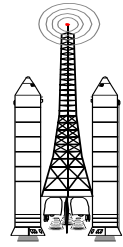


POWER BOOSTER AMPLIFIER

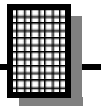


Ramsey Electronics Model No.

LPA1

Looking to boost the output of a small transmitter or signal generator? Look no further. Our general purpose broadband power amplifier is ideal for the test bench as well as any ham radio applications. Get up to 1 watt RF power output!

- **State of the art “MMIC” amplifier technology ensures great quality amplification.**
- **The perfect lab amplifier for any lab bench! Excellent bandwidth and gain characteristics make the LPA1 a useful tool for amateurs and professionals alike.**
- **Boost almost any low power transmitter, up to 10mW maximum input, from 300Khz to 1Ghz with up to one watt of power.**
- **Specially engineered PC board makes building a snap!**
- **No maintenance operation makes the LPA1 perfect for hassle free operation.**
- **Amplification at up to 7,000 times the input power at 10Mhz!**
- **Perfect for boosting your QRP transmitter. Works on all bands from 160 meters to the 1Ghz band!**



RAMSEY TRANSMITTER KITS

- FM100B Professional FM Stereo Transmitter
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RAMSEY RECEIVER KITS

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- HR Series HF All Mode Receivers
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- QRP Power Amplifiers

RAMSEY MINI-KITS

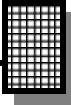
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LPA1 POWER BOOSTER AMPLIFIER KIT INSTRUCTION MANUAL

Ramsey Electronics publication No. MLPA1 Revision 1.7a

First printing: April 2003





KIT ASSEMBLY AND INSTRUCTION MANUAL FOR

LPA1 POWER BOOSTER AMPLIFIER

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RAMSEY ELECTRONICS, INC.
590 Fishers Station Drive
Victor, New York 14564
Phone (585) 924-4560
Fax (585) 924-4555

Welcome to the LPA Power Booster Amplifier

Thank you for purchasing the LPA1 Power Booster Amplifier. The LPA -1 is a state of the art amplifier for almost any low power transmitter. With a frequency range from 100Khz to almost 1Ghz, it is no wonder that it is so versatile. And with an incredible gain of up to 38.5dB (7079 times the input power) at 10 Mhz, you can finally be heard over all of the noise and interference on many bands. For very low power ham radio QRP equipment, VCR “rabbits,” and virtually anything else that you can hook it to, you will notice a big difference in the signal distance and clarity. A gain of 38.5dB means that only 125 micro watts will get you 1 watt of crystal clear power!

You'll notice that the PC board included with your kit contains plating on both sides of the board. This topside ground “plane” is necessary to create the proper RF impedance in the traces run on the bottom side of the board. We have also used the latest in trouble free amplifiers, the Mini Circuits MAV3 IC, to provide crystal clear linear amplification.

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 are to follow each step in the manual in order, and practice good soldering and kit building skills, the kit is next to fail-safe.

Circuit description

Your Power Booster Amplifier consists of a simple circuit in terms of components. Since the kit operates at frequencies as high as 1Ghz, your board has been specially engineered for proper impedance matching. As signals go up in frequency, they behave very differently than you might expect. Without a properly designed board, the signal may actually begin to reflect throughout the circuit. These reflections may cause a substantial loss of gain in the circuit. To help eliminate this effect, your board has been designed using a process called micro-strip design. This feature is what allows you to get relatively high gain from your LPA1 at very high frequencies. Throughout the construction of this kit, it is extremely important to make sure that all leads on components are kept as short as possible. If you do not make an attempt to make the leads as short as possible, you may not find the output power or gain as we have designed it.

The main components of the circuit are the RF amplifier and Q2, an MRF581 power transistor. The MAV3 is a state of the art amplifier specially designed to work in a wide range of radio frequencies. The MAV3 amplifies the signal, but does not have the power output capabilities to push out such high power. For this reason, Q2 is placed in the circuit. Q2 amplifies the signal a bit more, and is capable of generating a large amount of power out of the circuit.

There are three other parts of this circuit. One simply turns on and supplies power to the circuit. The second, supplies power to the MAV3 amplifier. The third biases Q2 for proper operation.

