The Enhanced Manhattan Islander Audio Amp

A new audio amplifier kit from the *Four State QRP Group* featuring K8IQY's design and K3PEG's *Enhanced Manhattan* templates

Kitted with Permission from K8IQY, NJQRP, and NA5N

This newly designed kit is very different from the now retired and excellent NJQRP *Islander* kit, and it deserves your close scrutiny.

Four State QRP Group

The K8IQY *Islander* Audio Amplifier was originally kitted and distributed by the NJQRP club. It was developed so a speaker could be used with the SW+ series CW transceivers from *Small Wonder Labs*. This updated kit has a few new features. This new amplifier should work well with any QRP transceiver like the *DCxx* series from *Hendricks QRP Kits*, *Rockmites*, *AT Sprint* series, etc. or as a test bench audio amp. This amp is very quiet, has a lot of gain and with suitable coupling would make a nice amplifier to drive headphones too!

So what's with the name?

Enhanced *Manhattan* templates by Larry Przyborowski, K3PEG. Larry is well known for his wonderful *Enhanced Manhattan* templates and builds of K8IQY's *2N2/40+ and 2N2/20* xcvr designs. Now build this kit in one of two ways, either traditional or *Enhanced* Manhattan style!

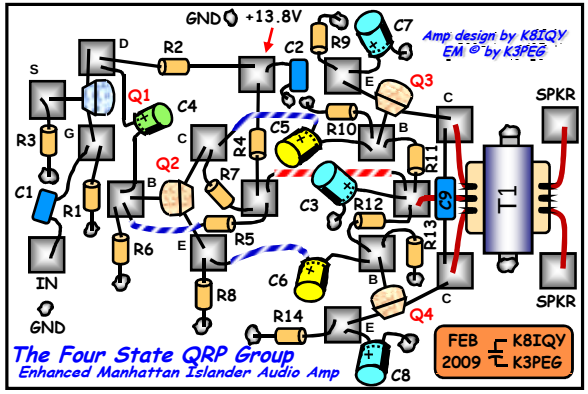
Manhattan kit utilizing 3/16" square pads. No round islands to punch, no drill press needed to cut pads as before, all pads are readily fabricated for easy construction.

Islander can be built either traditional or *Enhanced* Manhattan style with through-hole parts!

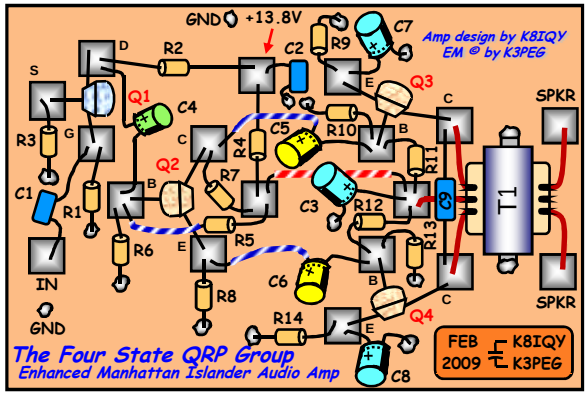
Audio Amp completely redesigned by K8IQY. A preamp has been added, increasing the input impedance, isolation, and adding even more gain. Overall amplifier power gain is nearly 65 dB!

The Enhanced Manhattan Islander Audio Amp
- EM Templates and Kit Info -

Actual size (2” x 3”) *EM* templates



“WHITE” BACKGROUND



“COPPER” BACKGROUND

The ***Enhanced Manhattan Islander Audio Amp*** kit is complete with all parts to finish the amplifier. There are no islands to cut with a drill press or tiny SMT parts to solder as in the original *Islander* kit. All parts are supplied in the new kit are the through-hole type. All you need to supply is some solder, solder wick, glue and a few assembly tools.

There are two ways to build this new kit! You can choose either K3PEG’s *Enhanced Manhattan* (*EM*) construction method in which an illustrated paper print of one of the above *EM* templates (above) is applied to the copper-clad board or build it using the Traditional Manhattan construction method. K3PEG’s *EM* method will enable one to achieve an easily built, professional looking finished project. Both procedures are described, the choice is yours to make.

DESIGNED BY JIM KORTGE, K8IQY - ILLUSTRATED BY LARRY PRZYBOROWSKI, K3PEG

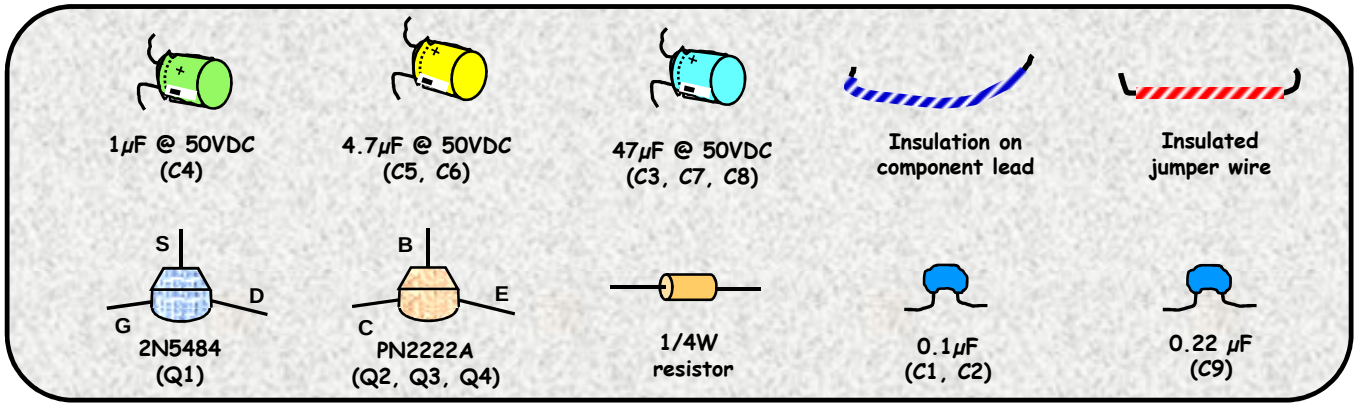
The Enhanced Manhattan Islander Audio Amp

- Choose Building Method, Parts List and Identification -

Check the kit's parts against the list below. The graphics below identify circuit components by an assigned color. Constructing this kit using the *Enhanced Manhattan* method begins on the next page.

NOTE → If you choose to build this kit using the Traditional Manhattan construction method please go to page **10** for detailed building steps.

