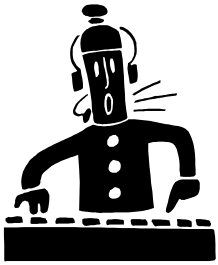
PHONE PATCH MIXER KIT



Ramsey Electronics Model No. PPM3

Ever wish you could broadcast on-the-air telephone calls like the commercial radio stations? Well now you can! The PPM3 gives you the ability to broadcast both sides of a phone conversation without having to change any connections to return to your music or other programming. Perfect for the budding talk radio star in your house!

- **Operates on 8 to 12 volts DC**
- **Automatic noise gating**
- **Automatic variable gain and compression**
- **Allows both sides of a phone conversation to be broadcast over-the-air**
- **Connect your line level audio source to the PPM3 and use the loop output; no separate mixing board needed**

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- **FM100B Professional FM Stereo Transmitter**
- **TXE433 or 916 Transmitter & Encoder Module**
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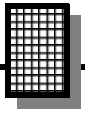

KIT ASSEMBLY AND INSTRUCTION MANUAL FOR

PHONE PATCH MIXER KIT

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PPM3 INTRODUCTION

We've all heard those awesome call-in programs on the radio. You know, the ones where the host lets the average Joe give his opinion on-the-air to all of his listeners . . . regardless of intelligence level or speaking skills! Yes, we've all been embarrassed for poor old Joe when he puts his foot in his mouth and we've all thought that we could be much more brilliant and interesting than the high paid host we're listening to. Well, here's your opportunity to try your hand at talk radio on a micro scale. You FM and AM micro or hobby broadcasters know what fun it is to decide the programming on your house station and be able to listen to all your favorites out in the yard or garage. And your close neighbors have been listening too, as you've heard over the back fence. Then there are those of you who use our hobby transmitters at swap meets or flea markets and hamfests to tell the happy customers how to find the best deals and where the doughnuts are. We designed the PPM3 to add a whole new dimension to your transmitting/broadcasting experience. Now you can allow the locals to call in and voice an opinion and hear it broadcast on your micro station. Hey, we all know how much people love to hear their own voice on the radio. They're probably listening to you already and wondering how come you get to have all the fun (We know it's because you're spending all the time and money but they didn't think that far!) . . . now you can let them have some fun of their own! Have your listeners let you know what they'd like to hear on your station, let them tell people in your listening area about upcoming events in their own words, start a new talk radio program to deal with community issues . . . the possibilities are limited only by your imagination . . . and your callers diction and phone etiquette. No, you probably won't become the next Rush Limbaugh but you can enjoy that "in control" feeling in your own "broadcast booth" taking those phone calls just like the big boys. Thanks to all of you who called and emailed to let us know that you wanted a kit like this. We know you're going to love using the PPM3 with your hobby broadcast equipment. Let's stop talking and start understanding and building your new Phone Patch Mixer!

PPM3 CIRCUIT DESCRIPTION

The PPM3 is essentially a stereo audio mixer, with one stereo line input and two specialized mono inputs, each feeding into the stereo line output. The phone and mic inputs each have a pre-amp stage that acts as a complete signal conditioner. The mixing core is done with two op amps, U2:C for the left channel and U2:D for the right channel.

The line inputs are AC coupled and volume adjusted by R2 and then fed into the mixer. The maximum voltage gain from the line inputs to the line outputs for each channel is 3.2, or 10 dB. This is set by the ratio of R22/R23 for the left channel and R21/R24 for the right channel. The maximum voltage gain can be calculated for each channel by:

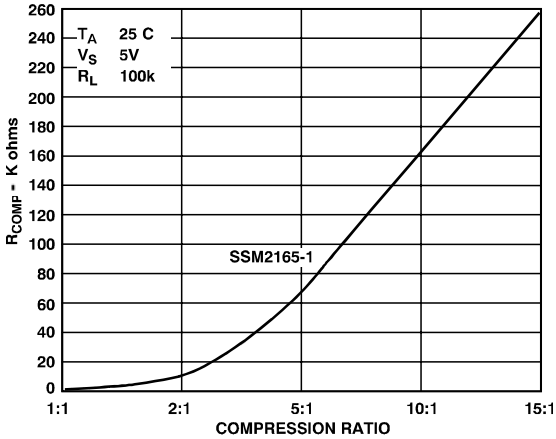
G(left) = R22 / R23 = 15K / 4.7K = 3.2
G(right) = R21 / R24 = 15K / 4.7K = 3.2

If you are interested in the gain in dB format, it can be converted by the following:

G(dB) = 20 * Log (G) = 20 * Log (3.2) = 10 dB

These are the maximum gains that are achieved when the line volume pot is set to its full (clockwise) position.

The microphone input has a DC phantom power of +5V which is required for some microphones. If not needed, this can be eliminated by not installing R13. If you're not sure what your mic needs, install R13. The signal is AC coupled by C33 before it goes into the pre-amp. A value of 5.6nF was chosen because with an input impedance for the pre-amp of 180 K, a high-pass filter is utilized that cuts out frequencies below roughly 150 Hz. In effect, this is desirable for a vocal microphone because it will eliminate some annoying "pops" and other low-frequency noise like 60 Hz AC line hum, for example. U3 is the pre-amp that performs a few useful functions all in one part. First, it acts as a noise gate which simply means that it effectively "turns off" the mic when only background noise is present, and then automatically turns back on when there is a minimum signal. It also acts as a variable compression amplifier, which means that it will amplify a quiet whisper more than it would a loud shout. Its compression ratio is determined by R9, which with the 39K resistor, works out to be about a 3.5:1 compression ratio. C6 controls the release time of the compression and the real-time rms averaging for the internal level detector. This capacitor can range from 2.2uF to 22uF. The 10uF value seemed to give a good compromise. Too small of a value and the gain will change two fast, two large a value can result in slow response times to signal dynamics. If other compression ratios are desired, this chart can be used:



The microphone pushbutton switch (S3) is used to turn on the mic channel by pushing it in, and to mute the mic channel by leaving it out. The mic LED is powered on when the mic is on by using the other half of the switch.

