IMPORTANT WARRANTY INFORMATION! PLEASE READ

Return Policy on Kits When *Not* Purchased Directly From Vectronics: Before continuing any further with your VEC kit check with your Dealer about their return policy. If your Dealer allows returns, your kit must be returned *before* you begin construction.

Return Policy on Kits When Purchased Directly From Vectronics: Your VEC kit may be returned to the factory *in its pre-assembled condition only*. The reason for this stipulation is, once you begin installing and soldering parts, you essentially take over the role of the device's manufacturer. From this point on, neither Vectronics nor its dealers can reasonably be held accountable for the quality or the outcome of your work. Because of this, Vectronics cannot accept return of any kit-in-progress or completed work as a warranty item for any reason whatsoever. If you are a new or inexperienced kit builder, we urge you to read the manual carefully and determine whether or not you're ready to take on the job. If you wish to change your mind and return your kit, you may--but you must do it *before* you begin construction, and within ten (10) working days of the time it arrives.

Vectronics Warrants: Your kit contains each item specified in the parts list.

Missing Parts: If you determine, during your pre-construction inventory, that any part is missing, please contact Vectronics and we'll send the missing item to you free of charge. However, *before* you contact Vectronics, *please look carefully* to confirm you haven't misread the marking on one of the other items provided with the kit. Also, make certain an alternative part hasn't been substituted for the item you're missing. If a specific part is no longer available, or if Engineering has determined that an alternative component is more suitable, Vectronics reserves the right to make substitutions at any time. In most cases, these changes will be clearly noted in an addendum to the manual.

Defective Parts: Today's electronic parts are physically and electrically resilient, and defective components are rare. However, if you discover an item during your pre-construction inventory that's obviously broken or unserviceable, we'll replace it. Just return the part to Vectronics at the address below accompanied with an explanation. Upon receipt, we'll test it. If it's defective and appears unused, we'll ship you a new one right away at no charge.

Missing or Defective Parts After You Begin Assembly: Parts and materials lost or damaged *after construction begins* are not covered under the terms of this warranty. However, most parts supplied with VEC kits are relatively inexpensive and Vectronics can replace them for a reasonable charge. Simply contact the factory with a complete description. We'll process your order quickly and get you back on track.

Factory Repair After You Begin Assembly: *Kits-in progress and completed kits are specifically excluded from coverage by the Vectronics warranty*. However, as a service to customers, technicians are available to evaluate and repair malfunctioning kits for a minimum service fee of $18.00 (½ hour rate) plus $7.00 shipping and handling (prices subject to change). To qualify for repair service, your kit must be fully completed, unmodified, and the printed circuit board assembled using rosin-core solder. In the event your repair will require more than an hour to fix (or $36.00, subject to change), our technicians will contact you in advance by telephone before performing the work. Defective units should be shipped prepaid to:

Vectronics
1007 HWY 25 South
Starkville, MS 39759

When shipping, pack your kit well and include the minimum payment plus shipping and handling charges ($25.00 total). No work can be performed without pre-payment. Also, provide a valid UPS return address and a day time phone number where you may be reached.

INTRODUCTION

Thank you for purchasing the VEC-841K Tunable CW Audio Filter kit. The VEC-841K consists of a four stage, switch selectable band pass CW filter, using selected components that will make “cleaning up” CW signals effortless and easy. Featuring razor sharp selectivity and extremely steep sided skirts, and a Tunable Notch, makes even the weakest signal stand out. Also, the VEC-841K has a built-in 1 watt audio amplifier that will easily drive headphones or an external speaker. With the VEC-841K you bring up any hard to hear signal out of a “band pile up” for easy listening, or get rid of unwanted, annoying signals. The VEC-841K also features a headphone output that will allow the use of standard mono headphones. The VEC-841K is powered from any 9-18 volt DC power supply.

TOOLS AND SUPPLIES

Construction Area: Kit construction requires a clean, smooth, and well-lighted area where you can easily organize and handle small parts without losing them. An inexpensive sheet of white poster board makes an excellent construction surface, while providing protection for the underlying table or desk. Well-diffused overhead lighting is a plus, and a supplemental high-intensity desk lamp will prove especially helpful for close-up work. Safety is an important consideration. Be sure to use a suitable high-temperature stand for your soldering iron, and keep the work area free of combustible clutter.

Universal Kit-building Tools: Although your particular kit may require additional items to complete, virtually all construction projects require a work area outfitted with the following tools and supplies:

- ☐ 30-60 watt Soldering Iron
- ☐ High-temperature Iron Holder with a Moist Cleaning Sponge
- ☐ Rosin-core Solder (thin wire-size preferred)
- ☐ Needle Nose Pliers or Surgical Hemostats
- ☐ Diagonal Cutters or "Nippy Cutters"
- ☐ Wire Strippers
- ☐ Solder Sucker, Vacuum Pump, or Desoldering Braid
- ☐ Bright Desk Lamp
- ☐ Magnifying Glass

BEFORE YOU START BUILDING

Experience shows there are *four common mistakes* builders make. Avoid these, and your kit will probably work on the first try! Here's what they are:

1. **Installing the Wrong Part:** It always pays to double-check each step. A 1K and a 10K resistor may look *almost* the same, but they may act very differently in an electronic circuit! Same for capacitors--a device marked 102 (or .001 uF) may have very different operating characteristics from one marked 103 (or .01uF).

2. **Installing Parts Backwards:** Always check the polarity of electrolytic capacitors to make sure the positive (+) lead goes in the (+) hole on the circuit board. Transistors have a flat side or emitter tab to help you identify the correct mounting position. ICs have a notch or dot at one end indicating the correct direction of insertion. Diodes have a banded end indicating correct polarity. Always double-check--especially before applying power to the circuit!

