

The PZM Modification Kit

The PZM Modification kit is a small kit of parts to help home constructors modify their microphones. The original concept was just a bag of parts with a schematic and an assembly drawing. Perhaps this deterred some constructors, but after spending the time and effort redesigning the board, it seemed warranted including more detailed instructions. Those “skilled in the art” may proceed without further assistance. The kit comprises: the circuit board, these instructions, the schematic, and all electronic parts needed to finish the circuit board. There’s even some small-diameter solder included as some of the circuit board pads are teeny-tiny indeed¹. The microphone is NOT included. Unlike a Heathkit, this kit does not include an enclosure, hardware, or connectors.

If you’ve ever done any sort of electronic assembly, and you know how to solder on a printed circuit board, you should have no trouble assembling this. You should have a temperature controlled soldering iron that can be set to 600-700 degrees F, with a small chisel tip. No soldering guns, please. Flush cutters are nice for lead trimming, but diagonal cutters will do.

Soldering

With any circuit, proper soldering is essential. It’s not difficult, but this kit is not recommended for a first soldering project. A length of suitable solder is included with the kit. You’ll need the following soldering equipment:

1. Temperature controlled soldering iron with a suitably small tip capable of being adjusted to a tip temperature between 600-700 degrees Fahrenheit.
2. 63/37 alloy rosin-core solder, .031” diameter. 60/40 alloy is acceptable. (63/37 supplied, see footnote)

Desoldering

If you goof, be very careful when desoldering. Each hole has plating that connects the top layer with the bottom layer. If you’re not careful, you’ll pull the plating out when you remove the part. If this happens, be sure to solder the part on both sides of the board. The very best tool for this sort of work is a vacuum powered solder sucker. In 2nd and 3rd place are the hand operated desoldering pumps and solder wick.

- The best thing you can do is to be double damn sure before you solder, so you don’t have to desolder.
- If you have to desolder a resistor, put the board in a vise, grab the lead with a pair of long nose pliers, apply tension, heat the joint from the other side of the board. Once the solder melts, the lead should pull free. Repeat for the other end of the part.
- Anything with more than 2 leads can be very difficult.
- Consider sacrificing the part (cut the body off) so you can remove the leads one at a time.
- Once you get the part clear of the hole, you can clear the hole with a round toothpick, or something straight and pointy that doesn’t take solder, like a dental pick.

It may be easier to mount the board in a vise, grasp the lead with a pair of pliers, heat the connection while pulling on the pliers. Afterwards use something like a dental pick or the desoldering pump to remove the solder from the hole. If you don’t have a vacuum powered solder sucker, the safest method is to cut the part in two (or cut the leads at the part body), and then work from the component side of the board. For radial leaded components, like the capacitors, this may not be possible.

Replacement Parts

If you need a replacement part for any reason, Uneeda Audio will replace up to 6 parts at no charge. There are limits to our generosity, and you are advised to not test them². The LM394 is \$12. Circuit board damage is not included in this offer..

Best, of course, is to not goof in the first place!

PZM Cable Length

The output of the PZM plate is moderate impedance (under 10k-ohms). It is unbalanced, but since one end of the unbalanced line is floating out in free space, there is little likelihood of any current flow in the shield, which is usually why unbalanced wiring has trouble. The cable supplied by RS is fairly long, and you may want to shorten it, which is your privilege. All testing was performed with the cable cut about 12-inches shorter than it was supplied. The test lab is in a moderate RF environment, which is the biggest concern with leaving the cable at the factory supplied length. Should you choose to shorten it, consider leaving the cable long enough to reach the floor from the highest height that the microphone is likely to be operated from, 10-feet perhaps? The cable at the balanced low-impedance output can be nearly any length, several hundred feet should not be a problem.

¹ With the adoption of RoHS restrictions in EU countries, solder is not supplied with kits sent to RoHS countries .

² Offer can be withdrawn at a moment’s notice, at our whim and/or caprice.

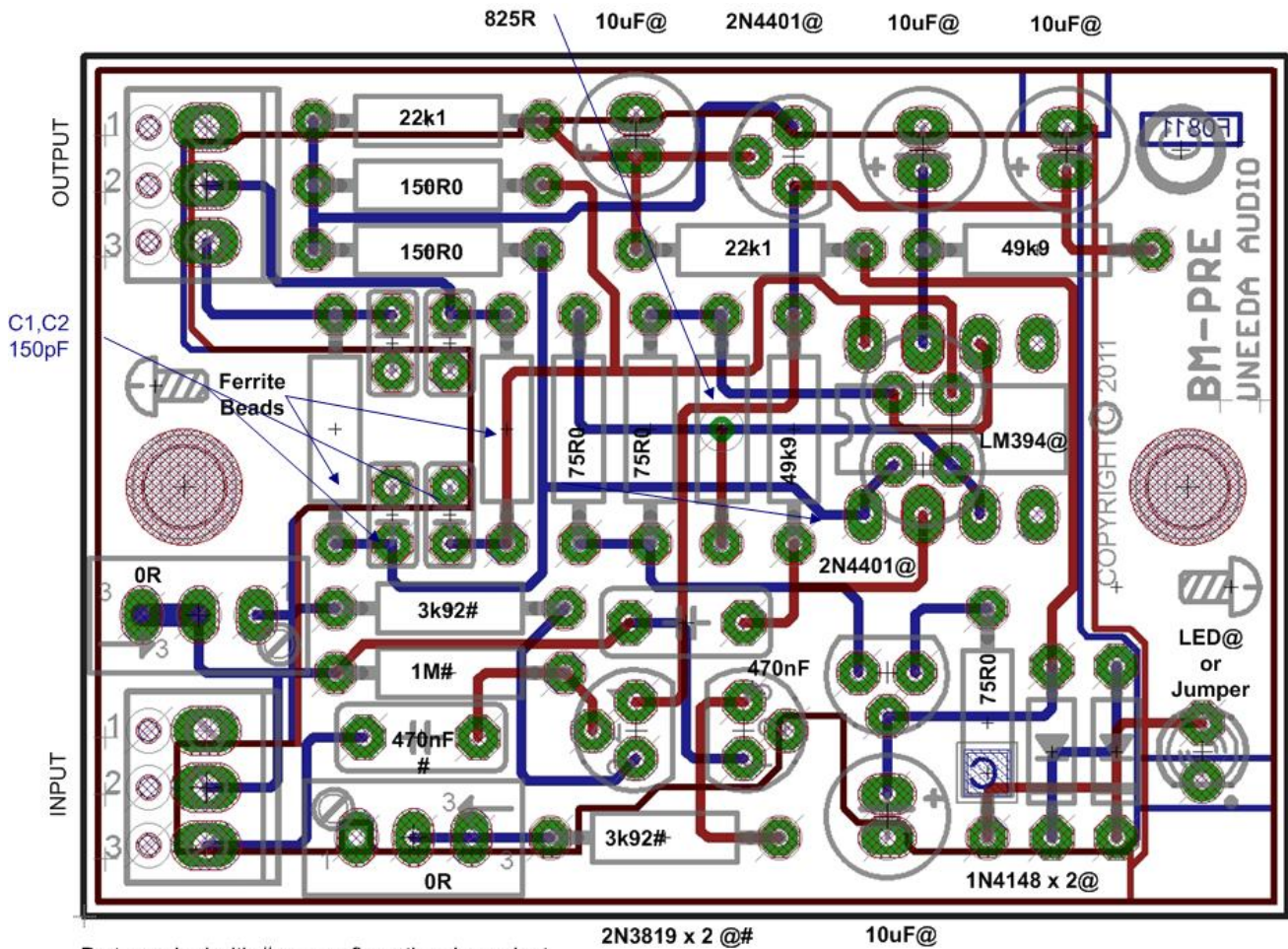
Parts Identification

There are many 1% resistors used in this design. Some are marked with the value, some are color coded, and some may not have any value markings at all. When in doubt, use an ohmmeter. I use the European convention of writing values without using a decimal point (which can get lost).

