

INTRODUCTION

General Information: Ever wish you could edit the "dead air time" from tape recordings of meetings, speeches, interviews, etc? Now you can do it *while you record* with the VEC-483K Voice Activated Tape Recorder Switch Kit. With voice activation, you save money by recording more information on each tape--and you save valuable listening time during playback because every inch of tape is filled with information. In addition to voice-activating your recorder, the VEC-483K helps you make better quality recordings because it places a high-quality electret microphone near the sound source, and far away from the noisy tape transport mechanism in your machine.

Circuitry: The VEC-483K has two parts. First, a sensitive electret microphone picks up sound and sends it to your recorder via the external microphone jack. Second, a high-gain op-amp samples the microphone signal, amplifies it, and then detects it--using the detector level to drive a FET switch. This switch, in turn, activates and pauses your recorder via the remote jack. Sensitivity and hold-delay are both adjustable to your liking. The unit is internally powered by a long-lasting 9-volt alkaline battery.

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. Diffused overhead lighting is a plus, and a supplemental high-intensity desk lamp is especially helpful for close-up work. Safety is always important! Use a suitable high-temperature stand for your soldering iron, and keep the work area free of clutter.

Universal Kit-building Tools: No special tools are required to complete this kit beyond common items normally used for bench construction. We recommend the following:

- Soldering Iron (grounded-tip and temperature-controlled preferred)
- High-temperature Iron Holder with Cleaning Sponge
- Solder, 60/40 or 63/37 with rosin or "no-clean" flux (.031" dia. is good size).
- Needle Nose Pliers or Surgical Hemostats
- Diagonal Cutters or "Nippy Cutters"
- Solder Sucker (squeeze or vacuum pump type), 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. ICs have a notch or dot at one end indicating the correct direction of insertion. 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.

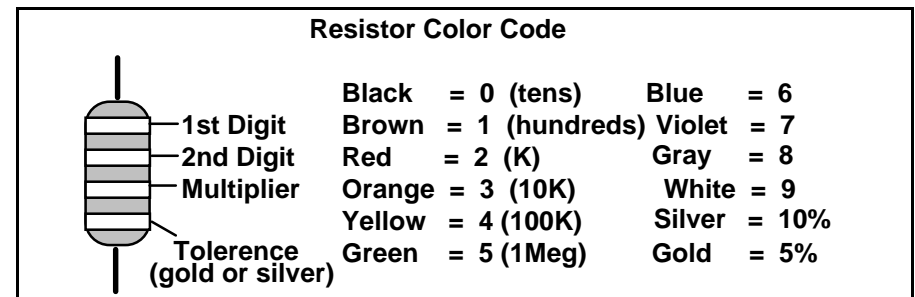
Soldering Tips: *Cleanliness* and good *heat distribution* are the two secrets of professional soldering. Before you install and solder each part, inspect leads or pins for oxidation. If the metal surface is dull, sand with fine emery paper until shiny. Allow the tip of your iron to contact both the 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. Keep a damp sponge handy to wipe your soldering tip on. This removes excess solder, and keeps the tip properly tinned. If the iron is going to sit idling for long periods, wipe the tip, add some fresh solder, and unplug the iron.

Desoldering Tips: If you make a mistake and need to remove a part, follow these instructions carefully! First, grasp the component with 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 multiple-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.


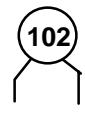

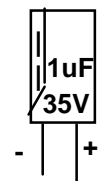
Work Habits: Kit construction requires the ability to follow detailed instructions and, in many cases, to perform new and unfamiliar tasks. To avoid making needless mistakes, work for short periods when you're fresh and alert. Recreational construction projects are more informative and more fun when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



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 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.

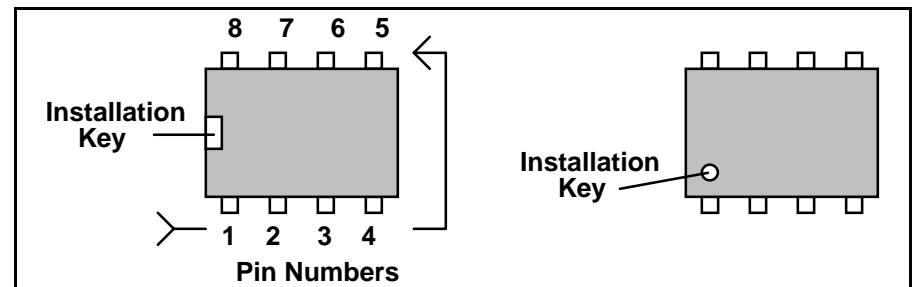
Reading Capacitors: Unlike resistors, capacitors no longer use a color code for value identification. Instead, the value, or a 3-number code, is printed on the body.