The phone line input is meant to monitor both ends of a phone conversation. An external local phone connected to the output phone jack is needed to perform dialing and to take the phone line "off hook" in order to answer a call. The phone input can be disconnected from the phone lines and muted by using the phone pushbutton switch. Like the mic switch, mute is "out" and on is "in". The phone signal is filtered for unwanted high frequency noise by C3 and C4; this is called low-pass filtering (LPF). It is also filtered for unwanted low frequency noise by C5, which is called high-pass filtering (HPF). This cap is also used to block the high DC voltage on the phone line from passing through the isolation transformer, T1. Because of this DC voltage which normally is 50 VDC off-hook, and can even have spikes upwards of hundreds of volts, the first three caps in the circuit (C3, C4, C5) were chosen to be able to handle 1 kV each. R30 performs some signal attenuation and isolation, and then the isolation transformer T1 further helps prevent unwanted interference between the phone line circuit and the PPM3 circuitry. T1 also takes the differential phone audio signal and converts it to a single-ended signal (which means one side is grounded). C31 performs some more LPF, and C16 performs some more HPF. R31 is one more protection against the PPM3 circuit interfering with the phone line circuits and vise-versa. The two diodes, D1 and D2 provide a final protection against high-level signals reaching the PPM3 circuitry and potentially doing damage. They provide an upper voltage limit of 0.7 volts and a lower voltage limit of –0.7 volts. Any signal outside these limits will be shorted to ground. At this point, the signal is amplified with the same type of pre-amp that mic circuit used, but with a different compression level. The problem with monitoring both sides of a phone conversation is that the signal from the local phone is usually much higher is amplitude than the signal from

the far-end phone. So the solution is to use a high amount of compression in order to amplify the far-end, weaker signal much more than the local stronger signal. In this way both sides of the conversation are closer to each other in signal strength when applied to the main mixer. A 100K ohm resistor was used to set the compression level around 7:1. The same chart that was used for the mic circuit can also be used with the phone circuit if a different compression ratio is desired.

The clip detect circuit that powers the clip LED is basically constantly comparing the signals from both the left and right channels against a set threshold that is close to the mixer amp's upper voltage rail, which is where it clips. There is a little amount of hysteresis to enable the LED to be lit up long enough to visibly see it during short signal spikes. The core of the peak detect circuit is D3, D7, R25, and C24. Basically, an averaging DC peak voltage sample is created, held with a charge on C24, and discharged with R25. R20 and R17 control the charge time of C24.

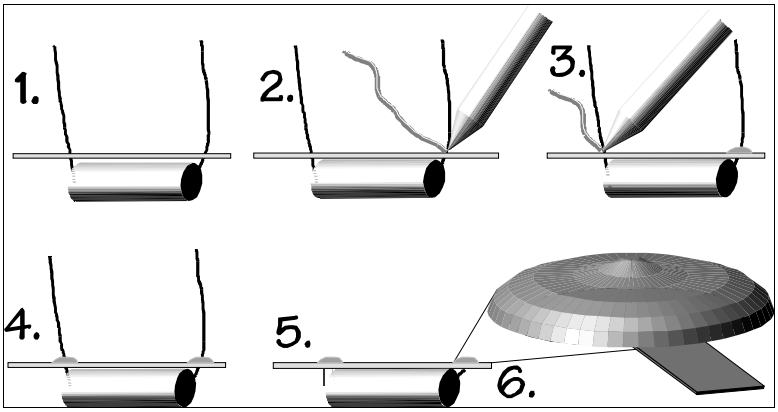
RAMSEY "LEARN-AS-YOU-BUILD" ASSEMBLY STRATEGY

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 to 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 to 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.

Mount all electrical parts on the top side of the board provided. To install parts, the component should be placed flat to the board, and the leads should be bent on the backside of the board to prevent the part falling out before soldering (1). The part is then soldered securely to the board (2-4), and the remaining lead length is clipped off (5). Notice how the solder joint looks close up, clean and smooth with no holes or sharp points (6).



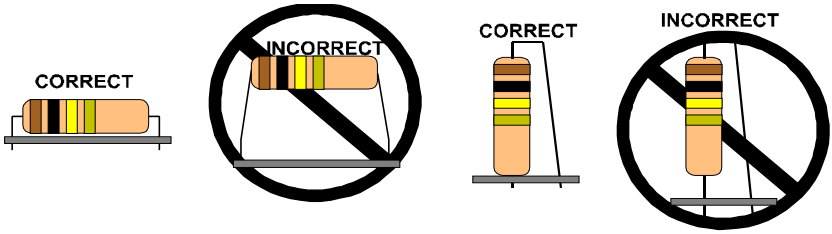
Although we know that you are anxious to complete the assembly of your phone patch mixer kit it is best to follow the step-by-step instructions in this manual. Try to avoid the urge to jump ahead installing components.

