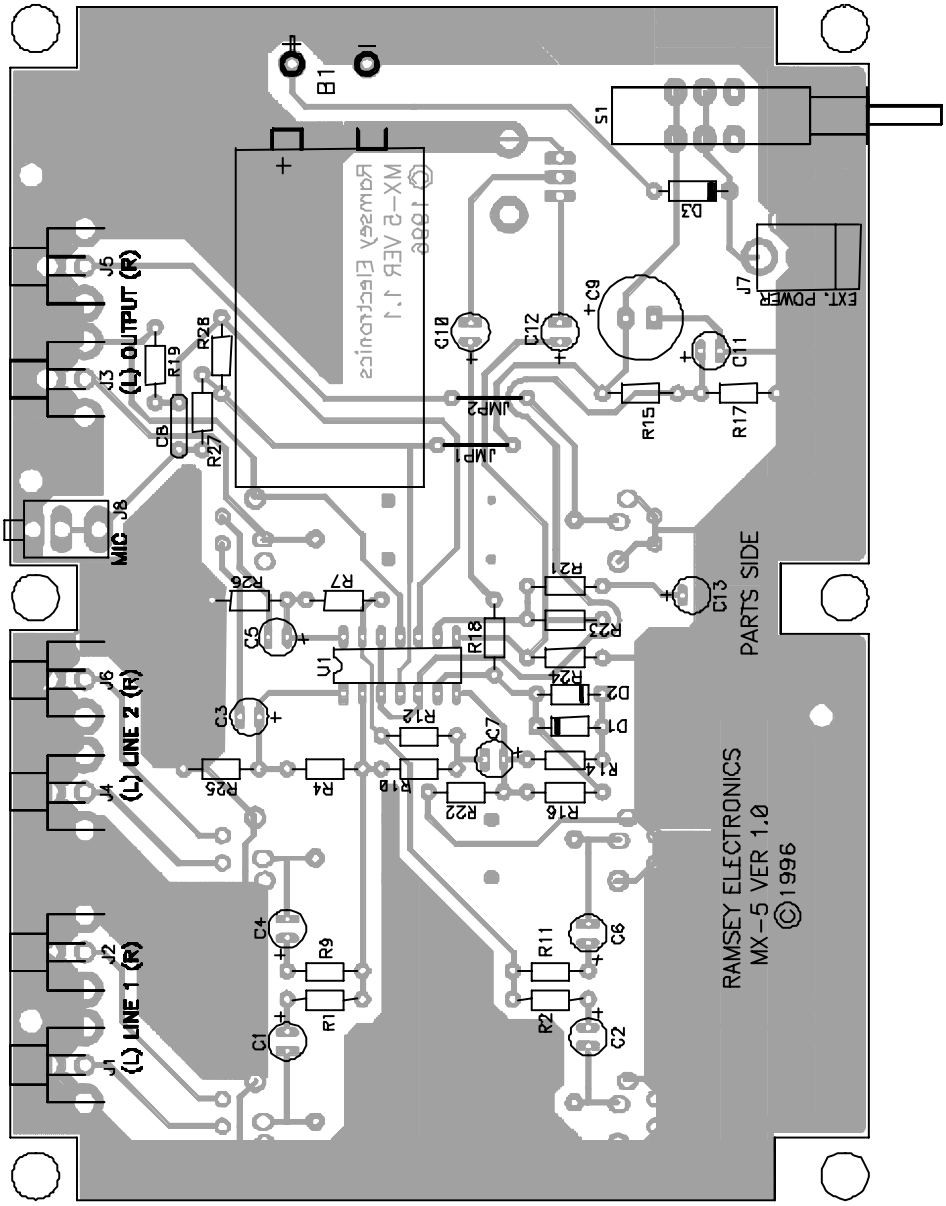
PROBLEM: The microphone input screeches when I turn up the control and no microphone is plugged in.
SOLUTION: Hmmm, the way this project worked out, by using a very high input impedance on the microphone as well as high gain, the mic amplifier tends to pick up on all sorts of circuit noise. Just make sure either to leave the control turned all the way down when not in use, or just leave a microphone plugged in.

