

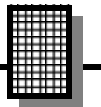
PROFESSIONAL COMPACT STEREO MIXER

Ramsey Electronics Model No. MX10

Now here's the simple easy to use mixer for all of you home brew DJs out there! This mixer has all of the features you will ever need to mix audio as the professionals do - in a small compact size! Perfect for DJing on the desktop transmitter, making car tapes, mixing for a wedding or anywhere else a mixer could be needed.

- **2 Line inputs, 1 phono and 2 mic inputs, all most people will ever need!**
- **Overload protection on the microphones input to “soften” distortion**
- **LED peak hold meters for accurate audio levels**
- **Line output for driving amplifiers or transmitters such as the FM-25**
- **Slider pots control Main, Line1, Line2, panning and phono.**
- **Small size with BIG audio quality!**
- **Runs from 12VAC wall adapter**





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MX10 STEREO MIXER INSTRUCTION MANUAL

Ramsey Electronics publication No. MMX10 Revision 1.0

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KIT ASSEMBLY AND INSTRUCTION MANUAL FOR

MX10 STEREO THREE INPUT MIXER

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INTRODUCTION TO THE MX10

Seeing the need for a high fidelity low noise mixer to be used with our micropower transmitters, we came up with this easy to build compact mixer. The small size lends to the small size of the transmitter for portability. You can easily fit an entire radio station inside of a briefcase, just try that with electronics of just a few decades ago! While designed to go with our micropower transmitters, the MX10 will work as well, if not better than most commercial mixers on the market today.

Mixers are used in all sorts of audio applications such as rock concerts, DJ booths in night clubs, weddings, 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 MX10 has two inputs for line levels which may include a CD player and a tape deck, it also has one stereo input for a phono with RIAA equalization (boosts bass response of records). The MX10 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.

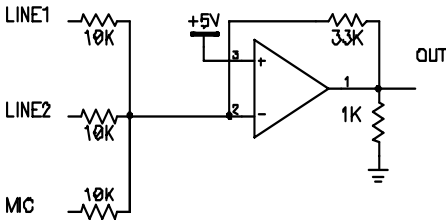
We also included more than one microphone input on the MX10 which allows two people to talk at the same time. When one microphone is plugged in to the left channel mic, it exits the mixer in both channels. When both mics are plugged in, the left one comes out the left channel, while the right one comes out the right channel. This leads to a nice effect on a transmitter for a listener to visualize the DJs.

The MX10 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. Now you can give those professionals a run for their money. We hope you enjoy building and using the MX10, we sure did at Ramsey!

MX10 CIRCUIT DESCRIPTION

We will use the schematic diagram to step through the circuit and find out what makes it “tick”. There are plenty of different devices performing different tasks in the MX10. The most common active component is the opamps. These are used in a number of ways in the MX10, one of which is mixing.

To perform mixing, an opamp is set up in what is called a summing amplifier. This amplifier does exactly what it says. It takes all of its inputs and adds them together on the output. Following is an example of a summing amplifier in a mixer, similar to the ones in the MX10.



There are three inputs to this amplifier. The 10K ohm resistors determine how much gain each of the inputs has, and the 33K resistor sets the overall gain. To find the gain of each branch, there is a simple equation:

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

RF = 33K 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.

R9, R22, R14, and R58 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 50mV, 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 around 20. In our case we have chosen a 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:

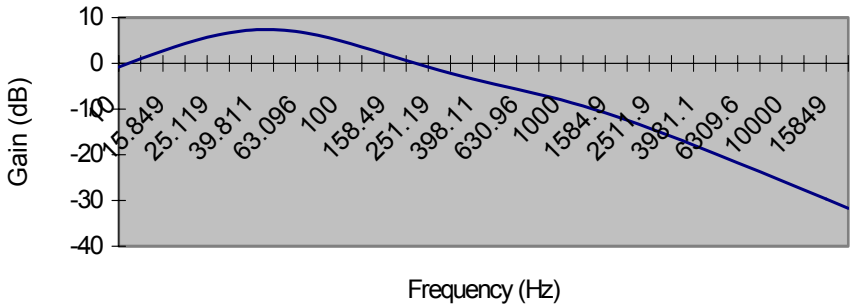
$$A_{mic} = 1 + \frac{R_{23}}{R_{21}}$$

In our case we chose R23 at 220K ohms, so for a gain of 20, R21 needed to be about 1/20th of that value or about 10K. (Notice the values around U5:A)

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 if the forward bias direction before they turn on. On signals under .7V P/P, the gain of the second stage is determined by R_i of 10K (R28) and R_f of 10K (R27). 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 R30 into the gain equation as well. Now you have an $R_f = R27$ in parallel with R30. 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.

U6:A and U6:B are both RIAA equalization circuits. This compensates for the peculiar frequency response you get on records due to the way vinyl and the phonograph needle interact. This circuit boosts the bass and reduces the treble to give a level response throughout the hearing range. The nice part of this circuit is that it is easy to modify into a line input instead of a record input. This is described later in the manual.

RIAA Equalization



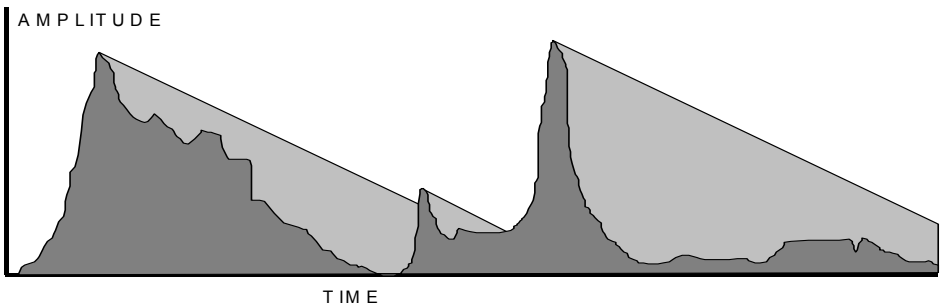
U4:D and U4:C are the summing amplifiers. These take the audio from the line level inputs, the phono inputs and the two microphones and adds them all together. R26 then adjusts the summed outputs to the peak hold meters, the earphones, and the output jack.

