



# THE ESPRESSO

*Owner's Manual*

## PHANTOM POWER SUPPLY



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## *Portable Phantom Power Supply*

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## INTRODUCTION

Phantom Power is an ingenious method for powering condenser microphones and other audio devices with active electronics circuits. A relatively high DC voltage (usually 48V) is supplied to an audio signal; since an audio signal consists of only AC (alternating current), a capacitively coupled signal can alternate around any DC voltage without being noticed by the receiving circuitry – a phantom power supply.

Most mixing consoles and many portable recorders provide balanced mic inputs with phantom power. But when you want to use a recorder or mixer without phantom power or balanced inputs, you may be severely limited in the types of microphones you can use. Also, recording straight to a smartphone is becoming increasingly popular, but phones do not provide proper phantom power.

The Espresso Portable Phantom Power Supply takes one 9V battery and furnishes 30-48V phantom power to a female XLR input and outputs a balanced or unbalanced signal via a ¼" jack. Designed specifically as a companion to the Cortado Balanced Contact Mic, it can also be used to power a variety of condenser mics. This enables you to use these quality microphones with mixers, recorders, and even instrument amplifiers not furnishing phantom power; or, with a nifty adapter cable, you can record straight into your smartphone using simple audio/voice recording apps.

What's more, the Espresso can be easily configured to properly unbalance the input signal to give a line-level output. In this capacity it functions similar to a reversed active DI box, but small and light enough to hang on your instrument strap.

## USING YOUR ESPRESSO POWER SUPPLY

The Espresso was designed to be useful in a wide variety of applications. The following are some general instructions, followed by some more specific application notes. PLEASE READ THIS GUIDE CAREFULLY BEFORE YOU PLUG YOUR ESPRESSO INTO ANYTHING! If you are not careful, you could possibly damage the Espresso or the device you plug it into.

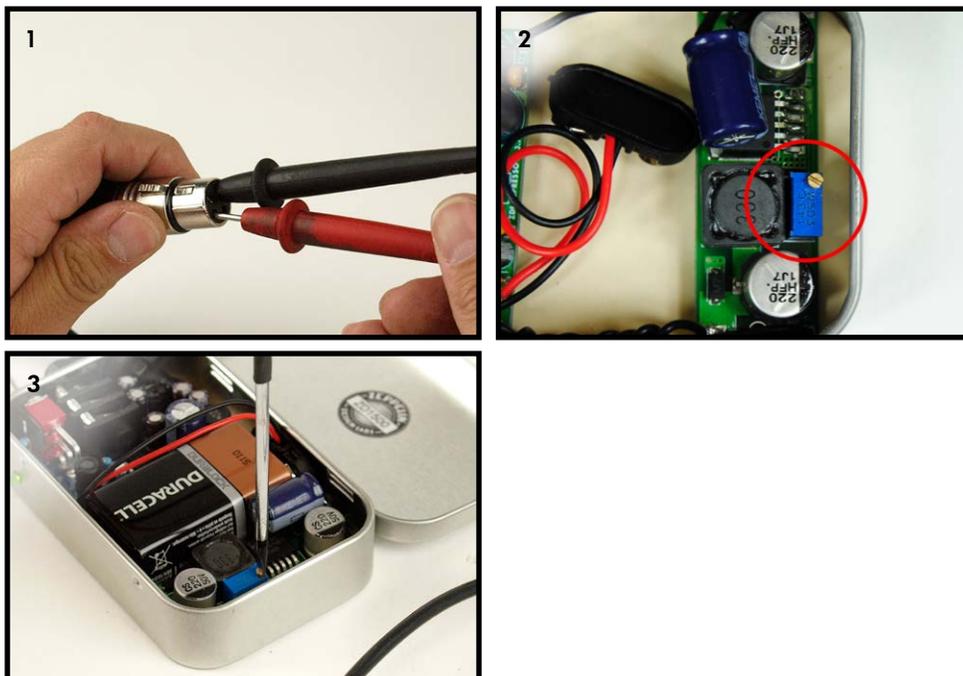
### VOLTAGE ADJUSTMENT

This is not a volume control! Read on...

The Espresso phantom voltage can be adjusted continuously from around 30V to 48V. The voltage you use depends on the microphone you are powering and your application. Generally, the higher the phantom voltage the better, because the phantom voltage defines the headroom (not output volume) of the microphone. For class A biased microphones, any incoming signal peak bigger than half the phantom voltage will be clipped. But on the other hand, the higher the voltage the shorter the battery life. Figure 1 below illustrates that lowering the voltage from 48V to 36V will reduce the current draw on the battery by over 20%.