Remember that all of the components will be mounted on the component side of the circuit board and soldered on the solder side of the circuit board (the side that contains the printed circuit traces). Have a look at the parts layout diagram to help with your assembly.

Use the boxes to check off your progress.

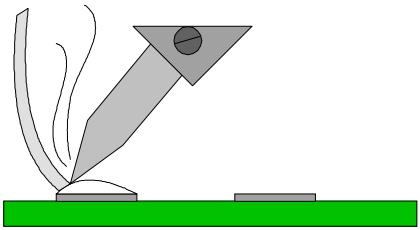
Check all received parts against the parts list. The parts list describes the various markings that may be found on the kit parts. Carefully sort the parts into small piles to aid in finding the correct part at the required time.

Proper Component Installation:

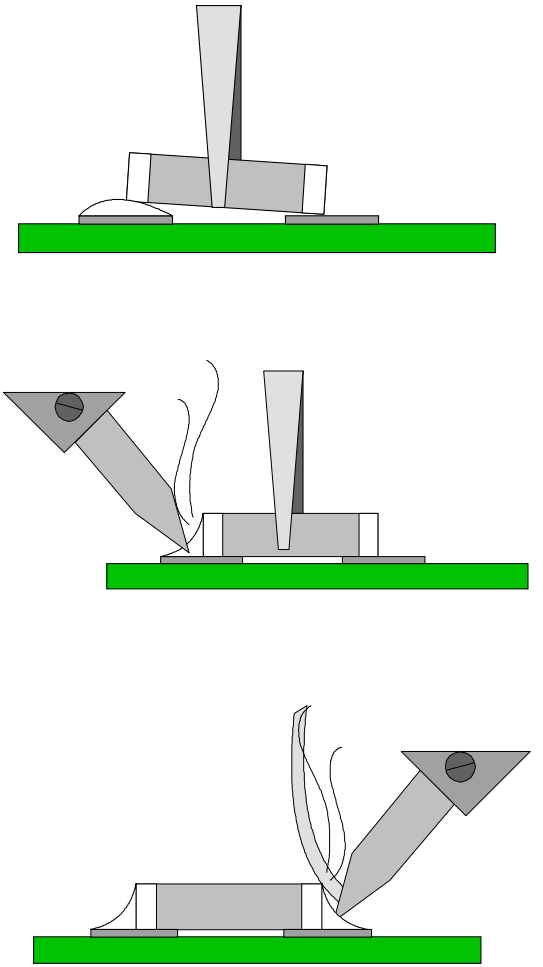


Surface mount component soldering instructions:

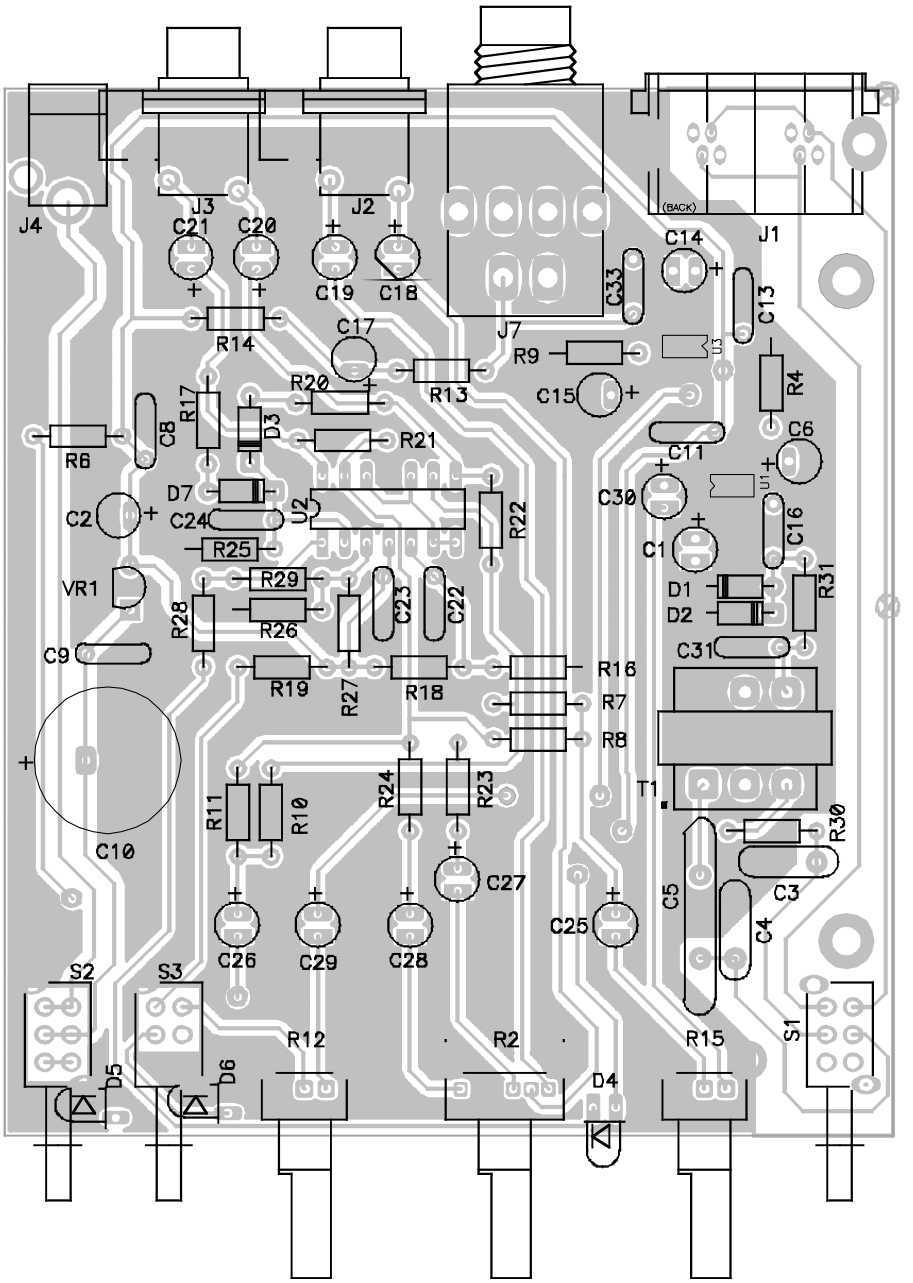
The SMT components will be affixed to the topside of the PC board in the U1 and U3 positions. Patience is the key when installing surface mount components. Typically, the first step (after identifying the component) is to “tin” one of the PC traces that will connect to the part. This may go a little “against the grain” at first, but it is by far the easiest method. Notice also that when reheating the solder that the iron tip does not come in contact with the “tab” on the body of the chip component. Over heating of this solder tab can cause a fracture of the bond to the component causing an intermittent connection.