Ramsey “Learn-as-you-build” Power Booster Assembly Strategy

Since the LPA1 runs at very high frequencies, it is extremely important that you follow the instructions provided. Incorrectly installed components, excessively long component leads, and bad solder joints may mean that your kit won't work. For reasons like this it is advisable to follow the step-by-step instructions in the manual and not jump ahead.

Be sure to read through all of the steps, and check the boxes as you go along to be sure that you didn't miss any important steps. Before you switch on the power in a hurry to see results, check all transistors, the MAV3 amplifier, D1 and C3 for proper orientation. Also check the board for any possible solder shorts, or cold solder joints. All of these mistakes could have detrimental effects on your kit - not to mention your ego!

Throughout the construction of the kit, we will try to explain the various components and their function in the circuit. Who ever said that you can't learn something while you are having fun? If your kit has problems, we have also included a step by step troubleshooting section to guide you through them. Please remember that most problems occur out of bad soldering technique and improperly placed components. A clear head and a meter are all that you probably need to solve the problem. Since it is virtually impossible for our technicians to “troubleshoot” step by step over the phone, please follow the troubleshooting guide provided in your manual.

Kit building tips:

Use a good soldering technique - let your soldering iron tip gently heat both the wires and pads simultaneously. Apply the solder to the wire 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. If the pads have not heated up sufficiently, melted solder (heated by the iron itself) will form a cold solder joint and will not conduct. These appear to be dull beads of solder, and can be fixed easily by applying heat to the pad and wire. Mount all parts on the top side of the board. This is the side with no traces or pads.

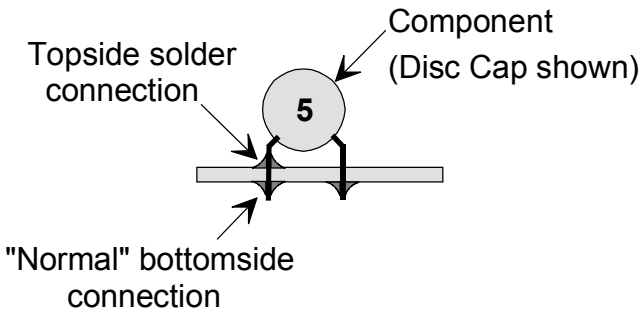
Part installation - when parts are installed, the part is placed flat to the board, and the leads are bent on the backside of the board to prevent the part from falling out before soldering. The part is then soldered securely to the board, and the remaining lead length is clipped off. Please keep in mind that it is extremely vital to place the parts as close to the board as possible. This is necessary for proper operation over the wide frequency range of the amplifier.

Double sided component soldering instructions:

You'll notice that the circuit board contains plating on both sides of the board, with a large ground "plane" area on the component side of the circuit board. In order to electrically connect this topside ground plane to the bottom side ground connections, it will be necessary to solder some connections on both the top and bottom sides of the circuit board.

These topside connections will be clearly pointed out when necessary in the assembly instructions. When so instructed, be sure the solder "flows" around the topside connection, as shown. When installing a disc capacitor, be sure to scrape away any insulating material which may be coated on the lead near the components' body. Also, be aware that for every part that you solder on the top side of the board, there should also be a connection on the bottom side for that same lead.

Another important consideration when building high frequency RF circuits is to keep the component lead lengths as short as mechanically possible to keep the components close to the PC board. This will avoid adding stray capacitance or inductance into the circuit.



RAMSEY LPA1 Power Booster Amplifier Parts List

SEMICONDUCTORS

- 1 MAR3 RF amplifier [Small, black, round on one side] (U1)
- 1 PNP transistor [marked 221334] (Q1)
- 1 MRF581 NPN power transistor [Small, black, round and marked "581"] (Q2)
- 1 Red LED (D1)

CAPACITORS

- 8 .01uF disc capacitor [marked .01 or 103 or 10nF] (C1,2,4,5,6,7,8,9)
- 1 10uF electrolytic (C3)

INDUCTORS

- 1 VK200 inductor [black ferrite core and bare wire to wind through it] (L1)
- 1 5.6uH inductor [resembles a resistor marked green-blue-gold-yellow] (L2)