- ❑ C1, C2 – 0.1 µF radial lead capacitor
- ❑ C3, C7, C8 - 47 µF @ 50 VDC
- ❑ C4 – 1µF @ 50 VDC
- ❑ C5, C6 - 4.7 µF @ 50 VDC
- ❑ C9 – 0.22 µF radial lead capacitor
- ❑ R1 – 100K Ω 1/4W resistor
- ❑ R2 – 2.7K Ω 1/4W resistor
- ❑ R3 – 270 Ω 1/4W resistor
- ❑ Q1 – 2N5484 FET transistor
- ❑ Six-inch piece of 3/16" wide by 0.015" thick, flexible copper clad board.
- ❑ R4 – 15 Ω 1/4W resistor
- ❑ R5, R11, R12 – 10K Ω 1/4W resistor
- ❑ R6 – 6.8K Ω 1/4W resistor
- ❑ R7, R8 – 470 Ω 1/4W resistor
- ❑ R9, R14 – 39 Ω 1/4W resistor
- ❑ R10, R13 – 1.5K Ω 1/4W resistor
- ❑ T1 – 1.2K c.t. Ω to 8 Ω c.t. (Xicon TL-003)
- ❑ Q2, Q3, Q4 – PN2222A transistor
- ❑ 2" x 3" by 0.045" thick copper clad board.



USE the Adobe Reader program's Zoom feature for a better view!

The Enhanced Manhattan Islander Audio Amp
- Background Information on the EM Method -

Enhanced Manhattan (*EM*) is a new method devised to "Enhance" the appearance and ease of construction of electronic projects using the tried and true, Traditional Manhattan construction technique. A colorful illustrated template, showing the precise location for parts and wiring, is glued down to the copper clad board making it easy for the builder to create an exact duplicate of the project with little chance of making a mistake. The template is also helpful for locating parts and trouble-shooting any problems you may have with your completed board. The finished project takes on a professional appearance that is nearly impossible to attain using traditional Manhattan construction procedures.

EM was created in 2002 by Larry Przyborowski, K3PEG. Larry is quickly becoming recognized for his *Enhanced Manhattan* templates. By using the *Enhanced Manhattan* method, the builder can easily construct an oftentimes difficult project by using the illustrated template as a guide. Larry developed and made beautiful *EM* templates for the popular 2n2/40+ and 2n2/20 transceivers. *EM* templates for building those may be found on the Yahoo "2n2-40 Group". Larry also made *EM* templates for the *AMQRP Elsie* LC meter, K8IQY's *4017* transverter and others are in the works!

It's important to state that this document's content was proofread and reviewed by my long time friend Ron Hege, K3PF. My sincere thanks go to him for assisting me in getting this document ready in a timely fashion. I couldn't have done it without his help. Thanks Ron!

The Enhanced Manhattan Islander Audio Amp

- What Does the Enhanced Manhattan (EM) Method Have to Offer? -

Here are eleven advantages or improvements over standard Manhattan construction:

1. The *EM* construction method solves the dreaded copper corrosion problem by completely covering a copper clad board's surface with an illustrated paper template.
2. The *EM* template provides the builder with a color-coded, full-sized pictorial representation of a circuit's components. Nearly all components are depicted in realistic fashion. What you see is what you place! ☺
3. The *EM* template is an actual size layout ensuring accurate parts placement, and component identification both during and after construction. Component leads may be formed on a copy of the template (without interference from actual adjacent parts) and then transferred to the *EM* template on a board for mounting. A 2X size template may be provided for increased clarity.
4. The *EM* template identifies all semi-conductor, transformer and multi-pinned component leads right on the template to ensure their proper identification and connection in the circuit.
5. The *EM* template enhances circuit testing and troubleshooting. All parts are identified on the pictorial layout with their respective circuit nomenclatures, e.g. C1, R12, T1, etc.
6. Two actual size EM templates are provided, one with a white and one with a copper-tone background. Your choice.
7. The *EM* template is distributed in Adobe Acrobat™ file format. Once viewed and magnified (would you believe up to thousands of times without distortion?), the template becomes a great building aid. Adobe Acrobat™ allows you to magnify the "living circuitry" out of it. ☺
8. The *EM* template, when printed, results in the desired outcome, a 1-to-1 scale sized printout. An ink jet printer makes a really nice, color-coded EM template. Glue down the template, cut out the paper exposing the ground points, solder 'tin' the board through those openings and build!
9. The *EM* template reduces the chance of error during construction. Duplication is ensured for group building.
9. There's no need to worry about component leads touching the ground plane. You only need to insulate wires that must cross one another.
11. The *EM* construction method results in a clean and professional finished look. ☺

The Enhanced Manhattan Islander Audio Amp
- *Enhanced Manhattan* Method, Board Preparation -

- ❑ Inkjet print the actual size *EM* templates via the Adobe Acrobat™ Reader program onto regular paper (20# weight paper or card stock). Ensure that the template is 2 inches by 3 inches. Regular 20# weight paper works just fine!
- ❑ Although not necessary, you may want to give the two templates a light coat or two of a clear plastic spray to protect the printer ink from fading or smudging. If you spray the templates allow the clear coat to dry. Cut along the dotted lines outside the *EM* label that you select for your build of the amplifier. Choose white or copper-tone background.
- ❑ Perform the 3rd and 4th steps under "Board preparation" on page **10** to 'tin', clean and cut the six-inch, copper clad strip and then return here to the next step.
- ★❑ Use a glue to adhere the template to the copper clad board. A generic paper glue stick (applied to the board and then spread out with a lightly dampened foam brush) or *Elmer's™* glue (spread out with a dry foam brush) work very well. Whichever glue product you choose, make sure you have just a thin coat of it (brushed out) applied to the board. Lightly tack the template to the board and hold the pair up to a light so that you see the board's edges through the paper. Move the template with your thumbs and when you're satisfied press the paper down. Use a round object, about one-inch in diameter, to roll the template uniformly into the glue. Flip the board over, apply glue to about 3/8" of the board's perimeter and tightly fold the paper onto it. Roll the paper with a round object. Clean up excess glue.
- ❑ Allow the glued down paper template to dry completely. Slightly warming the board will help dry out any moisture from beneath the template.
- ★❑ Using a pointed X-acto® knife, cut small rectangular cut outs at each of the ground points (◯) and pick out the paper.
- ❑ Solder 'tin' the board at the ground points (◯) through the open areas.
- ❑ Glue down all the Manhattan pads DIRECTLY to the squares (▣) illustrated on the paper template using either a fast setting Epoxy or a jelled Quick-Set Glue (*Cyanoacrylate*) adhesive. Allow sufficient time for the adhesive to dry.