3. **Faulty Solder Connections:** Inspect for cold-solder joints and solder bridges. Cold solder joints happen when you don't fully heat the connection--or when metallic corrosion and oxide contaminate a component lead or pad. Solder bridges form when a trail of excess solder shorts pads or tracks together (see Solder Tips below).

4. **Omitting or Misreading a Part:** This is easier to do than you might think! Always double-check to make sure you completed each step in an assembly sequence.

Soldering Tips: *Cleanliness* and good *heat distribution* are the two secrets of professional soldering. Before you install and solder each part, inspect leads or pins for oxidation. If the metal surface is dull, sand with fine emery paper until shiny. Also, clean the oxidation and excess solder from the soldering iron tip to allow maximum heat transfer. Allow the tip of your iron to contact both the lead and pad for about one second (count "one-thousand-one") before feeding solder to the connection. Surfaces must become hot enough for solder to *flow smoothly*. Feed solder to the opposite side of the lead from your iron tip--solder will wick around the lead toward the tip, wetting all exposed surfaces. Apply solder sparingly, and do not touch solder directly to the hot iron tip to promote rapid melting.

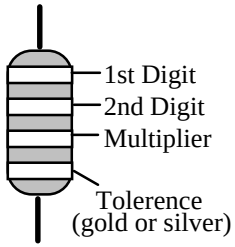
Desoldering Tips: If you make a mistake and need to remove a part, follow these instructions carefully! First, grasp the component with a pair of hemostats or needle-nose pliers. Heat the pad beneath the lead you intend to extract, and pull gently. The lead should come out. Repeat for the other lead. Solder may fill in behind the lead as you extract it--especially if you are working on a

double-sided board with plate-through holes. Should this happen, try heating the pad again and inserting a common pin into the hole. Solder won't stick to the pin's chromium plating. When the pad cools, remove the pin and insert the correct component. For ICs or multi-pin parts, use desoldering braid to remove excess solder before attempting to extract the part. Alternatively, a low-cost vacuum-bulb or spring-loaded solder sucker may be used. Parts damaged or severely overheated during extraction should be replaced rather than reinstalled.

Work Habits: Kit construction requires the ability to follow detailed instructions and, in many cases, to perform new and unfamiliar tasks. To avoid making needless mistakes, work for short periods when you're fresh and alert. Recreational construction project are more informative and more fun when you take your time. Enjoy!

Sorting and Reading Resistors: The electrical value of resistors is indicated by a color code (shown below). You don't have to memorize this code to work with resistors, but you do need to understand how it works:

Resistor Color Code

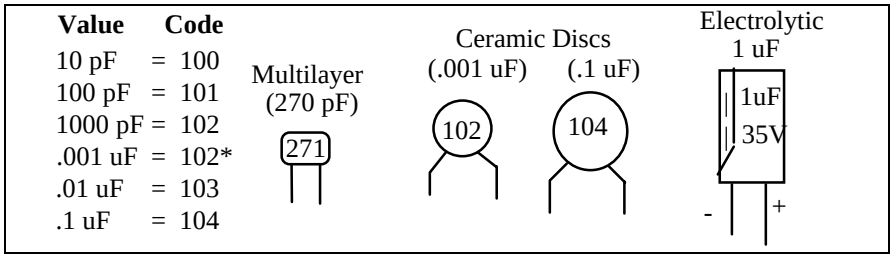


Black = 0 (tens)	Blue = 6
Brown = 1 (hundreds)	Violet = 7
Red = 2 (K)	Gray = 8
Orange = 3 (10K)	White = 9
Yellow = 4 (100K)	Silver = 10%
Green = 5 (1Meg)	Gold = 5%

When you look at a resistor, check its multiplier code first. Any resistor with a black multiplier band falls between 10 and 99 ohms in value. Brown designates a value between 100 and 999 ohms. Red indicates a value from 1000 to 9999 ohms, which is also expressed as 1.0K to 9.9K. An orange multiplier band designates 10K to 99K, etc. To sort and inventory resistors, first separate them into groups by multiplier band (make a pile of 10s, 100s, Ks, 10Ks, etc.). Next, sort each group by specific value (1K, 2.2K, 4.7K, etc.). This procedure makes the inventory easier, and also makes locating specific parts more convenient later on during construction. Some builders find it especially helpful to arrange resistors in ascending order along a strip of double-sided tape.

Some VEC kits may contain molded chokes which appear, at first glance, similar to resistors in both shape and band marking. However, a closer look will enable you to differentiate between the two--chokes are generally larger in diameter and fatter at the ends than resistors. When doing your inventory, separate out any chokes and consult the parts list for specific color-code information.

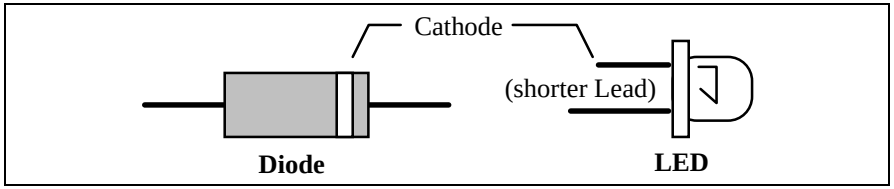
Reading Capacitors: Unlike resistors, capacitors no longer use a color code for value identification. Instead, the value, or a 3-number code, is printed on the body.