The earphone amplifiers consisting of U3 and U2 are set up as summing amplifiers as well. Each branch of the summing amplifier is connected the same as the ones in U4. When you switch between CUE and play, the signal is just redirected from the earphone summing circuits to the line level summing

circuits. The earphone amplifiers LM386s have quite a bit of kick to them, which should be more than enough to out power most DJ systems.

The peak hold meters serve the function of displaying peak amplitudes in your audio so your eye can see them. Normally a short duration pulse such as a drum beat or strum of a guitar has a very short time duration for the initial higher power sound. If we didn't use a peak hold circuit, your eye would be hard pressed to see the LEDs blink on the bargraph, or in the case of an analog meter, the mechanical weight holds back the needle from going to the actual peak.

The peak hold circuit consisting U4:A and U4:B combined with D6, R43, C14, D19, R60, and C17 takes an instantaneous peak and stores it in the two 10uF capacitors. The resistors then discharge the capacitors at a slow rate. These capacitors and resistors extend the peak long enough in duration so that your eye can see it. The function of the diode is to DC rectify the incoming audio signals since we only are interested in the positive going signals. If we did not DC rectify the signal, we would constantly positively charge the capacitor on a positive pulse, then negatively charge it on a negative pulse. The net result would be a meter that just barely twinkled at you. Here is an example of what a peak hold circuit does for you. The dark gray is the original signal, and the light gray is the peak hold signal. As you can see the light gray stays at a higher amplitude for a longer period of time.



The power supply for the MX10 is a little different than you may have expected. 12VAC is plugged into J8, the power jack. The 12VAC is then rectified to DC using diodes D29, 31, 34, and 35. This is then "smoothed" out using C30, which averages out most of the bumps and lumps out of the power supply noises. VR1, a voltage regulator takes out the rest of the bumps and lumps, and gives us a clean smooth +12 VDC power source with very little noise. U8:C is then set up to give us a buffered, regulated split supply voltage. The output of this opamp is now used to generate a ground, while the supply voltages are now +5 and -5 volts (closer to +6 and -6) in reference to this "ground". This method is an easy way to get a split supply from a single supply such as ours.

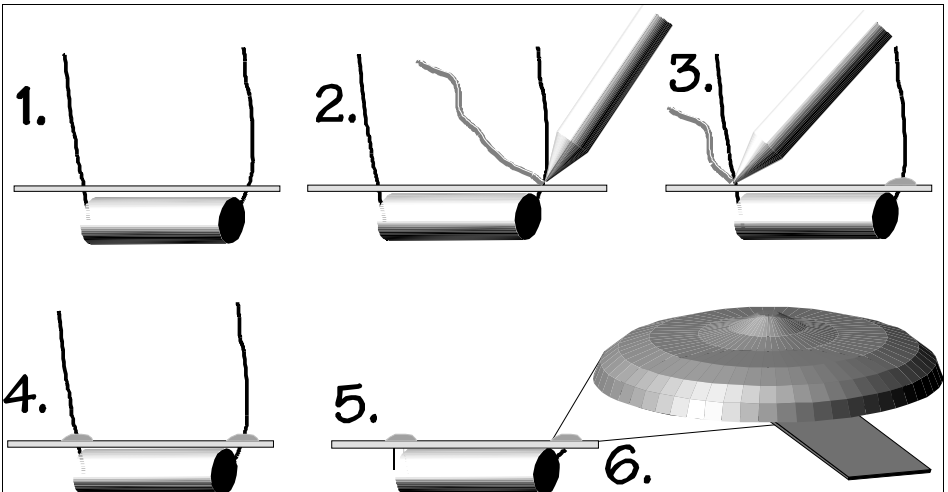
RAMSEY “LEARN-AS-YOU-BUILD” ASSEMBLY STRATEGY

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!

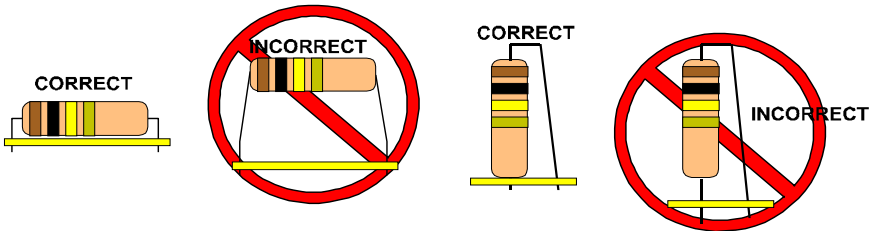
Kit building tips:

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, let's 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 MX10 PARTS LIST

Semiconductors

- 3 LF347 Dual operational amplifiers (U4,5,6)
- 2 LM386 Audio power amplifiers (U2,3)
- 2 LM3915 LED bargraph drivers (U7,8)
- 4 1N4002 type diodes (black epoxy body with white stripe)(D29,31,34,35)
- 6 1N4148 type diodes (small glass body with black stripe)(D1,2,5,6,8,19)
- 10 Small yellow LEDs (D3,10,11,12,13,14,22,23,24,25)
- 6 Small green LEDs (D4,7,9,18,20,21)
- 6 Small red LEDs (D15,16,17,26,27,28)
- 1 7808 +8 volt regulator (VR1)