  Do not allow any Cyanoacrylate adhesive to contact human skin as it will quickly glue skin to skin or human skin to anything else it comes in contact with!
- ❑ The board is now fully prepared to be populated with parts. Assembly sequence follows on the next pages.

★ **Refer to the 'Construction Methods and Hints' and the 'EM Component Templates and Detail' pages for illustrations.**

The Enhanced Manhattan Islander Audio Amp

- Assembly Sequence for Either Manhattan Method -

The following assembly sequence is provided for those who are new to Manhattan style and for those who prefer to follow detailed instructions and learn a few tips along the way. 'Seasoned veterans' will no doubt proceed using their own Manhattan building technique!

Refer to the "Enhanced Manhattan Islander Audio Amp" EM templates for proper component placement.

- ❑ *Note that the small EM templates shown in this document are actual size. Therefore, they serve nicely for determining wire lengths, component lead lengths and their actual positions.*

★❑ Begin by installing the jumper wire. It is shown as the red striped wire on the "*Enhanced Manhattan Islander Audio Amp "EM* templates. Cut a 1" length of 24-28 gauge insulated wire, strip about 3/16" of insulation from each end, and solder 'tin' the ends. Follow the *EM* template to shape and route this wire into place on the board from the pad at the bottom of R4's location to the pad where C3's "+" lead will connect. Solder the wire into place.

Refer to the base diagram for the PN2222A transistors Q2, Q4 and Q4 (FIGURE 3) and the base diagram for the 2N5484 FET transistor Q1 (FIGURE 4) for the following steps:

★❑ The leads of transistors Q1, Q2, Q3 and Q4 will now be formed such that they will reach their proper pads. This is readily done using the actual size *EM* "Transistor lead routing" template, FIGURE 6. Work with the transistors one at a time. Note the direction of the "flat" side of each transistor. The leads of all transistors are identified by a single letter next to the pad to which it will connect. Refer to the transistor base diagrams, FIGURES 3 and 4.

★❑ Start with Q1, the 2N5484 FET transistor. Don't bend the leads at the transistor! Start any bend at least 1/16" from a transistor's base. Hold Q1 centered above its respective pads (FIGURE 6) ensuring that the proper leads point to the correct pads. Cut Q1's leads to suitable lengths for connection. Again, pre 'tin' the last 1/8" or so of the leads to make installation a lot easier. Use either tweezers or a small pair of needle-nosed pliers as a heat sink to hold a lead while solder 'tinning' it. Solder Q1 into place. Repeat the above process for the remaining three transistors: Q2, Q3 and Q4. *Note: Using a jewelers screwdriver 's blade tip allows you to hold down a lead while soldering it to a Manhattan pad. Most jewelers screwdrivers offer a knurled body that provides a slip-proof grip!*

★❑ Properly identify the PRIMARY winding of T1. Examine each side of T1 to find a **"P"** printed on one of its sides. The side with the "P" printed on it is, of course, the PRIMARY winding.

★ **Refer to the 'Construction Methods and Hints' and the 'EM Component Templates and Detail' pages for illustrations.**

The Enhanced Manhattan Islander Audio Amp

- Assembly Sequence, continued -

- ❑ Carefully bend T1's mounting tabs about half their lengths outward at a 'right angle'. Solder tin the bent portion of each of T1's tabs and then remove excess solder.
- ★ ❑ Orient T1 above FIGURE 5 such that its primary winding leads are positioned to the LEFT (remember to look for the "**P**") . Using a small pair of needle-nosed pliers, support each of the leads near T1's body and then carefully bend each of them such that they conform to their outlines as shown on FIGURE 5.
- ❑ Note that the center lead of T1's SECONDARY winding is not used so it may be clipped off near the transformer. *Make sure that it's the center lead of T1's SECONDARY winding you cut off and NOT the PRIMARY's center lead!*
- ★ ❑ Again hold T1 in position above FIGURE 5, and then cut its leads to suitable lengths and pre 'tin' them for mounting. Carefully align T1 in position on the board and solder its mounting tabs to their ground positions. Finish up by soldering T1's five leads to their respective pads. *Note: Using a jewelers screwdriver blade tip allows you to easily hold down a lead while soldering it onto a Manhattan pad.*
- ❑ Refer to the *EM* template to install resistor R5. Place a short length of sleeving (insulation salvaged from scrap wire) over one lead of the resistor leaving about 3/16" of bare wire. Pre 'tin' the last 1/8" or so of both leads. Solder R5 in place with its insulated lead connecting to the "base" lead of Q2.
- ❑ Install resistors R2 and R4 in a horizontal fashion as shown on the *EM* template and solder them in place.
- ★ ❑ Form the leads of resistors R1, R3, R6, R8, R9, R10, R13 and R14 in a vertical fashion (FIGURE 2). Hold each of the resistors, in turn, centered above their respective positions and cut their leads to suitable lengths for connection. Pre 'tin' the last 1/8" or so of their leads. Solder the resistors in their respective positions *with their bottom leads soldered to their ground points* . Doing so will make the resistors' bare 'top leads' convenient test points for troubleshooting later, if required. *Installation order is not important.*
- ★ ❑ Form the leads of resistors R11 and R12 in a vertical fashion (FIGURE 2). Hold each of the resistors, in turn, centered above their respective positions and cut their leads to suitable lengths for connection. Pre 'tin' the last 1/8" or so of their leads.
- ❑ Solder resistor R11's bottom lead to the pad where Q3's "base" lead is connected and solder R12's bottom lead to the pad where Q4's "base" lead is connected. Solder the top leads of R11 and R12 to pad where T1's primary center lead is connected.
- ❑ Prepare the leads of resistor R7 as you did with R11 and R12. Solder R7 in position with its top lead connected to Q2's "collector" pad and its other lead as shown on the *EM* template.

★ **Refer to the 'Construction Methods and Hints' and the 'EM Component Templates and Detail' pages for illustrations.**

The Enhanced Manhattan Islander Audio Amp
- Assembly Sequence, continued -

★ ❑ Form the leads of capacitors C1, C2 and C9 in a horizontal fashion (FIGURE 1). Hold each of the capacitors, in turn, centered above their respective Manhattan pads and clip their leads to suitable lengths for connection. Solder the capacitors into place. *Note: Using a jewelers screwdriver makes the component lead forming process easy and repeatable.*

★ ❑ Form the leads of electrolytic capacitors C3, C4, C7 and C8 in a horizontal fashion. While ***Observing polarity***, hold each of these capacitors, in turn, centered above their respective Manhattan pads and clip their leads to suitable lengths for connection. Pre 'tin' the last 1/8" or so of their leads with solder. ***Observe proper polarity*** and solder each of the electrolytic capacitors "vertically" into place.