Unlike a 5% or 10% resistor, a 1% resistor has three digits as part of its value. The fourth digit is the multiplier. The colors used are the same as for other resistors, however the tolerance band is brown rather than gold or silver. If the resistor is marked with numbers, the first three digits are significant, the fourth is the multiplier. If the resistor is banded, then (again) the first three bands are significant and the fourth band is the multiplier. These resistors are all used.

Value	Marked
75R0, 75.0 ohms	75R, vio/grn/blk/gold
150R0, 150.0 ohms	1500, brn/grn/blk/blk
825R, 825 ohms	8250, gry/red/grn/blk
3k92, 3920 ohms, 3.92k	3921, org/wht/red/brn
22k1, 22100 ohms, 22.1k	2212, red/red/brn/red
49k9, 49900 ohms, 49.9k	4992, yel/wht/wht/red
1Meg, 1,000,000 ohms, 1M	1004, brn/blk/blk/yel

PCB Assembly Instructions

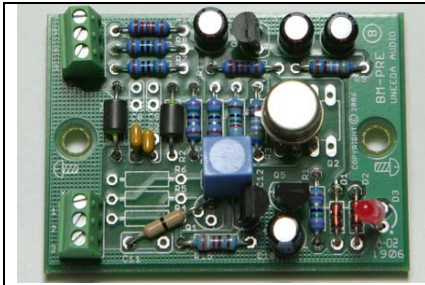


Parts marked with # are configuration dependent
 Parts marked with @ are polarity sensitive.

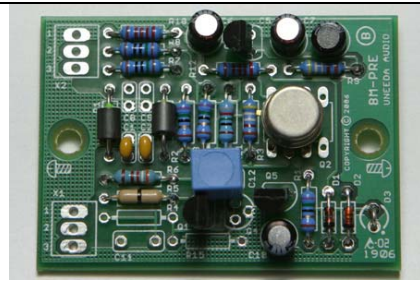
Parts List

Qty	Ref Des	Description	Remarks
1	R6, R15	Res, MF, 3k92, 1% <org/wht/red/brn>	Only one part used
2	R3, R9	Res, MF, 49k9, 1% <yel/wht/wht/red>	
1	R11	Res, MF, 825R, 1% <gry/red/grn/blk>	Gain set resistor
3	R13, R14, R16	Res, MF, 75R0, 1% <vio/grn/blk/gold>	
2	R7, R8	Res, MF, 150R, 1% <brn/grn/blk/blk>	
2	R10, R12	Res, MF, 22k1, 1% <red/red/brn/red>	
2	R4, R17	Trimpot, value TBD, not currently used.	Short pins 1 & 2
1	R5	Res, MF, 1M0, 1% <brn/blk/blk/yel>	Only one part used on PCB
1	R5, no design.	Jumper, 0-ohm (looks like a resistor, but with a single black band)	Config 1, 3
2	L1, L2	Bead, Ferrite, Taiyo Yuden FBA04VA450BA-00	PCB marked R1, R2
2	C11, C12	Cap, film, 470nF	
3	C5, C6, C7, C10	Cap, lytic, submini, 10uF, 35V	
2	C1, C2, C8, C9	Cap, cer, 120pf or 150pf	C8, C9 not stuffed
2	D1, D2	Diode, 1N914/1N4148	
2	Q1, Q2	Transistor, JFET, N-CH, 2N3819	10% match
3	Q3, Q5	Transistor, NPN, 2N4401	
0	R1, R2	This reference not used.	
0	Q4, Q6, Q7	This reference not used.	
1	Q8	Transistor, dual, supermatch, NPN, LM394	
1	D3	Red Led or jumper. If no LED, then stuff jumper.	Not supplied.
1	PCB	Printed Circuit Board	

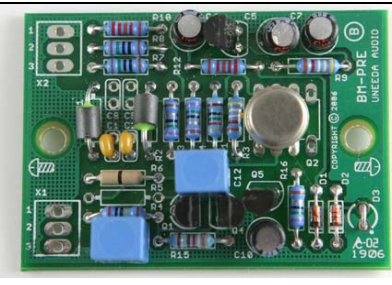
Note: Drawings showing the reference designators can be found at the end of this document.



**Completed Config 1 Board.
(Note LED)**



**Completed Config 2 Board.
(Note jumper instead of LED)**



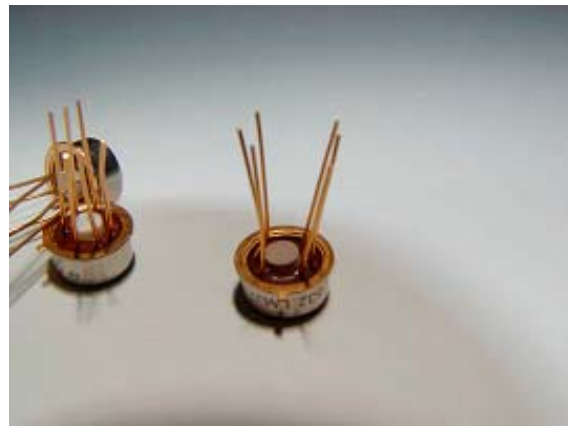
Completed Config 3 Board

Note: Configuration specific assembly drawings can be found at the end of this document. The boards shown in the pictures are revision B. Refer to the configuration drawings at the end of this document. Appendix B describes the different microphone models and their configuration requirements. Parts supplied may look different from those shown in the above pictures.

Basic Board Assembly

The basic idea behind the sequence used is component height. That way, when you flip the board over to solder, gravity will help you pin the components against the board. All three configurations of the board require stuffing the following components.