Resistors

- 30 10K ohm resistors (brown-black-orange) R1,2,3,4,7,8,16,17,20,21, 27,28,33,34,36,37,39,45,46,48,49,51,52, 54,61,63,76,77,82,84).
- 12 100K ohm resistors (brown-black-yellow) R29,38,43,50,55,60,62,65, 70,71,80,85)
- 2 220K ohm resistors (red-red-yellow) (R32,44).
- 10 1K ohm resistors (brown-black-red) (R30,35,41,42,47,59,81,83,92,93)
- 4 1M ohm resistors (brown-black-green) (R53,56,64,66)
- 2 2 ohm resistors (red-black-gold) (R68,69)
- 2 180 ohm resistors (brown-gray-brown) (R57,67)
- 2 68K ohm resistors (blue-gray-orange) (R88,89)

Capacitors

- 18 10uF electrolytic capacitors (C1,2,4,6,7,9,10,11,14,15,17,18,20,21, 24,25,26,36)
- 1 470uF electrolytic capacitor (C30)
- 3 220uF electrolytic capacitors (C3,31,33)
- 7 .1uF ceramic capacitors (marked .1 or 104) (C12,13,28,29,32,34,35)
- 2 .0033uF ceramic capacitors (marked .0033 or 332) (C16,22)
- 2 .001uF ceramic capacitors (marked .001 or 102) (C19,27)
- 3 .01uF ceramic capacitors (marked .01, 10n, or 103) (C5,8,23)

Controls

- 5 10K ohm slider potentiometers (R9,14,22,26,58)
- 4 10K ohm top mount potentiometers (R6,13,31,40)
- 6 DPDT top board mount slide switches (S1,2,3,4,5,6)

Miscellaneous

- 2 Microphone jacks (3/8") (J5,6)
- 1 2.5mm Power jack (J8)
- 5 3.5mm stereo jacks (J1,2,3,4,7)
- 1 6 foot grounding wire

ASSEMBLY OF THE MX10

Now we are getting to the good stuff-assembling the MX10. We will begin by mounting first the low parts, beginning with the parts on the side of the board labeled as “PARTS” side on the PC board. When we are finished with that side, we will begin to install parts on the “CONTROL” 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. In the case of this project we will attempt to go from top to bottom, left to right. Notice many of the resistors are “standing”, which allows for a smaller PC board layout.

- 1. Orient the board as shown in the parts layout diagram.
- 2. Install R2, a 10K ohm resistor (brown-black-orange).
- 3. Install R7, a 10K ohm resistor (brown-black-orange).
- 4. Install R20, another 10K ohm resistor (brown-black-orange).
- 5. Install R16, a 10K ohm resistor (brown-black-orange).
- 6. Install R8, a 10K ohm resistor (brown-black-orange).
- 7. Install R21, a 10K ohm resistor (brown-black-orange).
- 8. Install R17, a 10K ohm resistor (brown-black-orange).
- 9. Install R92, a 1K ohm resistor (brown-black-red).
- 10. Install R34, a 10K ohm resistor (brown-black-orange).
- 11. Install R30, a 1K ohm resistor (brown-black-red).
- 12. Install R36, a 10K ohm resistor (brown-black-orange).
- 13. Install R3, a 10K ohm resistor (brown-black-orange).
- 14. Install R29, a 100K ohm resistor (brown-black-yellow).
- 15. Install R33, a standup 10K ohm resistor (brown-black-orange).
- 16. Install R32, a 220K ohm resistor (red-red-yellow).
- 17. Since U5 (LF347) can be considered a low profile part, we will install it now. Notice that the IC has a dot or a notch indicating pin 1. This will be installed in the same direction as shown in the parts layout diagram. This part is responsible for the microphone amplifiers and the “soft clipping circuits” we talked about in the circuit description. Make sure all 14 pins are through the PC board before soldering the part to the board.

- 18. Install R27, a 10K ohm resistor (brown-black-orange).
- 19. Install R28, a 10K ohm resistor (brown-black-orange).
- 20. Install D1, a 1N4148 type diode (orange body with black stripe). Make sure that the cathode end (with the stripe) is installed in the same orientation as where the "arrow" is pointing to the stripe of the diode symbol. The stripe of the diode is the same as the stripe on the layout.
- 21. Use the same procedure to install D2, another 1N4148 type diode. Make sure the band on the diode is in the same direction as the stripe on the symbol in the layout.
- 22. Install R57, a 180 ohm resistor (brown-gray-brown).
- 23. Install R55, a 100K ohm resistor (brown-black-yellow).
- 24. Install R81, a 1K ohm resistor (brown-black-red).
- 25. Install R56, a 1M ohm resistor (brown-black-green).
- 26. Install R80, a 100K ohm resistor (brown-black-yellow).
- 27. Install R85, a 100K ohm resistor (brown-black-yellow).
- 28. Install R53, a 1M ohm resistor (brown-black-green).
- 29. Install R50, a 100K ohm resistor (brown-black-yellow).
- 30. Install R62, a 100K ohm resistor (brown-black-yellow).
- 31. Install R84, a 10K ohm resistor (brown-black-orange).
- 32. Install R38, a 100K ohm resistor (brown-black-yellow).
- 33. Install R45, a 10K ohm resistor (brown-black-orange).
- 34. Install R44, a 220K ohm resistor (red-red-yellow).
- 35. Install R39, a 10K ohm resistor (brown-black-orange).
- 36. Install R37, a 10K ohm resistor (brown-black-orange).
- 37. Install D8, a 1N4148 type diode (orange body with black stripe). Make sure that the cathode end (with the stripe) is installed in the same orientation as the "arrow" pointing to the stripe of the diode symbol.
- 38. Install D5, another 1N4148 type diode (orange body with black stripe). Again make sure the stripe is in the same orientation as shown.