★ ❑ Form the leads of electrolytic capacitors C5 and C6 in a horizontal fashion. While ***Observing polarity***, hold each of these capacitors, in turn, centered above their respective Manhattan pads and clip their leads to suitable lengths for connection. Place a short length of insulation (salvaged from scrap wire) over the "positive" leads of the two capacitors. Strip about 3/16" of the insulation off of the wire lead. Pre 'tin' the last 1/8" or so of the capacitor's leads with solder. ***Observe proper polarity*** and solder each of the electrolytic capacitors "vertically" into place.

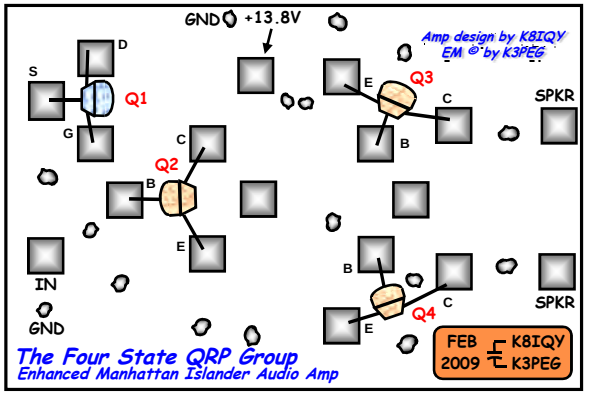
❑ **Congratulations!** You have completed your "*Enhanced Manhattan Islander Audio Amp" kit* using either the *Enhanced* or the traditional Manhattan construction method. Carefully check your work and get ready to test and use it. **T**ypical circuit voltage readings are provided on one of the amplifier's schematics for troubleshooting purposes.

Thank you for supporting ***The Four State QRP Group*** *and* ***Ozarkcon*** *!*

★ **Refer to the 'Construction Methods and Hints' and the 'EM Component Templates and Detail' pages for illustrations.**

The Enhanced Manhattan Islander Audio Amp
- Traditional Manhattan Method, board preparation -

Follow the instructions below to build the kit using the Traditional Manhattan method.



❑ Using an *X-acto*® knife (or similar), cut out the square (▢) and ground areas (○) in the template shown above. Then, cut out the entire template and tape it over the 2" x 3" board. The square openings are used to locate Manhattan pads and the ○'s are used to locate solder points on the board. Cut the template from this page and tape it to the copper clad board. Mark the board with an 'x' thru each square symbol (▢) *and* a 'dot' for each ground point symbol (○) shown on the above template.

❑ Remove the paper template and solder 'tin' the 'dot' locations on the board. Remove any excess solder.

★ ❑ Use a 40W iron to solder 'tin' the 3/16" by six-inch strip of copper clad material. Next, remove excess solder from the 'tinned' strip by using 3/16" to 1/4" wide *Soder-Wick*® braid or equivalent and a 40W soldering iron having a 3/16" or larger wide tip. "Draw" the heated braid along the 'tinned' strip in a perpendicular manner. Repeat as necessary to remove all excess solder. Flatten the strip. *You will appreciate why you solder 'tinned' the strip when you begin to build your kit!*

★ ❑ Thoroughly clean the solder 'tinned', six-inch, copper clad strip with alcohol and ensure it is completely dry. Using either scissors or a wire stripper/shear (IMO, the best tool for this job ☺) cut the solder 'tinned', six-strip into 3/16" square Manhattan pads. Eighteen pads are required to build the kit.

❑ Using the "*Xs" you marked on the board* as a guide, glue down all the Manhattan pads "DIRECTLY" to the board using either a fast setting Epoxy or Jelled Quick-Set Glue (*Cyanoacrylate*) adhesive. Allow sufficient time for the adhesive to dry. ***Do not allow Cyanoacrylate adhesive to contact human skin as it will quickly glue skin to skin or human skin to anything else it comes in contact with! Note: There's no need to mark the "Xs" for the EM building method.***

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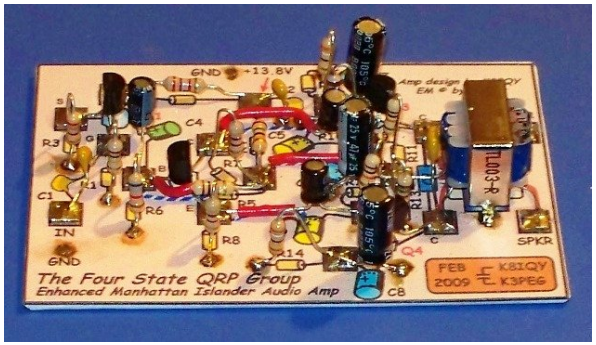
❑ *The board is now fully prepared to be populated with parts. Please go to page* ***7*** *for further instructions.*

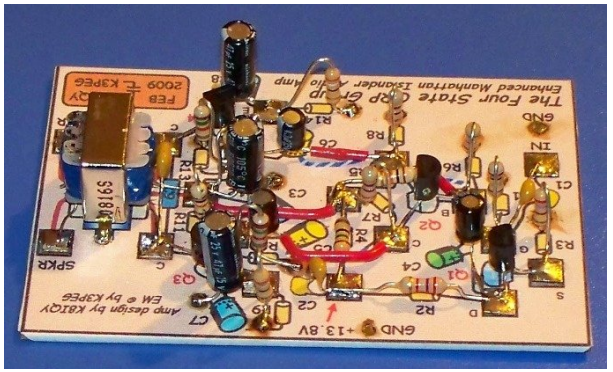
★ **Refer to 'Construction Methods and Hints' page for illustrations.**