1. Stuff the two diodes, D1 and D2. Mind their polarity. (the color bands correspond to the bar in the symbol)
2. Stuff these resistors:
R3, R9: 49k9, yel/wht/wht/red
R11: 825R, gry/red/grn/blk
R13, R14, R16: 75R0, vio/grn/blk/gold
R7, R8: 150R, brn/grn/blk/blk
R10, R12: 22k1, red/red/brn/red
3. Flip the board over and solder all the resistor leads and trim the excess wire from each connection.
4. R1 and R2 are ferrite beads. Stuff, solder, trim.
5. **R4, R17 need to be bypassed. Take a piece of resistor lead, bend it into a U and insert between pins 1 and 2 of each part. Solder and trim.**
6. Stuff C1, C2 (120pf ceramic). Solder and trim.
7. Stuff C5, C6, C7, C10 (10uF, electrolytic). Don't force them flush with the board. Observe polarity. Solder and trim.
8. Stuff and solder C12 (470nF, film).
9. D3, a red LED, is optional. It serves as a pilot light. The LED is polarity sensitive. The two wires are unequal length. When you insert the LED, orient it so the longer lead is in the hole nearest the mounting hole for the circuit board. **If you don't stuff it, you must connect the two holes with a piece of wire. If you get it backwards, the circuit won't work, and the LED won't illuminate.**
10. Stuff transistors Q3, and Q5 (2N4401). Pay attention to the orientation of each transistor. Q2, the LM394 may be packaged in an 8-pin DIP or in an 8-pin metal can. The metal can package has pins 1 and 6 aligned with the metal tab, and the leads are numbered clockwise from pin 1. The metal tab aligns with the orientation slot of the IC pattern. Use the eight pads that are arranged in two rows of four. Three leads insert into the first three holes of the IC pattern and the remaining three leads insert into the holes on the opposite side of the pattern. Pins 4 and 5 remain empty. Solder and trim the transistor leads. Refer to the pictures of the PCB.
 - a. **Note:** Pins 4 and 5 are not used with the metal can package. The RoHS compliant LM394 is no longer available.



LM394 details: Note the metal tab. There are two rows of leads on each side of the tab.

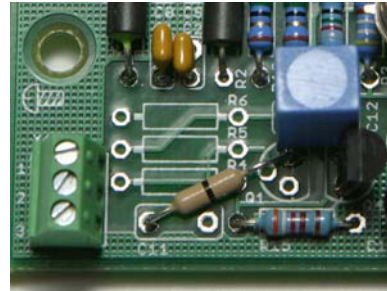
Configurations

Refer to the assembly drawings on pages 13 and 14. The photos shown here are for the revision B board. They are close, but not quite the same as the revision C board.

For use with RS 33-1080 and 33-1090 (config 1)

1. Stuff and solder a zero-ohm jumper (looks like a resistor, but has a single black band) between the drain connection of Q1 to the C11 pad nearest the input connections. Circuit-wise this connects the output of Q4 to terminal 1 of the input.
2. Stuff Q4 (2N3819) and R15 (3k92, org/wht/red/brn). Solder and trim.
3. Snip the wire between the battery box and the microphone. Toss the battery box. Cut the wire near the battery box end.
4. Strip the cable coming from the microphone. Connect the shield to X1-3, connect the inner conductor to X1-2. **Note:** X1-3 is **not** grounded.
5. Wire the input/output connectors as follows:

X1-1 - NC	X2-1 - XLR pin 1 + case
X1-2 - Hot/Signal	X2-2 - XLR pin 2
X1-3 - Shield	X2-3 - XLR pin 3

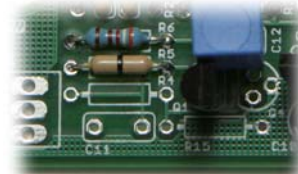


Stuffing detail for Config 1.
Photo shows rev b board.

For use with RS 33-3020 and 33-3022, or a generic electret capsule. (config 2)

1. Stuff Q1 and R6. Solder and trim.
2. Stuff and solder a zero-ohm jumper (looks like a resistor, but has a single black band) for R5.
3. Snip the wire between the battery box and the microphone. Toss the battery box. This step does not apply to the generic capsule.
4. Strip the cable coming from the microphone. For the 330-3022 model, snip the white wire and ignore it. Connect the shield to X1-1, connect the inner conductor to X1-2. For the generic capsule, the ground lead connects to X1-1 and the 'hot' lead connects to X1-2.
5. Wire the input/output connections as follows:

X1-1 - Shield	X2-1 - XLR pin 1 + case
X1-2 - Hot/Signal	X2-2 - XLR pin 3
X1-3 - NC	X2-3 - XLR pin 2



Stuffing detail for Config 2
Photo shows rev b board.

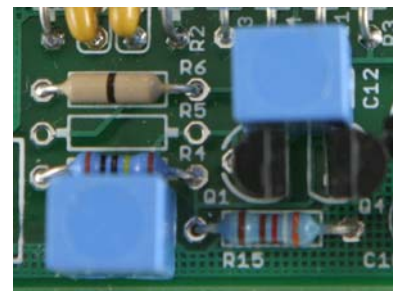
For use as a direct box (config 3)

The direct box configuration provides a high ($> \frac{1}{2}$ megohm) input impedance which is ideal for piezo and other self-generating pickups. There is no provision for floating the ground between the DI box and the console's ground. For this reason, this configuration can not be used with a companion amplifier that is mulded to the pickup and the DI box. In a studio application, this should not be a problem.

1. Stuff R6 & R15 (3k92, org/wht/red/brn), R5 (1Meg, brn/blk/blk/yel). Solder and trim.
2. Stuff Q1 and Q4 (2N3819). Solder and trim.
3. Stuff C11 (470nF, film). Solder and trim.
4. Connect the input jack shield to X1-1, the hot lead to X1-3. Add a 1-megohm (or larger) resistor between hot and shield at the jack.
5. Wire the input/output connectors as follows:

X1-1 - Input Ground + case	X2-1 - XLR pin 1
X1-2 - NC	X2-2 - XLR pin 2
X1-3 - Input/signal	X2-3 - XLR pin 3

Use a shorting jack for the input! Connect case to pin 1 thru 56R



Stuffing detail for Config 3.
Photo shows rev b board.

Choice of Enclosure and Connectors.

The completed board needs to be mounted in a metal enclosure. The die-cast aluminum alloy cases made by Bud Metal Products (CU-124) and Hammond (1590B-BK). The Hammond part comes pre-painted. These cases are particularly suited for this application because they are exceedingly strong yet are easy to machine. The male XLR connector needs a 3/4" mounting hole, and the TB4M mini-xlr requires a 15/32" mounting hole. The larger hole can be drilled using a step (cone) bit or punched using a Greenlee chassis punch. The smaller hole is best drilled.

When mounting the mini-XLR, prior to threading the nut onto the connector body, use a drop of Loctite or nail polish as a chemical lockwasher. Before tightening the nut, apply the Loctite to the threads of the connector body before you thread the nut on and also apply a drop to the chassis underneath the nut before you tighten it. The flat washer should go between the front part of the connector and the chassis.

