VPM-1

Owner's Guide

VOLUME PEDAL MOD

ZEPPELIN DESIGN LABS

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VPM-1

MOD FOR ERNIE BALL VOLUME PEDALS.

Owner's Guide

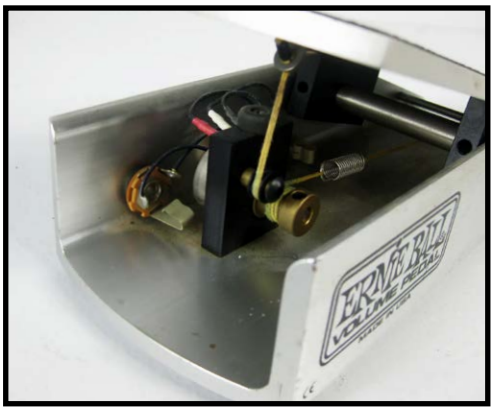
INTRODUCTION

ABOUT THE ERNIE BALL VOLUME PEDAL

The Ernie Ball volume pedal has been around since 1975. The chassis of these early volume pedals was originally made from two pieces of angle iron welded together, which earned them a reputation of being extremely robust. Later, the chassis was replaced with a solid aluminum extrusion that greatly reduced the weight while retaining the structural integrity of the original. A somewhat novel approach was used to alter the value of a volume potentiometer incorporating a string and a set of springs, reminiscent of the tuning wheel on older analog radios. Over the years, some minor mechanical and electrical design changes have been made, but the general concept of how these pedals work has remained the same.

The Ernie Ball volume pedal has a lot of great features. Being made out of solid aluminum, it is nearly indestructible. The string and spring mechanism for turning the potentiometer creates a very smooth response in volume. Also, the placement of the axle on the treadle makes for a very comfortable pedal action. It's no wonder that the Ernie Ball volume pedal is the most popular volume pedal in the world.

But for all its great features, there are a couple of serious down-sides to this pedal. Since the audio signal is sent straight through the potentiometer, any problems with the potentiometer are directly translated to the audio signal. This means that if the potentiometer gets dirty or worn out, the audio signal can sound scratchy. Also, the passive nature of this pedal means that the electrical load of the potentiometer can have drastic tonal effects on the signal. Any stray capacitance in the guitar cable or anywhere else in the system will create a RC (resistance-capacitance) filter when coupled with the given value of the potentiometer. When the potentiometer is turned all the way up, to a higher resistance, this effect is less noticeable; but when the potentiometer is turned to a lower resistance, the high frequencies in the audible range start to become attenuated. This is what causes the "tone suck" effect when adjusting the volume control on a passive guitar. Many musicians have resorted to adding a buffer pedal before their passive volume pedal to help rectify this issue.



Another serious issue with these Ernie Ball volume pedals involves the string and spring mechanism for adjusting the potentiometer. Over time, the string can actually stretch and cause the action of the pedal to be off. This often manifests itself in the potentiometer not getting turned all the way in one

direction or the other, which prevents the audio signal from getting as loud or as quiet as it should. Eventually the string will wear completely out and break. Most long-term Ernie Ball volume pedal users have experienced this, and usually at the most inopportune times. Few things make a guitarist more frustrated than not being able to turn up their volume before a solo.

These limitations of the stock Ernie Ball volume pedal have driven a lot of frustrated guitarists to create their own mods for this pedal. Mostly these mods just incorporate a buffer or boost circuit into the pedal to counteract the "tone suck" effects of the passive potentiometer. Here at Zeppelin Design Labs, we have been fans of the Ernie Ball volume pedal for years, and have developed our own mod. Born out of a frustration with its limitations and a passion for its potential, we have created what we think is the "mother of all volume pedal mods." We've improved upon every limitation of this pedal while retaining all the great characteristics that make it the most popular volume pedal of all time.

HOW THE VPM-1 WORKS

Our first goal with this mod was to eliminate the string. We replaced it with a magnetic distance sensor, called a Hall effect sensor. A magnet is affixed to the underside of the treadle and the Hall effect sensor outputs a voltage proportional to the distance to the magnet (See Figure 1, page 5). This voltage is fed into the ADC (analog to digital converter) of a microcontroller. A microcontroller is a tiny computer capable of receiving and sending voltages. This microcontroller manipulates the brightness of the LEDs inside a pair of optocouplers, based on the voltage from the Hall effect sensor. These optocouplers each contain a light-dependent resistor (LDR) which work together to control the volume of the audio signal. The audio path is completely analog, but it is digitally controlled through the LEDs in the optocouplers. Because the audio is digitally controlled, we can easily change many

parameters of how the signal is processed. First, we've incorporated five different tapers (or sweeps, or response curves), including logarithmic, linear, and reverse logarithmic. Next, we've included a "reverse" feature that allows you to reverse the treadle action. Finally, one of the most useful features of this mod is the ability to program the pedal positions for minimum and maximum volume, which allows you to set the active range of the pedal's sweep.

The Gain knob adds up to 14 dB gain to your signal. The TUNER jack provides a buffered split signal which you can route either to a tuner or to a second signal chain.

The VPM-1 comes standard in mono configuration, but stereo configuration is available with a small add-on upgrade board. In the stereo configuration, the VPM-1 can operate as either a traditional stereo volume pedal where both audio channels get louder and quieter together, or it can operate as a "pan" pedal, where one audio channel gets louder as the other gets quieter. Pan mode enables the user to pan between two different signals. Another add-on upgrade board gives the VPM-1 the ability to be used as an expression pedal, with programmable settings to accommodate the different expression jack wiring configurations found on a wide range of effects pedals.