Once this is accomplished, the part can be installed by holding it with tweezers in contact with the “tinned” trace and re-heating the solder (see the associated diagrams). Another commonly used technique is to glue the surface mount components to the printed circuit board before soldering. The procedure is to take a small amount of glue (usually with a pin or toothpick) and “dab” the circuit board in the place where the component will be affixed. Be careful not to apply too much glue as when the part is placed it may “squash” the glue underneath the soldering tabs of the component. Carefully place the part into position, and when the glue dries, solder the connection.



PPM3 PARTS PLACEMENT DIAGRAM



PARTS SUPPLIED WITH YOUR PPM3 KIT

Capacitors

- ❒ 1 2.2nF ceramic disc capacitor [marked 222] (C16)
- ❒ 1 5.6nF ceramic disc capacitor [marked 562] (C33)
- ❒ 3 10nF ceramic disc capacitors [marked 103] (C11,C13,C23)
- ❒ 2 High voltage 10nF capacitors [large red capacitors marked .01M] (C3, C4)
- ❒ 1 47nF ceramic disc capacitor [marked 473] (C31)
- ❒ 4 0.1uF ceramic disc capacitors [marked 104] (C8,C9,C22,C24)
- ❒ 1 High voltage 0.1uF ceramic disc capacitor [very large orange cap marked .1M] (C5)
- ❒ 4 1uF electrolytic capacitors [cylindrical body with a stripe or band, marked 1uF] (C25,C26,C29,C30)
- ❒ 12 10uF electrolytic capacitors [cylindrical body with a stripe or band, marked 10uF] (C1,C2,C6,C14,C15,C17,C18,C19,C20,C21, C27,C28)
- ❒ 1 1000uF electrolytic capacitor [cylindrical body with a stripe or band, marked 1000uF] (C10)

Resistors

- ❒ 1 10k stereo audio pot (R2)
- ❒ 2 10k audio pots (R12,R15)
- ❒ 5 470 ohm resistors [yellow-violet-brown] (R6,R17,R19,R20,R28)
- ❒ 7 4.7k ohm resistors [yellow-violet-red] (R7,R8,R10,R11,R23,R24,R31)
- ❒ 1 5.6k ohm resistor [green-blue-red] (R30)
- ❒ 4 10k ohm resistors [brown-black-orange] (R13,R14,R16,R18)
- ❒ 3 15k ohm resistors [brown-green-orange] (R21,R22,R27)
- ❒ 1 39k ohm resistor [orange-gray-orange] (R9)
- ❒ 1 75k ohm resistor [violet-green-orange] (R26)
- ❒ 1 100k ohm resistor [brown-black-yellow] (R4)
- ❒ 1 220k ohm resistor [red-red-yellow] (R29)
- ❒ 1 1 Meg ohm resistor [brown-black-green] (R25)

Semiconductors and Integrated Circuits

- ❒ 4 1N4148 diodes [orange glass body with black band, marked 4148] (D1,D2,D3,D7)
- ❒ 1 78L05 voltage regulator [like a transistor marked LM78L05] (VR1)
- ❒ 1 Green LED (D5)
- ❒ 2 Red LEDs (D4,D6)
- ❒ 1 LMC6484 Quad opamp (U2)

❒ 2 SSM2165-1S surface mount microphone amplifier ICs (U1,U3)

Miscellaneous Components

❒ 3 DPDT switches (S1,S2,S3)
❒ 1 1/4” stereo jack (J7)
❒ 1 Dual RJ11 jack (J1)
❒ 1 2.1mm power jack (J4)
❒ 2 Dual RCA jacks (J2,J3)
❒ 1 Isolation transformer [large yellow part with 6 leads] (T1)
❒ 1 Piece of heat shrink tubing

PPM3 SCHEMATIC DIAGRAM

PPM3 PHONE PATCH MIXER ASSEMBLY

Assembly of the PPM3 is easy but still requires some time and patience. We will start with the surface mount parts and get them out of the way.

As with any static sensitive parts be careful when installing the IC's in this kit. Don't rub your feet across the carpet and then grab the chip out of your kit as it may be damaged. It's helpful to ground yourself to a metal object before picking up and installing the next three parts.