A pair of spacers is included for mounting the board into your enclosure. The spacers need to be swaged into the circuit board. Do this by inserting the spacer from the bottom (circuit side) of the board, then place the assembly circuit side down on a hard surface (like cement). Insert the point of a #2 phillips screwdriver into the end of the spacer where it emerges on the component side of the board. Strike the handle of the screwdriver smartly with a hammer to swage the spacer in place. Repeat for the remaining spacer. The spacers are threaded for 4-40 machine screws.

The input connector (coming from the PZM plate) could be a 3.5mm TRS plug, but that is only really suitable for version 2, where the cable shield is actually connected to circuit ground. The Switchcraft 4-pin mini-XLR connector is a better choice, as you have total control over which conductor goes where and the connectors lock together. Contrary to common practice, put the female connector on the cable coming from the mic and use the chassis-mount male (TB4M) in the box.

See Appendix A for mini-XLR connector wiring.

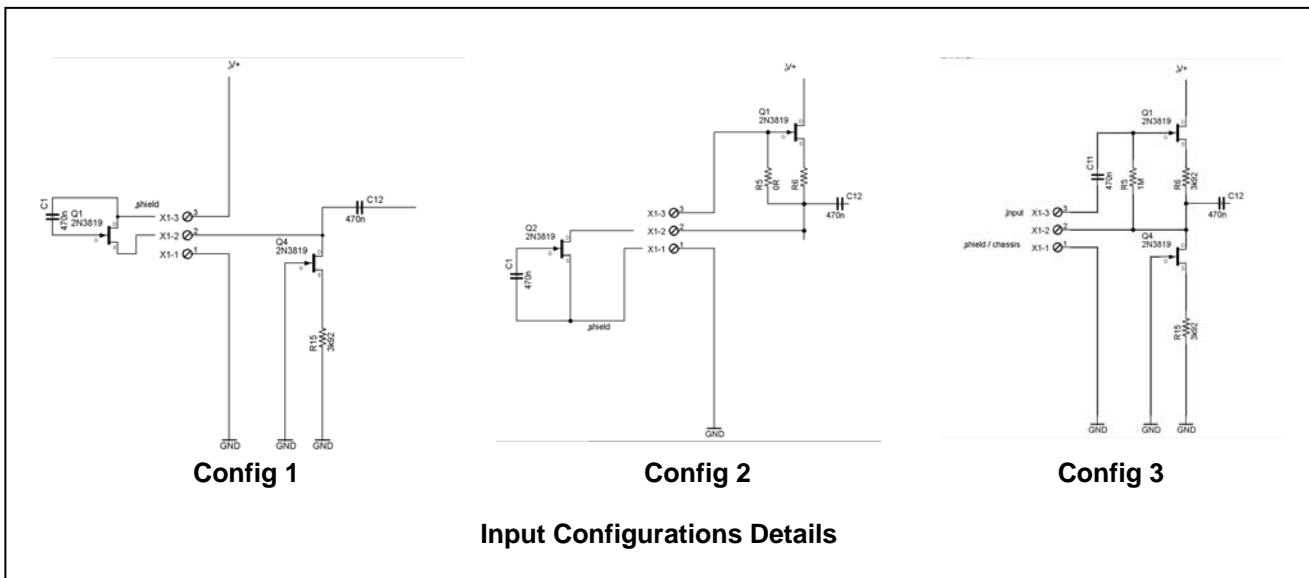
The output connector should be an XLR-male connector. Connect pin-1 of the XLR connector directly to the chassis box through a very short wire. Alternatively, if you are concerned about possible ground loops, you can ground the box for RF via a 10nF (larger OK) ceramic capacitor (it's important that this is a ceramic capacitor) in parallel with a 56R 1/2-watt resistor.

Circuit Description

Refer to the schematic diagrams. The first, *Input Configurations*, shows the three different variations of the input circuit. For the original RS PZM microphones, Q4 acts as a current source load for the microphone capsule. The output of the microphone circuit is coupled via C12 to the differential line driver stage Q2.

For the other microphone configurations (version 2), Q4 is not present, and Q1 acts as a current source load for the microphone capsule. The output of the microphone circuit is coupled via C12 to the differential line driver stage Q2.

For the direct box application (version 3), matched JFETs Q1 and Q4 are connected as a current-source loaded source follower. Q1 is the source follower and Q4 is the current source load.



The differential line driver uses supermatch transistor Q2 connected as a differential amplifier. R13 and R14 provide some degeneration and R11 partially couples the emitters to raise the gain. The supplied value of R11 provides about 6dB of gain.

Yes, you could use a pot here to make the gain variable, but it needs to have a reverse-log taper (CCW-log), which is difficult to find (you could use a CW-log pot, but to spread the range evenly across the rotation, it will need to be connected so that it rotates "backwards." A linear taper pot will have most of its range in the first 50% of its rotation). Another possibility would

be to use a make-before-break switch with discrete resistors. Gain and headroom are always a balancing act; increasing the gain is always at the expense of headroom.

Q5 is a current source that sets the operating point of the diff-amp. C5 ensures that the base of Q2B is at AC ground.

R7 and R8 are the collector load resistors for Q8 (along with the phantom feed resistors at the microphone input). Their junction provides a place to pick off the dc phantom power voltage. This voltage operates the remainder of the circuitry.

The currents drawn by the different portions of the circuit cause the collector voltage of Q2A/B to be roughly 20V. The output voltage depends on the voltage divider R10/R12, Since R10/R12 are equal, the voltage at their junction is roughly 1/2 the voltage at the top of the divider, just slightly more than 10V. Emitter follower Q3's base is tied to the junction of R10 and R12, so its emitter voltage is its base voltage minus one V_{be} drop or about 10V to the microphone capsule and the two input FETs. C6 ensures that there is no residual audio at Q3's base and C7 bypasses any noise output from Q3 to ground.

The two ferrite beads and C1, C2 make a lowpass filter at RF frequencies to guard against RFI caused by the balanced output line acting as an antenna. C8 and C9, normally not used, allow changing the filter to either a PI configuration or to a lowpass filter looking towards the microphone cable.

In Case of Difficulty

A few builders have had trouble making the circuit work. Almost without exception, most problems are due to poor soldering technique. Check your connections. Look for stuffing errors. Try cleaning the residual flux off the solder side of the board using 95% isopropyl alcohol and a brush or use a commercial flux remover so that you can truly see the solder joints.

All voltage measurements made with a DMM, with respect to ground, unless otherwise noted, with the microphone capsule connected (except for step 1).