OK, we have done our fair share of assembly up to this point. Now we will take a short break and check the work we have done up to this point. We have just completed the microphone amplifier sections of the circuit, and for the ease of assembly have completed some of the RIAA equalization for the phono amplifier.

We want to check our circuit for cold solder joints and possible solder bridges. Also check the diodes you installed for correct orientation. Then we will be

ready to continue with the rest of the project.

- 39. Install R54, a 10K ohm resistor (brown-black-orange).
- 40. Install R52, a 10K ohm resistor (brown-black-orange).
- 41. Install R82, a 10K ohm resistor (brown-black-orange).
- 42. Install R70, a 100K ohm resistor (brown-black-yellow).
- 43. Install D6, a 1N4148 type diode. This diode and U4:A form the “real diode” section of the peak hold circuit. “real diode” means that there is no .7 volt drop across the diode that would normally occur with just a diode by itself. This “real diode” allows us to rectify signals all the way from 0 volts up to a few volts less than the supply voltage; a diode by itself would only be from .7 volts up, not allowing us to see any low level signals below .7 volts on the peak hold circuit.
- 44. Install R46, a 10K ohm resistor (brown-black-orange).
- 45. Install U4, a LF347 type opamp. Make sure and align the notch or dot associated with pin one with the notch shown in the parts layout diagram. Also check to be sure all 14 pins are through the board before soldering the IC in place. This IC is responsible for the peak hold circuits and the main mixer (summing amplifiers) circuits.
- 46. Install R88, a 68K ohm resistor (blue-gray-orange).
- 47. Install R48, a 10K ohm resistor (brown-black-orange).
- 48. Install R42, a 1K ohm resistor (brown-black-red).
- 49. Install R66, a 1M ohm resistor (brown-black-green).
- 50. Install R64, a 1M ohm resistor (brown-black-green).
- 51. Install R65, a 100K ohm resistor (brown-black-yellow).
- 52. Install U6, a LF347 type quad opamp. Make sure and align the dot or notch with the notch shown in the parts layout diagram. Make sure all 14 pins are through the board before soldering. This IC is responsible for the RIAA circuits and the split supply ground reference.
- 53. Install R4, a 10K ohm resistor (brown-black-orange).
- 54. Install R1, a 10K ohm resistor (brown-black-orange).
- 55. Install R83, a 1K ohm resistor (brown-black-red).
- 56. Install R71, a 100K ohm resistor (brown-black-yellow).
- 57. Install R60, a 100K ohm resistor (brown-black-yellow).
- 58. Install D19, a 1N4148 type diode (orange glass body with black stripe). Make sure and install the stripe (cathode) in the same orientation as shown in the parts layout diagram.

- 59. Install R89, a 68K ohm resistor (blue-gray-orange).
- 60. Install R43, a 100K ohm resistor (brown-black-yellow).
- 61. Install R67, a 180 ohm resistor (brown-gray-brown).
- 62. Install R76, a 10K ohm resistor (brown-black-orange).
- 63. Install R77, another 10K ohm resistor (brown-black-orange).
- 64. Install R51, a 10K ohm resistor (brown-black-orange).
- 65. Install R49, a 10K ohm resistor (brown-black-orange).
- 66. Install R68, a 2.0 ohm resistor (red-black-gold).
- 67. Install R61, a 10K ohm resistor (brown-black-orange).
- 68. Install R63, a 10K ohm resistor (brown-black-orange).
- 69. Install R69, a 2.0 ohm resistor (red-black-gold).
- 70. Install R93, a 1K ohm resistor (brown-black-red).
- 71. Install U3, one of the LM386 audio amplifier ICs. This IC and U2 are responsible for amplifying the line level of the audio in this circuit to a low impedance so that it can drive a pair of earphones. Make sure the notched end is oriented properly, then solder all 8 pins.
- 72. Install U2, the other LM386 audio amplifier IC. Again make sure the notch is installed in the correct orientation. Solder all 8 pins.
- 73. Install R35, a 1K ohm resistor (brown-black-red).
- 74. Install R41, a 1K ohm resistor (brown-black-red).
- 75. Install R59, a 1K ohm resistor (brown-black-red).
- 76. Install R47, a 1K ohm resistor (brown-black-red).
- 77. Install D29, a 1N4002 type rectifier diode. (black body with white stripe). This diode combined with D35, 34, and 31 form a bridge rectifier which converts AC to DC to form our power supply. Be sure to install the end with the line in the same orientation as shown.
- 78. Install D35, a 1N4002 type rectifier diode. (black body with white stripe). Again note orientation.
- 79. Install D34, another 1N4002 type rectifier diode. (black body with white stripe).
- 80. Install D31, the last of the 1N4002 bridge rectifier diodes. Again check its orientation before installing. (Black body with white stripe).

Now we will move on to the higher profile components such as capacitors, switches and jacks. Before continuing we want to check all of our solder joints for possible solder bridges and cold solder joints. Now for ease of locating

parts, we will quit going from left to right, top to bottom and begin to install parts close to one another.