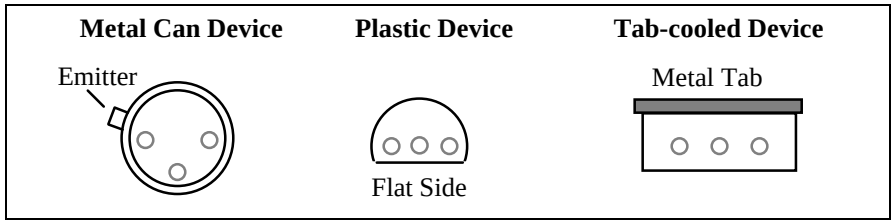
As with resistors, it's helpful to sort capacitors by type, and then to arrange them in ascending order of value. Small-value capacitors are characterized in pF (or pico-Farads), while larger values are labeled in uF (or micro-Farads). The transition from pF to uF occurs at 1000 pF (or .001 uF)*. Today, most monolithic and disc-ceramic capacitors are marked with a three-number code. The first two digits indicate a numerical value, while the last digit indicates a multiplier (same as resistors).

Electrolytic capacitors are always marked in uF. Electrolytics are polarized devices and must be oriented correctly during installation. If you become confused by markings on the case, remember the uncut negative lead is slightly shorter than the positive lead.

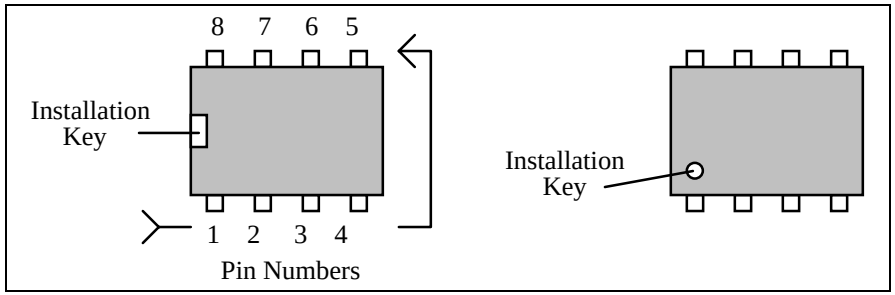
Diodes: Diodes are also polarized devices that must be installed correctly. Always look for the banded or cathode end when installing, and follow instructions carefully.



Transistors: If transistors are installed incorrectly, damage may result when power is applied. Transistors in metal cases have a small tab near the emitter lead to identify correct positioning. Semiconductors housed in small plastic cases (TO-92) have an easily-identified flat side to identify mounting orientation. Many specialized diodes and low-current voltage regulators also use this type packaging. Larger plastic transistors and voltage regulators use a case backed with a prominent metal tab to dissipate heat (T-220). Here orientation is indicated by the positioning of the cooling tab.



Integrated Circuits: Proper IC positioning is indicated by a dot or square marking located on one end of the device. A corresponding mark will be silk-screened on the PC board and printed on the kit's parts-placement diagram. To identify specific IC pin numbers for testing purposes, see the diagram below. Pin numbers always start at the keyed end of the case and progress counter-clockwise around the device, as shown:



PARTS LIST

Your kit should contain all of the parts in the following list. Please go through the parts bag to identify and inventory each item on the checklist before you start building. If any parts are missing or damaged, refer to the warranty section of this manual for replacement instructions. If you can't positively identify an unfamiliar item in the bag on the basis of the information given, set it aside until all other items are checked off. You may then be able to identify it by process of elimination. Finally, your kit will go together more smoothly if parts are organized by type and arranged by value ahead of time. Use this inventory as an opportunity to sort and arrange parts so you can identify and find them quickly.

☑	Qty	Part Description	Designation
Fixed Resistors:			
☐	1	2.7 ohm resistor (red-violet-gold)	R35
☐	1	5.1 ohm, 1/2 watt resistor (green-brown-gold)	R32
☐	1	68 ohm resistor; 1/2 watt (blue-gray-black)	R36
☐	3	470 ohm resistor (yellow-violet-brown)	R10, R28, R29

☐	1	2.2K ohm resistor (red-red-red)	R11
☐	6	4.7K ohm resistor (yellow-violet-red)	R5, R6, R7, R8 R18, R33
☐	10	10K ohm resistor (brown-black-orange)	R1, R9, R12, R13 R19, R20, R23 R30, R31, R34
☐	2	24K ohm resistor (red-yellow-orange)	R3, R22
☐	5	100K ohm resistor (brown-black-yellow)	R2, R14, R15 R17, R21
☐	1	130K ohm resistor (brown-orange-yellow)	R4
☐	1	240K ohm resistor (red-yellow-yellow)	R16

Capacitors:

☐	4	.1uF disc ceramic capacitor (104, 104Z)	C1, C3, C16, C17
☐	3	.01uF disc ceramic capacitor (103, 103Z)	C2, C4, C15
☐	4	1000pF polystyrene capacitors (1000J)	C5, C6, C7, C8
☐	1	100uF electrolytic capacitor	C12
☐	2	470uF electrolytic capacitor	C11, C14
☐	1	10uF electrolytic capacitor (radial leads)	C13
☐	2	10uF electrolytic capacitor (axial leads)	C9, C10

Semi-conductors:

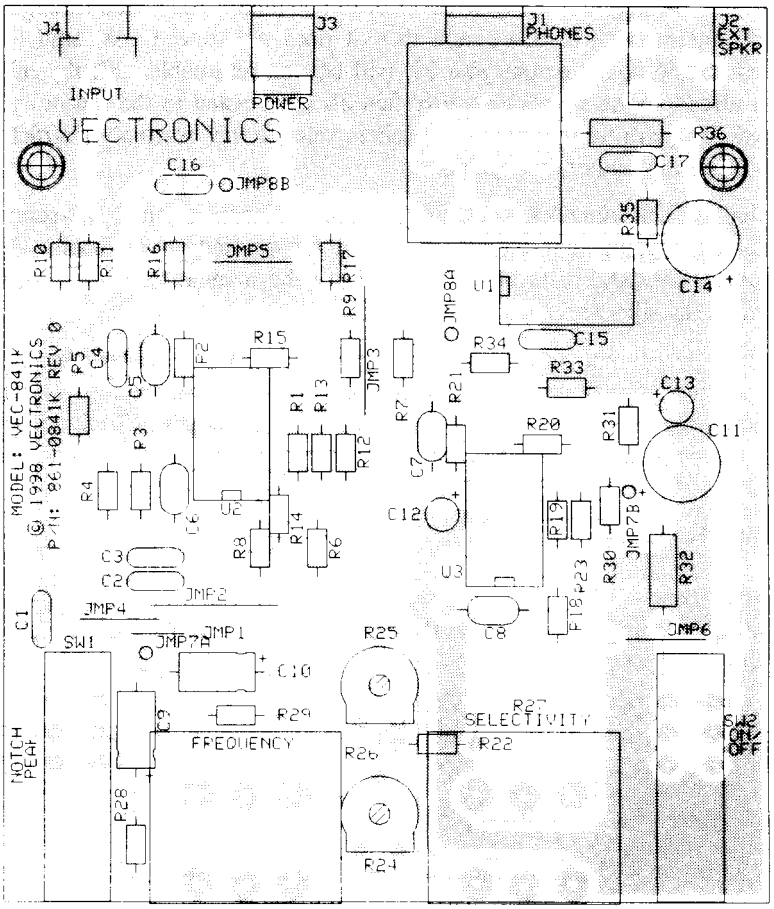
☐	2	TL084 quad operational amplifiers IC	U2, U3
☐	1	LM380 2 watt audio amplifier IC	U1

Miscellaneous:

☐	1	10K ohm horizontal trimpot (10K or 103)	R25
☐	1	500K ohm horizontal trimpot (500K or 504)	R24
☐	2	500K Dual Linear potentiometer	R26, R27
☐	2	2-pole 2-position push button switch	SW1, SW2
☐	1	RCA phono jack	J4
☐	1	1/4" stereo phone jack	J1
☐	1	3.5mm stereo jack	J2
☐	1	2.1mm coaxial DC jack	J3
☐	3	14-pin IC sockets	For U1, U2, U3
☐	2	6" insulated stranded wires	Circuit wiring
☐	1	VEC-841K PC board	
☐	1	Instruction Manual	

PARTS PLACEMENT DIAGRAM

PARTS PLACEMENT DIAGRAM



STEP-BY-STEP ASSEMBLY

Before assembling your kit, please take time to read and understand the VEC kit warranty printed on the inside cover of this manual. Also, read through the assembly instructions to make sure the kit does not exceed your skill level. Once you begin construction, your kit will be non-returnable. Finally, if you haven't already done so, please verify that all parts listed in the inventory are included. If anything is missing or broken, refer to the warranty instructions for replacing missing or damaged parts.

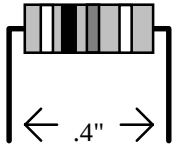
Note that part designators, such as R1, C3, etc., appear on a silk-screened legend on the component-mounting side of the printed circuit board. This corresponds with the parts placement page in the manual. All parts will be inserted on the silk-screen side of the board.

If you have last-minute questions about what you need to build your kit, please refer back to the section titled "Tools and Supplies". If you're ready to begin now, here we go! The directions use two sets of check boxes. Check one when a step is complete and use the other for double-checking your work before operation.

Installing Resistors:

☐ ☐ 1. Locate resistor R35. This is a 2.7 ohm resistor (red-violet-gold).

Carefully bend the leads close to the resistor body to form right-angles (see following diagram).



☐ ☐ 2. Insert R35 into its mounting holes so the resistor body rests against the board. Solder in place and trim the leads.

☐ ☐ 3. Locate resistor R10. This is a 470 ohm resistor (yellow-violet-brown). Carefully bend the leads close to the resistor body as in Step #1. Insert at R10, solder in place and trim the leads

☐ ☐ 4. Locate resistor R28. This is a 470 ohm resistor (yellow-violet-brown). Carefully bend the leads close to the resistor body as in Step #1. Insert at R28, solder in place and trim the leads.

☐ ☐ 5. Locate resistor R29. This is a 470 ohm resistor (yellow-violet-brown). Carefully bend the leads close to the resistor body as in Step #1. Insert at R29, solder in place and trim the leads.

☐ ☐ 6. Locate resistor R11. This is a 2.2K resistor (red-red-red). Carefully bend the leads close to the resistor body as in Step #1. Insert at R11, solder in place and trim the leads.

☐ ☐ 7. Locate resistor R5. This is a 4.7K resistor (yellow-violet-red). Carefully bend the leads close to the resistor body as in Step #1. Insert at R5, solder in place and trim the leads.

☐ ☐ 8. Locate resistor R6. This is a 4.7K resistor (yellow-violet-red). Carefully bend the leads close to the resistor body as in Step #1. Insert at R6, solder in place and trim the leads.

☐ ☐ 9. Locate resistor R7. This is a 4.7K resistor (yellow-violet-red). Carefully bend the leads close to the resistor body as in Step #1. Insert at R7, solder in place and trim the leads.

☐ ☐ 10. Locate resistor R8. This is a 4.7K resistor (yellow-violet-red). Carefully bend the leads close to the resistor body as in Step #1. Insert at R8, solder in place and trim the leads.

☐ ☐ 11. Locate resistor R18. This is a 4.7K resistor (yellow-violet-red). Carefully bend the leads close to the resistor body as in Step #1. Insert at R18, solder in place and trim the leads.

☐ ☐ 12. Locate resistor R33. This is a 4.7K resistor (yellow-violet-red). Carefully bend the leads close to the resistor body as in Step #1. Insert at R33, solder in place and trim the leads.

☐ ☐ 13. Locate resistor R1. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R1, solder in place and trim the leads.

☐ ☐ 14. Locate resistor R9 This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R9, solder in place and trim the leads.

☐ ☐ 15. Locate resistor R12. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R12, solder in place and trim the leads.