Step	What to do	Expected reading	Remarks
1.	With the capsule <i>disconnected</i> , and the preamp connected to a working microphone input with P48 supplied and the gain turned up, touch the input connection with your finger.	You should hear hum when you touch the input.	The preamp is (<i>apparently</i>) working. Reconnect the microphone capsule and continue.
2.	if the LED is installed, is it illuminated? If it is not installed, there must be a wire jumper installed in its place.	LED is lit.	Checks the current source, Q5 and for current flow from the P48 source.
3.	what is the voltage at the junction of R7, R8, and R10 to ground?	18-22VDC	This is the supply voltage to the circuit.
4.	The voltage ACROSS R16.	No more than 0.7v.	It is limited by the V_{be} voltage of Q5 and the two series diodes D1 and D2. This is an across voltage because the presence or absence of the LED is not known. Doing an across measurement eliminates the LED from the picture. So, if this voltage is OK, AND the LED is lit (if present), then this part of the circuit is OK.
5.	The voltage at the 'top' of R3 and R9 (referring to the schematic) should be about 1/2 of that measured in step 1 minus about 0.6v (the V_{be} drop of Q3).	About 1/2 of what was measured in Step 1	If the voltage is high, then Q3 is probably toast. If it is low, then there's something wrong with R10 or R12. Correct value stuffed?
6.	If the voltage across the capsule matches (or nearly matches) the voltage in step 3, then the capsule isn't drawing current. That could be a bad capsule, bad cable, or bad connections between the board and the cable. This is irregardless of configuration.	3 to 6v, possibly higher, but not 10v or more.	If the voltage is that high, and you are using configuration 2, then check Q2 and its circuit. If you are using configuration 1, then check current source Q1 and its circuit.

7.	The voltages at the junctions of L1 and R7, and R8 and L2, should be equal, or very, very nearly so (within millivolts).	18 to 22v ref to ground	check voltage in steps 6 and 7; these should also be very, very nearly equal. These are the XLR connections.
8.	The voltages at the bases of Q2 should also be very, very nearly equal, if not equal (equal is ideal)	slightly less than what was measured in step 3.	component values (R3, R9) or capacitors C12, C5.
9.	The voltages at the emitters of Q2 should also be equal, or very, very nearly that.	about 0.6v less than that measured in step 6.	Q2 may have been maimed, especially if the collector voltages aren't very nearly equal.
10.	There should be substantially no voltage drop across R3 and R9. or stated another way, the voltages at the BOTTOM (referring to the schematic) of R3 and R9 should be very nearly the same as that measured in step 3.	zero, 0.	If there is voltage drop, then Q2 may have been maimed, or C12 or C5 are defective (more likely C5). C5 may be soldered in backwards (white polarity stripe towards OUTSIDE of the board).

If you decide to contact Uneeda Audio, please include the voltages measured in steps 3-10, and the result of the tests in steps 1 and 2. Please state the configuration you built, what other test equipment you have or don't have (DMM, O'Scope, Signal Generator), and your electronics experience level (rank novice, veteran kit builder, EE, etc.)

Licensing Information

NOTE: No license is granted with respect to this circuit. Permission is hereby granted to construct the circuit and use it for your own use. Permission to use this circuit in a commercial context (i.e. turn it into a product for sale) is not granted. Purchasing the kit is a per-instance license to construct the circuit. Doing this for someone else is allowed.

Warranty

This circuit is warranted to work when constructed properly. Only the circuitry contained on the printed circuit board is warranted. The microphone element connected thereto and its connecting cable is specifically excluded. The kit is warranted to contain all parts shown in the parts list. There are no other warranties, expressed, implied, for fitness of purpose, for loss of revenue or for anything else due to the use of this circuit.

Uneeda Audio will supply up to 6 replacement parts at no charge. There are limits to our generosity, and you are advised to not test them.³

Circuit boards damaged by poor soldering (or desoldering) technique or improper solder or solder flux will not be replaced. Circuit boards returned for repair will be repaired for the cost of time and materials unless our inspection reveals a faulty component. The criterion for this judgment solely rests with Uneeda Audio and with no other person or persons.

By modifying your Radio Shack product in this manner, you acknowledge and understand that any Radio Shack warranty that your product may have had is now void. Radio Shack doesn't know anything about this product, so don't ask them about it (not that they know anything at all about anything). Always remember the microphone's humble beginnings.

Disclaimer

Radio Shack (RS) is a trademark of Tandy Corporation. PZM is a trademark of Crown International, a Harman Corporation. Shure is a trademark of Shure Incorporated.

The mention or use of these and other trademarks in no way affects the rights of the trademark owners.

³ This offer can be withdrawn at a moment's notice, at our whim and/or caprice.

Appendix A. Connector Wiring

Because the connector wiring changes with configuration, it can be a bit confusing. Here, in one place, in tabular form, is the wiring for all configurations and all connectors.

XLR Connector wiring							
	Male Std XLR		Male Mini XLR		Female Cable mount mini xlr		
Config 1	A3M	PCB	TB4M	PCB	TA4F	Microphone	Remarks
	1+ case	X2-1	1	NC	1	NC	For 33-1080 and 33-1090 Pin 1 not used
	2	X2-2	2	X1-3	2+3	shield	2+3 jump needed for Shure wireless compatibility
	3	X2-3	3	NC	4	Hot/center conductor	
			4	X1-2			
Config 2	A3M	PCB	TB4M	PCB	TA4F	Microphone	Remarks
	1+ case	X2-1	1	X1-1	1	Shield	For 33-3020, 33-3022, and 33-3041 or generic ECM.
	2	X2-3	2&4	NC	2	5k1 to pin 3	
	3	X2-2	3	X1-2	3	Center cond.	
					4	NC	
Config 3	A3M	PCB	Phone jack	PCB			Remarks
	1	X2-1	sleeve	X1-1		Case to pin 1 thru 56R	Direct Box
	2	X2-2	NC	X1-2			
	3	X2-3	Tip	X1-3			
Note: NC means No Connection							

Appendix B. Mini-XLR Wiring

The Switchcraft mini-XLR connectors require a bit of discussion on their own, especially if you don't have any previous experience with this connector. In particular, the cable connector warrants closer examination. Disassemble the connector by unscrewing the black strain relief at the rear of the connector. Grasp the connector body in one hand, and the metal strain relief in the other. Pull them gently apart. Disengage the metal strain relief from the connector body. The actual female connector insert may or may not come out. If it doesn't, then use a small screwdriver at the connector face to push the insert through the connector shell and out the rear.

Once the pieces are out in the open, carefully disassemble them, taking note of how they go back together. Practice reassembly several times until you are familiar with the process. Now you can begin wiring.

The female cable connector is fiddly. The insulator at the rear (solder end) detaches from the female insert, AND the female insert pushes out of the body to the rear. When you go to attach the wire, thread the wire thru the strain relief, and then thru the detached part of the female insert. Now do your soldering. Take note of the pin locations before you start.

Assemble by pushing the insert into the connector shell, mate the other insulator part, then slide the crimp-on strain relief onto the cable and mate it with the insert. It does require a bit of force. Leave a bit of wire loose between the connector insert and the first crimp point (stress relief), then crimp the metal tangs down onto the cable. Now screw the strain relief onto the connector shell.

Shrink sleeving between the exit point of the strain relief and into the crimp point can be used to reinforce this part of the assembly.

Note that the pin numbers are molded into the inserts. You need good eyesight to spot this.

Part number TA4(MF) is the cable mount connector.
Part number TB4(MF) is the chassis mount connector.