- 81. Install C1, a 10uF electrolytic capacitor. Notice this is the first capacitor of this type. You want to 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 remember this!
- 82. Install C4, a 10uF electrolytic capacitor. Check orientation!
- 83. Install C7, another 10uF electrolytic capacitor. Be sure it is oriented correctly!
- 84. Install C9, another 10uF electrolytic capacitor. Again check orientation.
- 85. Install C16, a .0033uF ceramic capacitor (marked .0033 or 332).
- 86. Install C19, a .001uF ceramic capacitor (marked .001 or 102).
- 87. Install C15, a 10uF electrolytic capacitor (orientation!)
- 88. Install C20, another 10uF electrolytic capacitor. Again check its orientation before soldering.
- 89. Install C29, a .1uF ceramic capacitor (marked .1 or 104).
- 90. Install C27, a .0033uF ceramic capacitor (marked .0033 or 332).
- 91. Install C22, a .001uF ceramic capacitor (marked .001 or 102).
- 92. Install C26, a 10uF electrolytic capacitor. Orientation!
- 93. Install C10, yet another 10uF electrolytic capacitor. Again orientation!
- 94. Install C21, even another 10uF electrolytic capacitor. Orientation.
- 95. Install C11, a 10uF electrolytic capacitor. (Yikes, do we have to tell you again to check orientation? my typing fingers are gettin' tired !)
- 96. Install C30, a 470uF electrolytic. This part is responsible for taking the pulsed DC from the bridge rectifier and “smoothing” it out to a more level DC voltage. That is one of the many reasons why you want to check orientation before soldering.
- 97. Install VR1, the 7808 +8 volt regulator. This converts the raw DC from the bridge rectifier and C30, which will still have AC ripple on it from the pulsed DC from the rectifier, and finishes “smoothing” it out (regulation).
- 98. Install C25, a 10uF electrolytic capacitor. Orientation !
- 99. Install C23, a .01uF ceramic capacitor (marked .01, 10n or 103)
- 100. Install C36, a 10uF electrolytic capacitor. Again note orientation.

- 101. Wow, it's hard to believe we have come 100 steps already! Install C36, a 10uF electrolytic capacitor. Again check the orientation before continuing.
- 102. Install C34, a .1uF ceramic capacitor (marked .1 or 104).
- 103. Install C8, a .01uF ceramic capacitor (marked 103, 10n or .01).
- 104. Install C33, a 220uF electrolytic capacitor (orientation!)
- 105. Install C5, a .01uF ceramic capacitor (marked .01, 103 or 10n).
- 106. Install C6, a 10uF electrolytic capacitor. Orientation!
- 107. Install C3, a 220uF electrolytic capacitor. Again note orientation.
- 108. Install C2, a 10uF electrolytic capacitor. Orientation yet again!
- 109. Install C32, a .1uF ceramic capacitor (marked .1 or 104).
- 110. Install C31, a 220uF electrolytic capacitor. Again note orientation when installing.
- 111. Install C17, a 10uF electrolytic capacitor. Check orientation.
- 112. Install C35, a .1uF ceramic capacitor. (Marked .1 or 104).
- 113. Install C28, a .1uF ceramic capacitor. (Marked .1 or 104).
- 114. Install C14, a 10uF electrolytic capacitor. Orientation !
- 115. Install C18, a 10uF electrolytic capacitor. Again check installation direction for correct polarity.
- 116. Install C24, a 10uF electrolytic capacitor. Orientation !
- 117. Install C13, a .1uF ceramic capacitor (marked .1 or 104).
- 118. Install C12, another .1uF ceramic capacitor (marked .1 or 104).

Now we have finished installing all of the capacitors in the board. It would be a good time to take a break and give your eyeballs a rest. Go get a drink, eat something and come back with a new perspective on the kit. In that way we can check the board properly for solder bridges and possible cold solder joints with a better chance of finding them.

Now we will move on to the jacks on this side of the board.

- 119. Install J1, a 3.5mm stereo jack.
- 120. Install J3, a 3.5mm stereo jack.
- 121. Install J7, another 3.5mm stereo jack.
- 122. Install J4, yet another 3.5mm stereo jack.
- 123. Install J8, a 2.5mm power connecting jack.
- 124. Install J2, a 3.5mm stereo jack.

- ❑ 125. Install J6, a 3.5mm mono microphone jack. (Identified by only three mounting pins instead of five) Note that they don't fit exactly in the holes since a better jack was ordered than the one the kit was originally designed for.
- ❑ 126. Install J5, a 3.5mm mono microphone jack.

We have just completed this entire side of the PC board and now we are ready to begin working on the other side of the board. Flip the board over and notice where all of the controls are to go. Notice that the pins on the slider pots are arranged so that the sliders can only be installed in one direction. Again we will start with the lower and smaller components and then work our way up.

The next few steps concerning the installation of the LEDs for the meters and the microphone in indicators are a little different than usual. Instead of installing one part at a time, we will be installing in groups. This will make for easier installation.

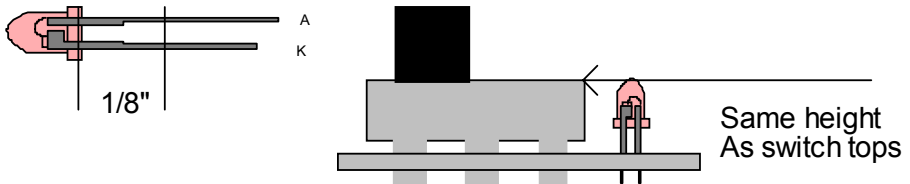
- ❑ 127. For height reference we want to install S4, a DPDT board mount slide switch. Make sure and mount the part flush and level to the board.
- ❑ 128. Install S3, another DPDT board mount slide switch. Again make sure it is mounted flush to the PC board.

Notice how the LEDs for the bargraph are laid out in groups of color. We have two rows of three green LEDs on the left, two rows of four yellow ones in the middle, and two rows of red on the right. When the LEDs are installed, the top of the LED should be at the same height as the surface of the switch plate (not the switch handle).