❒ 1. Install U3, the SSM2165-1S surface mount IC. Be sure you have it lined up with the silkscreen on the PC board so that the notched or dotted end of the component is placed correctly. In the case of U3 the notch points toward C13. The dot or notch indicates pin 1 (the pin beneath the notch if the notch is to the left) and the rest of the pins are counted by going around the chip in a counterclockwise direction. Tin one pad and then line the IC up so that all the other pins are placed over the pads they will be soldered to. Once the chip is lined up correctly, carefully solder the pin to the pad that was tinned. Make sure that the rest of the pins are lined up well before soldering a pin on the opposite side of the chip, then continue around and solder all the pins. Be careful not to bridge the traces between two of the legs of the chip.

❒ 2. In the same way, install U1. The notch or dot on this chip is placed toward C30, opposite of U3 that you just installed. Follow the same method and be sure that the pins line up well before soldering them all into place.

Whew! That was some work. But the toughest two parts have been placed. Check over your work to be sure there are no unwanted bridges and that the pins all look soldered. Now let's move on to the larger through-hole components.

❒ 3. Install U2, the LM6484AIN IC. Follow the PC board silkscreen and Parts Layout Diagram for proper orientation of this part. The dot or notch on one end indicates pin 1. The chip must be placed correctly or it will not work. Be sure to solder all 14 pins. We're soldering this part in first so that you can let the board sit on it to keep the part flush to the PC board. Simply solder in one corner pin, make sure the others are all through the board equally, and then solder the other corner pin. Check flatness again, then you can solder the rest of the pins

❒ 4. Install C21, 10uF electrolytic capacitor. Electrolytics are polarized and must be installed correctly or they tend to explode. You'll see a marking on the PC board to indicate the positive lead. On the part itself you'll see a band or stripe down one side; this indicates the negative lead. This lead is typically the shorter of the two leads as well. Be sure to orient the part so that the positive lead goes in the hole marked with a '+' sign, then solder the part in place.

- ❒ 5. In the same way install C20, a 10uF electrolytic capacitor, again checking your polarity before soldering.
- ❒ 6. Install C19 and C18, noting that these are also 10uF electrolytics and the polarity is exactly opposite to the two parts you just installed. Simply follow the silkscreen and layout diagram for proper placement.
- ❒ 7. Install R14, 10k ohms (brown-black-orange). Resistors have no polarity and can be installed in either direction, although your board will look more uniform if you have all the gold stripes headed in the same direction.
- ❒ 8. Install R6, 470 ohms (yellow-violet-brown).
- ❒ 9. Install C8, 0.1uF capacitor (marked 104). Like resistors, disc caps can be installed in either direction.
- ❒ 10. Install R17, 470 ohms (yellow-violet-brown).
- ❒ 11. Install D3, 1N4148 diode (orange glass body with black band). The band indicates the cathode or negative side of the part. Follow the PC board silkscreen and Part Layout Diagram for correct placement of the band before soldering the part in place.
- ❒ 12. Install R21, 15k ohms (brown-green-orange).
- ❒ 13. Install R20, 470 ohms (yellow-violet-brown).
- ❒ 14. Install C17, 10uF electrolytic capacitor. Remember to watch the polarity when installing!
- ❒ 15. Install R13, 10k ohms (brown-black-orange).
- ❒ 16. Install D7, another 1N4148 diode (orange glass body with black band). Remember to line the black band up with the silkscreen for correct orientation.
- ❒ 17. Install C24, 0.1uF disc capacitor (marked 104).
- ❒ 18. Install R25, 1 Meg ohms (brown-black-green). 1 meg is 1 million ohms! Wow!
- ❒ 19. Install C2, 10uF electrolytic capacitor. Follow the silkscreen for polarity.
- ❒ 20. Install VR1, the 78L05 5 volt regulator. Place the flat side as shown on the silkscreen. This part regulates the incoming voltage down to 5 volts for the parts that require it, and, along with its associated capacitors, smoothes out the voltage and “cleans” it up.
- ❒ 21. Install C9, 0.1uF disc capacitor (marked 104).
- ❒ 22. Install R28, 470 ohms (yellow-violet-brown).
- ❒ 23. Install R29, 220k ohms (red-red-yellow).
- ❒ 24. Install R26, 75k ohms (violet-green-orange).