If you use the same wiring that Shure does for their wireless mics, then you can also plug any microphone configuration into a Shure wireless transmitter (or one of their lavalier mikes into a configuration 2 preamp).

If you're using the configuration 1 wiring, note that the shield of the cable going to the PZM plate is **NOT** grounded, so you need to be careful that once the connector is assembled, the shield of this cable can not touch the connector shell or the crimp-on strain relief. Judicious application of shrink sleeving to the outer jacket of the cable helps here.

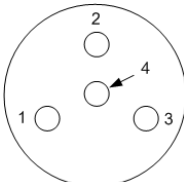
The configuration 2 wiring is compatible with Shure wireless hardware as long as you include a 5k1 resistor within the connector. For size reasons, an 1/8w resistor is preferred, but a 1/4w part will fit if you're meticulous.

If you have both microphone models, and you use this wiring scheme, then plugging the wrong microphone into the wrong box won't damage anything (although you won't get sound).

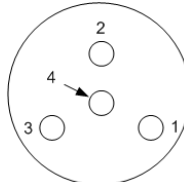
Remember: if you wire the microphones as shown in the table, you can use either with a Shure wireless transmitter.

Config 1 Chassis		Config 2 Chassis	
TB4M	PCB	TB4M	PCB
1	NC	1	X1-1
2	X1-3	2	NC
3	NC	3	X1-2
4	X1-2	4	NC

Config 1 Cable		Config 2 Cable	
TA4F	Cable	TA4F	Cable
1	NC	1	Shield
2	Shield	2	5k1 to pin 3
3	Tie to pin 4	3	Center conductor
	Center conductor	4	NC



Male Solder side



Male Face

Female Face

Female Solder side

Shure Beltpack Connector Pin Assignments

Pin 1 – Shield
Pin 2 – 5V power for ECM
Pin 3 – Audio Input to beltpack
Pin 4 – 20k resistor to pin 1.

Mini XLR connector wiring.

Appendix C. RS PZM (de)Evolution

There are now four microphones that have been sold over the years with the appellation, “Pressure Zone Microphone” or “Boundary Microphone.”

The 33-1090A is the only one of the four that uses the patented Pressure Zone principal. The second two are boundary microphones, in which a mike capsule is mounted parallel to a boundary plane (the diaphragm is perpendicular to the boundary). The 33-3022 was designed to work with an input having electret bias voltage present, such as the soundcard of a computer or the mic input of a camcorder. The latest and newest isn’t a boundary microphone at all. It is just an omni capsule mounted at the top of the conical housing.

Only the 33-109A is a configuration 1 microphone. The rest are all configuration 2.

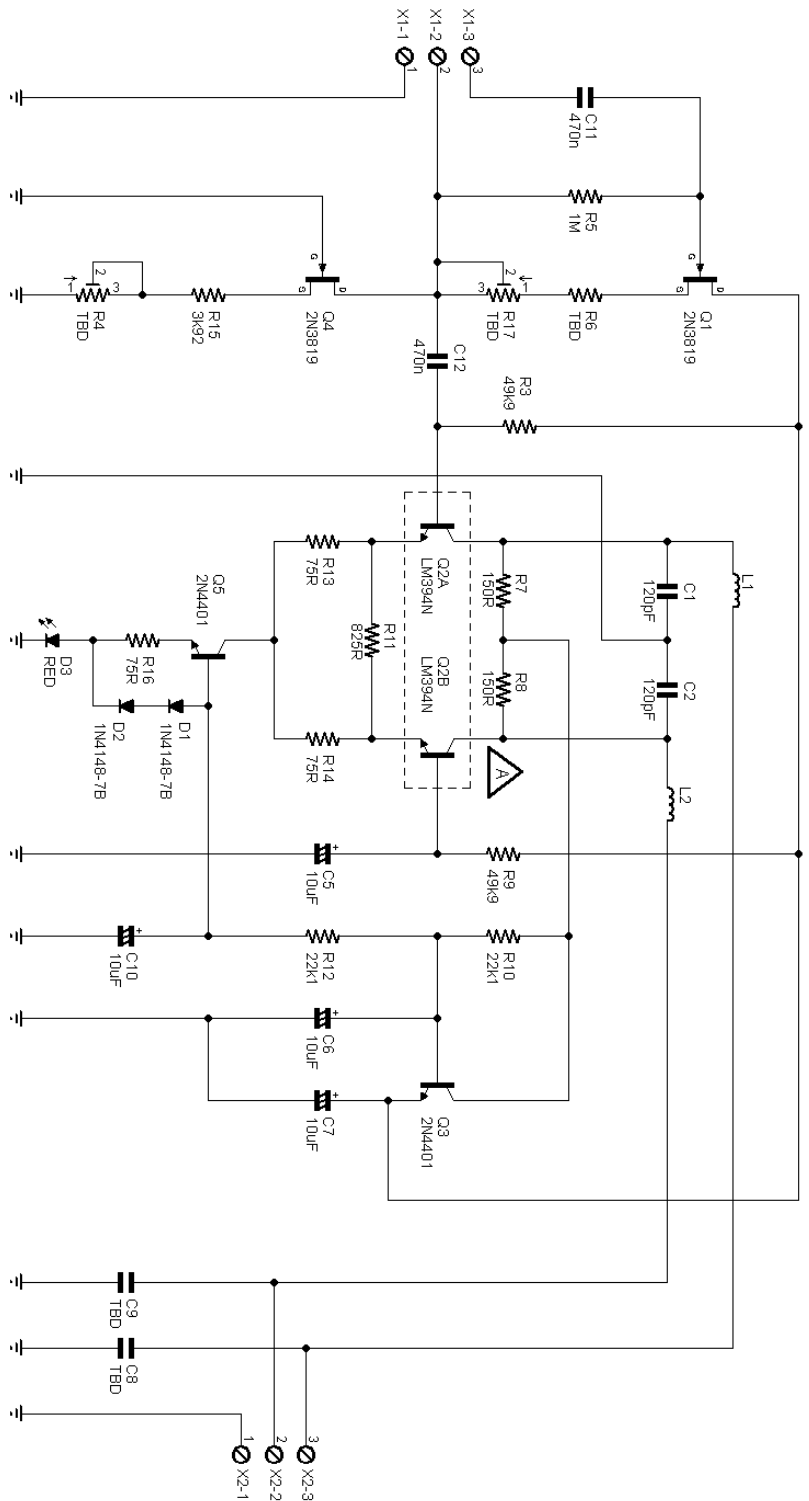
RS currently sells a Boundary Microphone made by Audio Technica, Model ATR-97, SKU 55016481. Nothing is known about this microphone.

The 33-3041 Business Microphone is just an omnidirectional electret microphone capsule mounted at the end of the housing pointing straight up in the air (the 2nd object from the left in the photo). This is not a PZM nor is it a boundary microphone. It is a configuration 2 microphone.