Your Espresso is factory-preset to 42V, which works well with the Cortado Balanced Piezo Contact Mic. This offers a good compromise between battery life and microphone headroom for most applications. For other condenser microphones you'll have to experiment to find the lowest phantom voltage needed to power the mic and supply headroom sufficient for your application.

To set the phantom voltage, use your volt meter set to DC volts and measure between pin 1 and pin 2 on the XLR jack (1). The trim pot is the bright blue rectangular box on the power module (2). It can be turned with a small, flat-head screwdriver (3). Clockwise raises the voltage, and counterclockwise lowers the voltage. CAUTION: Never raise the voltage above 50V! The capacitors are only rated for 50V and may be damaged if they are exposed to higher voltage.



Note that when you adjust the output voltage, the Espresso is under no-load condition – there is no microphone attached. The actual voltage the microphone receives is dependent on the current draw of that particular microphone. This is because there are a couple of resistors in series with the phantom voltage that are used to separate the signals on pin 2 and 3 on the XLR jack. The more load (or current draw of the microphone), the more the voltage will drop across these resistors. For example, Figure 2 plots the output voltage for two different microphones (shown with broken lines) when the power module on the Espresso was adjusted to 42.0V. Your Espresso should perform well with microphones that draw up to about 5mA.

At low phantom voltages, or when the battery is nearly drained, the power supply may oscillate. This will most likely sound like low frequency thumping, called motor boating. If this happens, listen to the output through a mixer or amp while you raise or lower the phantom voltage until the motor boating stops. Motor boating is more likely to occur when the phantom voltage is set lower than about 30V, so we recommend not setting the voltage lower than that.

## BATTERY LIFE

Many factors influence battery life, some of which you have little control over, such as climate. But you can control two things that have major influence on battery life: battery selection and output voltage, and microphone selection.

All 9V batteries are not equal. There are many types and brands, each with different chemistries and performance characteristics. Do not waste your money on cheap batteries! You will get what you pay for. We recommend Energizer MAX brand alkaline or lithium 9V batteries. They consistently out-perform other brands in field tests.

As discussed in the previous section, the higher the output voltage, the shorter the battery life. Figure 1 indicates that when powering the Cortado, an Espresso set to 36V draws over 20% less current than when it is set to 48V. Thus to maximize battery life, set the voltage to the lowest setting that provides adequate headroom to your microphone.

The current a microphone requires to function can vary widely as well. The Espresso is designed to perform well with microphones that draw from 1 - 5 mA. Figure 2 shows the results of lab tests in which the Espresso powered a Cortado contact mic continuously for over 22 hours; a 3 mA mic for 19 hours; and we expect a 5 mA mic to last about 15 hours.

In lab testing, we discovered that, for a high-quality battery like the Energizer MAX at least, turning the Espresso on and off makes no significant difference in battery life; that is, the stress of powering up the Espresso is offset by permitting the battery to rest between uses. Thus feel free to shut off the Espresso between takes if it is convenient to do so. You will get about the same hours of useful “on” time no matter how often you turn the unit on and off.