- ❑ 129. We will begin by installing just the left most green LEDs to get a good height reference for the rest of the LEDs (D4 and D18). Notice how one lead of the LEDs are longer than the other. This longer lead indicates the anode side of the LED. The anode side of all the LEDs in the meter face away from the switches we have just installed. They are represented by the triangle in the circuit board layout, not the line end of the LEDs. To help you level the LEDs, there is an aluminum spacer included to place under the LEDs while mounting them. Use the spacer between the leads of the LEDs, then remove it once the LEDs are all installed.
- ❑ 130. Install the next two green LEDs. (D7 and D20) Make sure you install them with the long leads facing away from the switches.
- ❑ 131. Install the last of the green LEDs (D9 and D21). Again check for where the long leads go.
- ❑ 132. Install the first two yellow LEDs just to the right of the last green ones. (D10 and D22). Make sure the long leads are facing away from S3

and S4.

- ❑ 133. Install the next two yellow LEDs (D11 and D23) Check the long lead side!
- ❑ 134. Install two more yellow LEDs (D13 and D24). Again check the long lead side.
- ❑ 135. Install the last of the yellow LEDs to go in the meter (D14 and D25). There should be two left over for the microphone indicators.
- ❑ 136. Install the first of the red LEDs to go in the meter just to the right of the yellow LEDs (D15 and D26). Make sure the long leads are oriented correctly.
- ❑ 137. Install the next two red LEDs. (D16 and D27) Long leads!
- ❑ 138. Install the last of the red LEDs and the last of the LEDs to go in the meter (D17 and D28). Make sure the longer leads are facing away from



the switches!

- ❑ 139. Now we will install the remaining yellow LEDs that indicate whether or not the microphone is in or out. Install D12. The long lead in this case faces in the opposite direction of the LEDs in the meter. (Note the triangle side on the parts layout). Again this LED is mounted at the same height as the switch.
- ❑ 140. Install D3, the other yellow LED. Again note that the long lead is in the opposite direction as those in the meter (triangle side).
- ❑ 141. Install U8, a LM3915 bargraph display driver. Make sure the notched end is oriented as shown in the layout, and that all 18 pins are through the board before soldering.
- ❑ 142. Install U7, the other LM3914 type bargraph display driver. Again note the notched end of the part in relation to the layout, and make sure all 18 pins are through the board before soldering.
- ❑ 143. Install R40, a top mount 10K ohm potentiometer. (Green with black post)
- ❑ 144. Install R13, a top mounting 10K ohm potentiometer. (Green with black post).
- ❑ 145. Install R31, another top mounting 10K ohm potentiometer. (Green with black post).

- 146. Install R6, the last of the 10K ohm board mount pots.
- 147. Install R26, a 10K ohm slider potentiometer. Notice how the pot only installs easily one direction. Make sure that the leads under this slider and all others are trimmed short enough as to not short circuit to the body of the slider pots. Check to make sure all pins are through the board and that the part is flush before soldering.
- 148. Install R58, a 10K ohm slider potentiometer. Check under it before soldering for potential shorts to the body of the pot.
- 149. Install R14, another 10K ohm slider pot. Again check under it before soldering for possible shorts. Also make sure the part is flush and that all pins are through before soldering.
- 150. Install R22, yet another 10K ohm slider pot. Check under it for shorts and solder all the pins.
- 151. Install R9, the last of the 10K ohm slider pots. Again check under it for possible shorts, and make sure all the pins are through the board before soldering
- 152. Install S6, a DPDT type slider switch. Make sure it is flush before soldering it.
- 153. Install S5, a DPDT type slider switch.
- 154. Install S2, a DPDT type slider switch.
- 155. Install S1, a DPDT type slider switch.
- 156. Strip 1/4" of insulation from one end of the grounding wire. Twist and tin the end for mounting in the PC board.
- 157. Install the wire into the grounding hole directly behind C26 on the parts side of the board. This wire is used to ground the MX10 directly to the rest of the audio system to reduce 60Hz hum in the audio.

We have just completed the part installation of our MX10 mixer kit. Now we want to go back through and check all of our solder joints and connections for a poor connection or a solder bridge. Also check part orientation and polarity as well as under the slider pots for shorts made from part leads on the reverse side of the board.

It may be a good time to re-heat some of the LEDs to align them straight so that they look good.

INITIAL TESTING THE MX10

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

- Line level source such as a tape deck, signal generator (SG-550) or CD player.
- Record level source such as a record player or signal generator. (Ramsey SG-550)
- A destination such as an audio amp, transmitter or earphones
- A microphone if you are planning on using one.
- 2 or more 3/8" stereo jacks to a pair of RCA jacks like the ones used with portable CD players.

- [1] Connect the line level source to the LINE1 input jack.
- [2] Connect the record player level to the PHONO input.
- [3] Connect the destination up to the OUTPUT jacks or plug in your earphones.
- [4] Turn down all the controls to their minimum settings.
- [5] Plug in a 12VAC power supply into J8.
- [6] Verify that the destination is receiving your LINE level sound. Vary the levels of the MAIN pot and the LINE1 and PAN pot to do this. Also note your bargraph display and check for any LEDs which do not light.
- [7] Plug the line level source into the LINE2 input jacks.
- [8] Vary MAIN and LINE2 and PAN pots to verify they work also.
- [9] Plug your microphone into the microphone jacks. Switch on the microphones and make sure the LEDs light. Vary MAIN and L.MIC and R. MIC to make sure they are operational as well.
- [10] Vary the phono control and MAIN to verify their operation.
- [11] With the MON/CUE switch in the CUE position, go through and check all CUE switches to make sure each input can be directed to the earphones.

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 12 volts between the tab of VR1 and pin 4 of U4. If that is not it, check all ICs for proper installation. Thereafter it's 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: One or more LEDs do not light.

SOLUTION: Uh-oh ! Check the orientation of the LEDs to make sure you put them in the correct way. Try reversing the orientation of the unlit LEDs to see if they light then.

PROBLEM: When running the output of this into the FM10A or FM25B, I seem to be driving the transmitters into distortion when MAIN is turned up full.