☐ ☐ 16. Locate resistor R13. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R13, solder in place and trim the leads.

☐ ☐ 17. Locate resistor R19. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R19, solder in place and trim the leads.

☐ ☐ 18. Locate resistor R20. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R20, solder in place and trim the leads.

☐ ☐ 19. Locate resistor R23. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R23, solder in place and trim the leads.

☐ ☐ 20. Locate resistor R30. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R30, solder in place and trim the leads.

☐ ☐ 21. Locate resistor R31. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R31, solder in place and trim the leads.

☐ ☐ 22. Locate resistor R34. This is a 10K resistor (brown-black-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R34, solder in place and trim the leads.

☐ ☐ 23. Locate resistor R3. This is a 24K resistor (red-yellow-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R3, solder in place and trim the leads.

☐ ☐ 24. Locate resistor R22. This is a 24K resistor (red-yellow-orange). Carefully bend the leads close to the resistor body as in Step #1. Insert at R22, solder in place and trim the leads.

☐ ☐ 25. Locate resistor R2. This is a 100K resistor (brown-black-yellow). Carefully bend the leads close to the resistor body as in Step #1. Insert at R2, solder in place and trim the leads.

☐ ☐ 26. Locate resistor R14. This is a 100K resistor (brown-black-yellow). Carefully bend the leads close to the resistor body as in Step #1. Insert at R14, solder in place and trim the leads.

☐ ☐ 27. Locate resistor R15. This is a 100K resistor (brown-black-yellow). Carefully bend the leads close to the resistor body as in Step #1. Insert at R15, solder in place and trim the leads.

☐ ☐ 28. Locate resistor R17. This is a 100K resistor (brown-black-yellow). Carefully bend the leads close to the resistor body as in Step #1. Insert at R17, solder in place and trim the leads.

☐ ☐ 29. Locate resistor R21. This is a 100K resistor (brown-black-yellow). Carefully bend the leads close to the resistor body as in Step #1. Insert at R21, solder in place and trim the leads.

☐ ☐ 30. Locate resistor R4. This is a 130K resistor (brown-orange-yellow). Carefully bend the leads close to the resistor body as in Step #1. Insert at R4, solder in place and trim the leads.

☐ ☐ 31. Locate resistor R16. This is a 240K resistor (red-yellow-yellow). Carefully bend the leads close to the resistor body as in Step #1. Insert at R16, solder in place and trim the leads.

☐ ☐ 32. Locate resistor R32. This is a 5.1 ohm, 1/2 watt resistor (green-brown-gold). Carefully bend the leads close to the resistor body as in Step #1. Insert at R32, solder in place and trim the leads.

☐ ☐ 33. Locate resistor R36. This is a 68 ohm, 1/2 watt resistor (blue-gray-black). Carefully bend the leads close to the resistor body as in Step #1. Insert at R36, solder in place and trim the leads.

Installing Non-polarized Capacitors:

Important Note: Capacitors C5-C8 are made of a polystyrene type material. Avoid overheating these components when soldering to prevent melting the capacitor body.

☐ ☐ 1. Locate capacitor C5 (1000pF). The is a polystyrene capacitor and will be marked with a "1000J" on the body (actual value in pF).

☐ ☐ 2. Mount C5 and solder both leads in place, making sure the capacitor remains seated. Remove excess leads on the bottom side of the board with diagonal cutters.

☐ ☐ 3. Locate capacitor C6 (1000pF). The is a polystyrene capacitor and will be marked with a "1000J" on the body (actual value in pF). Insert at C6, solder in place and trim the leads.

☐ ☐ 4. Locate capacitor C7 (1000pF). Insert at C7, solder in place and trim the leads.

☐ ☐ 5. Locate capacitor C8 (1000pF). Insert at C8, solder in place and trim the leads.

☐ ☐ 6. Locate capacitor C1 (.1uF). The is a disc ceramic capacitor and will be marked with either a "104" or "104Z" on the body (actual value in uF). Insert at C1, solder in place and trim the leads.

☐ ☐ 7. Locate capacitor C3 (.1uF). Insert at C3, solder in place and trim the leads.

☐ ☐ 8. Locate capacitor C16 (.1uF). Insert at C16, solder in place and trim the leads.

☐ ☐ 9. Locate capacitor C17 (.1uF). Insert at C17, solder in place and trim the leads.

☐ ☐ 10. Locate capacitor C2 (.01uF). The is a disc ceramic capacitor and will be marked with either a "103" or "103Z" on the body. (actual value in uF). Insert at C2, solder in place and trim the leads.

☐ ☐ 11. Locate capacitor C4 (.01uF). Insert at C4, solder in place and trim the leads.

☐ ☐ 12. Locate capacitor C15 (.01uF). Insert at C15, solder in place and trim the leads.

At this point you may want to take a few minutes to double check your work. There are still quite a few parts to be installed on this board.

Installing Trimpots:

☐ ☐ 1. Locate R25. This is a 10K horizontal trimpot.

☐ ☐ 2. Insert R25 into its mounting holes until it stops, making sure that all three (3) legs are inserted into the board. Bend the legs outward to secure the part to the board. Solder in place.

☐ ☐ 3. Locate R24. This is a 500K horizontal trimpot.

☐ ☐ 4. Insert R24 into its mounting holes until it stops, making sure that all three (3) legs are inserted into the board. Bend the legs outward to secure the part to the board. Solder in place.

Installing Electrolytic Capacitors:

Important Note: *Electrolytic caps are polarized and must be installed the correct way in order to work.* Each capacitor's plus (+) mounting holes are noted on both the circuit board and parts placement diagram. If the markings on the capacitor body are unclear, the plus (+) lead is always the longer of the two.