Figure 1: VPM-1 Block Diagram

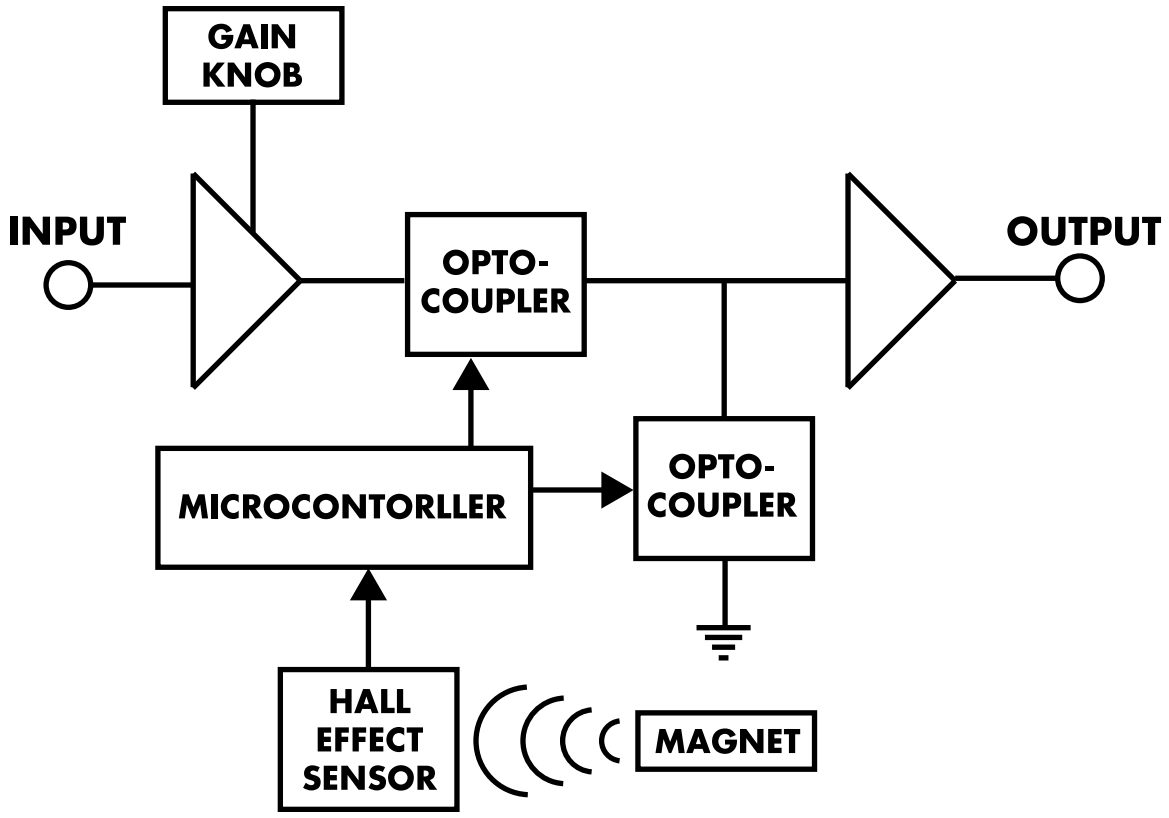


Figure 2: VPM-1 Chassis Front

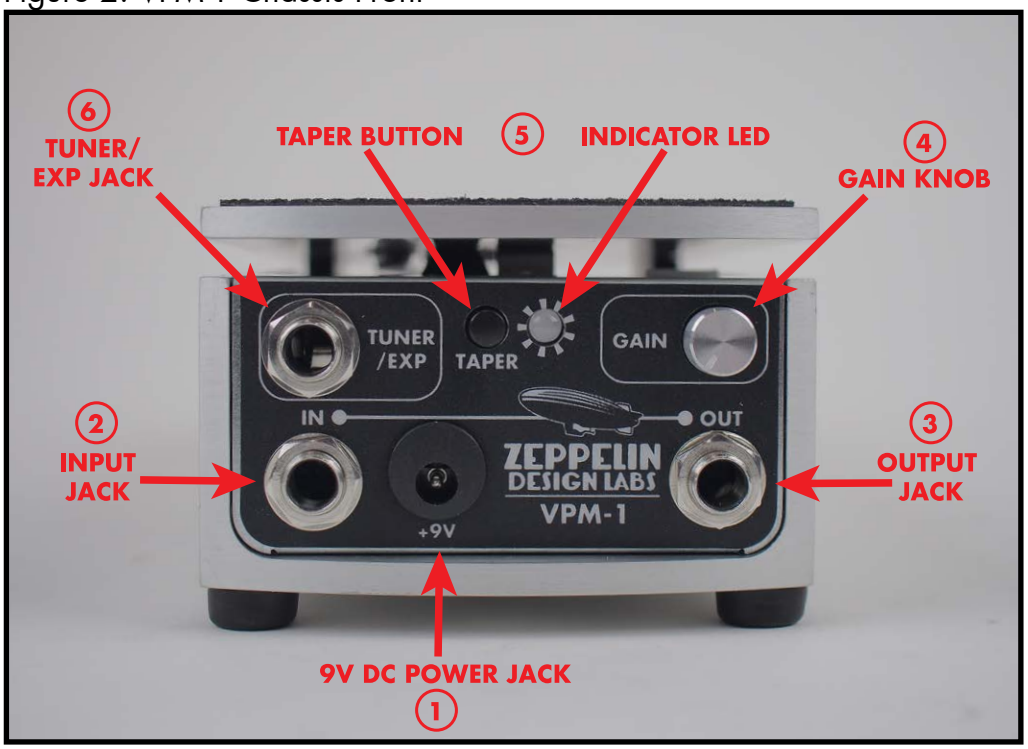
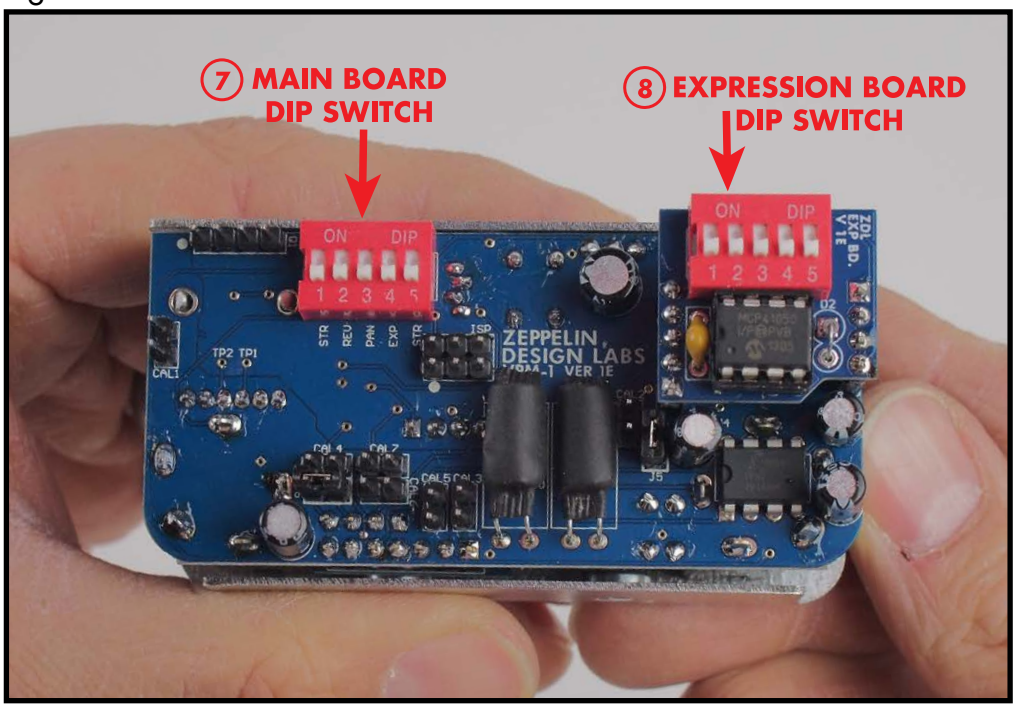


Figure 3: VPM-1 DIP Switch Locations



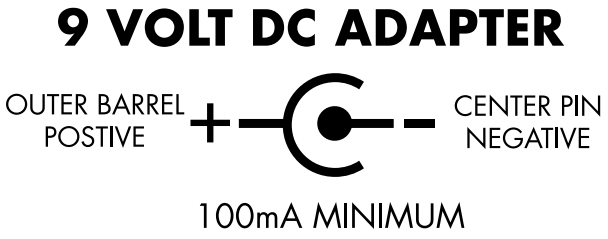
AUDIO SPECIFICATIONS

Parameter	Value
Maximum Gain	14 dB (@ 1 KHz)
Maximum Input Voltage	> 5 Vpp (@ 1 KHz)
Typical Gain Reduction (Volume Off)	> -70 dB (@ 1 KHz, Unity Gain)
Current Consumption	~50 mA (9 V DC Input)
Input Impedance	1 MΩ
Output Impedance	~1 KΩ

FEATURES

1. 9V POWER JACK

You can power your VPM-1with a typical 9V DC pedal power supply ("wall wart"). It must be rated for at least 100mA, with center-negative polarity. To avoid power supply noise and ground loop hum, it is possible to connect a battery to the VPM-1 by using a "barrel-to-9V-battery-snap" adapter. Just make sure that the adapter is wired correctly with the positive terminal of the battery connected to the outside of the barrel jack. The actual current draw of the VPM-1 is around 50mA, so a battery probably won't last too long if it is left plugged in, but it is a good way to troubleshoot noise issues.



2. INPUT JACK

The input jack of the VPM-1 accepts a normal 1/4" instrument cable. It can also accept a TRS cable or stereo cable for stereo use (see "STEREO UPGRADE" on page 12) The input impedance of the VPM-1 (in either mono or stereo) is 1 mega-ohm.

3. OUTPUT JACK

The VPM-1's output jack can accept either a mono instrument cable or a stereo TRS cable (see "STEREO UPGRADE" on page 12). The VPM-1's output impedance is ~200 mega-ohms, so it should not have any trouble driving long cable lengths or other heavy loads.

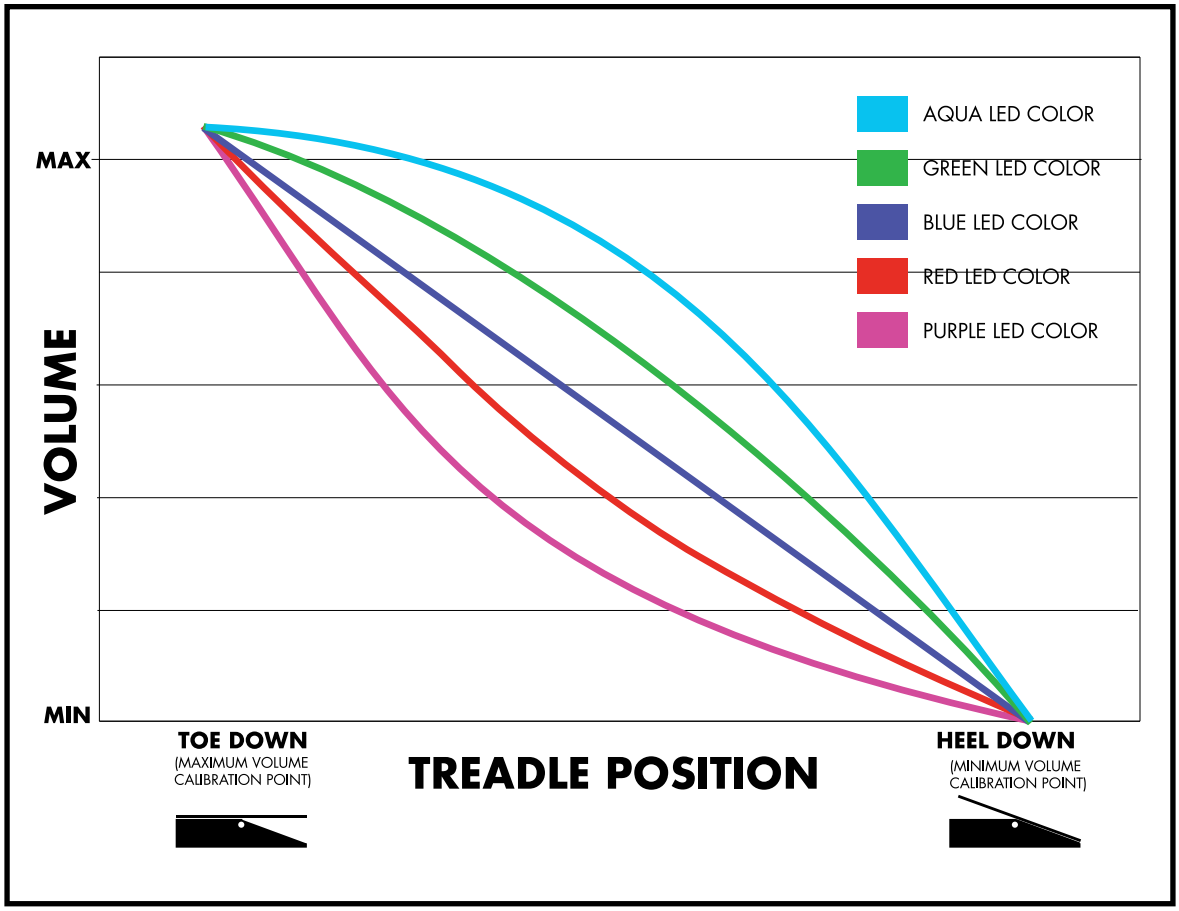
4. GAIN KNOB

The VPM-1 uses a power boost converter to change the 9V DC power supplied to the circuit into18V, which allows for a significant amount of clean headroom for the audio signal. Because of this, the gain knob can add up to 14 dB of gain to the signal. In the fully counter clockwise position, the gain is at unity (no signal gain added). "Figure 1: VPM-1 Block Diagram" on page 5 shows this knob controls the gain of the first amplifier stage, right before the voltage dividing optocouplers. We suggest keeping the gain at 0 unless you need a signal boost, and then only use as much gain as you need to drive your amplifier or other pedals. 14 dB of gain is a significant increase in signal voltage, and can easily overdrive the inputs of most other electronic devices. So please use with caution.