		
<p>33-1080 and 33-1090A PZM Config 1.</p>	<p>33-3020 Boundary Microphone Config 2</p>	<p>33-3022 Boundary Microphone Config 2</p>
		
<p>Audio Technica ATR-97 Boundary Microphone</p>	<p>33-3041 Business Microphone Config 2</p>	

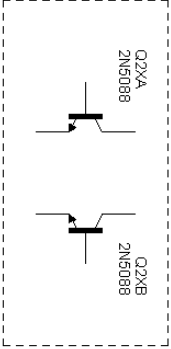
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF UNEEEDAUDIO (RICK CHINN). ANY REPRODUCTION IN PART OR WHOLE IS STRICTLY PROHIBITED WITHOUT WRITTEN PERMISSION.

PROPRIETARY



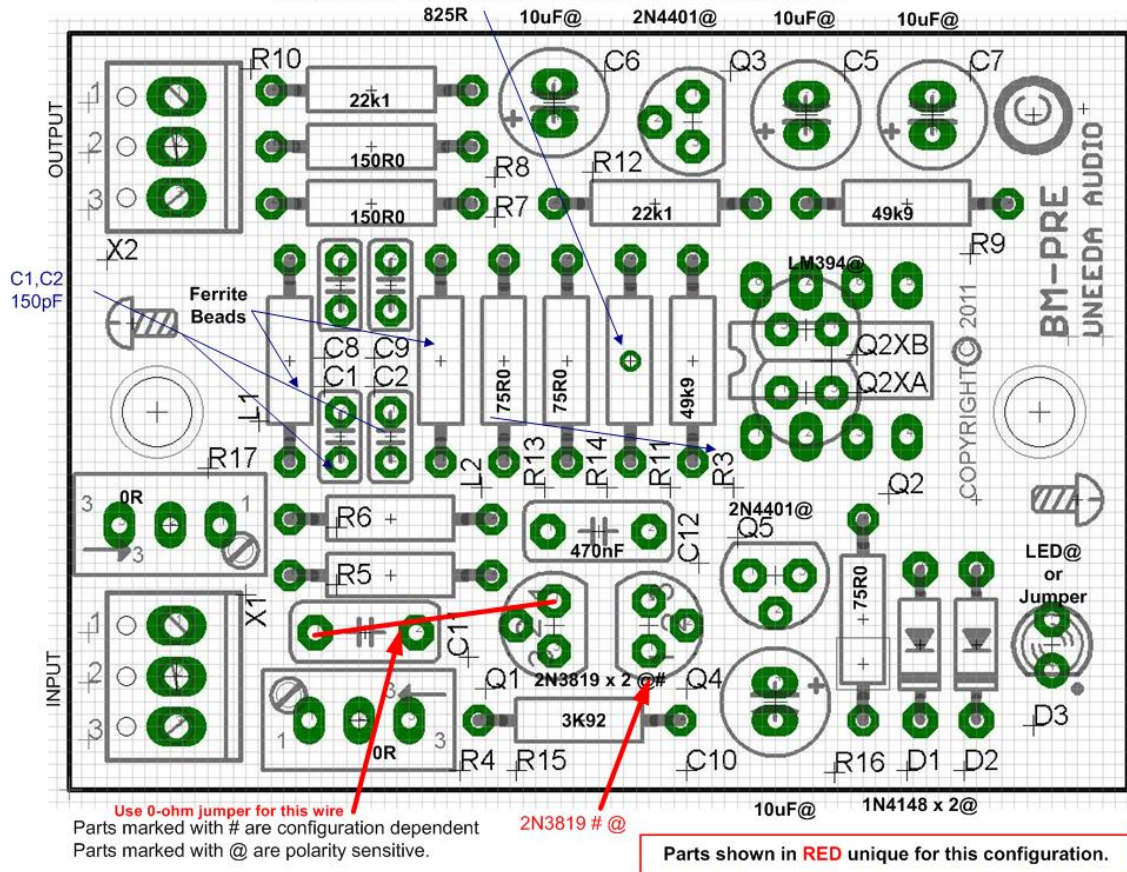
A ALTERNATE Q2 STUFF OPTION

- SWAGE1
SWAGE-HOLE-139
- SWAGE2
SWAGE-HOLE-139

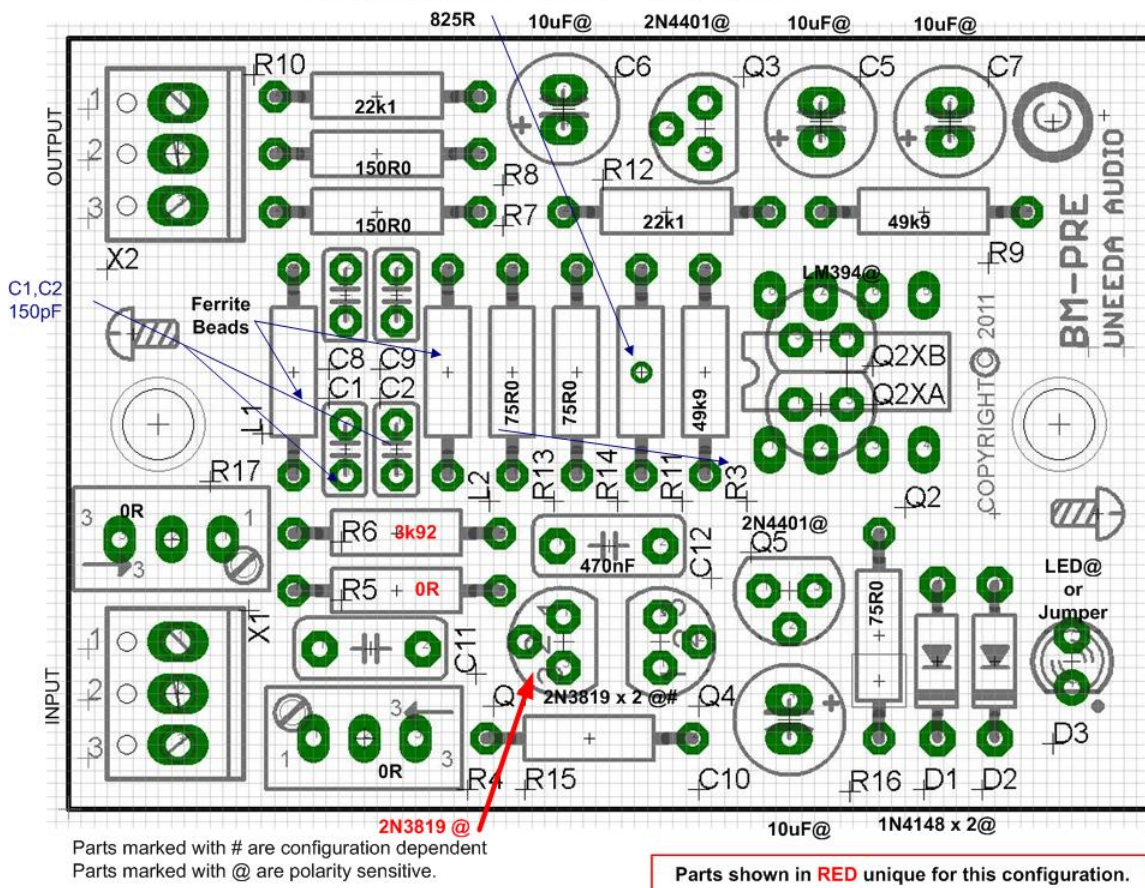


ISSUE	UNEEEDAUDIO	THIS DRAWING CONTAINS COPYRIGHT MATERIAL AND SHOULD NOT BE USED WITHOUT WRITTEN PERMISSION.	© 2009
DRAWN	R.CHINN	TITLE	BOUNDARY MIKE PREAMP
CHECKED	R.CHINN	DATE	11/28/2011 12:12:01 AM
DATE	11/18/10	DRG N°	ED-BMP-3XX
FILE:	BMP-REV-C	PAGE:	1/1