The Enhanced Manhattan Islander Audio Amp

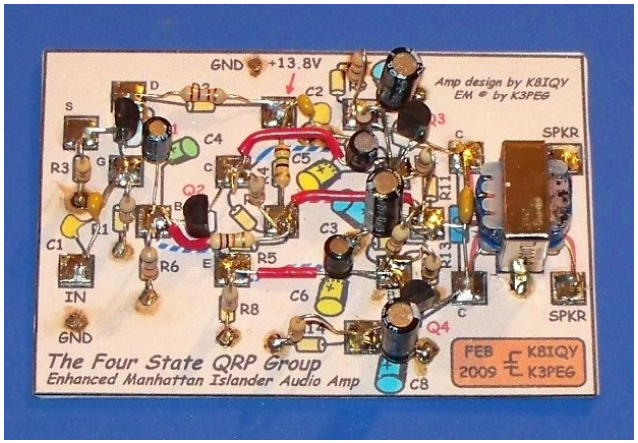
- Photographs of the EM Prototype -



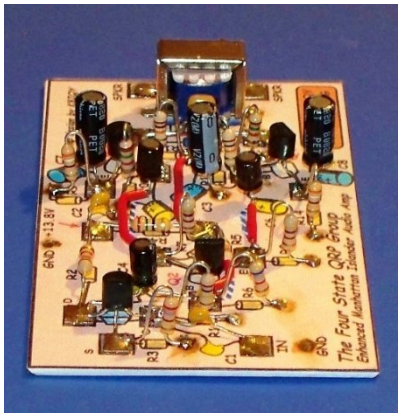
'Front' view



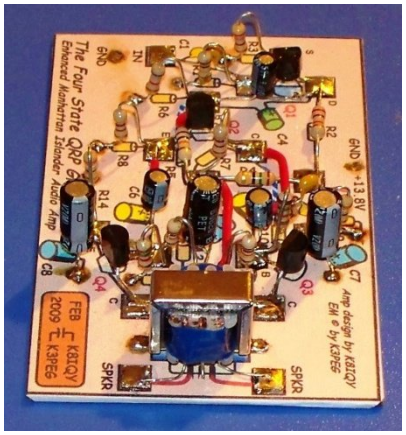
'Rear' view



'Top' view



'Input end' view



'T1 end' view

USE the Adobe Reader program's Zoom feature for a better view!

The Enhanced Manhattan Islander Audio Amp

- *EM* Component Templates and Detail -

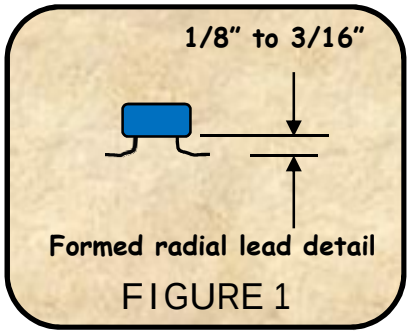


FIGURE 1

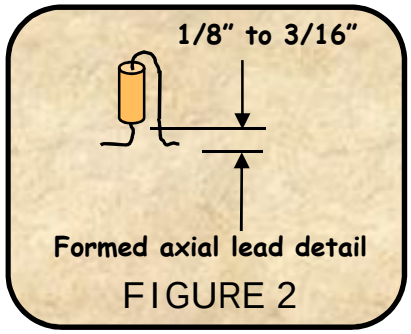


FIGURE 2

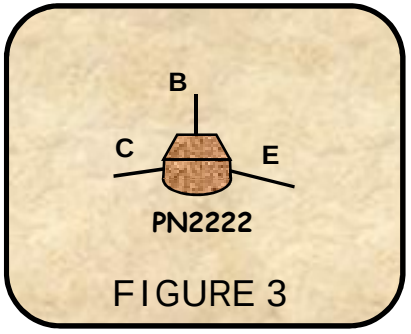


FIGURE 3

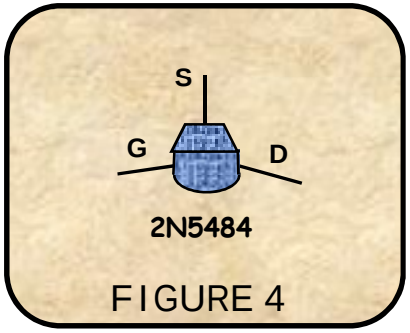
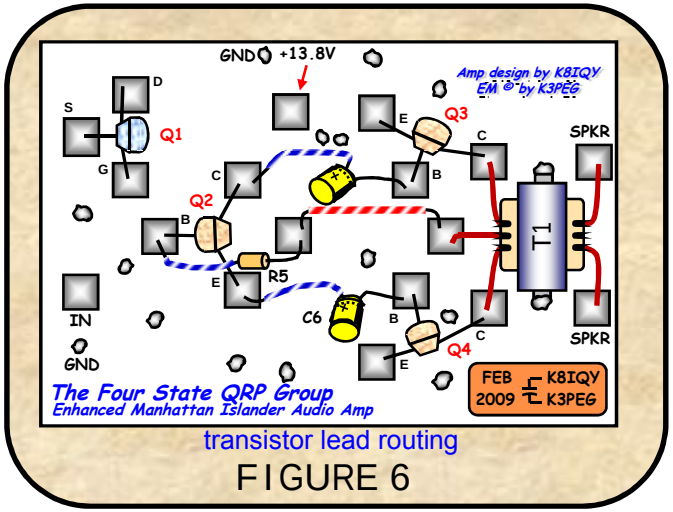


FIGURE 4



transistor lead routing

FIGURE 6

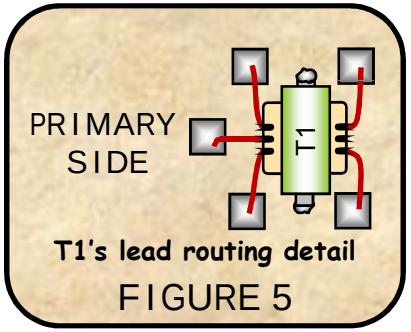
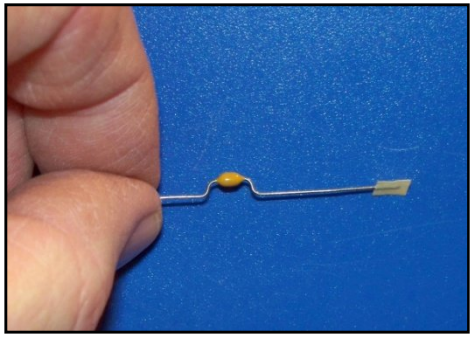


FIGURE 5

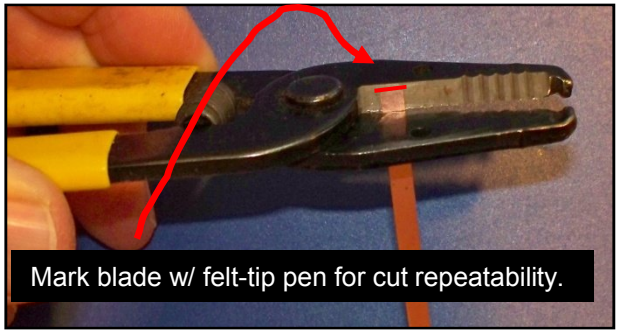
HINT:

Although not required, using '63/37' alloy solder makes assembly a bit easier. The reason is that '63/37' solder solidifies much more quickly than the familiar '60/40' solder, after pulling the soldering iron tip away from the molten solder on the pad. This property of '63/37' solder enables the builder to quickly 'tack' solder a component's lead onto a pad with less chance of any previously soldered leads coming off. The trick to accomplishing this feat is to first tin the component lead, then quickly apply just enough heat to tack solder the lead to the pad. This operation must be completed before too much heat is transferred to the pad to completely melt all the solder holding previously mounted components in place.