5. TAPER BUTTON / LED INDICATOR

The VPM-1 is a "multi-taper" volume pedal. The "taper" of the pedal refers to how quickly the volume fades in and out at different points along the treadle's sweep. On a logarithmic taper the volume comes in very slowly at the start of the treadle's sweep but gets louder very quickly toward the end of the sweep. This is illustrated by the purple curve in "Figure 4: VPM-1 Response Curves". On a

Figure 4: VPM-1 Response Curves



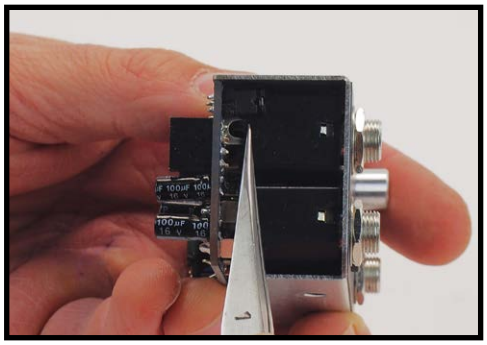
reverse logarithmic (or inverse logarithmic) taper the volume comes in very quickly at the beginning of the treadle's sweep, but then increases slowly toward the end of the sweep. See the aqua curve for an example. A linear taper has the same volume change per treadle movement all the way through the sweep, such as the blue curve.

The VPM-1 has five different tapers to choose from: 2 logarithmic tapers, 2 reverse logarithmic tapers, and a linear taper. Pressing the taper button cycles through all five tapers. The color of the LED indicates which taper is currently selected. Figure 4 gives a visual reference for all five curves and their corresponding LED colors. Once you find the taper that you like best, hold the button down for three seconds to store it as your "preset." The VMP-1 recalls its stored preset every time it is powered up.

6. TUNER/EXP JACK

The standard VPM-1 (no expression upgrade) uses the TUNER/EXP jack as a tuner output. When the Expression upgrade is present, it is used instead as the expression control voltage output. See .

The header labeled "TUNER" on the main PCB must be jumped in order for audio signal to be routed to this jack. This jumper is already in place if you ordered your VPM-1 pre-built. If you ever need to remove this jumper, the chassis must be taken out of the pedal in order to access it.

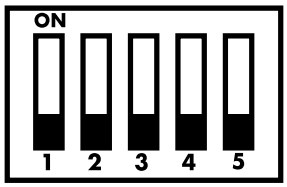
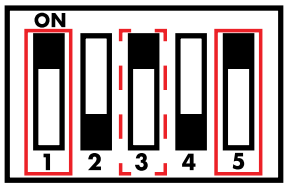
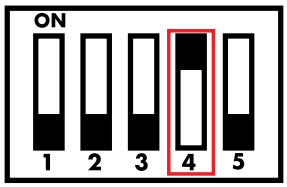
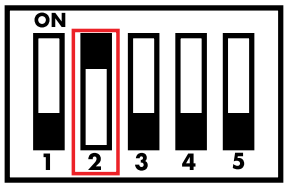


The signal going out of the tuner jack is a unity-gain buffered signal taken directly from the input jack; no other processing has been done to this signal. In this regard, the tuner output can be used as a signal splitter to drive another effects chain.

7. MAIN BOARD DIP SWITCH

The main board DIP switch (shown on page 6, "Figure 3: VPM-1 DIP Switch Locations") controls several functions. "Figure 6: Main Board DIP Switch Positions" shows how to set this DIP switch to control the pedal in different ways. To access this DIP switch while the circuit board and chassis are still in the pedal, you'll probably need to use a skinny screwdriver or tweezers.

Figure 6: Main Board DIP Switch Positions

	KEEP ALL SWITCHES OFF TO USE THE VPM-1 IN MONO CONFIGURATION
	TURN ON SWITCHES 1 AND 5 TO USE STEREO CONFIGURATION WHILE IN STEREO CONFIGURATION TURN ON SWITCH 3 TO USE THE PANNING FUNCTION
	TURN ON SWITCH 4 TO USE EXPRESSION CONFIGURATION **THE VMP-1 DOES NOT PASS AUDIO WHEN THE EXPRESSION CONFIGURATION IS SELECTED
	TURN ON SWITCH 2 TO USE THE REVERSE FUNCTION **THE REVERSE FUNCTION CAN BE USED IN MONO, STEREO, OR EXPRESSION CONFIGURATION

EXPRESSION UPGRADE

If you opted for the expression upgrade board, the VPM-1 can be used as an expression pedal to control different parameters on other effects pedals. Using the expression function requires the use of a TRS (tip-ring-sleeve) cable between the TUNER/EXP jack and the expression input jack of the pedal you want to control. (Some pedals only require a regular TS instrument cable.) This circuit uses a digital potentiometer ("pot") to control a voltage between 0 and 5 volts on this jack, depending on the treadle position. This circuit emulates an analog expression pedal that uses a traditional potentiometer. The VPM-1 can not control any pedal with an expression control voltage larger than 5 volts.

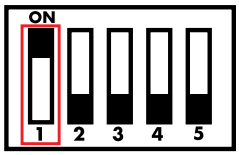
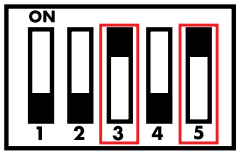
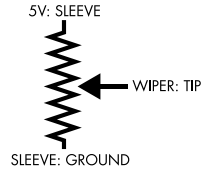
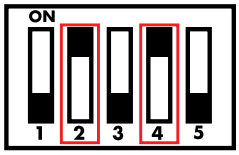
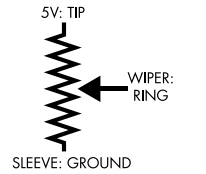
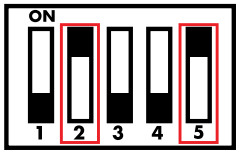
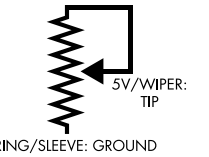
To turn on Expression:

1. Turn "ON" Switch 4 on the main DIP switch
2. Turn "OFF" Switch 1 on the expression DIP switch
3. Consult the documentation for the pedal you wish to control and determine how its expression jack is wired. Consult "Figure 5: Expression Board DIP Switch Settings" and find the configuration that matches your pedal's needs. Set Switches 2-5 on the expression DIP switch to suit.

The currently-selected taper will influence the expression output. The "reverse" switch can also be used in expression mode. See "REVERSE TREADLE ACTION" on page 13.

You can toggle between expression and tuner function by turning "ON" Switch 1 on the expression DIP switch. This will disable expression and route the audio signal to the TUNER/EXP jack.

Figure 5: Expression Board DIP Switch Settings

	TUNER ON (EXPRESSION OUTPUT DISABLED) TURN ON: 1	
	5V: SLEEVE WIPER: TIP SLEEVE: GROUND TURN ON: 3 AND 5	
	5V: TIP WIPER: RING SLEEVE: GROUND TURN ON: 2 AND 4	
	5V / WIPER: TIP RING / SLEEVE: GROUND TURN ON: 2 AND 5 (MOSTLY FOR LINE6 PEDALS)	

A WORD ABOUT DIGITAL POTENTIOMETERS: The expression upgrade comes with two different digital potentiometer IC's (integrated circuits). The digital pot that is installed on the board is labeled MCP41050, which is a 50K ohm pot. The other IC is labeled MCP41010, which is a 10K ohm pot. We provide the optional 10K pot because some newer pedals will perform better with this value. If you would like to replace the digital pot on your expression board please see "APPENDIX 3: REPLACING THE DIGITAL POTENTIOMETER" on page 27. Please fully read and pay close attention to the information about static discharge so that you don't damage your ICs!

STEREO UPGRADE

The stereo upgrade board gives the VPM-1 the ability to control a stereo audio signal. This upgrade board has a second set of optocouplers on it and all the related circuitry to control the second audio path. Both sets of optocouplers have been hand selected so that the channels will closely match each other. The "stereo setup" routine (described in the VPM-1 Assembly Manual) uses software to help match these optocoupler sets even closer. If you ordered your VPM-1 pre-built, this routine was performed for you at the Lab.

The stereo function is controlled by the main board DIP switch (see "MAIN BOARD DIP SWITCH" on page 10). Set Switches 1 and 5 to the "ON" position to enable stereo. The two TRS adapter cables are used to "break out" the left and right channels. Plug them into the input and output jacks. The black female jack on the adapter is the left channel (tip), and the red female jack is the right channel (ring).

While the stereo function is enabled, the VPM-1 can operate in two ways: panning configuration and traditional stereo configuration. DIP switch 3 toggles between these two modes.

PANNING CONFIGURATION

When Switch 3 is in the "ON" position, the VPM-1 is in panning configuration. This means that when the treadle is moved across its sweep, the pedal will pan between the left and right channels. When the treadle is in the heel down position, only one channel will be audible; when the treadle is in the toe down position, only the other channel will be audible. The reverse switch determines which channel is active in each position; see "REVERSE TREADLE ACTION" on page 13. In the middle of the taper's sweep both channels will be audible (at half full volume when the linear taper is used). We suggest using only the linear taper for the panning function; otherwise the sweep will be lopsided, meaning one channel will fade in and out faster than the other.

TRADITIONAL STEREO CONFIGURATION:

When switch 3 is in the "OFF" position the VPM-1 is in the traditional stereo configuration. In this configuration the volume of both channels are adjusted in unison and they will both follow the selected taper.

REVERSE TREADLE ACTION

The "reverse" function is activated when main board DIP Switch 2 is in the "ON" position. See "Figure 6: Main Board DIP Switch Positions" on page 10. This causes the VPM-1 treadle to behave in the opposite direction. In this setting, the volume is in the maximum position when the treadle's heel is all the way down, and in the minimum position when the treadle's toe is all the way down. The effect is the same in Mono, Stereo, and Expression modes. In Panning Stereo mode, the reverse mode will swap the left and right channels.