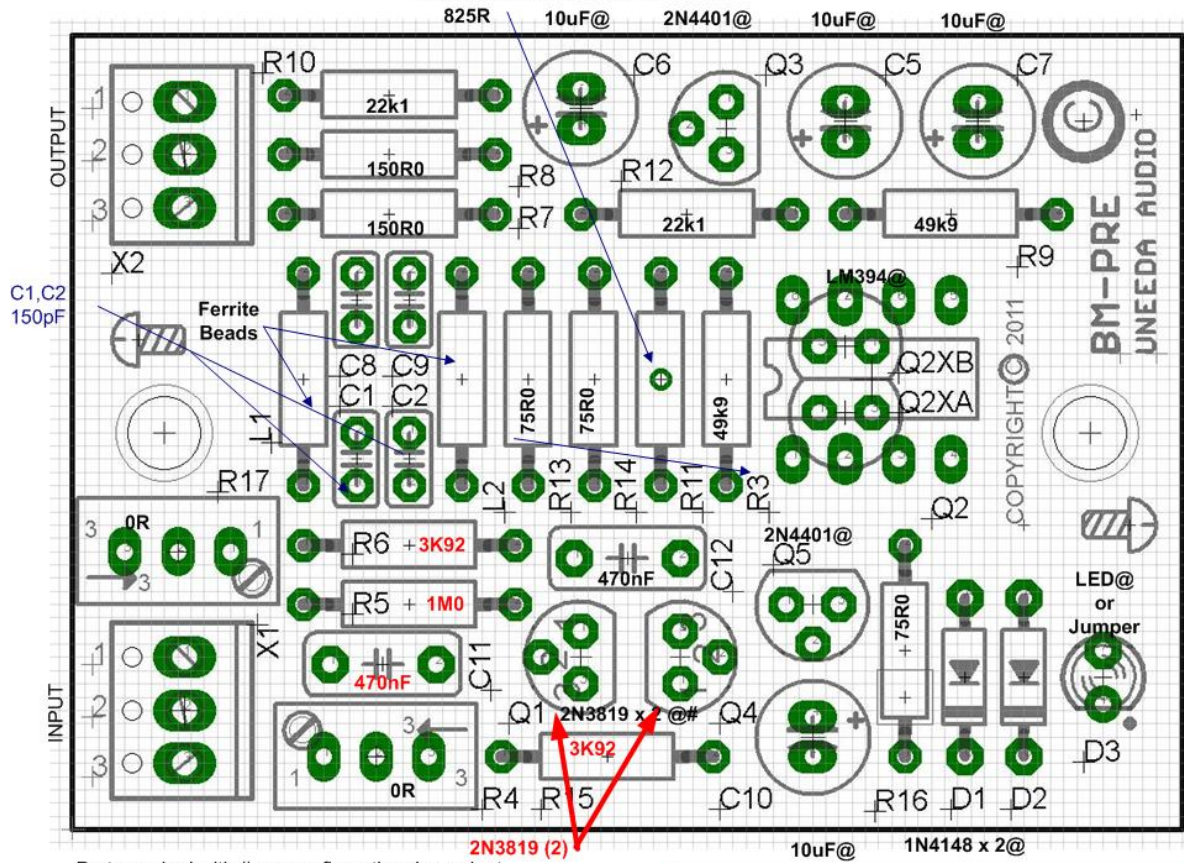
Configuration 1. For use with 33-1080 and 33-1090 microphones



Configuration 2. For 33-3020 and 33-3022 microphones.



Configuration 3. Active Direct Box



Parts marked with # are configuration dependent
 Parts marked with @ are polarity sensitive.

Parts shown in RED unique for this configuration.

Revision History

9/11/06	Revised from 2003 version. Added new pix, added individual stuffing diags for each config.
9/20/06	Clarified connections for config 1, and changed wording for I/O connections for other 2 configs. Fixed error in Config 1 instructions; had Q2 rather than Q1 for the jumper location.
3/24/07	Rev C2. Revised and clarified wiring for Mini-XLR connector. Changed compatibility notice for Shure wireless transmitters.
4/1/07	RevC3. Added “in case of difficulty” section.
2/21/08	Rev C4. Corrected typo in “in case of difficulty” section and clarified things.
3/16/08	Rev C5. Corrected connections in text for config 2; checked others.
3/22/08	Rev C6. Removed Q4 from BOM, changed C1, C2, C8, C9 to be either 120pf or 150pf Added Appendix A, revised wiring for mini-xlr connectors (moved material from body) Added Appendix B, described the four different models.
4/6/08	Rev C7: Corrected typo for input connections in instructions for configuration 1 and 2 (page 4). Added language describing the mini-XLR connector assembly and caveats.
11/4/08	Rev C8 Slight change in circuit description (function of R11). Revised Mini-XLR connection diagram to make clearer.
2/23/09	Rev C9 Added D1, D2 to BOM. They were omitted.
3/13/2009	Rev C10 Added Appendix A with table for all configuration wiring. Original appendices A & B renamed. Changed case connection for Config 3.
3/14/2009	Rev C10.1 Clarified Appendix A table, Corrected value error in schematic (R10, R12). Schematic revised to show R1, R2 as inductors, now designated L1, L2.
12/13/2009	Rev C10.2 Clarified some small details. Added note about replacement parts. No major changes.
3/15/2010	Rev C10.3 Clarified color code in parts list, added note about color bands on diodes in assembly instructions, other small changes, revised configuration schematics drawing.
4/1/2010	Rev C10.4 Added per-instance wording in license disclaimer.
7/25/2011	Rev C10.5 Corrected color code for R6 and R15 on page 2.
7/25/2011	Rev C10.6 Added additional words for RF grounding the metal box.
9/28/2011	Rev C10.7 Added D1-D2 to assembly sequence, added words to assembly step 8, and Appendix B.
11/28/2011	Rev D.1 Revised for PCB Revision C.
12/1/2011	Rev D.2 Added jumpers around R4 and R17 in assembly sequence.
12/26/2011	Rev D.3 Added R4, R17 to parts list, revised assembly for Config3. Emphasized steps for R4, R17 in master assembly sequence.