RESISTORS

- 1 6.8 ohm resistor [blue-grey-gold] (R2)
- 4 1K ohm resistor [brown-black-red] (R1,5,6,7)
- 1 150 ohm resistor [brown-green-brown] (R4)
- 1 10K ohm resistor [brown-black-orange] (R3)
- 1 220 ohm resistor [red-red-brown] (R8)

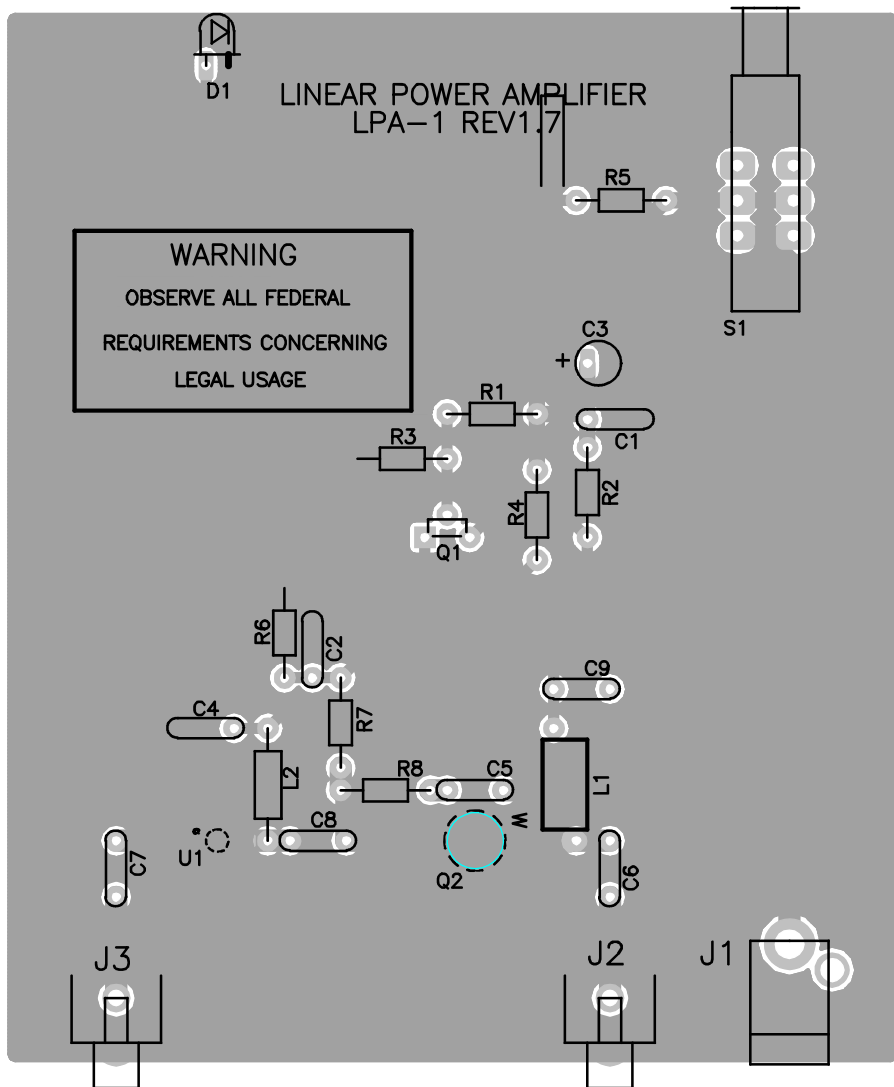
MISCELLANEOUS

- 1 Power jack (J1)
- 2 RCA jacks (J2,3)
- 1 PB switch (S1)

REQUIRED, NOT SUPPLIED

- Power source, 12 VDC
- Enclosure, Ramsey CLPA or equal
- Transmitter (You know, the thing that you want to amplify!)
- Receiver (You know, the thing that you want to use to hear what you amplify!)

LPA1 PARTS LAYOUT DIAGRAM



Feedback Circuit:

Your Ramsey LPA1 Power Booster Amplifier has been designed to give you great amplification over a wide range of frequencies. Included in the design of the circuit is a feedback loop consisting of the parts R8 and C5. You must decide whether or not to include the feedback circuit into your kit.