APPENDIX 1: INSTALLING THE "READY-TO-INSTALL" VPM-1

WHAT'S IN THE BOX

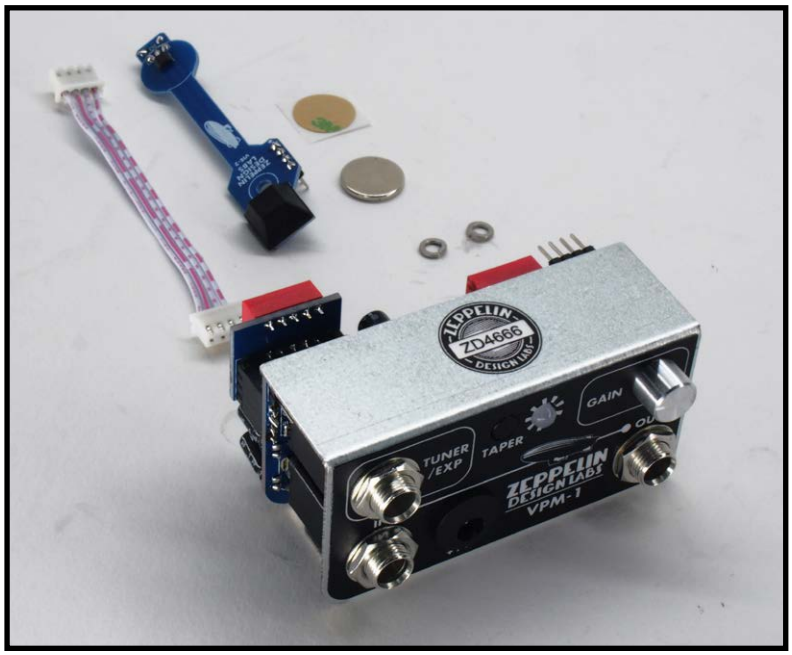


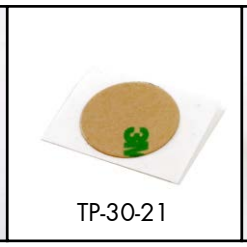
Table 1: Ready-To-Install VPM-1 Bill Of Materials

ZDL Part #	Description	Notes	Qty
CB-06-10	Ribbon Cable, 4 wire x 10cm		1
FA-93-35	Lock washer, Split Ring 3.5mm		2
FA-12-15	Magnet		1
PC-11-01	VPM-1 Main Board Assembly		1
PC-11-02	Sensor Board Assembly		1
TP-30-21	Tape, Double Sided, 15mm Circle		1
DC-20-21	Calibration Card		1


CB-06-10


FA-93-35


FA-12-15


TP-30-21


PC-11-01


PC-11-02

FA-93-35

If you have a full size Ernie Ball volume pedal (model numbers: 6165, 6166, 6167, 6168) then you'll need to use our Large Format Pedal Adapter, so that the VPM-1 main board module can attach to your volume pedal chassis. The kit is available from our website.

VPM-1 Large Format Pedal Adapter Kit Contents

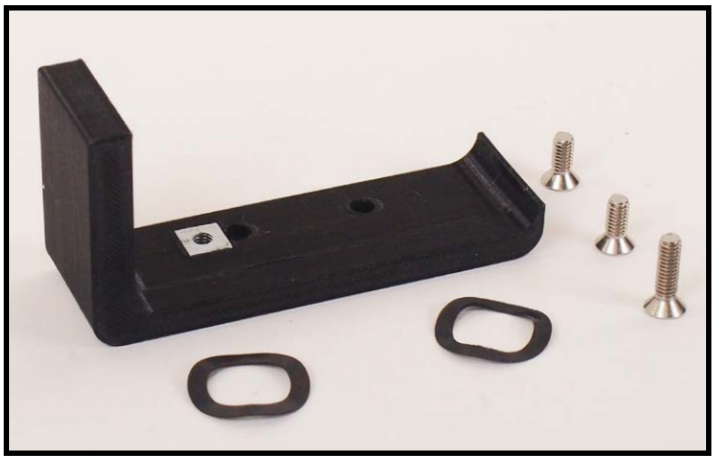
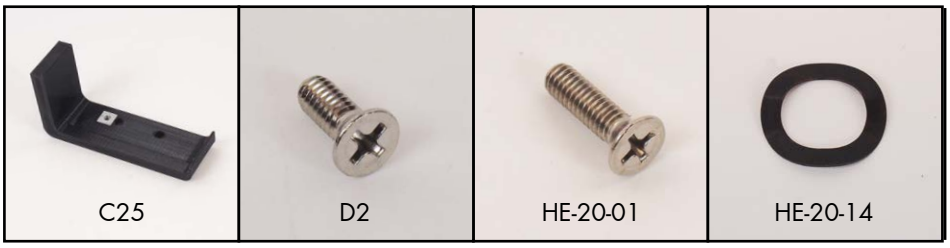


Table 4: VPM-1 Large Format Adapter Kit Bill of Materials

ZDL Part #	Description	Notes	Qty
HE-20-01	VPM-1 Adapter		1
HE-20-14	1/2" Flat head Screw		2
HE-20-15	3/4" Flat head Screw		1
HE-25-08	Tension washers		2



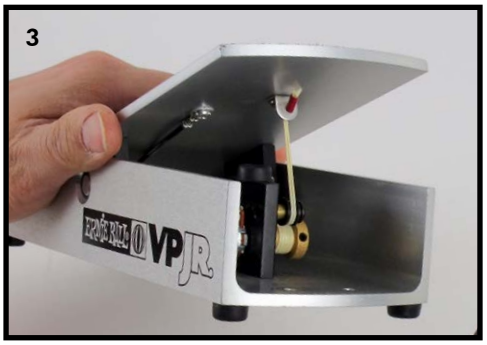
WHAT YOU WILL NEED

1. #2 Philips screw driver
2. Flat head screw driver
3. Flush cutters or small diagonal cutters
4. Super glue; We prefer the "gel" type because it's easy to control, but any type will work.
5. Isopropyl alcohol and cleaning rag
6. X-acto or hobby knife (if you need to tighten the treadle)

A WORD OF CAUTION: This kit contains at least two circuit boards (depending on your upgrades) on which several types of IC (integrated circuits) components are installed. In general, ICs are quite sensitive to static electricity and can easily be damaged. Humans are not sensitive to static electricity at these low, yet damaging levels; in fact, most people can't even feel a static discharge less than 1000 volts! So it is easy to damage these components without even knowing it. Before touching any of the PCBs in this kit, and often while working with them, ground yourself preferably by touching something grounded to the mains like the metal chassis of a plugged-in amplifier, or a refrigerator. At the very least touch a large conductive object like a metal desk or filing cabinet. In our lab, we wear conductive, anti-static bracelets that are connected to the electrical main's ground.

PREPARING THE ERNIE BALL VOLUME PEDAL

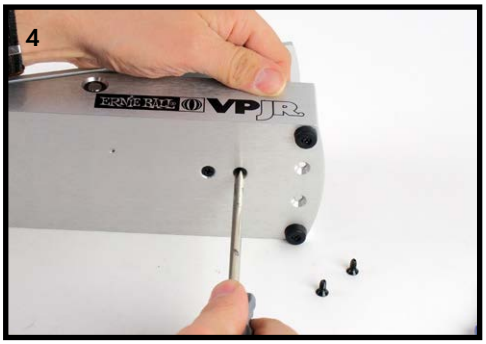
1. JACK MODULE: With your #2 Philips screwdriver, remove the two jack module screws from the bottom of the pedal chassis (127). If you have a large format pedal you'll probably be able to remove the potentiometer wire header from the jack module. If you have a VP Jr. or the wires are soldered onto the jack module you'll need to use your flush cutters to snip off the wires on the potentiometer (128). Hang on to the screws; we will use them to install the VPM-1 main board module.

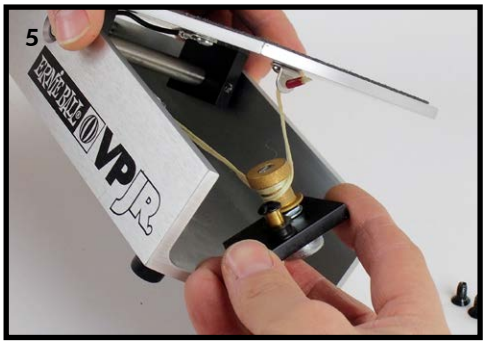


2. POTENTIOMETER BLOCK:

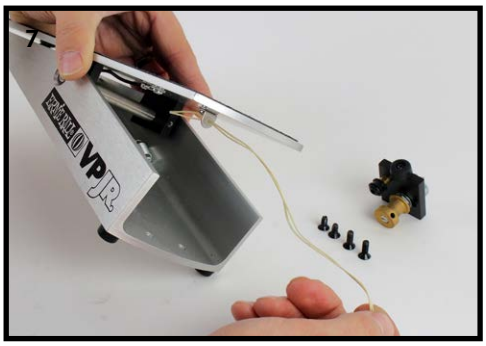
a. With a #2 Philips screwdriver, remove the two screws that hold in the potentiometer block (4). Note these screws are longer than those from the jack module so keep them separate.

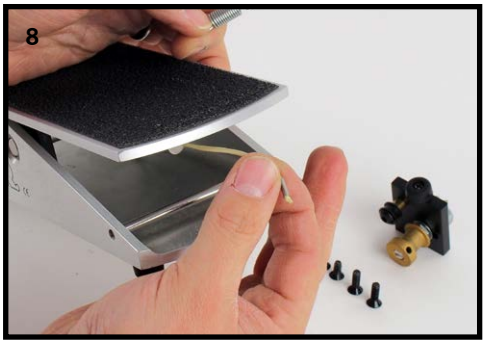
b. Now unwind the string from the pulley to get the block out (5).

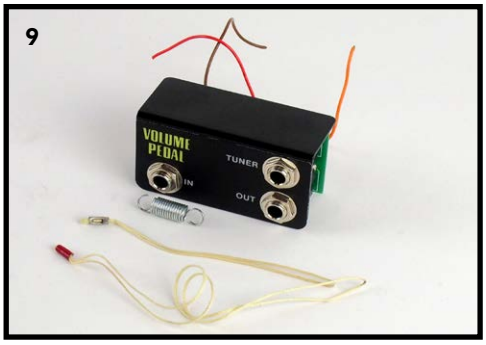




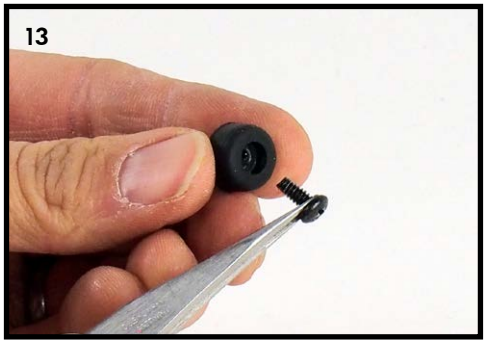
c. At this point the strings and spring should be loose in the pedal. You can pull the strings out though their eyelets and the spring should just fall out (6-8). You can set the strings, spring and jack module aside because we won't be using these again (9-11).