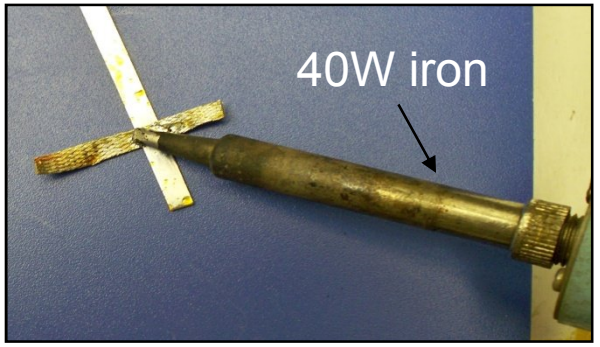
USE the Adobe Reader program's Zoom feature for a better view!



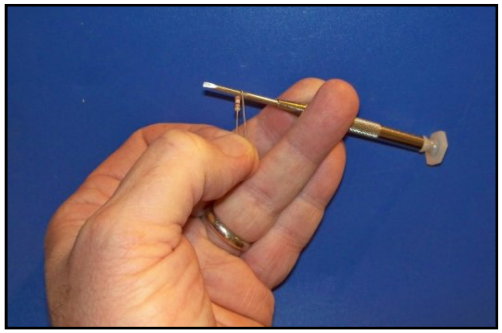
C9's axial leads, horizontally formed
(kit capacitor is blue in color)



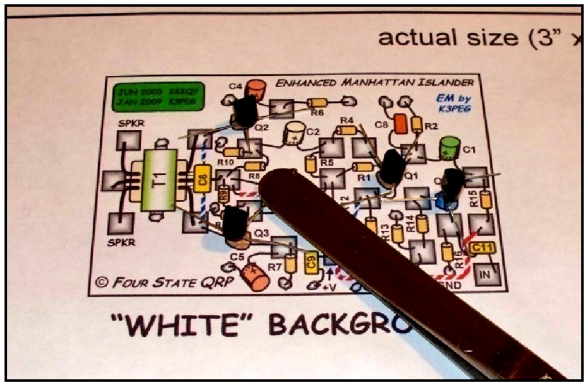
Cutting pads using a wire stripper



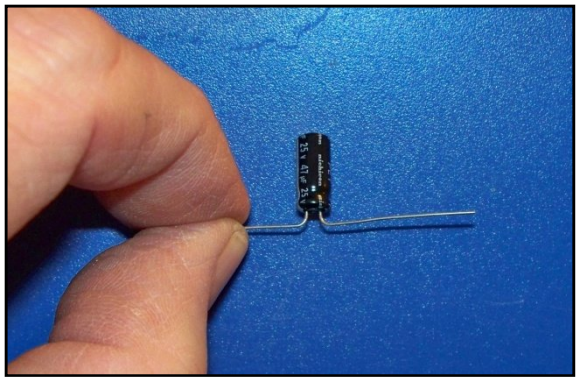
Removing excess solder from the 'tinned' strip



Forming leads using a jeweler's screwdriver



Transistor leads formed over an *EM* template



Electrolytic cap's radial leads horizontally formed

USE the Adobe Reader program's Zoom feature for a better view!

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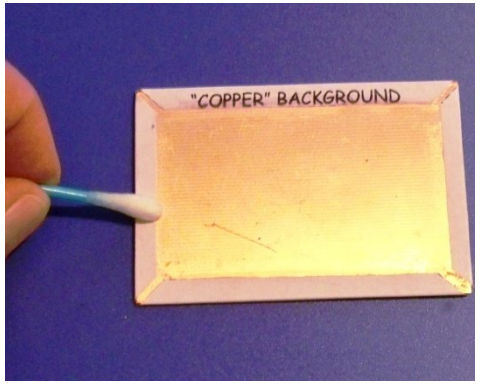
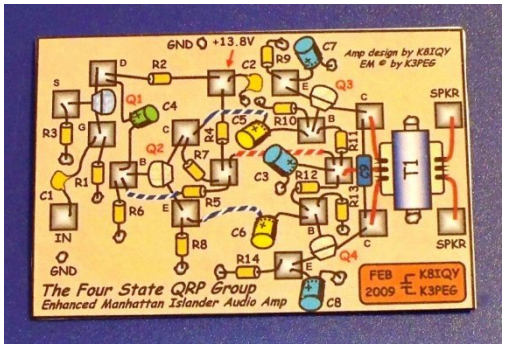
Rolling the *EM* template onto board

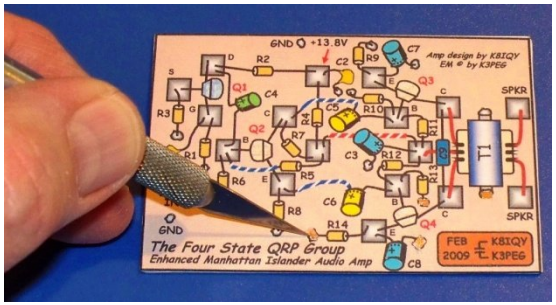
Brushing glue along board's rear perimeter