SOLUTION: Because the MX10 has some gain, you will either need to keep the MAIN adjustment from going all the way to full, or you can open the FM10A or FM25B, and adjust the controls for level on their inputs.

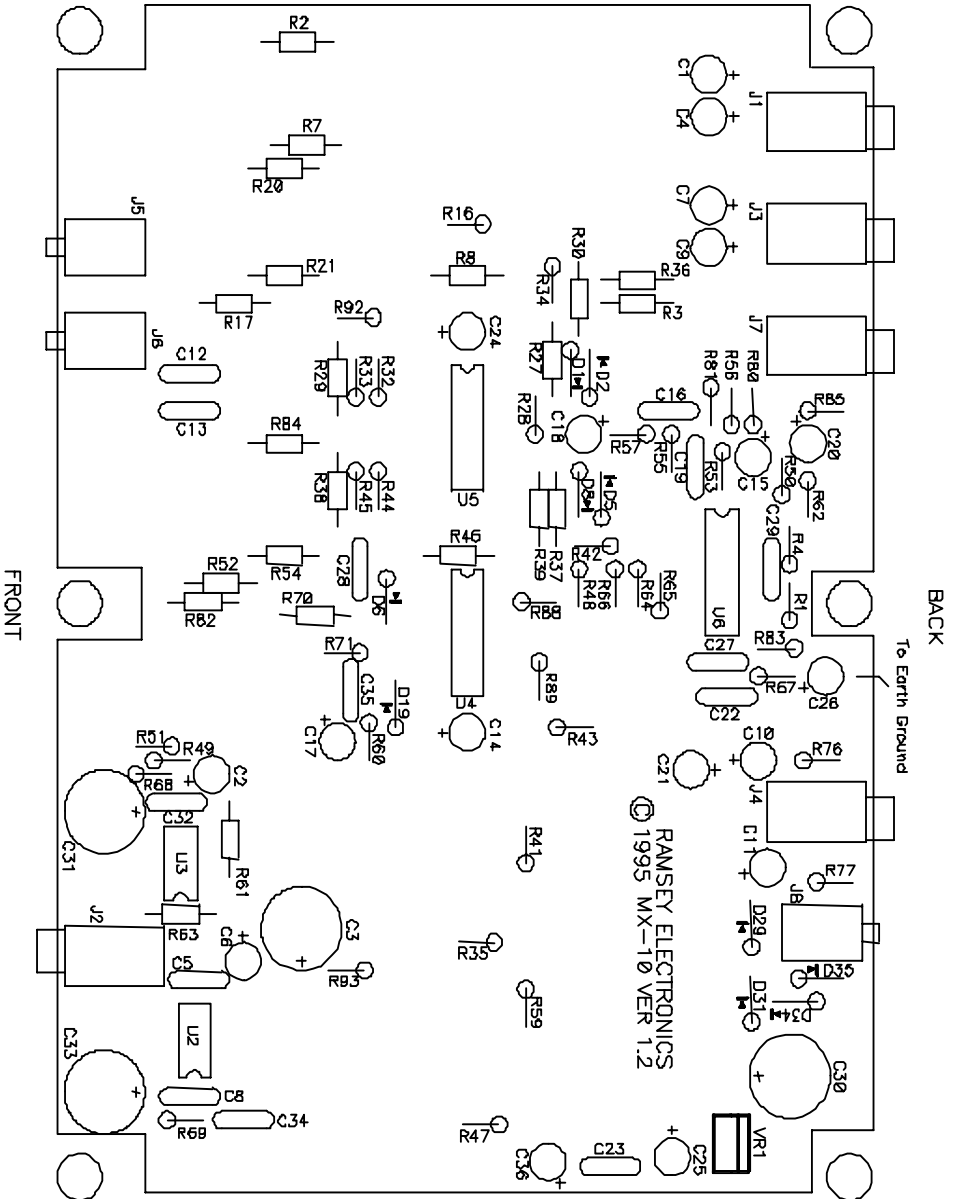
MODIFYING THE PHONO INPUT

This is for those of you who don't want to use the phono input, but would like to have another LINE input. Follow these steps and you will then have another line input! Don't destroy your parts taking them out since you may want to re-install them later.