According to the table below, with the feedback circuit in place, you may experience a lower gain at frequencies up to 500Mhz. However, you will note that this gain is relatively steady over this range. The loop also provides slightly higher gain above 500Mhz. Please consider carefully which frequency you are using and how much gain you require from the circuit. Installing the feedback circuit has proven to add more circuit stability and immunity to spurious signals. If you are experiencing difficulty with spurious signals, it is a good idea to install the feedback circuit.

A good rule of thumb is to complete the circuit including the feedback circuit. If you need more gain at lower frequencies, you are then able to remove the feedback components.

Amplifier gain vs. frequency

Frequency (Mhz)	Gain (dB) w/o feedback	Gain w/o feedback	Gain (dB) w/ feedback	Gain w/ feedback
10	36.4	4365	30	1000
50	35.7	3715	29.6	912
100	34.4	2754	28.9	776
200	30.6	1148	28.7	741
300	26.8	479	27	501
400	24.2	263	25.5	355
500	22	158	23.9	245
600	20.3	107	22.3	170
700	17.4	55	18.6	72
800	15.7	37	16.6	46
900	16.5	45	16.9	49
1000	16	40	16.4	44

Now we will begin building our kit. There are just a few more things to know before we put the first components in.

For each part, our word “Install” always means these steps.

- 1 Pick the correct value to start with.
- 2 Insert it into the correct PC board location.
- 3 Orient it correctly, following 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. (Electrolytic capacitor polarity, transistor shapes, dotted and notched ends of parts, and so forth.)
- 4 Solder all connections unless directed otherwise. Use enough heat and solder flow for clean, shiny, completed connections.

Please take us seriously when we say that good soldering is essential to the proper operation of your amplifier!

- Use a 25 Watt soldering pencil with a clean, sharp tip.
- Use only rosin core solder intended for electronics use.
- Use bright lighting, a magnifying lamp or bench-style magnifier may be helpful.
- Do your work in stages, taking breaks to check your work. Brush away any wire cuttings so that they don’t lodge between solder connections.

Since you may appreciate some “warm-up” soldering practice as well as a chance to put some “landmarks” on the PC board, we’ll first install some “hardware” components. This will also help us to get acquainted with the up - down, left - right orientation of the circuit board.

1. Install J2, the output RCA jack. Mount it flush with the board, making sure that it is sitting on the “component side.” The component side is the side that is almost completely covered with copper. The bottom side, or foil side, is the one with traces on it. Solder each lead to the bottom side of the board, making sure that the solder “flows” around all three connections.
2. Turn the board over to the top side and solder the connector mounting flange securely to the board. There is no need to use a ton of solder, but use enough to hold the connector firmly in place.
3. Install J3, the input RCA jack. Mount it the same way that you did the first one. Remember to solder the connections on the right and left sides to both the top and bottom sides of the board.

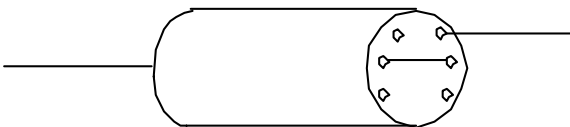
- ❑ 4. Install J1, the power jack. This is a black plastic jack. Solder the connection on the back of the jack to the bottom side of the board. Now, solder the other connection to both the bottom and the top sides.
- ❑ 5. Install S1, the main switch. The switch is black, with a white button coming out of it. Solder all six pins.

First we are going to install the power circuit. This circuit, containing R5, C3 and D1 light up the LED when the switch is on. After that, we will construct the part of the circuit that powers the MAR3.