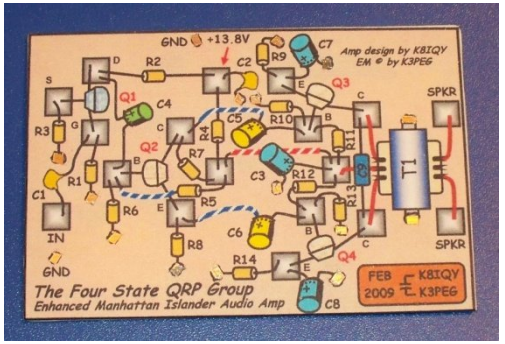
Cleaning up the excess glue



EM template glued to board



Knife "cut outs" of ground points



All ground points are cut out

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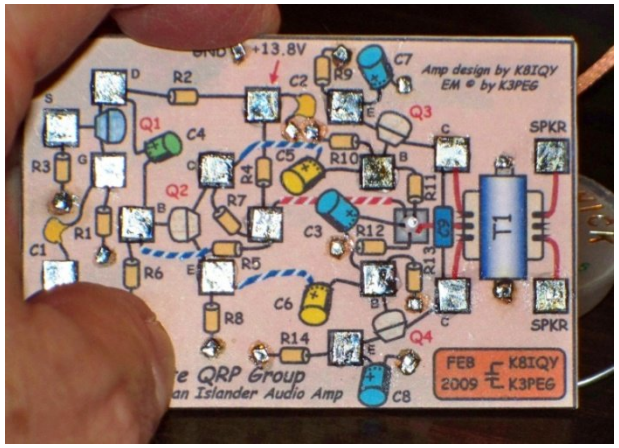
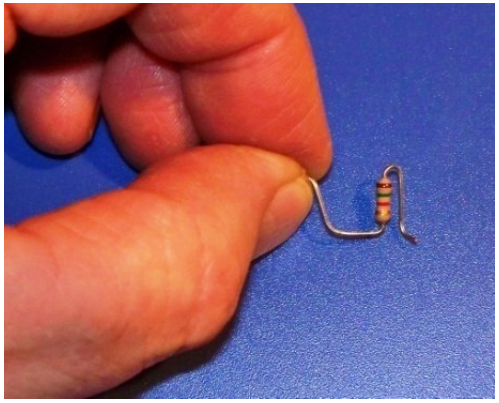
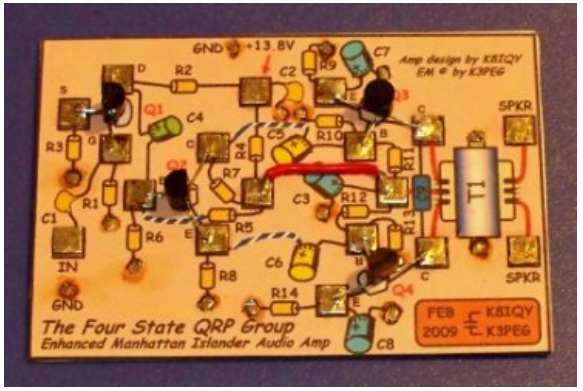


Pads glued down onto EM template and all ground points 'tinned'

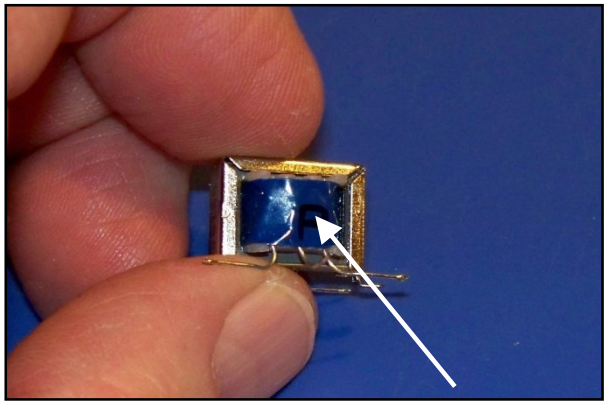


Bending excess lead length to 'get a grip' for installation.



All transistors and jumper wire installed

63/37 alloy solder; read about it on page 12



T1's Primary. Printed "P"

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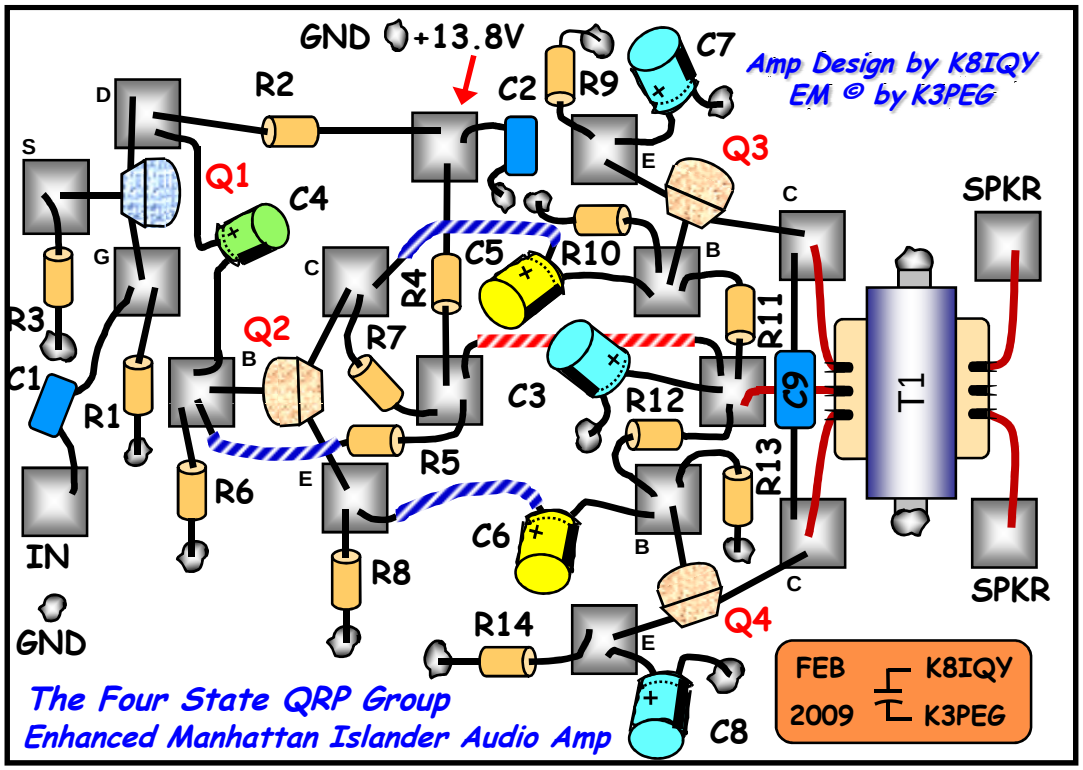
- Approximate 2x Size *EM* Template -