Value	Code			
10 pF	= 100	Multilayer (270 pF) 	Ceramic Discs (.001 uF) (.1 uF)	
100 pF	= 101			
1000 pF	= 102			
.001 uF	= 102*			
.01 uF	= 103			
.1 uF	= 104			Electrolytic 1 uF 

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.

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 begin at "1" at the keyed end of the case and progress along the device, as shown:



PARTS LIST

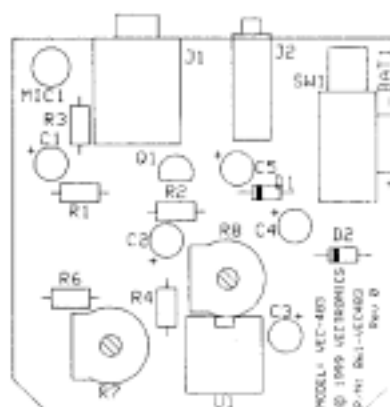
Your kit should contain all of the parts listed below. Please identify and inventory each item on the checklist before you start building. If any parts are missing or damaged, refer to the manual's warranty section for replacement instructions. If you can't positively identify an unfamiliar item on the 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.

<input checked="" type="checkbox"/>	Qty	Part Description	Designation	VEC P/N
<input type="checkbox"/>	2	1K resistor (brown-black-red)	R3, R4	100-3100
<input type="checkbox"/>	2	10K resistor (brown-black-orange)	R1, R2	100-4100
<input type="checkbox"/>	1	47K resistor (yellow-violet-orange)	R6	100-4470
<input type="checkbox"/>	2	500K trimpot	R7, R8	133-5500
<input type="checkbox"/>	3	1 uF electrolytic capacitor	C1, C4, C5	270-4100-2
<input type="checkbox"/>	2	10 uF electrolytic capacitor	C2, C3	270-5100-1
<input type="checkbox"/>	2	1N4148 diode	D1, D2	300-4148
<input type="checkbox"/>	1	2N7000 plastic FET transistor	Q1	305-7000
<input type="checkbox"/>	1	LM358 op-amp (8-pin)	U1	324-0358
<input type="checkbox"/>	1	Microphone element, electret	MIC1	410-1092
<input type="checkbox"/>	1	2P2T mini power switch	SW1	504-2022
<input type="checkbox"/>	1	3.5mm stereo jack	J1	601-5005
<input type="checkbox"/>	1	2.5mm mono jack	J2	601-4009
<input type="checkbox"/>	1	9V battery snap	BAT1	730-3005
<input type="checkbox"/>	1	8 pin IC socket	<i>for U1</i>	625-0008
<input type="checkbox"/>	1	Plastic wire tie		745-2149
<input type="checkbox"/>	1	VEC-483 printed circuit board		861-VEC483
<input type="checkbox"/>	1	Owner's Manual		925-VEC483K

PARTS PLACEMENT

PARTS PLACEMENT



STEP-BY-STEP ASSEMBLY INSTRUCTIONS

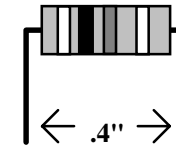
In these instructions, when you see the term *install*, this means to locate, identify, and insert the part into its mounting holes on the PCB board. This includes pre-bending or straightening leads as needed so force is not required to seat the part. Once a component is mounted, bend each lead over to hold it in place. Use sharp side-cutters to clip off excess lead length before soldering. Make sure trimmed leads don't touch other pads and tracks, or a short circuit may result:



The term *solder* means to solder the part's leads in place, and to inspect both (or all) solder connections for flaws or solder bridges. Nip off excess protruding leads with a sharp pair of side cutters.

Notice that the directions use two check boxes. Check one when a step is complete and use the other for double-checking your work before operation.

This kit has 5 fixed-value resistors. Mount these now, starting with the smallest value and moving to the largest. Before mounting each one, carefully bend both leads close to the resistor body to form right-angles, as shown below:



Locate two (2) 1K resistors (brown-black-red).