- ❑ 6. Install R5, 1K ohm resistor [brown-black-red]. All resistors must be mounted flush with the board.
- ❑ 7. Install C3, 10uF electrolytic capacitor. C3 has “polarity.” Polarity means that the capacitor must be inserted a certain way. You may notice that on one side of the capacitor, there is a black stripe with minus signs. This is the negative end. Looking at the parts layout diagram, you will notice the positive side marked. When looking at the board from the front (switch and LED side) the black stripe should be to the left when properly installed. Capacitors allow AC waves to pass, while blocking off DC power. C3 filters off any noise in the power circuit into ground before it can affect the circuit.
- ❑ 8. Install D1, the LED. The flat edge (and the shorter leg) must face towards the switch. If the LED is backwards, it will not light.
- ❑ 9. Solder the topside connection of the LED leg closest to the switch. You have now completed the power circuit.
- ❑ 10. Install R4, 150 ohm resistor [brown-green-brown].
- ❑ 11. Install L2, 5.6uH inductor [green-blue-gold-yellow]. It will look like a large resistor. It does not have any polarity, so it can be mounted in any direction, and should be mounted as close to the board as you can. L2 is called a “choke,” and is used to prevent the RF signal from getting up into the rest of the circuit.
- ❑ 12. Install C4, .01 uF disc capacitor [marked .01 or 103 or 10nF]. In order to get the capacitor as close as possible to the board, take a pair of needle nose pliers or a sharp knife and scratch away or crack off the insulation on the legs of the capacitors. (Be careful not to break their legs off. Capacitors have feelings too!) Solder the connection closest to the outside of the board on both the top and bottom sides of the board.

Now that we have completed the power circuits, we will move on to the biasing circuit. This circuit holds the transistor output voltages in the desired range.

- ❑ 13. Install C1, .01uF capacitor [marked .01 or 103 or 10nF]. Make sure that you crack or peel off the insulation on the legs of the capacitor. Solder the topside connection closest to the outside of the board (towards the switch side) on both the top and bottom sides of the board. This capacitor is also known as a power bypass capacitor because it bypasses any RF energy to ground.
- ❑ 14. Install R1, 1K ohm resistor [brown-black-red].
- ❑ 15. Install R3, 10K ohm resistor [brown-black-orange]. Solder the lead closest to C2 on the top side as well as the bottom side. R1 and R3 hold a constant voltage on the base of Q1. This allows Q1 to act as a current source.
- ❑ 16. Install R2, 6.8 ohm resistor [blue-grey-gold].
- ❑ 17. Install R6, 1K ohm resistor [brown-black-red]. Solder the lead closest to the LED to the top side as well as the bottom side.
- ❑ 18. Find C2, .01uF capacitor [marked .01 or 103 or 10nF]. Take off the insulation on it's legs and install the part. Solder the leg closest to the LED to the top side of the board in addition to the bottom connections. Don't forget to take the insulation off of the legs. C2 keeps any RF energy from affecting the bias voltage on Q2.
- ❑ 19. Install R7, 1K ohm resistor [brown-black-red].
- ❑ 20. Install Q1, PNP transistor [marked 221334]. You will notice that the transistor has a flat side with no writing on it. This side must face away from the RCA jacks.
- ❑ 21. Insert L1, VK200 inductor. Look for a ferrite bead with 6 holes and a piece of bare wire that you will need to "lace" through the holes as shown. Pass 1 1/2 turns through the holes, filling three holes and leaving a lead coming out at each end. Trim the ends to 1/4" and bend as needed for neat installation. Solder it so that it is laying flush with the board.