PROBLEM: When running the output of this into the FM-10A or FM-25, I seem to be driving the transmitters into distortion when MAIN is turned up full.
SOLUTION: Because the MX-5 has some gain, you will either need to keep the MAIN adjustment from going all the way to full, or you can open the FM-10A or FM-25, and adjust the controls for level on their inputs.

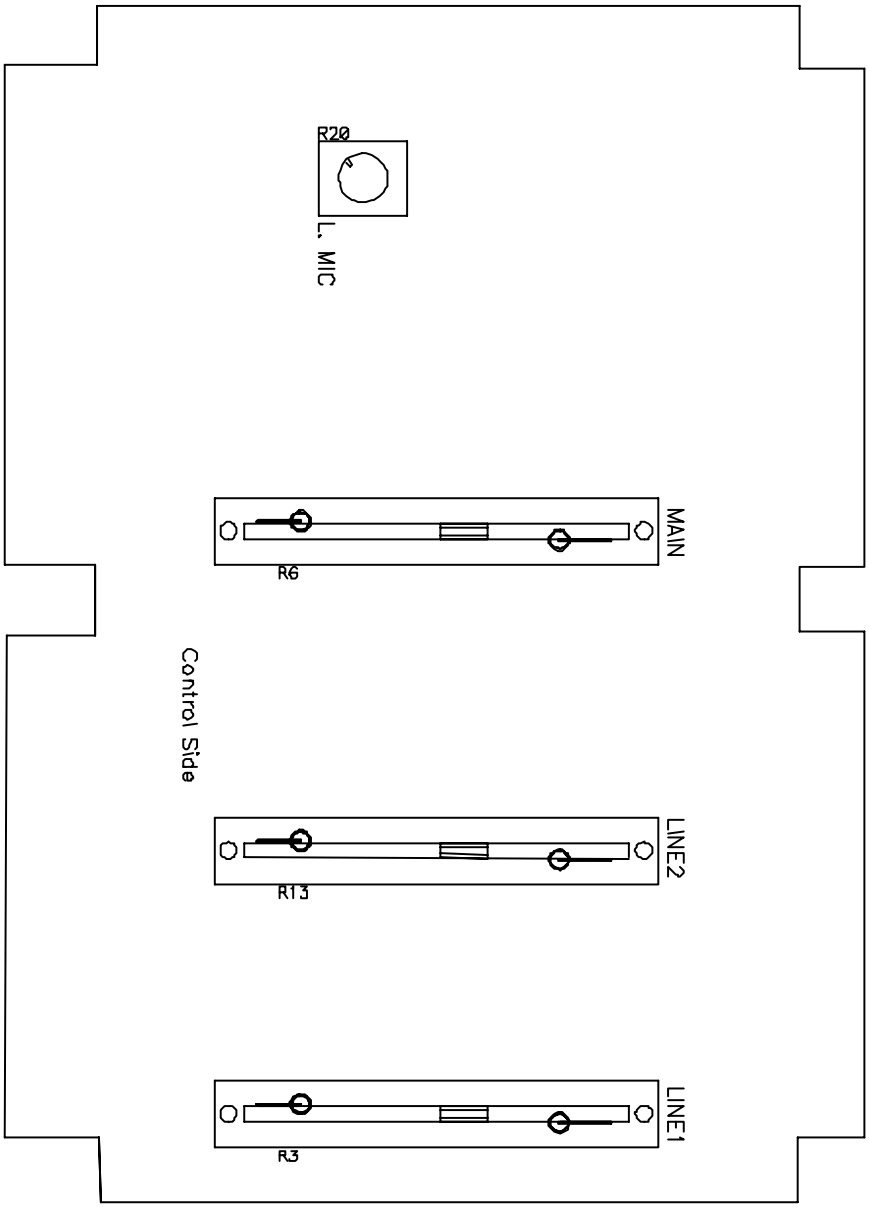
PARTS SIDE VALUES



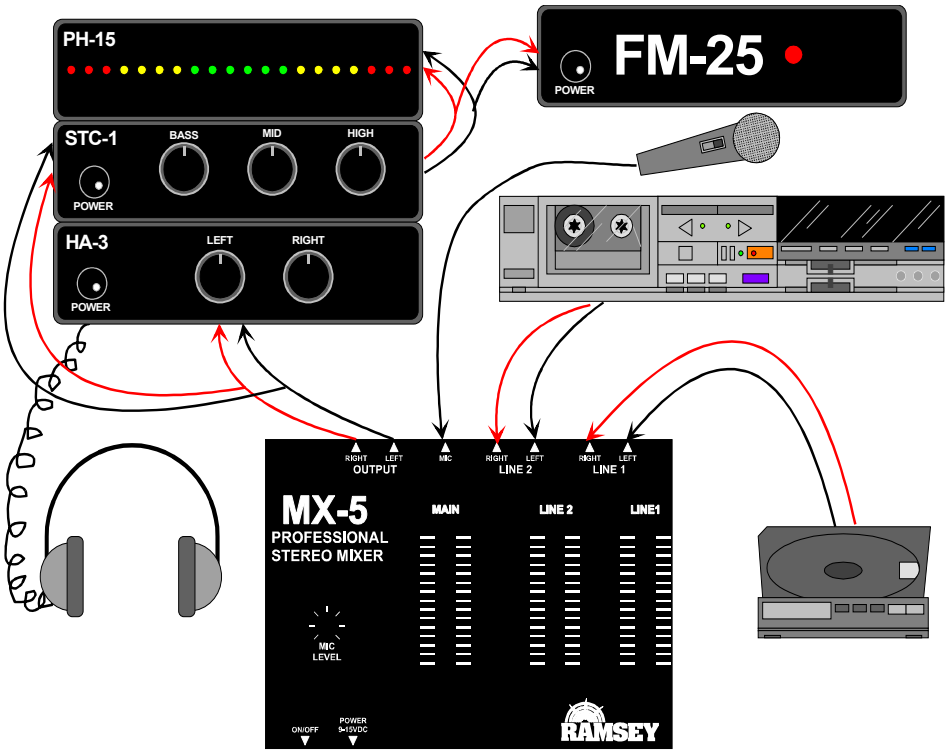
PARTS LAYOUT DIAGRAM



CONTROL SIDE LAYOUT



USING THE MX-5



Above shows a full installation for radio broadcasting using one of the Ramsey micropower transmitters. The parts and pieces are as follows:

- **MX-5**, our newly built mixer
- **PH-15**, Peak hold meter for watching audio levels
- **STC-1**, Stereo transmitter companion. Compression, limiting, bass, midrange, and treble controls. Active 8th order lowpass to get rid of interfering sounds.
- **FM-25**, the PLL stereo transmitter.
- **SHA-1** Headphone amplifiers for monitoring sound

To run this setup using an audio amplifier for DJing, just remove the STC-1, and replace the FM-25 with the audio amplifier of choice. To record a car tape or make a production, remove the STC-1 and replace the FM-25 with another tape deck. There are many other combinations available, and it is left to one's imagination. Some people use this kit to mix their home audio system's audio with the computer's audio. That way they can play a disk and have gory sounds