- 1. Install 1K at R3 and solder.
- 2. Install 1K at R4 and solder.

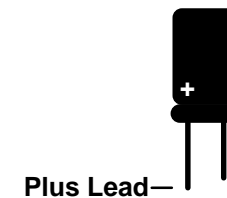
Locate two (2) 10-K resistors (brown-black-orange).

- 3. Install 10 K at R1 and solder.
- 4. Install 10 K at R2 and solder.
- 5. Find the 47-K resistor (yellow-violet-orange). Install at R6 and solder.

The next two (2) items are 500-K trim pots (black, screw adjustment in the center, 3 pins). When you install each trim pot, make sure it is seated firmly against the PC board with all three leads protruding.

- 6. Install a 500-K trim pot at R7 and solder.
- 7. Install a 500-K trim pot at R8 and solder.

There are five electrolytic capacitors in your kit. ***Electrolytic caps are polarized and must be installed the correct way in order to work.*** Each capacitor's plus (+) mounting hole is marked 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.



Locate three (3) 1-uF electrolytic capacitors. Observing polarity:

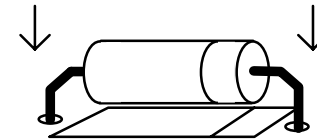
- 8. Install 1 uF at C1 and solder.
- 9. Install 1 uF at C4 and solder.

10. Install 1 uF at C5 and solder.

Locate two (2) 10-uF electrolytic capacitors. Observing polarity:

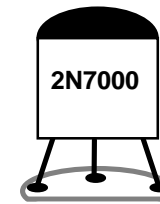
11. Install 10 uF at C2 and solder.
 12. Install 10 uF at C3 and solder.

Now, find two (2) 1N4148 silicon diodes (glass body). Like capacitors, diodes are polarized devices that must be installed correctly. Always look for the banded end when installing--and align this with the banded end shown on the PC layout.



13. Install a 1N4148 at D1 and solder.
 14. Install a 1N4148 at D2 and solder.

Locate the 2N7000 plastic transistor. Like the electrolytic caps, transistors must be oriented correctly to work properly.



15. Install the 2N7000 FET at Q1 and solder.

The ICs in your kit will be installed in a IC socket. Like the IC itself, the socket is keyed at one end to indicate proper positioning. During installation, orient the socket so the notch corresponds to the key on the PC layout.



When installing the socket, make sure all pins enter the mounting holes and appear on the opposite side of the PC board (it's easy to fold one or more under).

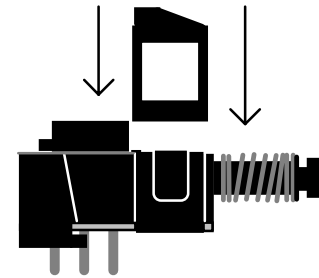
Also, when soldering, make sure the socket remains flat against the board surface.

- 16. Find the 8-pin IC socket. Orient to U1, install, and solder all pins.

Next, align the LM358 IC with the socket, matching its key with the socket key. When you install, press in slowly--making sure all pins go into the socket holes and none fold over under the device.

- 17. Observing the key, install the LM358 at U1.

Your kit contains a miniature DPDT switch. Some versions require installation of a plastic clip-on support at the front of the switch body. This piece relieves stress on the pins and ensures level seating during installation. If your parts kit contains this piece, install as shown:



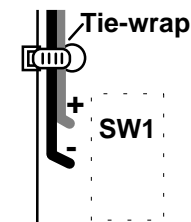
- 18. Install the DPDT mini power switch at SW1

Locate the 9-V battery snap clip, and note the red+ lead and black- lead.

- 19. Install the red lead at BAT1 (+) and solder.

- 20. Install the black lead at BAT1 (-) and solder.

Find the oversized hole slightly to the rear of the BAT1 connections. The plastic tie-wrap supplied with your kit will be installed here to bind the two battery leads to the PC board. This will help prevent lead breakage later on.



21. Locate the tie-wrap and install as shown.

Your kit has two (2) min-phonos jacks. The larger of the two is a 3.5 mm stereo jack, and the smaller is a 2.5 mm mono jack. When installing jacks, make sure the case sets firmly against the PC board surface before soldering.

22. Install the 3.5 mm jack (larger) at J1 and solder.
 23. Install the 2.5 mm jack (smaller) at J2 and solder.

Finally, locate the electret condenser microphone element (MIC1) and observe the leads. One is grounded to the case by a bridge of metal, while the other is not. The grounded lead must correspond with the groundplane mounting hole on the PC board.