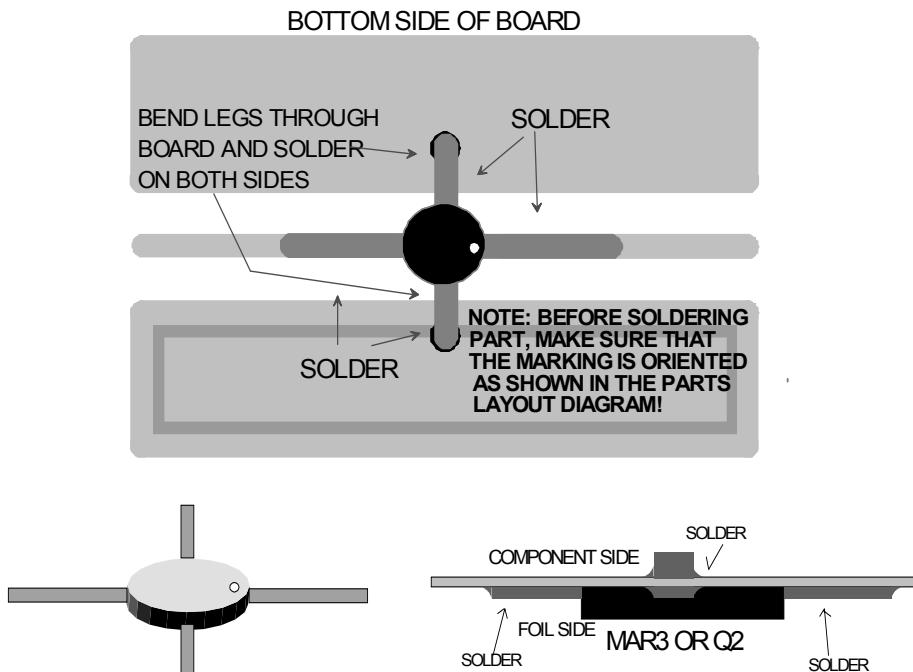


- 22. Install C9, .01uF capacitor [marked .01 or 103 or 10nF]. The insulation should be stripped from the legs and a topside connection made nearest the edge of the board.

Now that you have installed the biasing circuit, we have only a few more parts to put in before we install the amplifiers. This is a good time to look back over your work and look for misplaced parts and bad solder joints. You should take a rest now if you need one.

Take a look at the table on page 10. This table shows the gain of your Power Booster Amplifier at certain frequencies. The higher the gain, the more power your kit will put out with the same input signal. Using the table to aid you, decide whether or not you would like to insert the feedback circuit (R8 and C5). As a default, you should install R8 and C5.

- 23. If you have decided to include the feedback circuit, install R8 now. R8 is a 220 ohm resistor [red-red-brown].
- 24. Install C5 only if you have decided to include the feedback circuit. C5 is a .01uF capacitor [marked .01 or 103]. Be sure to take the insulation off of the legs first.
- 25. Install C7, .01 uF capacitor [marked .01 or 103 or 10nF]. Strip the insulation off of the legs before installing.
- 26. Install C8, .01 uF capacitor [marked .01 or 103 or 10nF]. Strip the insulation off of the legs.
- 27. Install C6, .01uF capacitor [marked .01 or 103 or 10nF]. Do you really need to strip the insulation off of the legs? YES!
- 28. Identify Q2, an MRF581 NPN Power Transistor. This part is round, has four legs coming off of it and is marked "581". You may notice that there are two parts matching this description. Q2 is the larger of the two parts, and the other, the MAR3 Amplifier, is smaller and has a "3" printed on it.
- 29. Turn over the board, so that the soldered side is up. You should see a small "M" near one lead of the transistor. This "M" should be near the lead closest to L1. If there are two "M" s on the part, orient the part using the Motorola trademark "M". Taking the two leads on either side of the lead nearest the Motorola "M," insert them through the two holes in the board. These two leads both go to ground. Check to see that the "M" is still closest to L1. Solder the two leads on the top and bottom sides of the board.
- 30. With the two remaining leads flat against the underside of the board,



solder them directly onto the board. All four leads should now be connected. Again, make sure that the small “M” is closest to L1. This is very important.

- ❑ 31. Find U1, the MAR3 amplifier. This looks like Q2, which you have just installed, but is a bit smaller and has a dot printed on it. The leg nearest this dot should be towards the outside of the board (or towards C7). Insert the two legs on each side of the dot into the board, mounting the part on the underside of the board.
- ❑ 32. Again, make sure that the leg nearest the dot is also nearest C7. If it is mounted properly, solder the two remaining legs flat on the underside of the board.

Congratulations! You have just completed your LPA1 Power Booster Amplifier. Please take a few minutes to look over your kit and ensure that all of the parts have been assembled correctly. Since a few of the parts may be unfamiliar to you, you may want to be extra sure that they have been inserted correctly. Also, make sure that you have soldered all of the top side connections in the correct spots. If you soldered the wrong connections, your project may not work. After you are sure that everything seems to be properly installed, move on to the setup and testing section. You will need a 12 volt supply, your transmitter, and a receiver.

Setup and testing

Now you are ready to set up and test your amplifier. Follow the steps below. If you have any problems, refer to our troubleshooting section.