3. Unscrew the rubber foot from on top of the potentiometer block (12). Once the foot is off, remove the screw from the foot because we'll use it later to attach the sensor board (13).

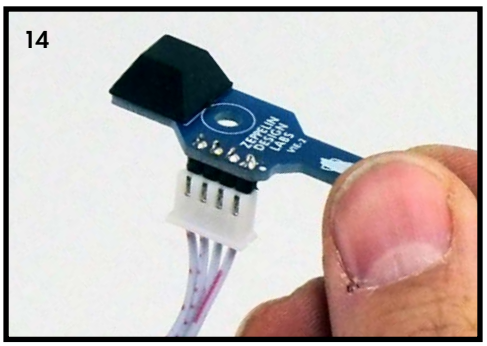


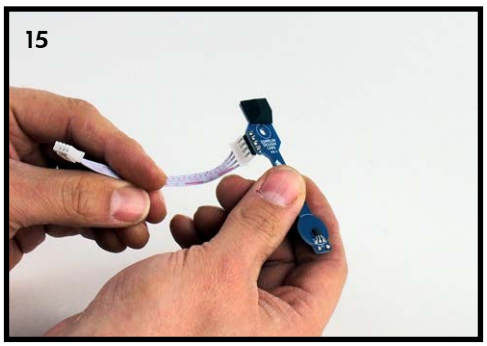
4. While it is empty, use a rag to wipe out the dust and dirt from the bottom of the chassis.

5. If you notice the treadle is very loose and isn't able to stay in one position between the two extremes, you should probably tighten the treadle. You'll need to do that now when the pedal chassis is empty. Please see Appendix 4. If your pedal's treadle is tight enough, please move on to the next section.

INSTALLING THE VPM-1

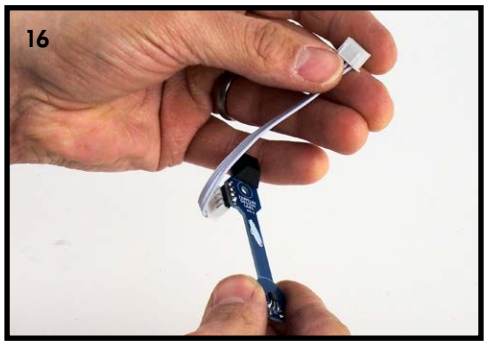
1. RIBBON CABLE: On the long skinny sensor board there is a 4-pin header. Place the ribbon cable on the header (14). Do you see the little white dot on the PCB, at one end of the header? Let's call that Pin 1. Now notice that all four wires of the ribbon cable are marked with unique patterns of dashes and dots. Note which pattern is associated with Pin 1. You will need this knowledge later.

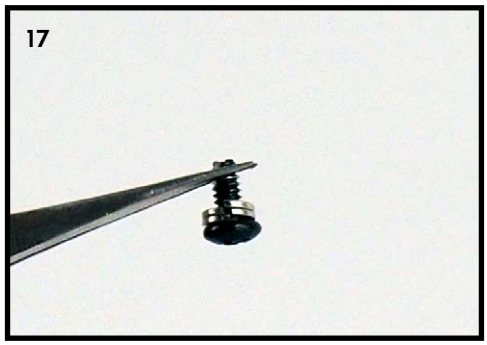




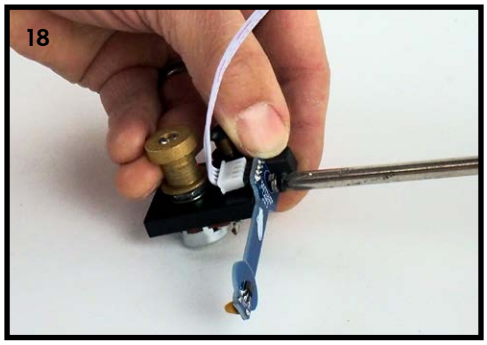
2. POTENTIOMETER BLOCK

a. Bend the ribbon cable on the sensor board upward, so it will not conflict with the pulley (16). Place the two lock washers (part FA-93-35) on the rubber foot screw (17).

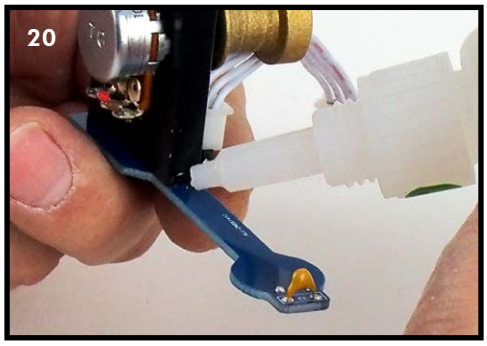


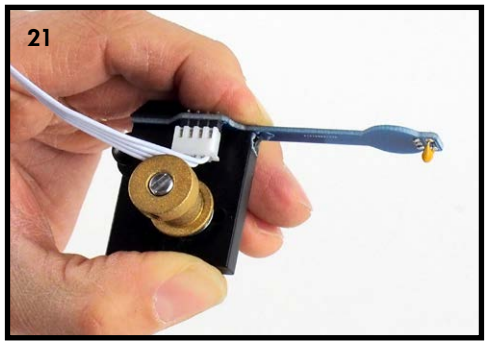


b. Use the screw to fasten the sensor board to the potentiometer block (18). Make sure the PCB is laying perfectly flat against the top of the potentiometer block (19). Sometimes when the screw is over-tightened the back of the PCB has a tendency to lift off the block a bit, so make sure that doesn't happen.

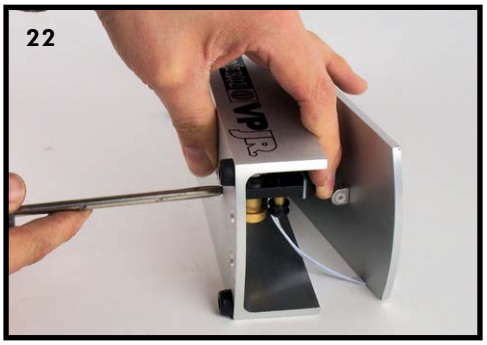


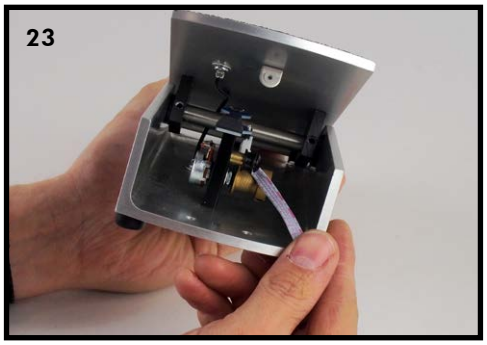
c. Align the sensor board with the top of the potentiometer block as in the picture and add a drop of super glue to the back, top edge of the block (20). This should affix the sensor board to the block to keep it from rotating as the pedal gets knocked around. It may be necessary to hold the board down to the top of the block as the glue sets to ensure the board is laying on the surface of the block (21). Once the glue cures you can tighten up the screw a bit, if needed.

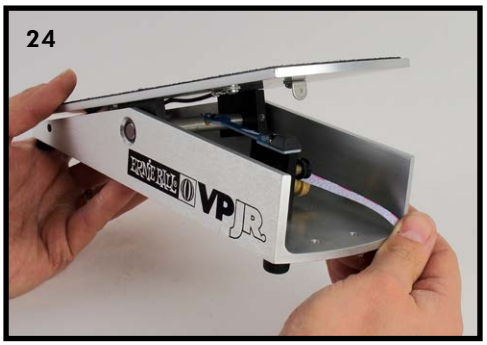




d. With the sensor board screwed and glued in place, you can now re-install the potentiometer block in the pedal chassis using the two longer screws (22). There is some play in how this block fits inside the pedal. Drive the screws snug but not tight. Visually line up the sensor board so it is aiming straight to the back of the pedal (23), then tighten the screws.

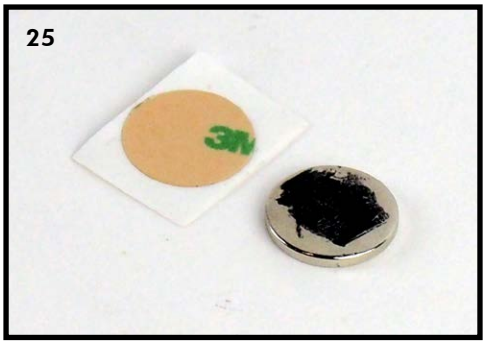


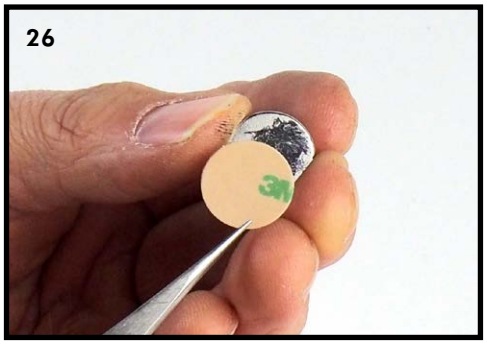




3. MAGNET: The magnet will be held on the underneath side of the treadle with the double-sided adhesive disc (TP-30-21).

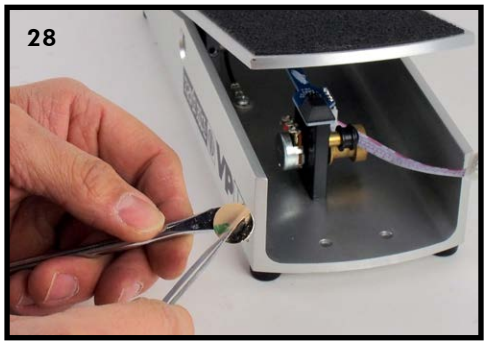
   a. The magnet has a black marking on one side (25). This marking indicates the side that the adhesive disc should be stuck to. Line the disc up to the magnet and press it firmly into place.