When positioning the mic element, space as far as possible above the surface of the PC board. Leads should protrude only enough to ensure a good solder connection.

24. Observing polarity, install the electret mic element at MIC1 and solder in place.

This concludes construction of your VEC-483K Voice-Activated Tape Switch. Before moving on, give your kit a thorough QC (quality control) inspection. This will help you discover accidental assembly errors that might prevent it from working properly--or that might cause damage to sensitive parts when you apply power. Follow this procedure:

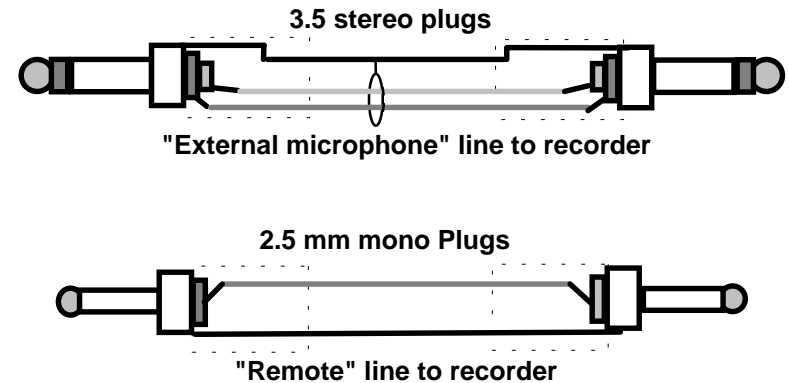
1. Compare parts locations with the parts-placement diagram. Was each part installed where it is supposed to be? Was the correct value used? Start at one side of the board and work your way across in an organized pattern.
2. Inspect the solder side of the board for cold-solder joints and solder bridges 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. Also, check the front-panel jacks, switches, and connectors for defective solder connections.
3. Finally, check electrolytic capacitors and diodes for correct polarity. Does the plus (+) polarity symbol on the part agree with the pictorial and with the

pattern on the PC board? Is the banded end of each diode positioned correctly? Were the IC and transistor installed correctly?

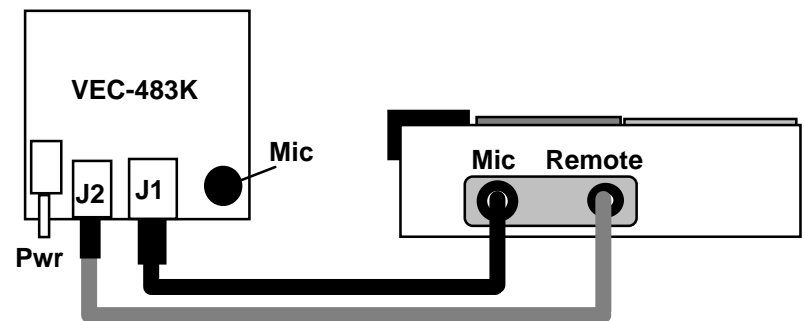
Be sure to correct *all* errors before continuing.

TESTING AND ALIGNMENT

Before you can test and operate your unit, you'll need two patch cords to connect the VEC-483K to your recorder. These may be purchased at Radio Shack, or you may make them up as shown:



These mic and switch lines may be any convenient length, but shielded cable should be used for the microphone cable if it's more than a foot or so long. Unshielded wire is okay for the remote line. Connect the VEC-483K to your tape recorder as follows:



The PC board has two set-up adjustments. For now, adjust trim pots R7 and R8 for mid-scale (12:00) using a small screwdriver. Once you're sure the unit is

working properly, you may set these more precisely for your personal preference.

1. Put SW1 in the *Off* position (switch button out).
2. Install a fresh 9-volt alkaline battery on the battery snap clip.
3. Press SW1 *On* (switch button in).
4. Place recorder in "record" mode.

If there's no sound present, the tape transport *should not remain on* with the record button is depressed. If it does remain on, check for construction errors--especially around U1. If not, proceed.

5. Whistle into the microphone.

The tape transport should start rolling. If it doesn't, look for errors around D1, D2 and Q1.

After a second or so of silence, the tape should shut off again, automatically. If it doesn't, look for errors around delay control R8. If the tape starts and stops automatically, your unit is working properly.