We sincerely hope you have enjoyed building this kit. We invite you to check out our catalog and see all of the projects that you can put together. We have one of the most complete line of kits available today, and many more products to come. Give us a buzz, well send you a catalog.

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FAX# (716) 924-4555

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 $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.

MX-5 STEREO THREE CHANNEL MIXER KIT
Quick Reference Page Guide

REQUIRED TOOLS

- Soldering Iron Ramsey #RTS06, (Radio Shack #RS64-2072)
- Thin Rosin Core Solder Ramsey #RTS12, (RS64-025)
- Needle Nose Pliers Ramsey #RTS05, (RS64-1844)
- Small Diagonal Cutters Ramsey #RTS04, (RS64-1845)

<OR> Complete Soldering Tool Set (RS64-2801)

ADDITIONAL SUGGESTED ITEMS

- Soldering Iron Holder/Cleaner (RS64-2078)
- Holder for PC Board/Parts Ramsey #RTS13, (RS64-2094)

Price: $10.00
Ramsey Publication No. MMX-5
Assembly and Instruction manual for:
RAMSEY MODEL NO. MX-5

TOTAL SOLDER POINTS
170

ESTIMATED ASSEMBLY TIME
Beginner ..... 7 hrs
Intermediate..... 5 hrs
Advanced..... 4 hrs

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