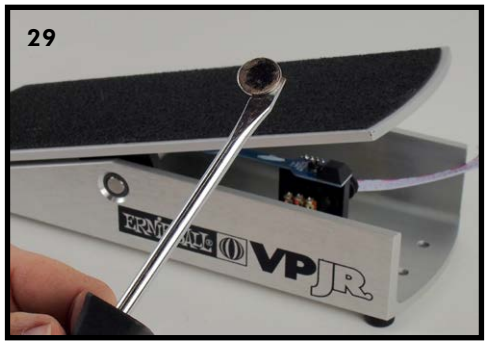




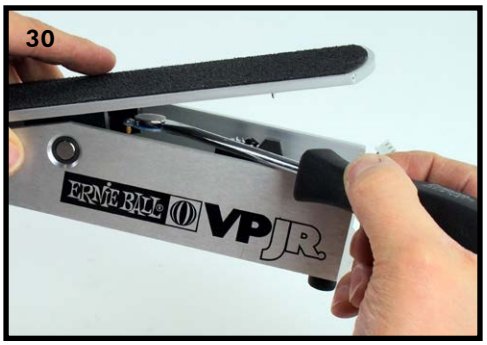
b. Now we need to attach the magnet to the bottom of the treadle. With your rag and isopropyl alcohol, clean the area on the treadle directly above the Hall effect sensor (27).

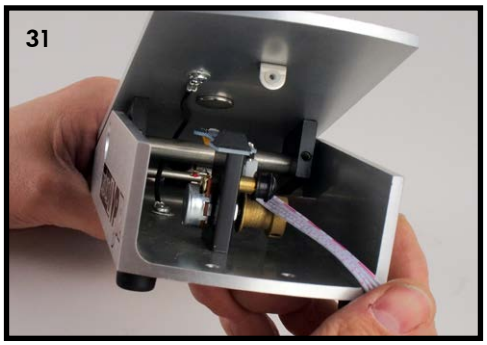
c. Attach the magnet to the end of a flat screwdriver with the adhesive disc facing up. Then peel off the backing paper on the adhesive disc (28,29).

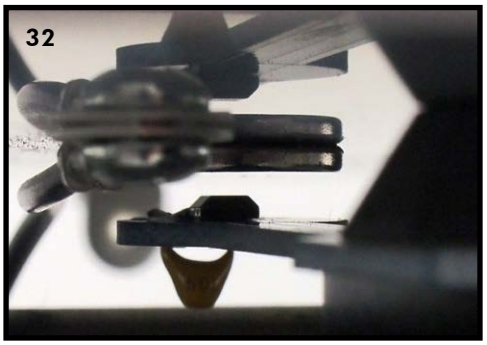




d. With the treadle wide open, place the end of the screwdriver (with the magnet still attached) on top of the circular part of the sensor board. The circular part of the board serves as a template for placement of the magnet. Make sure the Hall effect sensor is lined up to the center of the magnet. The magnet may need to be hanging off of the end of the screwdriver to be lined up properly (30). When the magnet is in the correct position, bring the treadle down on top of the magnet and screwdriver. The magnet should stick to the bottom of the treadle in the proper location (31,32). Press the magnet tightly to the treadle and hold it for a few seconds to bond it tightly. Now as the treadle moves down and up, the magnet gets closer to and farther from the sensor.





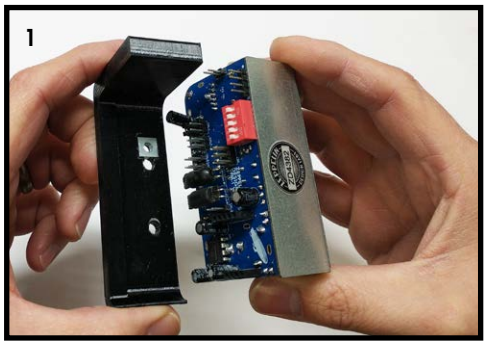


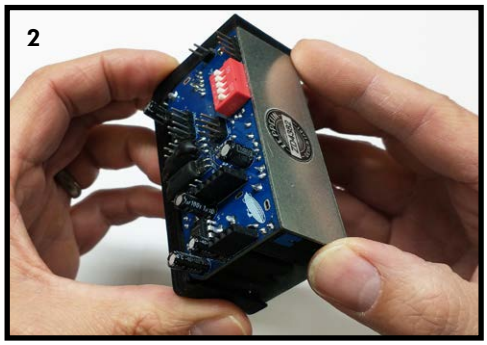
4. THE LARGE FORMAT ADAPTER (FOR MODEL NUMBERS: 6165, 6166, 6167, 6168)

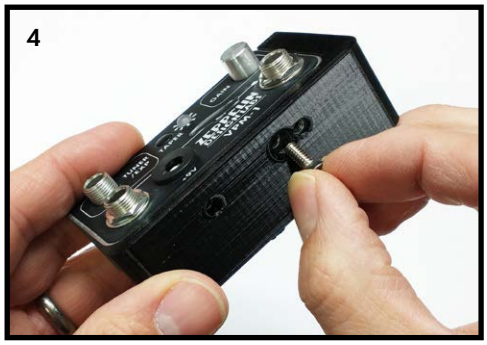
If you have a VP Jr. model volume pedal then please continue on to the next section: "INSTALLING THE MAIN BOARD MODULE."

If you have an original large format volume pedal (model numbers: 6165, 6166, 6167, 6168) you'll need to use our adapter kit to allow the VPM-1 main board module to screw into the volume pedal chassis. It is very simple to assemble, and only takes one screw to attach the main board module to the adapter.

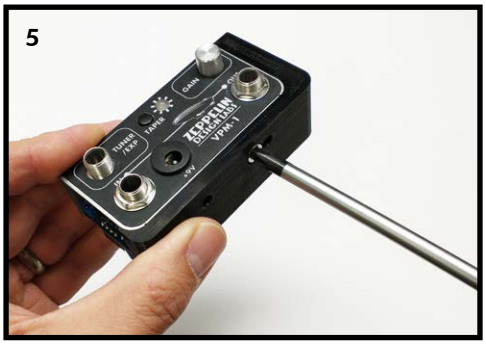
1. Line up the main board module to the adapter and slide the module chassis against the ridge on the bottom of the adapter. On the bottom of the adapter, make sure the screw holes in the module chassis are visible through the adapter holes.







2. In the middle hole of the adapter (the beveled hole) use one of the supplied 1/2" screws to attach the two pieces together.

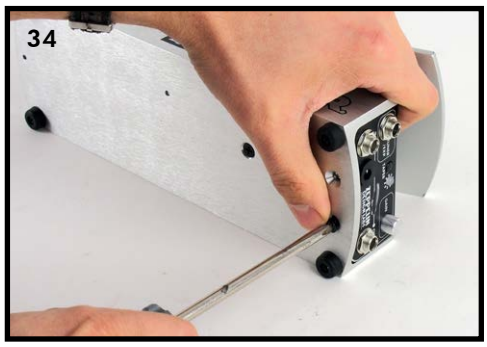


Now you can move on to "INSTALLING THE MAIN BOARD MODULE" where you will attach these combined parts into the pedal chassis.

5. INSTALLING THE MAIN BOARD MODULE

   a. Attach the ribbon cable to the main board header (33). Remember earlier when you noted the pattern on the cable wire near the dot on the sensor board? It is important that the pin by the dot on the sensor board is attached to the pin by the dot on the main board. Make sure it is not reversed.

   b. Slide the main board chassis into the volume pedal chassis and screw it in place with the short screws (34,35).



That's it!

You are almost ready to go! Move on to "APPENDIX 2: CALIBRATING THE VPM-1" on page 24.

APPENDIX 2: CALIBRATING THE VPM-1

We made a video to illustrate the following procedure, which you can find on our YouTube channel, in the VPM-1 playlist.

One of the things that makes the VPM-1 very versatile is the ability to set the active range (or sweep) of the treadle to a position that is most comfortable for you. This means that you can set the minimum volume position and maximum volume position anywhere along the pedal's range of movement. Any point below the minimum-volume position will be zero volume, and anything above the maximum-volume point will be maximum volume. Calibrating the VPM-1 is the process of setting these two points, plus three equidistant points in between. Since these five points are stored in the microcontroller's memory, calibrating the VPM-1 is only necessary once; but you may want to experiment with different sweep distances and placements to find what works best for you.

The five calibration points must be equally spaced across the desired range of treadle movement in order to produce the best volume linearity. The microcontroller will then manipulate these five points in different ways to create the four other available tapers. To help with this calibration procedure, we have included a "calibration card." The front of this card provides a colorful variety of ranges of treadle movement to choose from. On the back is something like a protractor. You might use this figure to lay out a custom sweep by choosing your own five points (just make sure they are equally spaced).

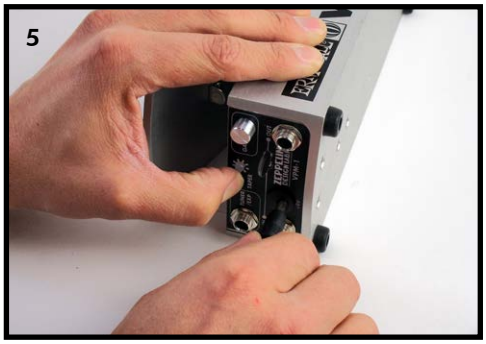
If this whole idea is a bit confusing to you, never fear! Just watch the video, follow the instructions, calibrate your pedal, and mess around with it for a while. Experiment with a few different sweep ranges until you are happy with the action. It is easy and hurts nothing to calibrate the VPM-1 again and again.

In this example (as in the video),we will use the calibration points shown in red on the card.

1. Set the treadle position where you want the minimum volume point to be. We have found that what typically works best is to move the treadle until the gap at the back is about ½ inch (12mm) (1,2). If you use the pedal's fully-open position for minimum volume, then depending on the variations in your pedal build, the minimum volume may not get all the way down to zero.

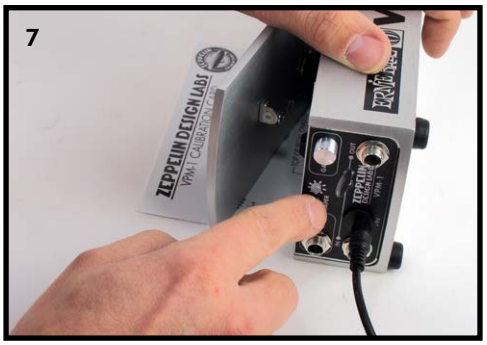
2. With the treadle set to your chosen minimum volume point and the pedal jacks pointing left, slide the calibration card on the back side of the pedal chassis. Align the black line on the card with the top of the pedal chassis (3). Slide the card toward the axle until the top dot on the red line is flush with the bottom of the treadle (4). Now tape the card in position.