Now is a good time to set up the Sensitivity and Delay controls.

Sensitivity: The Sensitivity of your VEC483K is controlled by R7. This sets the "start-up" threshold for activating the transport. Under noisy conditions, reducing sensitivity prevents stray background noise from starting the tape transport. If there's little background noise and a weak sound source, increased sensitivity is best.

Delay: The Delay (or hold) is controlled by R8. This sets the period of time the transport stays on after the sound stops. A short delay is best when the sound source is "up close and personal". A longer delay works best for variable sounds that may not always be strong enough to hold the switching circuit on.

Once you are satisfied that your unit is operating properly and adjusted to your needs, you may mount it in the enclosure of your choice. The VEC483KC is made especially for your unit, and is highly recommended.

OPERATING INSTRUCTIONS

Using Your Recorder Switch: Detailed operating instructions are contained in the previous section. In general, all you need to do is plug in your unit (microphone and remote), and turn the MFJ-483K on. If playback sounds "broken" because the transport drops out during words or phrases, increase

sensitivity (R7) until the recorder remains on. If playback sounds "choppy" because of constant stopping and starting, increase delay (R8) to add more natural spacing between words and phrases.

IN CASE OF DIFFICULTY

Before seeking outside assistance, check below for a possible solution:

Does not turn on: Check battery condition, snap clip, and power leads. Also, make sure lead polarity is correct (red to +, black to GND). Make sure power switch is "on".

Transport Stays on: Setting of R7 or R8 too high, remote cable shorted.

Transport Won't Start: Setting for R7 or R8 too low, remote cable open.

If these checks fail to uncover the problem, repeat the "QC" check one more time. Service records show that, for most malfunctioning kits, outright component failure is relatively rare. In most cases, the culprit is a misplaced part, reverse-polarized capacitor, improperly installed IC, or a faulty solder connection. If, despite your best effort, you cannot solve the problem, kit repair services are available through Vectronics. See the warranty on the inside front cover for complete instructions.

THEORY OF OPERATION

Electret microphone MIC1 picks up sound and generates an audio signal which loops through to microphone output jack J1. Along the way a sample of the audio signal is picked up by U1a, an op-amp configured as a variable gain audio amplifier. Stage gain is established by Sensitivity control R7. U1's amplified AF output signal is detected by D1/D2, converted to a dc level, and fed to the gate of Q1. When sufficient voltage is developed across the detector, FET switch Q1 conducts and pulls the recorder's "remote" line to ground--providing a current path for activation of the transport motor. To create the unit's "delay" function, a RC circuit on the gate of Q1 stores detector voltage and holds the gate voltage "high" at a decaying rate. The time constant of this circuit is adjustable by Delay Control R8. Q1 has sufficient current handling capacity to operate a wide range of small-recorder transport motors.

ENCLOSURE

To install your Voice-Activated Tape Recorder Switch in the VEC-483KC matching enclosure follow these instructions (*read all instructions before beginning ... take your time*):

1. Find the front panel decal and trim. Be sure to leave excess decal material around the edges. Put the front panel decal on. This is done by:
 - a.) Remove all debris and oil from the face plate. This should be done using a piece of cloth and alcohol.
 - b.) Remove the crack and peel to expose the adhesive.
 - c.) Place the decal on the front panel without securing it completely.
 - d.) Gently rub the alignment circles with your finger--if the circles are centered in the enclosure holes (also check the corner alignment marks) secure the decal by rubbing and removing all air bubbles.
 - e.) If the alignment circles are not centered, adjust the decal accordingly, then secure.
 - f.) Use a penknife, or small Exacto™ knife, to cut away the unused edges (*cut from the adhesive side*) and cut out the component holes (*cut from the description side*).
2. Now insert the PC board. This must be done by:
 - a.) Insert the front of the PC board into the metal faceplate with the jacks in their respective holes.
 - b.) Place the nuts onto the jacks and tighten. Ensure that the switch and the microphone are aligned properly.
 - c.) Install the red switch cap on the power switch (SW1).
3. Slide the face plate in the slots at the end of the bottom portion of the enclosure. Loop the battery snap through to the battery compartment. Now place the top portion over the bottom ensuring that the face plate slides into the slots. Secure the two enclosure portions together with the two mounting screws.
4. Finally, place a 9V battery into the battery compartment and attach to the battery snap. Make sure the power switch is off before installing the battery.