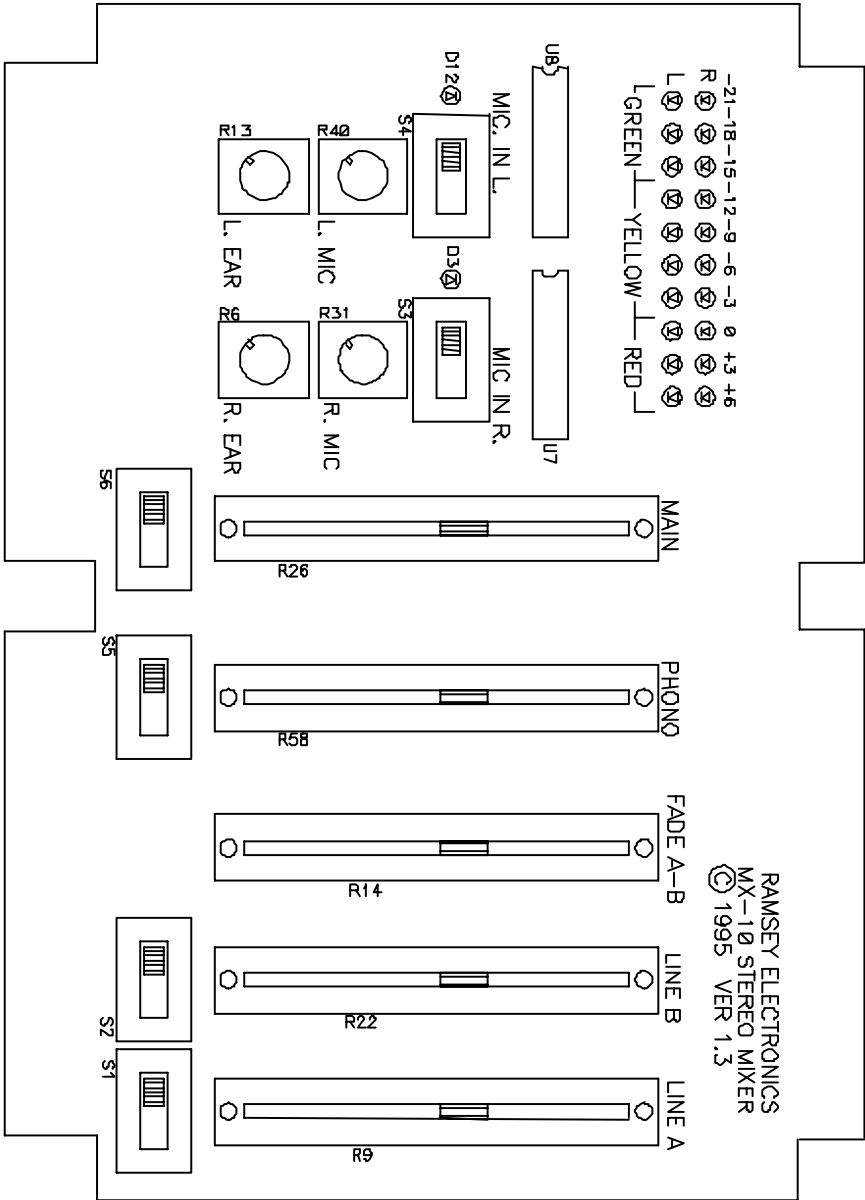
- 1. Remove R57, a 180 ohm resistor. (brown-gray-brown)
- 2. Remove C16, a .0033uF ceramic capacitor (marked .0033 or 332).
- 3. Remove R67, a 180 ohm resistor. (brown-gray-brown).
- 4. Remove C22, a .0033uF ceramic capacitor (marked .0033 or 332).

Now the PHONO amplifier only will have a level flat gain of 1. Now you can use it for another line level input.

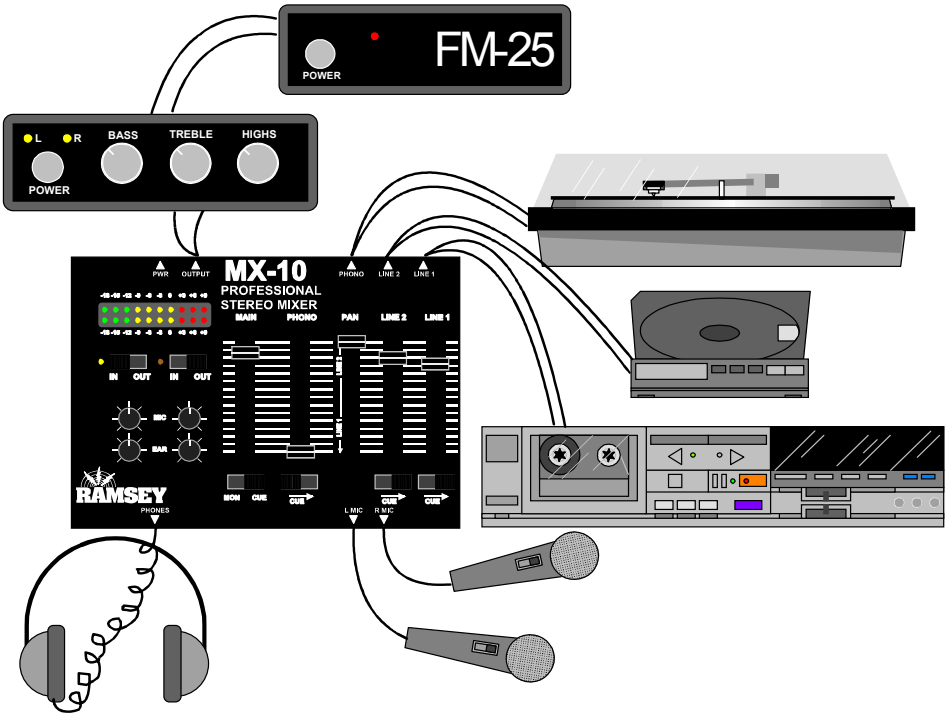
PARTS SIDE LAYOUT



CONTROL SIDE LAYOUT



USING THE MX10



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

- **MX10**, our newly built mixer
- **STC1**, Stereo transmitter companion. Compression, limiting, bass, midrange, and treble controls. Active 8th order lowpass to get rid of interfering sounds.
- **FM25B**, the PLL stereo transmitter.

To run this setup using an audio amplifier for DJing, just remove the STC1, and replace the FM25 with the audio amplifier of choice. To record a car tape or make a production, remove the STC1 and replace the FM25 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 gore from DOOM blasting out of their system.

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.

Call or write:

Ramsey Electronics
590 Fishers Station Drive
Victor, NY 14564

PH# (585) 924-4560
FAX# (585) 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 \$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.

PROFESSIONAL STEREO MIXER KIT

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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. MMX10

Assembly and Instruction manual for:

RAMSEY MODEL NO. MX10

PROFESSIONAL STEREO MIXER



RAMSEY ELECTRONICS, INC.

590 Fishers Station Drive

Victor, New York 14564

Phone (585) 924-4560

Fax (585) 924-4555

www.ramseykits.com

TOTAL SOLDER POINTS

275

ESTIMATED ASSEMBLY

TIME

Beginner8 hrs

Intermediate6 hrs

Advanced4 hrs