3. While holding down the TAPER button, plug the power into the VPM-1 (5). The LED should start flashing, indicating that the VPM-1 is in calibration mode. Release the button.

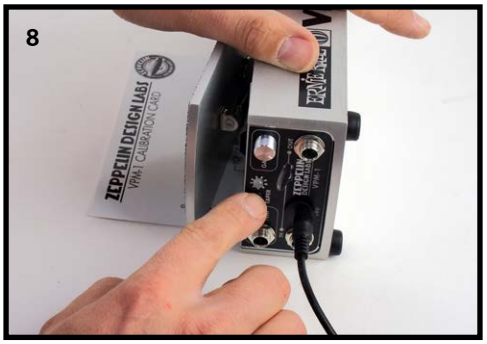


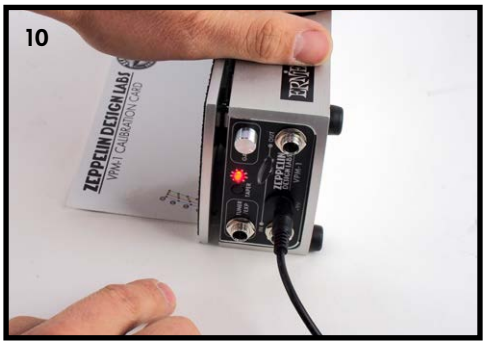
4. With the treadle still lined up with the top point on the red line, press the button. The LED will briefly flash again to indicate that this point was recorded in the microcontroller's memory (6).

5. Move the treadle to the next point down on the red line and press the button again. The LED will flash again indicating that this point was recorded (7).



6. Repeat this process for the three remaining points on the red line (8). After the last point is recorded, press the button one more time to exit calibration mode (9). You should see the LED cycle through all the colors, indicating the calibration process is done (10).





Your VPM-1 is now ready to use!

APPENDIX 3: REPLACING THE DIGITAL POTENTIOMETER

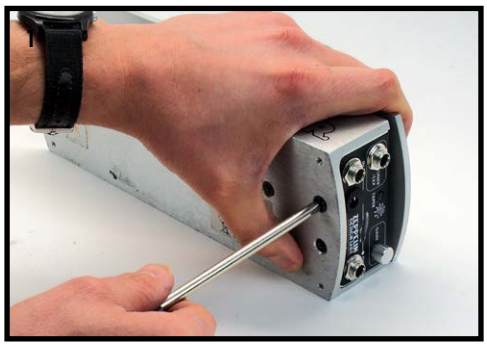
Your VPM-1 Expression upgrade came with a 50K digital pot installed on the board. Some effects pedals will work better for you with the optional 10K pot. Here's how to swap them out.

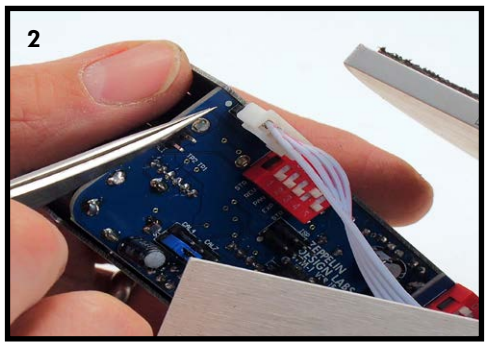
WHAT YOU WILL NEED

1. #2 Philips screw driver
2. Small flat head screw driver
3. A Sharpie or other black permanent marker

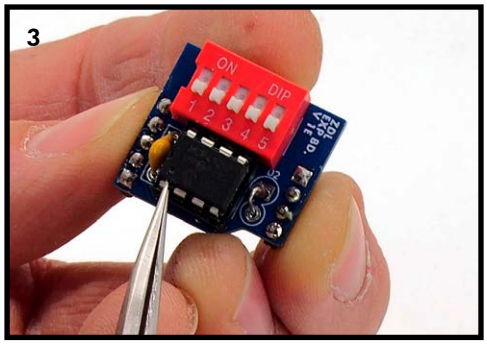
The digital potentiometer is a static-sensitive device. Please take the proper anti-static precautions before handling this IC. Please review "A WORD OF CAUTION" about static sensitive parts on page 16 before continuing.

1. To access the expression board you'll need to remove the VPM-1 main board chassis from the volume pedal. Unscrew the 2 screws under the main board chassis (1). Before you unplug the ribbon cable, use a black marker to draw some orientation marks on the ribbon cable header and the main circuit board so you know which direction to plug the ribbon cable back in later (2). It is very important to make sure this ribbon cable gets re-installed in the correct orientation.

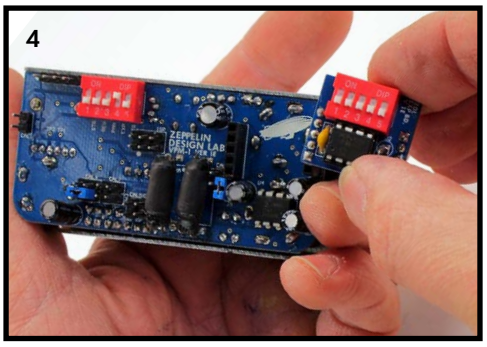


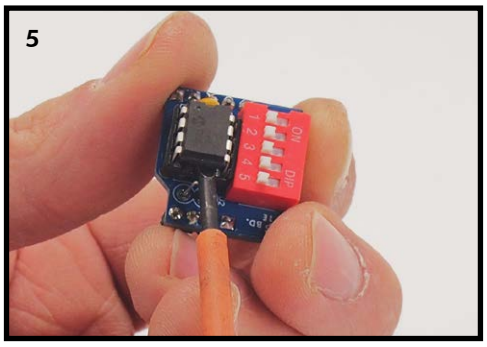


2. These digital potentiometer IC's have 8 pins and are installed in a socket on the expression board. Before you remove the digital potentiometer that is currently installed in the socket please note the dot and divot on one end of the IC (3). These markings on the IC are closest to the end of the socket with the divot.

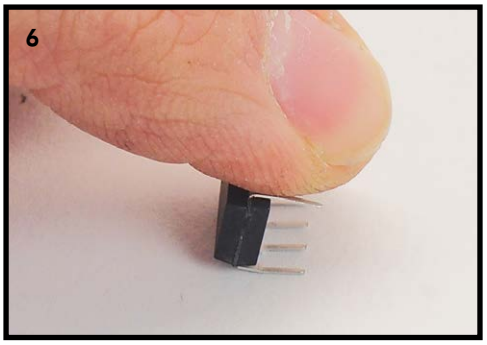


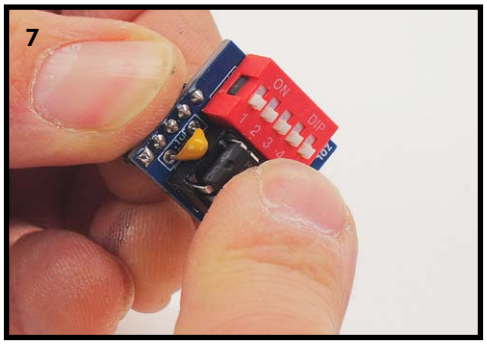
3. To make it easier to deal with the IC you can unplug the expression upgrade board from its headers on the main board (4). To remove the IC, place a small flat screwdriver under one end of the chip and very gently pry it out (5). Make sure to not bend any of its leads when doing this.



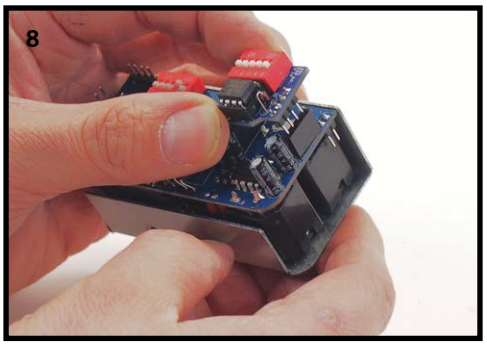


4. When you install the new digital pot in the socket it is very important to install this IC in the correct orientation. Remember the dot on the IC should be closest to the end of the socket with the divot. Carefully line the pins up to the socket. If the pins don't line up easily with the socket, you may have to gently bend the pins a little closer together by pushing each side of the chip down on the tabletop. (6). Once the pins line up to the socket holes, push the IC snugly into place (7)

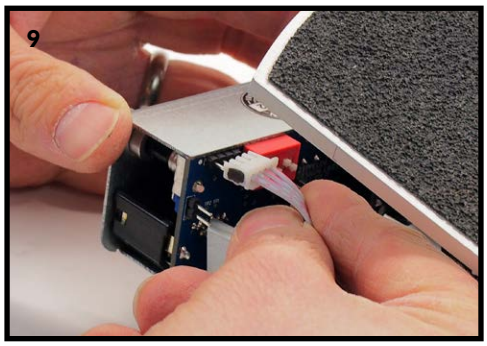




5. Place the expression board back in its main board headers (8).



6. Reattach the sensor board ribbon cable to the main board using the orientation marks that you made earlier (9) and re-install the main board chassis with the screws.



That's it!

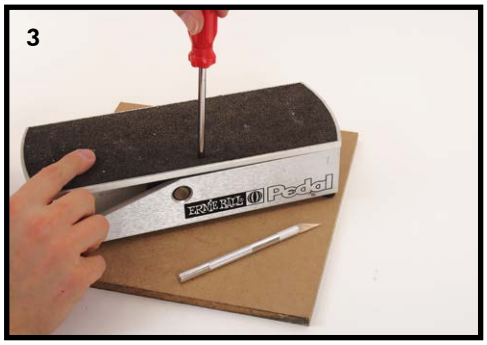
Your expression pedal is now ready to use!