- 1. Plug your kit into a 12V power source with the switch on your LPA1 turned off (click it until it is in the “out” position). You should not see the LED light up.
- 2. Turn on the switch. The LED should light up and stay on.
- 3. Turn on a (preferably portable) receiver to the same frequency as the transmitter. You may need to transmit to make sure that the two units are working properly.
- 4. Plug the output of your transmitter into J3, the input jack. Plug your antenna cable into J2, the output jack. Turn on the switch again. You should be able to receive the transmitted signal. You are probably too close to notice any increased power difference, so you may want to move the receiver away from the transmitter and try to see how far it will transmit. With such great amplification, the LPA1 should increase your transmitting distance several times, and you may find yourself going far away from your house!

That’s all that you need to do to test it out. You may now use your LPA1 for it’s intended purpose. You do not need to do anything else to use it because you have just set it up during testing.

Troubleshooting

PROBLEM: The LED does not light when I turn it on.

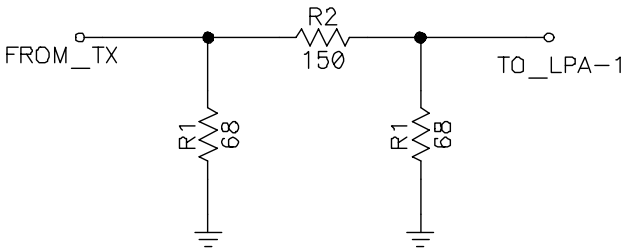
SOLUTION: Even if the LED doesn’t work, your amplifier may. First measure the voltage on the leg or R5 closest to the switch. If it does not measure near 12V, you have a problem with the power supply, power jack or the switch is not on. You may also have soldered a topside connection where you shouldn’t have. Check to be sure that D1 is installed the correct way (flat side towards switch).

PROBLEM: The LED comes on, but the amplifier is not working.

SOLUTION: Make sure that the MAV3 and Q2 are installed properly. The dot on the MAV3 should point towards C8. The “M” on Q2 should point towards C6. Next, check the placement and orientation of all parts. You may also have incorrectly soldered a topside connection where you shouldn’t have. A good place to check would be the topside connections of the jacks themselves.

PROBLEM: The amplified signal is distorted.

SOLUTION: Make sure that all of the component leads are as short as possible. Leaving the leads longer than necessary leaves you open for noise. You should also check the gain. You may be overdriving the amplifier. Try lowering the input power or installing the feedback circuit. The amplifier will only be able to deliver a watt of power, so any more will cause your signal to distort. If the gain is still too high, you can install an attenuating circuit like shown. The circuit is installed in series between the transmitter and the amplifier. Tables of resistor values can be found in various sources including the ARRL Handbook, an annual publication of the ARRL.



16dB attenuator (Source: ARRL Handbook)

Due to the fact that there are so many combinations of resistors in the above circuit, we regret that we cannot provide either resistor values or technical support. The ARRL handbook can be obtained by ordering direct from the ARRL, or may be found at your local Radio Shack.

Ordering Amplifier Parts:

For convenience, we offer the following parts **by mail request only**. Please do not call - complete and mail the order form. This saves you the small order fee and normal handling charge.

Component	Qty	Price (ea)	SubTotal
MAR 3 RF AMP		\$8.10	
MRF 581 NPN		\$8.85	
221334 PNP		\$.95	
Postage & Handling			\$ 1.00
TOTAL			

Conclusion

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

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

Thanks again, from the folks at Ramsey.

USAGE WARNING

Just as there is nothing illegal in owning a knife or using a prescription drug, there is nothing illegal in the owning or proper use of the LPA-1. However, just as a knife or drug may be abused, so may the LPA-1. It is your responsibility to use this amplifier legally and safely. We urge you to know and follow all guidelines governing usage of this device.

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 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.

LPA1 POWER BOOSTER AMPLIFIER Quick Reference Page Guide

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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. MLPA1

Assembly and Instruction manual for:

**RAMSEY MODEL NO. LPA1
POWER BOOSTER AMPLIFIER**

TOTAL SOLDER POINTS

74

ESTIMATED ASSEMBLY TIME

Beginner..... 2.3 hrs
Intermediate..... 1.3 hrs
Advanced 1.0 hrs



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