☐ ☐ 1. Locate capacitor C12 (100uF). This is an electrolytic capacitor and will be marked "100uF" (actual value in uF). *Remember, an electrolytic capacitor is a polarity sensitive component and must be installed properly.*

☐ ☐ 2. Carefully install C12, ensuring that both leads are fully seated, and that it is installed with respect to the proper polarity Once installed, then solder in place and trim the leads.

☐ ☐ 3. Locate capacitor C11 (470uF). This is an electrolytic capacitor and will be marked "470uF". Insert at C11, observing correct polarity, solder in place and trim the leads.

☐ ☐ 4. Locate capacitor C14 (470uF). Insert at C14, observing correct polarity, solder in place and trim the leads.

☐ ☐ 5. Locate capacitor C13 (10uF). This is an electrolytic capacitor and will be marked "10uF". There are two "styles" of 10uF capacitors in this kit. Capacitor C13 is the same "style" as C12, with the leads coming out of the bottom of the component. Insert at C13, observing correct polarity, solder in place and trim the leads.

☐ ☐ 6. Locate capacitor C9 (10uF). This is an electrolytic capacitor and will be marked "10uF" (actual value in uF). Capacitor C9 is the type of capacitor with leads coming out of the ends of the component (like a resistor). Insert at C9, observing correct polarity (positive lead toward R28), solder in place and trim the leads.

☐ ☐ 7. Locate capacitor C10 (10uF). This is an electrolytic capacitor and will be marked "10uF" (actual value in uF). Capacitor C10 is the type of capacitor with leads coming out of the ends of the component (like a resistor). Insert at C10, observing correct polarity, solder in place and trim the leads.

Installing PCB Jumpers:

☐ ☐ 1. Locate one (1) 6" piece of insulated wire. Using a ruler, measure and cut three (3) pieces 13/16" long.

☐ ☐ 2. Using a pair of wire strippers, remove 1/8" of insulation from each end of each 13/16" long piece.

☐ ☐ 3. Install one 13/16" jumper at JMP4. This wire is stranded, so be sure that all strands are in the hole. Once installed, solder in place and trim the leads.

☐ ☐ 4. Install one 13/16" jumper at JMP5. Solder in place and trim the leads.

☐ ☐ 5. Install the remaining 13/16" jumper at JMP6. Solder in place and trim the leads.

☐ ☐ 6. Locate another piece of the 6" insulated wire. Using a ruler, measure and cut two (2) pieces 1" long. With a pair of wire strippers, remove 3/16" of insulation from each end of each 1" long piece.

☐ ☐ 7. Install one of the 1" jumpers at JMP2. This wire is stranded, so be sure that all strands are in the hole. Once installed, solder in place and trim the leads.

☐ ☐ 8. Install the remaining 1" jumper at JMP3. Solder in place and trim the leads.

☐ ☐ 9. Use the rest of the 6" insulated wire--should be about 1" left over. With a ruler, measure and cut one (1) piece 5/8" long. Then remove 1/8" of insulation from each end of the 5/8" long piece.

☐ ☐ 10. Install the 5/8" jumper at JMP1. Solder in place and trim the leads.

☐ ☐ 11. Locate the remaining piece of the 6" insulated wire. Using a ruler, measure and cut one (1) piece 3¾" long. Then remove 1/8" of insulation from each end of the 3¾" long piece.

☐ ☐ 12. Install the 3¾" jumper between points JMP7A and JMP7B on the circuit board. Please refer to the "Parts Placement Diagram" for the location of points JMP7A and JMP7B. Once installed, solder in place and trim the leads.

☐ ☐ 13. Locate the remaining piece of the 6" insulated wire. Measure and cut one (1) piece 1¾" long, then remove 1/8" of insulation from each end of the 1¾" long piece.

☐ ☐ 14. Install the 1¾" jumper between points JMP8A and JMP8B on the circuit board. Please refer to the "Parts Placement Diagram" for the location of points JMP8A and JMP8B. Once installed, solder in place and trim the leads.

☐ ☐ 15. Select a scrap resistor lead to make the final jumper. Install at JMP9 and solder.

Installing Switches:

☐ ☐ 1. Locate push-button switch SW1. Referencing the "Parts Placement" section install SW1 so all six legs are inserted into the circuit board holes. Ensure that SW1 is parallel with the circuit board surface. Once installed, solder in place.

☐ ☐ 2. Locate push-button switch SW2. Install SW2 so all six legs are inserted into the circuit board holes. Ensure that SW2 is parallel with the circuit board surface. Once installed, solder in place.

Installing IC Sockets and ICs:

Important Note: Refer to the "Parts Placement" section for the proper orientation of Pin 1 of the IC sockets. Proper orientation is essential to ensure that the ICs are installed properly.

☐ ☐ 1. Locate a 14-pin IC socket. Install it at the location for U1, ensuring proper orientation of pin 1. Refer to "Parts Placement Diagram" for proper orientation of pin 1.

☐ ☐ 2. Bend the four corner pins against the solder pads to hold the socket in place. Solder in place. Be careful not to create any solder bridges between the pins.

☐ ☐ 3. Locate another 14-pin IC socket. Install it at the location U2, ensuring proper orientation of pin 1. Solder.

☐ ☐ 4. Locate the final 14-pin IC socket. Install it at the location for U3, ensuring proper orientation of pin 1. Solder.

☐ ☐ 5. Locate both TL084 op amp integrated circuits. Insert them into IC sockets for U2 and U3. Please refer to the "Parts Placement Diagram" for proper orientation. Be sure not to bend any of the pins underneath the IC body, and that all pins are inserted into the socket.

☐ ☐ 6. Locate the LM380 audio amplifier integrated circuit. Insert it into IC socket for U1. Please refer to the "Parts Placement Diagram" for proper orientation. Be sure not to bend any of the pins underneath the IC body, and that all pins are inserted into the socket.