- ❒ 25. Install R19, 470 ohms (yellow-violet-brown).
- ❒ 26. Install R27, 15k ohms (brown-green-orange).
- ❒ 27. Install C23, 10nF (marked 103).
- ❒ 28. Install C22, 0.1uF capacitor (marked 104).
- ❒ 29. Install R22, the last 15k ohm resistor (brown-green-orange).
- ❒ 30. Install R18, 10k ohms (brown-black-orange).
- ❒ 31. Install R16, 10k ohms (brown-black-orange).
- ❒ 32. Install R7, 4.7k ohms (yellow-violet-red).
- ❒ 33. Install R8, also 4.7k ohms (yellow-violet-red).
- ❒ 34. Install R11, 4.7k ohms (yellow-violet-red).
- ❒ 35. Install R10, another 4.7k ohm resistor (yellow-violet-red).
- ❒ 36. Install R24, 4.7k ohms (guess the color code or look above!!)
- ❒ 37. Install R23, yet another 4.7k ohm resistor (yellow-violet-red).
- ❒ 38. Install C26, the first of the 1uF electrolytics. Don't confuse these with the 10uF parts you've been installing; they're marked 1uF right on the side of the capacitor. They are polarity sensitive just like the others though, so follow the silkscreen for orientation of the positive lead.
- ❒ 39. Install C29, another 1uF electrolytic capacitor. Polarity!
- ❒ 40. Install C28 and C27, 10uF electrolytics. Again, be sure they're marked as 10uF and watch the orientation when installing.
- ❒ 41. Install C25, 1uF electrolytic capacitor. Bet you can guess that I'm going to tell you to be sure you orient it correctly before soldering! But hey, being reminded beats a big popping sound when you fire up your kit and a cap explodes, doesn't it?
- ❒ 42. Install C5, the honkin' huge orange capacitor marked .1M and also 1KV. This part can be installed in either direction but please be sure you seat it down on the board as far as you can without damaging it. If you don't then you'll have trouble getting the top cover on, you'll call me, and I'll say "I told you so". Let's avoid all that and get it down on the board right away, then solder both leads. There are several holes all around this part so be sure you get the right ones;they are the two larger center holes within the silkscreen outline of the part.
- ❒ 43. Install C4, one of the large red 0.01uF capacitors (marked .01M).
- ❒ 44. Install C3, the other large red 0.01uF caps (marked .01M).
- ❒ 45. Install R30, a 5.6k ohm resistor (green-blue-red).

We'll skip T1 for now and come back to it later.

- ❒ 46. Install C31, 47nF (marked 473).
- ❒ 47. Install D2, 1N4148 diode (orange glass body with a black band). Orient the black band with the band marked on the silkscreen and PC board layout.
- ❒ 48. Install D1, the last 1N4148 diode (orange glass body with a black band). Again, make sure you line up the black band on the part with the silkscreen marking for the part.
- ❒ 49. Install C1, 10uF electrolytic. Remember to line up the positive lead correctly.
- ❒ 50. Install R31, 4.7k ohms (yellow-violet-red).
- ❒ 51. Install C16, 2.2nF capacitor (marked 222).
- ❒ 52. Install C30, the last 1uF electrolytic capacitor. Watch the polarity when installing.
- ❒ 53. Install C11, 10nF (marked 103).
- ❒ 54. Install C6, a 10uF electrolytic capacitor. Follow the silkscreen for proper orientation (again!).
- ❒ 55. Install R4, 100k ohms (brown-black-yellow).
- ❒ 56. Install C13, 10nF capacitor (marked 103).
- ❒ 57. Install C14, 10uF electrolytic. Don't worry; I'll only remind you about polarity on one more of these parts. But like your parents always said when they gave you advice as a kid, you'll thank me later.
- ❒ 58. Install C33, 5.6nF (marked 562).
- ❒ 59. Install R9, 39k ohms (orange-white-orange).
- ❒ 60. Install C15, the last 10uF electrolytic. Oh go ahead, you know you have to make sure you install it correctly!!

Well, the regular parts and the surface mount parts are in; now we'll tackle some of the larger components. Then we'll be moments away from firing up your new kit and seeing what it can do. One note on the large parts though. Be sure you have them seated flat on the PC board and that you thoroughly solder all connections. You'll want strong solder joints for good mechanical connections and if these parts aren't seated properly they will not be robust You'll also have trouble when you put the kit in the case because things won't line up. A little care now will save a lot of heartache later. Oh, by the way, I know that the LEDs are rather small but we saved them for later so they wouldn't be flopping around while you flipped the board over and back a million times during construction. They're so bright and perky we thought we'd

save them for last. Ok, that's not the reason, it just makes sense to do them after all the big, bulky parts are in.

- ❒ 61. Install C10, the big 1000uF electrolytic capacitor. Ok, one last time, for real, make sure you get the positive lead and the negative lead oriented correctly before soldering. This one make a big band when it explodes.
- ❒ 62. Install J4, the 2.1mm power jack. It should fit snugly in the board but be sure it's flat before soldering. Make sure you use enough heat on the ground pin for a solid connection; because of the greater surface area of the ground connections they always require a bit more heat.
- ❒ 63. Install J3, one of the dual RCA jacks. They have mounting holes for the plastic tabs that help you line them up correctly but you still need to be sure they're seated flush to the board before you solder this jack and the next one, J2. Don't be nervous about leaving the soldering iron on the ground connection a couple of seconds longer than the other two pins. It won't hurt anything and it needs more heat.
- ❒ 64. In the same way, install J2, the other dual RCA jack.
- ❒ 65. Install J7, the large 1/4" stereo jack. This is another "be sure it's flat" part. Trust me, you really will thank me later.
- ❒ 66. Install J1, the dual RJ11 jack. This part snaps into place so that it is positioned correctly. Solder all leads.
- ❒ 67. Install T1, the isolation transformer. You'll see a dot on the PC board and a dot on the part. Orient the part so that the dots line up and solder all leads.
- ❒ 68. Install S2, one of the DPDT switches. To get these parts to lay down flat on the PC board I flipped the board over and let it rest on the higher parts while placing something under the switch to hold it in place. Then I soldered one lead, made sure the switch was positioned correctly and flush to the board, then soldered the rest of the pins.
- ❒ 69. Install S3, another DPDT switch. These guys (there are three of them) look a little bit like the AT-ATs from Star Wars: The Empire Strikes Back, don't they? Remember those big walkers with the imperials inside shooting everyone? Ok, never mind. Just solder all six leads in and let's move on.
- ❒ 70. Install S1, the last of the cool looking DPDT switches.
- ❒ 71. Install R12, one of the two 10k audio potentiometers, ever after to be known as pots. Yes, the mechanical connections on these that are soldered to the ground plane will require a bit more time and heat, within reason. A soldering gun or blow torch is not the idea; just a few more seconds of heat with the tip of your pencil-type iron will do.