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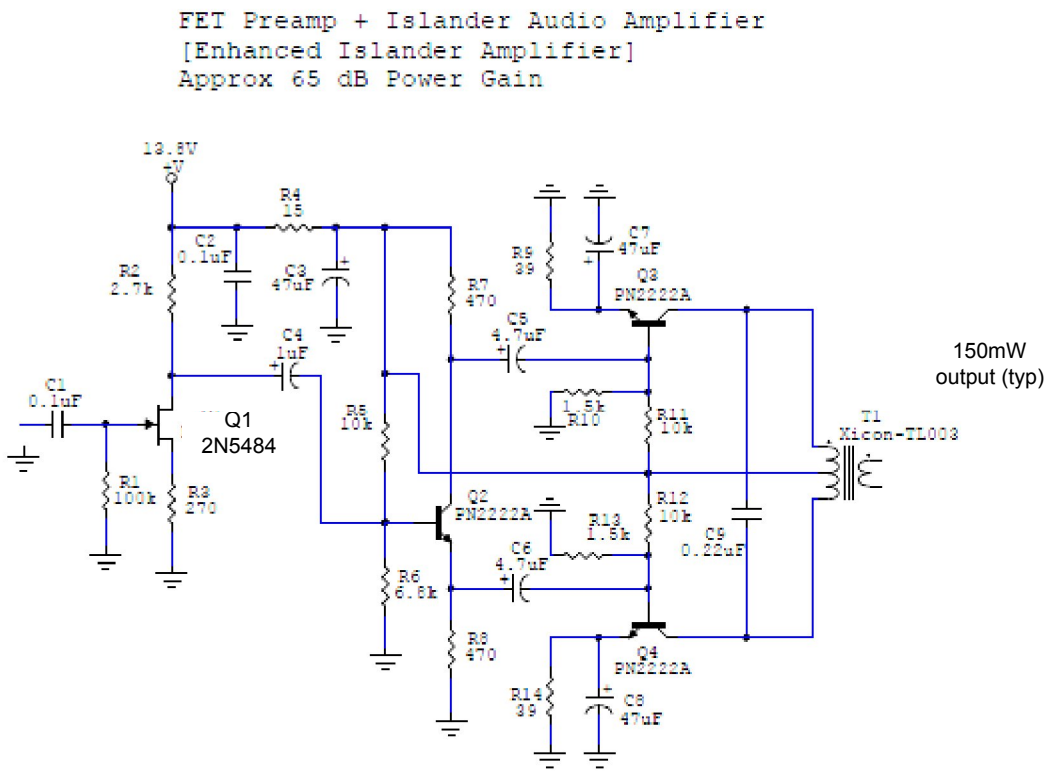
- Amplifier Schematic -



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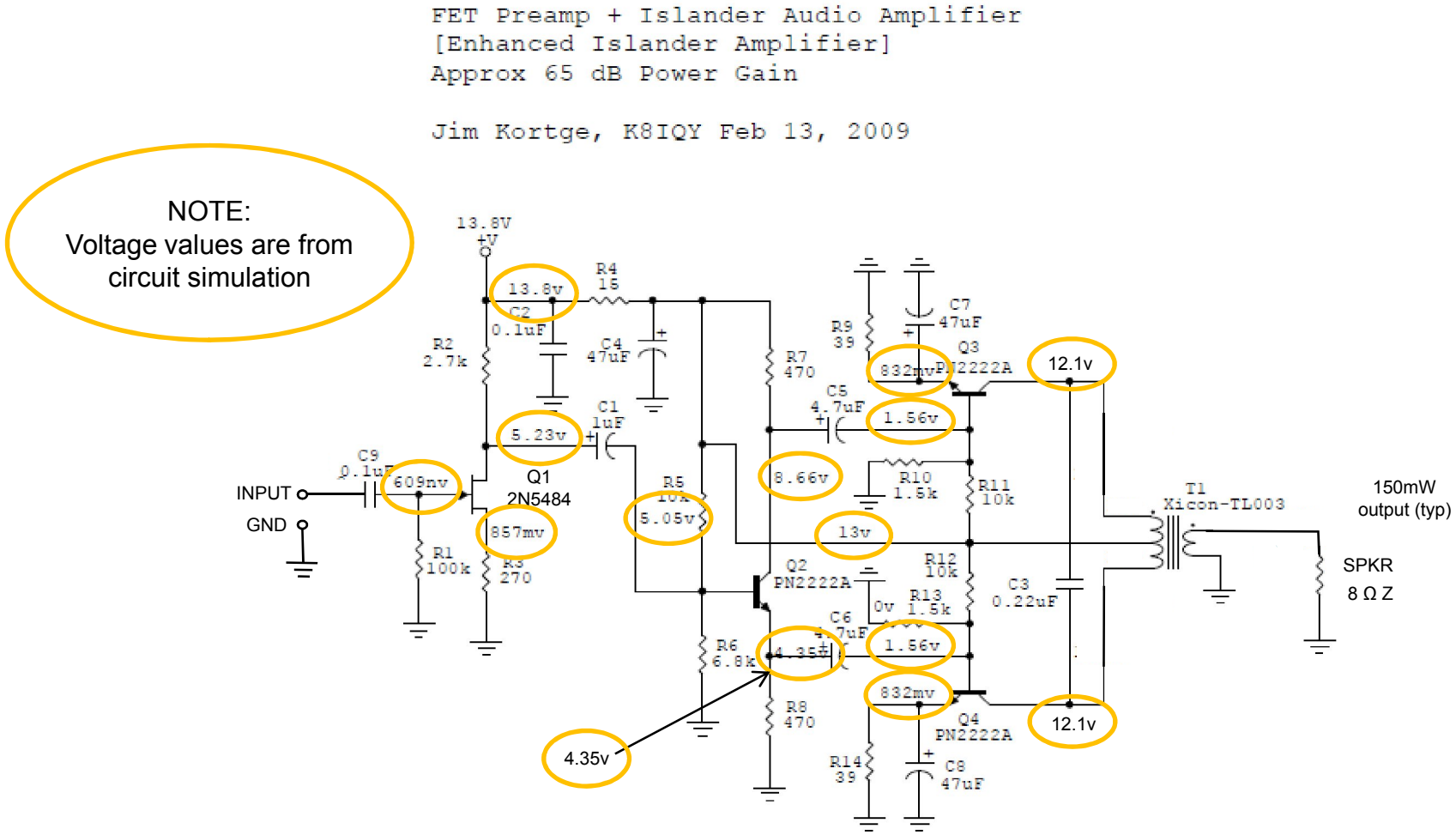
- Amplifier Schematic with Voltage Levels -



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- Frequency Response of the Amplifier -