Installing Jacks:

☐ ☐ 1. Locate the RCA phono jack, J4. Install J4 so that the three (3) frame legs and the center conductor pin are inserted into the circuit board. Be sure that the frame of J4 is fully seated and is parallel with the circuit board surface. Solder in place.

☐ ☐ 2. Locate the 2.1mm coaxial power jack, J3. Install J3 so all legs are fully inserted into the circuit board, and the body rests totally against the circuit board surface. Solder in place.

☐ ☐ 3. Locate the 1/4" phones jack, J1. Install J1 so all seven (7) legs are fully inserted into the circuit board. Solder in place.

☐ ☐ 4. Locate the 3.5mm external speaker jack, J2. Install J2 so all legs are fully inserted into the circuit board. Solder in place.

Installing Main Controls:

☐ ☐ 1. Locate resistor R26. This is a 500K linear dual potentiometer with six (6) legs. This part will be marked "105-2011" on the backside of the part.

☐ ☐ 2. Insert R26 into its mounting holes until it stops, making sure that all six (6) legs are inserted into the board. Also, make sure that the shaft is parallel with the circuit board surface. Solder in place.

☐ ☐ 3. Locate resistor R27. This is also a 500K linear dual potentiometer. Insert at R27, making sure that all six legs are inserted and the shaft is parallel with the circuit board surface. Solder in place.

At this point, your kit is finished and it's time to take a well-earned break! When you come back, be sure to give your work a close "quality control" inspection.

PC Board Inspection:

Before applying power to your kit, give it a thorough QC (quality control) inspection. This will help you find inadvertent assembly errors that might prevent the filter from working or cause damage to sensitive parts. Follow this procedure:

☐ Compare parts locations against the parts-placement diagram. Was each part installed where it is supposed to be? Was the correct value used? Start at one side of the board and work your way across in an organized pattern.

☐ Inspect the solder side of the board for cold-solder joints and solder bridges between tracks or pads. Use a magnifying glass to obtain a clear view of the track area. If you suspect a solder bridge, hold the board in front of a bright light for a better view. All joints should be smooth and shiny, indicating good solder wetting and flow. Resolder any beaded or dull-appearing connections.

If you find a construction error and need to remove a part or two, it will be easier if you have the right tools. One very convenient item for freeing soldered-in parts is a "solder sucker". This consists of a suction bulb or a spring loaded vacuum pump that draws molten solder away from the pad and lead. Alternatively, you may use a special copper braid called "solder wick" (solder suckers and solder wick are both available at your local Radio Shack or electronics supply house). If you suspect you've damaged a component during removal, better to replace it than risk reusing it!

Finally, rosin flux can absorb moisture, which may cause a problem for some electronic equipment. To remove flux, use isopropyl alcohol (or 95% grain alcohol) and an old toothbrush. Apply a generous amount of alcohol with the toothbrush and scrub gently. Once the flux has fully dissolved, blot the bottom

of the board dry with an untreated tissue. Give it a final alcohol wash, and allow to dry thoroughly.

Caution: alcohol is highly flammable and must be used with adequate ventilation! Use safety goggles, and avoid prolonged skin contact. It's also best to do this outdoors.

Now that assembly and inspection is completed, you're ready to begin the testing and alignment phase of construction.

TESTING AND ALIGNMENT

The correct way to test and align the VEC-841K is with a calibrated audio signal generator and oscilloscope. The alignment is very simple and easy, so it will not take much time. We have written a simple test and alignment procedure for you to follow. Please be sure to follow each step as it is written and laid out for you. This will ensure that filter will perform well. Well, if you are ready, then let's get started!

Test Equipment Needed:

The following is the test equipment required to accurately test and align the VEC-841K CW Audio Filter.

- Oscilloscope with a 10:1 probe and clip ground
- Audio Signal Generator with RCA cable
- Power Supply; 9-18 volts DC @ 300mA; cable must have a 2.1mm coaxial plug with the center pin positive and outer sleeve negative.
- Small 5 watt speaker with a 3.5mm mono plug. Tip is positive and sleeve is negative.
- Mono headphones (optional)
- Small Plastic Flat-tipped alignment tool

You may want to have a couple of knobs for the Frequency and Selectivity controls. They will be difficult to turn without knobs.

Initial Setup:

The following steps are to assist you in connecting your test equipment to the VEC-841K filter. Please follow each step as it is written and laid out for you.

1. Set SW1 and SW2 on the VEC-841K to the out position.
2. Set the Frequency and Selectivity controls, R26 and R27, fully clockwise.
3. Turn R27 counter-clockwise about 10% from fully clockwise.
4. Set R24 and R25 on the circuit board to MID-RANGE.
5. Connect the Audio Signal Generator to Signal Input jack, J4. The Signal input jack (J4) is an RCA phono type and requires an RCA phono plug.
6. Connect an external speaker to J2.
7. Connect the 9-18 volt DC power supply to J3. Power jack J3 requires a 2.1mm coaxial plug with the center pin positive and the outer sleeve negative.

It is probably best at this point to double check to see that your test equipment is setup as per the above steps. Also, be sure that the polarity of the power supply is correct, otherwise damage to the circuit will definitely result when power is applied.

Test Procedure:

This here is the actual test and alignment procedure. Please follow each step as it is written and laid out for you. This will ensure that the procedure is done correctly.

Important Note: If you are going to use a pair of headphones instead of an external speaker in this test, then be sure to set the SW2 to the ON position, before you put the headphones on your ears.

1. Turn ON all test equipment and set SW2 on the VEC-841K to ON. You may hear a pop in the external speaker. You may also hear the audio signal from the signal generator too. This is normal.
2. Set the Audio Signal Generator 2990 hertz.
3. Set the scope for the best possible display.
4. Connect the oscilloscope to J4 and set the output amplitude of the generator to 2 volts peak-to-peak.
5. Connect the oscilloscope to the outer lead of R36 (the 68 ohm 1/2 watt resistor). Connect the oscilloscope ground to the frame of J4.
6. Set SW1 on the VEC-841K to the IN position (NOTCH).
7. Using the frequency controls on the audio generator, set the frequency output so the signal presented on the scope is at it's absolute MINIMUM amplitude.