Figure 1: Phantom Voltage vs Current Draw

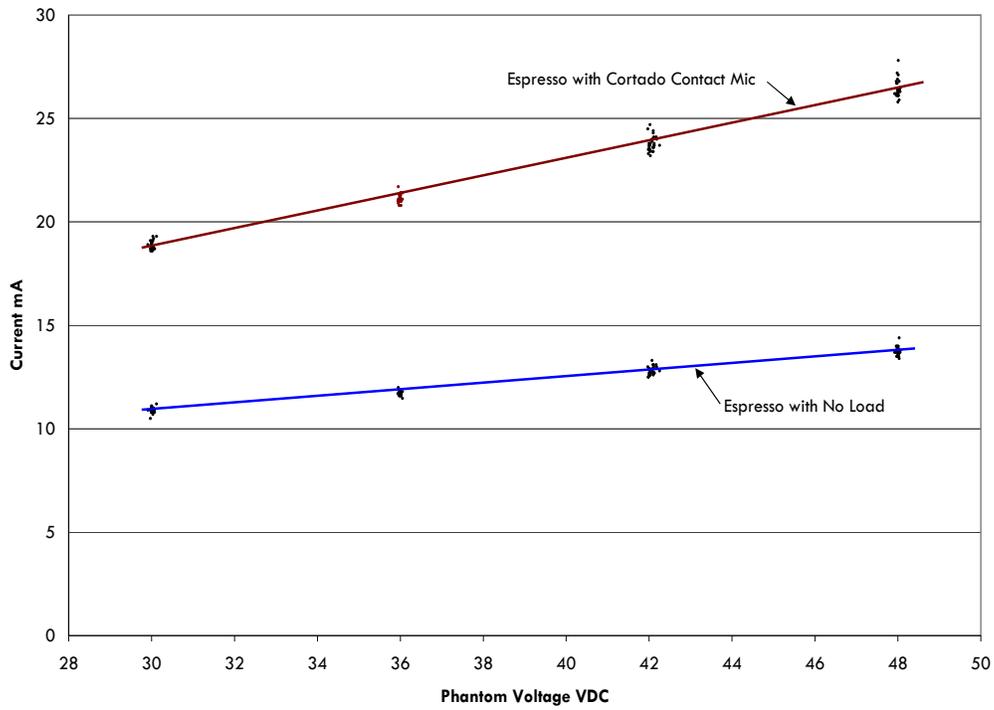
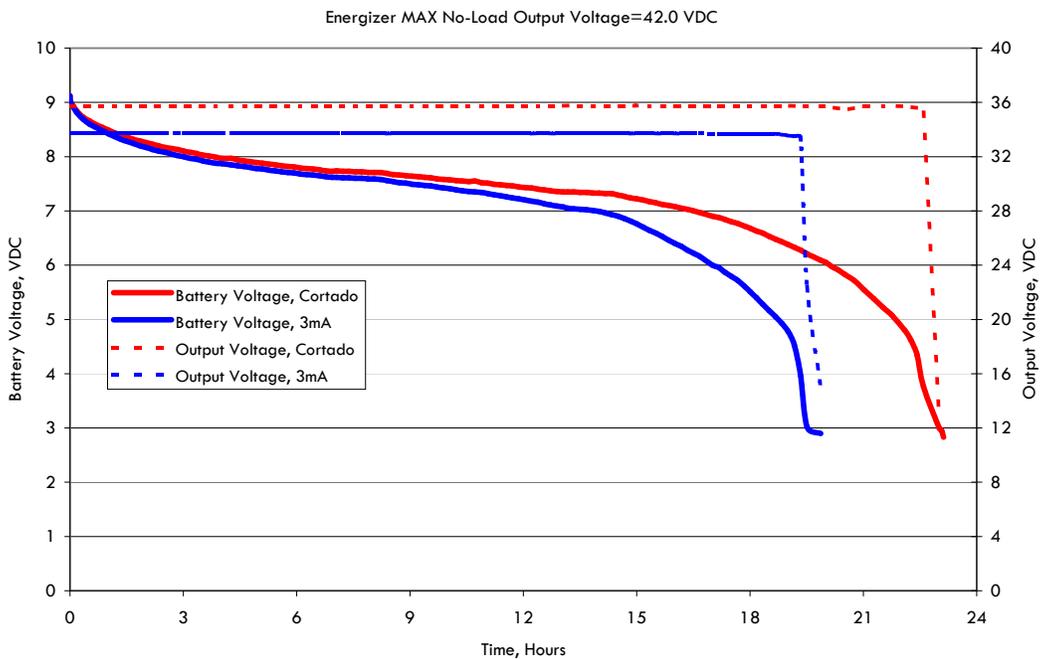
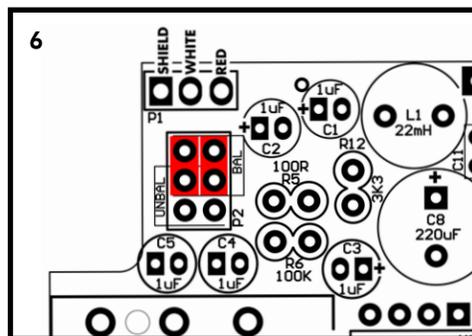
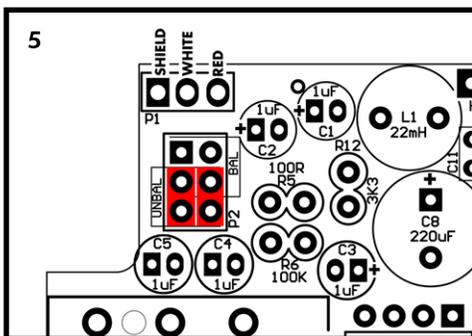
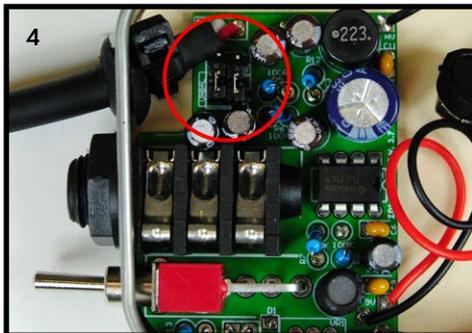