APPENDIX 4: TIGHTENING THE TREADLE ACTION

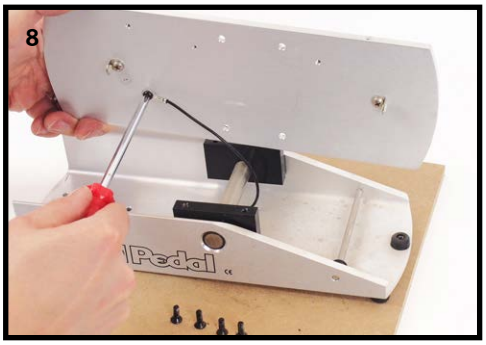
Sometimes when the string is removed from the volume pedal the tension of the treadle can become somewhat looser. This can be rectified by tightening or installing tension washers on the axle of the pedal. This requires the treadle and axle to be removed from the pedal. You will need a #2 Phillips screwdriver, a 2mm or 5/64" Allen (hex) wrench, needle nose pliers, and an X-acto (hobby) knife to perform this operation. (This process is demonstrated here on a large format Ernie Ball volume pedal, but the process is the same for the VP Jr. line of pedals)

1. There are 4 Phillips screws holding the treadle on to the axle mounts. These screws are hidden by the rubber grip on top of the treadle. Use your X-acto knife to find the slots in these screws by poking through the rubber at various places. When you have found the screws, cut slots into the rubber over the slots in the screws.

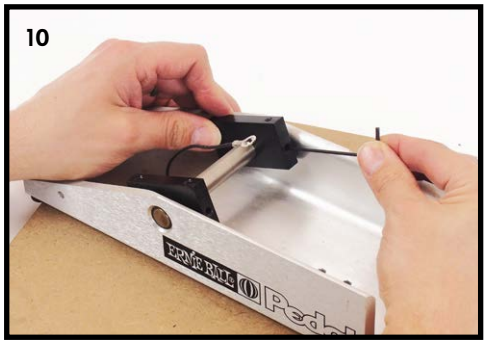
2. Use your Phillips screwdriver to back out each of the screws. Once the screws are partly out, it may be helpful to cut a circle out of the rubber grip around the screw heads. This helps to access the screws better.

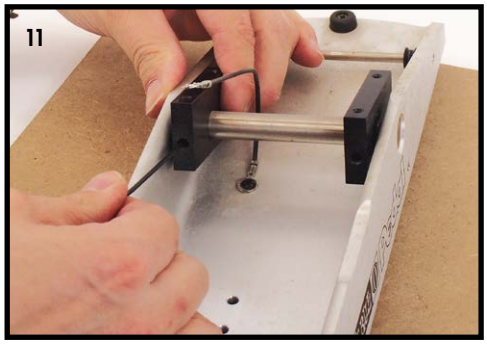


3. Unscrew the grounding wire lug on the bottom side of the treadle. Then mark the bottom of the treadle with an arrow pointing to the front of the pedal. This makes it much easier during re-assembly to quickly know which direction the treadle fits on the chassis..

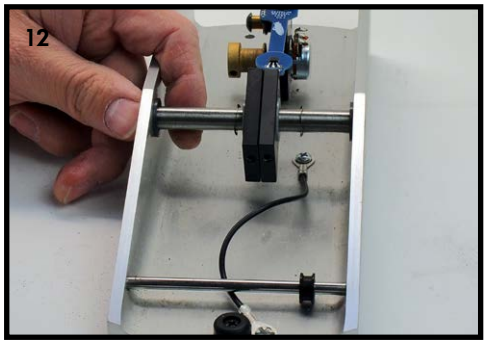


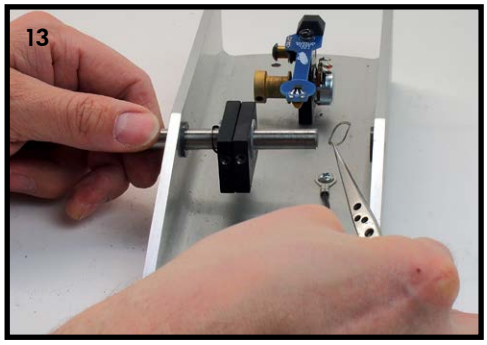
4. Use your Allen wrench to loosen both treadle mounting blocks on the axle.



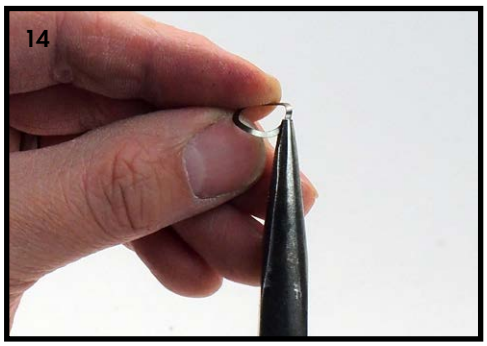


5. Once the treadle mounting blocks are loose, you can slide them toward the center of the axle. Slide the axle one direction, partly out of the chassis. If you have a large format volume pedal (models 6185, 6186, 6187, 6188), jump to step 7 (with the tension washers that came with your Large Format Adapter kit). If you have a VP Jr. or if tension washers are already on the axle, please continue with step 6.

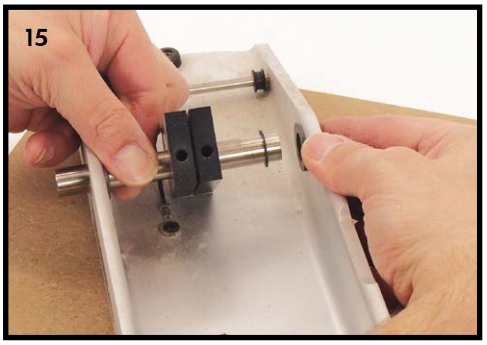


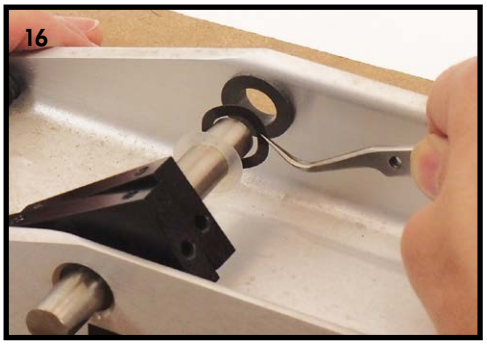


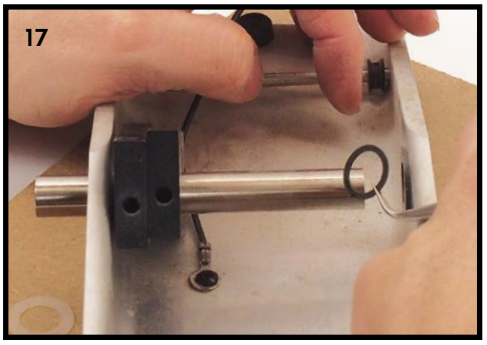
6. On your VP Jr., please remove the tension washer from the open side of the axle. Make sure to leave the white nylon washer where it is.
You'll notice that the tension washer is bent in two different directions. Use your needle nose pliers to increase the angle of these bends a little bit more. Don't bend the washer too much that it breaks, but just enough to increase the bend angle. The more tension this washer applies to the treadle mounts, the tighter the treadle will be.



7. Slide the axle to one side of the chassis. Insert the tension washer on the axle between the plastic washer and the axle insert on the chassis. If your pedal happens to have phenolic washers installed on the axle in addition to the nylon washers, you can remove them. The phenolic washers are not necessary because the tension washers will take their place.

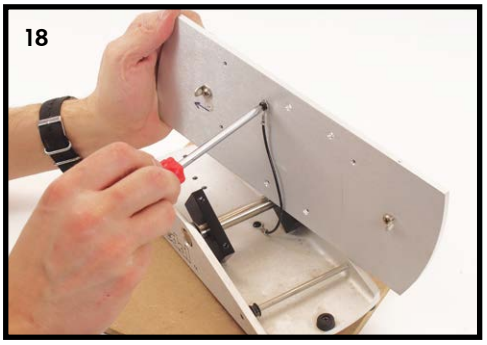






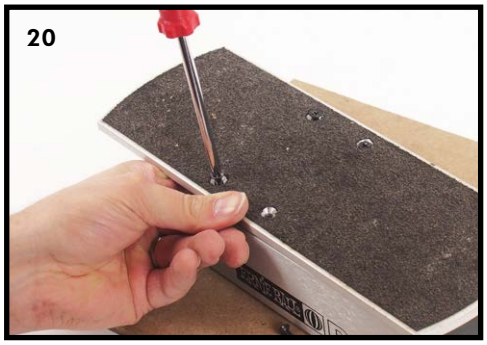
8. Slide the axle through it's insert until the other side of the axle is open. Repeat steps 8 and 9 with this side of the axle.

9. Re-attach the ground wire to the treadle. Make sure it is facing the correct way on the pedal chassis.



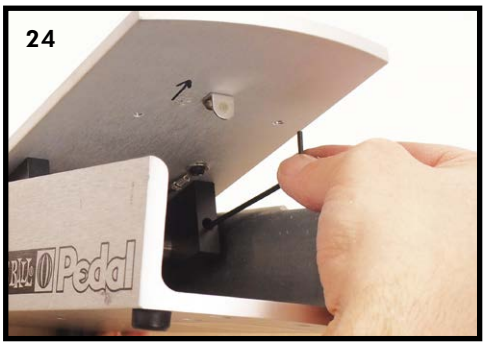
10. Partially screw the treadle to one of the mounting blocks. Only turn the screws 2 or 3 times into the mounting block. The treadle needs to still be loose enough to move around quite a bit in order to fit the screws in the other mounting block

11. Now that one side of the treadle is attached to one of the mounting blocks, reach under the treadle and pull the other mounting block to the side of the pedal. While holding it in this position you should be able to start attaching one screw through the treadle into that block. Only turn this screw enough turns to get the other screw started in it's hole.



12. Once all four screws have been started in their holes, you can now begin tightening them all, a little at a time,until they are all fully seated.

13. Once the treadle is fastened to the mounting blocks, open the treadle and use your 5/64" allen wrench to tighten each mounting block's set screw.



If you did everything correctly then the treadle action should be "stiffer" than it was before. If the treadle isn't as stiff as you'd like, feel free to repeat this process and bend the tension washer a little bit more (as described in step 8).

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