The frequency output of the generator represents the maximum frequency of the filter.

8. Set SW1 on the VEC-841K to the OUT position (PEAK).
9. Using the small plastic alignment tool, set R25 so the signal displayed on the scope is at maximum amplitude.
10. Set SW1 on the VEC-841K to the IN position (NOTCH). The signal on the scope should decrease to the same level as in step #7. If not, then something was done wrong, or there is something wrong with the filter. Go back and re-check all previous steps in this section.
11. Make sure SW1 on the VEC-841K is still at the IN position (NOTCH).
12. Set the signal generator to 1000 hertz.
13. Using the Frequency control (R26) on the VEC-841K set the signal displayed on the scope to it's absolute MINIMUM amplitude.
14. Set SW1 on the VEC-841K to the OUT position (PEAK).
15. Using the small plastic alignment tool, set R24 so the signal displayed on the scope is at maximum amplitude.
16. Set SW1 on the VEC-841K to the IN position (NOTCH). The signal on the scope should decrease to the same level as in step #13. If not, then something was done wrong, or there is something wrong with the filter. Go back and re-check all previous steps in this section.

If all has gone well to this point, you have completed the testing and alignment of the VEC-841K. If any step did not give you the specified results, as mentioned earlier, something is wrong with the VEC-841K, or the particular step in question was not done properly. The testing and alignment procedure must work 100% for the VEC-841K to function correctly.

OPERATING INSTRUCTIONS

You may use the VEC-841K with any communications receiver or scanner. You can also use the VEC-841K with a ham-radio transceiver. The VEC-841K requires any 9-18 volt DC source.

There are a few items that you will need to operate the VEC-841K. We have provided a list of these items below for your convenience.

- Communications Receiver, scanner, or Ham Radio transceiver with proper cables.
- 9-18 volt DC power supply
- External speaker with a 3.5mm mono plug
- Mono Headphones with 1/4" phone plug. (optional)

Receiver or Scanner Operation:

As mentioned in the above, you can use the VEC-841K with a communications receiver or scanner. A BFO, or Beat Frequency Oscillator, or a Fine Tuning control will assist you in fine tuning the received signals.

The filter requires audio from the external speaker or headphones output of the receiver or scanner. Apply the audio signal to the signal input jack, J4. The signal input jack uses an RCA phone jack (J4), which requires an RCA phono plug. The center pin of the RCA phono is positive, while the outer shell is ground.

Next, connect the **POSITIVE** lead of the external speaker to the TIP of a 3.5mm mono plug. Connect the ***NEGATIVE*** lead of the external speaker to the SLEEVE of the 3.5mm mono plug. Plug the 3.5mm mono plug into the External speaker jack, J2.

Next, connect the **POSITIVE** power supply lead to the **CENTER** conductor of a 2.1mm coaxial DC plug. Connect the **NEGATIVE** power supply lead to the outer **SLEEVE** of the 2.1mm coaxial DC plug. Before plugging in the power to the VEC-841K, set SW2 to the OUT (OFF) position. If you choose to use a pair of headphones, then DO NOT plug the headphones into the filter until SW2 is set to the IN position (ON).

Next, turn the receiver volume all the way down, then set SW2 to the IN position (ON). Set SW1 to the IN position (NOTCH). Now turn the receiver up slightly so you can hear the received signals on the external speaker, or headphones. The signal you are listening to is the "filtered" signal. Using the tuning knob on the radio, tune in a signal you want to listen to. Then use the FREQUENCY and SELECTIVITY controls to clean up any unwanted or annoying interference.

The maximum filter settings are when the FREQUENCY and SELECTIVITY controls are set fully clockwise. This is the highest "Q" setting for the filter, noting that at maximum selectivity you may experience a "ringing" effect. This is normal. The most usable setting for the Selectivity control is when it is back off in the counter-clockwise direction about 10-15% of the maximum setting.

Use the FREQUENCY control to either "peak up" desired signals while SW1 is in the PEAK position. While SW1 is in the NOTCH position, the FREQUENCY control can be used to "notch" or "null" unwanted interference.

The PEAK/NOTCH switch (SW1) is a dual function switch. The IN position is NOTCH, while the OUT position is PEAK. How you are using the VEC-841K, dictates what position SW1 will be in. Placing SW1 in the PEAK position you will be able to PEAK desired signals to bring them up where they are more readable and out of the SSB noise. Using the filter with SW1 in the NOTCH position, you can actually notch or null out nearby adjacent signals and interference.

You can also use a pair of mono headphones with a 1/4" mono plug attached. Connect your headphones to the phones jack, J5.

IN CASE OF DIFFICULTY

No Signal Filtering:

A newly constructed filter that fails to work upon initial power up, generally requires a very close and careful inspection of all work. Please go back through all steps of assembly and inspection, referring to the "Parts Placement Diagram". Most of the time there will be a part that is not installed or installed properly, a wrong value part in place of another, or a broken part. A close inspection at this point will reveal some accidental mistake.

Intermittent Filter Operation:

A filter that operates intermittently may have poor solder connections, a problem with broken wires, or low voltage power source. Self-oscillation, may be caused by a defective U1, U2, or U3. Also check for dirty or intermittent switch operation. Also, if you made the jumper going from Points C and D too long, self-oscillation can occur.

Filter Stops Filtering:

A working filter that fails "in-service" generally indicates a failure of one or more of the integrated circuits U1, U2, or U3. If you suspect a bad integrated

SCHEMATIC