❒ 72. Install R15, the other 10k audio pot.

❒ 73. Install R2, the 10k stereo audio pot.

Now the LEDs. As you may know, LEDs have a polarity just like diodes (they *are* diodes, light emitting ones) and must be installed correctly to work. The diagram below shows the anode (positive) and cathode (negative) pins of an LED. Your PC board is marked with a little diode symbol that looks like a triangle. The longer anode lead goes toward the large flat end of the triangle and the shorter cathode lead goes toward the point. On D5 and D6 the

cathode goes directly to the ground plane on the board so it's easy to see the orientation. You'll want to leave the leads as long as possible so that the LED can be bent over to poke through the front panel of your kit case.

❒ 74. Take the small piece of heat shrink tubing and cut it in half. Take one half of the tubing and place it over the longer anode lead of the green LED, D5. Place the LED with the longer, shielded lead toward the outer edge of the PC board. Bend the leads slightly on the backside of the board to hold the part in place and solder it in.

❒ 75. Take the leftover piece of heat shrink tubing and place it over the longer lead of one of the red LEDs. This one will be D6. Again, leave the leads long, make sure the tubed lead is facing the front edge of the PC board and solder the LED in place.

❒ 76. Install D4, the last LED and the last part in your kit. This time the longer anode lead should be placed in the hole closest to R15. Again, leave the leads long and solder it in place.

CONGRATULATIONS !

Wow, doing great! Your Phone Patch Mixer kit is now complete! Have a final look over your work, paying particular attention to the orientation of diodes, capacitors, and IC's. Carefully inspect the circuit board for stray leads or open solder connections, then trim and touch up any that need work. Remember that any problems you find now can save time and effort after the unit has been cased up and final assembled.

TESTING YOUR PPM3

Now it's time to see all your hard work pay off. Here's what you'll need to test and use your PPM3

- An 8 to 15 volt DC power supply, positive tip
- CD player or other device to provide a line level audio input to the PPM3
- A stereo or other device that has line level inputs
- A microphone
- A telephone with phone line attached
- A length of standard phone line cable
- An RCA cable to connect your line level audio source to the PPM3
- An RCA cable to connect the output of the PPM3 to your stereo or other line level device for testing and eventually for connecting to your transmitter.

We assume that you've carefully checked over your construction before connecting power and energizing the circuit. Yes, we warned you! If you run into problems at any point, move straight to the troubleshooting section.

❒ 1. Turn all volume pots (R12, R2, and R15) to minimum (counterclockwise)

❒ 2. Connect your 8 to 15 volt DC power source to J4

❒ 3. Turn on your PPM3; the green power LED should light

❒ 4. Connect your RCA cable from the line level source to the dual RCA jack labeled "Input" on the back of the PPM3

❒ 5. Connect your RCA cable from the dual RCA labeled "Output" on the PPM3 to your stereo or other audio device with a line level input. This will be used to test the audio section of the PPM3. Later you'll disconnect the stereo and use the output from the PPM3 as the line level stereo audio source for your transmitter.

❒ 6. Make sure your line level audio source is operating and you have a suitable level of audio going to the PPM3. With the PPM3 turned on and the volume on the stereo at a comfortable listening level, slowly turn R2 clockwise to increase the volume on the PPM3 until you can hear the audio coming through. You should be able to vary the audio level with R2 and also see the "Clip" LED light with peaks in the music.

❒ 7. Next connect your microphone to the "Microphone Input" on the PPM3. Now push the "Mic" button; the red LED should light. Speak into the microphone and vary the volume using the "Mic Volume" knob.

❒ 8. Plug your phone line from the wall jack into the “Telephone Input” on the back of the PPM3.

❒ 9. In order to control a phone line you need to connect a phone to the “Telephone Output” of the PPM3. If you lift the receiver on the phone you should be able to hear the dial tone through the unit. In order to test the unit properly you’ll have to have someone call you. You should be able to hear both side of the conversation and adjust your levels until they’re where you want them.

❒ 10. Once you know that the system works you’ll simply need to plug the line level output from the PPM3 to the line level input on your transmitter. Have another friend call you (assuming you have more than one friend) or bug the same friend and see how it sounds on the air.

USING THE PPM3

Now that you know that your PPM3 is fully operational you can begin using it. When broadcasting a phone conversation you’ll need to speak into the phone’s handset in order for the person on the other end of the line to hear you; the audio mix on the Line Out from the PPM3 does not get fed back into the phone line. (this is not a “full hybrid” phone interface and that’s why it doesn’t cost hundreds of dollars!) When you return to your normal programming you can speak into the mic like a typical DJ. A speakerphone may be the best option for use with the PPM3, allowing you to continue using the higher quality microphone audio for the “over-the-air” signal but still allow the person on the other end of the phone to hear you. This solution may be very cost effective for those users who want a full hybrid system but don’t want to spend hundreds of dollars.

You can take the line level output from your transmitter (the loop output on an FM25B or FM100B) and, as you did when initially testing the kit, connect it to the line level input on a stereo or other device so that you can hear what’s being broadcast. Be careful not to have the audio too loud so that it doesn’t get picked up by the mic and sent out over-the-air.

NOTE: An important thing to do when you’re finished with your phone call is to press the Phone Mute button to turn off the phone line section of your kit. If you forget to do this and your caller is still on the line anything they say will go directly to your transmitter and be broadcast. Also, if the phone rings the sound will go out over the air. Get in the habit of pressing the Phone Mute button after each phone call.

TROUBLESHOOTING GUIDE

If your PPM3 does not work at all, recheck the following:

- correct orientation of VR1 and the ICs (see PC board layout diagram).
- You should be able to measure the voltage on the input and output terminals of voltage regulator VR1. The input should be whatever the supply voltage is specified at, while the output should be 5 VDC +/- 5%.
- correct polarity of all electrolytic capacitors.
- correct orientation of diodes
- all solder connections

STILL HAVING TROUBLE?

While we had hoped that it wouldn't come to this, if you are still having trouble with your Phone Patch Mixer, here are a few additional suggestions.

Use a methodical, logical troubleshooting technique. Most problems can be solved using common sense. A volt-ohm meter and a clear head are usually all that are needed to correct any problem. Most problems are due to misplaced parts and/or bad solder connections. Working backwards through the assembly steps will often lead you to the problem. Revisit the extensive theory of operation included in this manual and try to apply it to your specific problem.

Have another set of eyes look through your work. Here at the shop we have often run into a "stone wall" of a problem only to have a fellow technician see our obvious error. It is sometimes very difficult to see your own mistake; taking a break can often solve this common problem.

Make sure that you have "checked" all the assembly steps boxes; you may have forgotten one or two of them.

PROBLEM: I get no audio when doing the initial test of the audio section.

SOLUTION: Check the volume level on your source to be sure it's up loud enough for you to hear. Next check your stereo or other device to be sure it's on, that it's set for the input you've connected to it (AUX or other . . . whatever an external source is on your particular stereo) and make sure the volume is loud enough. Another thing to check is that the volume pot, R2, is turned up enough for you to hear the output from the PPM3. You should always use

known good cables between the stereo, line level source, and PPM3. Try switching cables or using a different cable if you're having audio trouble.

PROBLEM: The microphone doesn't work.

SOLUTION: Test the microphone with another unit to be sure it works on its own. Make sure it's plugged solidly into the jack on the PPM3 and be sure that the "Mic Mute" button is pressed.

PROBLEM: One or more of my LEDs are not lighting.

SOLUTION: First of all, check to be sure you've got the LEDs installed correctly. Each LED has a flat side that corresponds to the negative or cathode lead of the part. Read back in the assembly instructions and make sure that the flat side and negative lead are placed correctly. If the power-on LED is not working make sure you have a good input voltage source and that it is plugged securely into the power jack on the PPM3. Ok, it seems simple but make sure the power switch is pressed. If the "Mic Mute" LED is not lit, check to be sure that that switch is pressed. The same goes for the "Clip" LED; you must have the "Phone Mute" button pushed and there must be enough audio level to cause the "Clip" LED to light.

PROBLEM: I just can't make the &#^$^@! thing work!

SOLUTION: Call Ramsey Support at 1-585-924-4560 or look at the warranty in this manual. We are here to help and reduce your frustration as much as possible. It is usually something simple. Have your board revision handy to help our technicians find the proper schematic for your needs. You can email our tech support as well at the ramseykits.com website. Oh, please count to ten before calling, taking some deep breaths first...

PPM3 PHONE PATCH MIXER SPECIFICATIONS

Here are few of the commonly requested specifications for the PPM3:

J4 Power Input

- Input working voltage range: 8 - 15 VDC
- Max current draw is between - mA.

Miscellaneous Information

- PCB Dimensions: 4.7" L x 4" W (max component height: ")
- Max. mic voltage gain 316 (50dB)
- Max. phone line voltage gain 18 (25dB)

CONCLUSION

We sincerely hope that you enjoy the use of this Ramsey product. As always, we have tried to compose our manual in the easiest, most user-friendly format that is possible. As our customers, we value your opinions, comments, and additions that you would like to see in future publications. Please submit comments or ideas to:

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

Please also feel free to visit our Website at www.ramseykits.com and offer your observations to other kit enthusiasts as well.

And once again, thanks from the folks here at Ramsey!

The Ramsey Kit Warranty

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

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

1. DEFECTIVE PARTS: It's always easy to blame a part for a problem in your kit, Before you conclude that a part may be bad, thoroughly check your work. Today's semiconductors and passive components have reached incredibly high reliability levels, and 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 hour labor) of $49.00, 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 $49.00 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.

PPM3 REMOTE INTERFACE KIT
Quick Reference Page Guide

REQUIRED TOOLS

- Soldering Iron Ramsey #RTS06
- Thin Rosin Core Solder Ramsey #RTS12
- Needle Nose Pliers Ramsey #RTS05
- Small Diagonal Cutters Ramsey #RTS04

ADDITIONAL SUGGESTED ITEMS

- Soldering Iron Holder/Cleaner (RS64-2078)
- Holder for PC Board/Parts Ramsey #RTS13,
- Desoldering Braid Ramsey #RTS08

ESTIMATED ASSEMBLY TIME

Beginner.....2 hrs
Intermediate.....1.25 hrs
Advanced .....0.75 hrs

Price: $5.00
Ramsey Publication No. MPPM3

Assembly and Instruction manual for:
RAMSEY MODEL NO. PPM3

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