Figure 2: Battery Life in Continuous Use



## BALANCED / UNBALANCED MODE

The Espresso has two operational modes: Balanced and Unbalanced. The mode is set by moving a pair of jumpers located on the audio board between the input cable and the output jack (4). The ready-to-use version of the Espresso comes with the jumpers set to the unbalanced position (5). To change to balanced mode (6), use needle-nose pliers to pull the jumpers one at a time, straight up and out of the Espresso. Carefully line up the jumper over the two destination pins and gently push down with the pliers. When both pins are in place, press them gently with your finger tip to assure they are fully seated.



Balanced mode allows the input from the XLR to remain balanced as it exits the Espresso through the 1/4" TRS jack. In this mode, the Espresso doesn't process the signal in any way; it just supplies phantom power to the input. Zeppelin Design Labs offers a 1/4" male TRS to male XLR adapter which is useful if you need a balanced XLR out of the Espresso (see the "Adapters" section).

In Unbalanced mode the Espresso sends the signal through a circuit that properly unbalances the balanced input signal from the female XLR jack. This mode would be useful for any unbalanced input on an instrument amplifier, mixing console, or recording device, such as a smartphone. In unbalanced mode the ring on the 1/4" output jack of the Espresso is capacitively coupled to ground, which shunts all signals to ground while safely keeping all static DC voltages (such as any phantom power voltage) from dropping.

See Table 1 for a list of common applications, along with the Espresso configuration and which type of cable or adapter you can use. If you are not sure if the device you are attaching to the output of your Espresso needs a balanced or unbalanced input, then consult your device's owner's manual.

Table 1: Common Applications

Device Connected to Espresso Output	Output Cable	Espresso Mode
Mixing Console ¼" In	¼" TRS to ¼" TRS	Balanced
Mixing Console XLR In	¼" TRS to XLR Male Adapter (available from ZDL)	Balanced
Smartphone	¼" TRS to ⅛" TRRS Adapter (available from ZDL)	Unbalanced
Instrument (guitar/bass) Amplifier	¼" TS to ¼" TS (regular instrument cable)	Unbalanced
PC Mic or Line Input*	¼" TRS to ⅛" TRS Adapter (available from ZDL)	Unbalanced

\*Computer sound cards vary, but typically the Microphone input is for unbalanced, mic level devices; the Line input is line-level and usually stereo (left and right in via ⅛" TRS jack). The Espresso may work best in one or the other. Experiment.

## ADAPTERS

Zeppelin Design Labs offers two different adapters for the Espresso.

- ¼" TRS to XLR male adapter (7)

This allows you to run a balanced signal out of the Espresso into an XLR jack. This would be helpful if you are using a mixing console that has XLR inputs, but doesn't have phantom power.

- ⅛" TRRS jack to ¼" male and ⅛" female "8" on page 8)

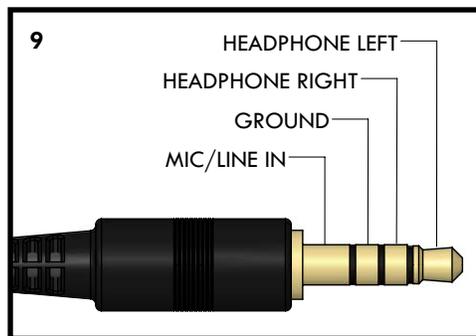
This allows you to run an unbalanced signal out of the Espresso into a smartphone for recording or signal analysis. The ⅛" female allows you to monitor your recording through headphones. Conforms to CTIA/AHJ standard.



## SMARTPHONE RECORDING

With the Espresso, you can record directly into your smartphone. The microphone input on most smartphones is actually located in the same jack as the headphones, in order to accommodate “hands free calling” via headphones with a built-in microphone. By separating the microphone input from the headphone output, a smartphone can be turned into a portable recording device.

The  $\frac{1}{8}$ ” jack that goes into a smartphone has 4 conductors on it. It is called a TRRS jack; that stands for tip, ring, ring, sleeve (9). Zeppelin Design Labs offers an adapter cable made specifically for the Espresso, that converts the  $\frac{1}{4}$ ” TRS output of the Espresso to a  $\frac{1}{8}$ ” TRRS for a smartphone input. It also has an  $\frac{1}{8}$ ” female for monitoring your recording with headphones. When this cable is plugged in, your smartphone recognizes that an external microphone/line-in is being used and the on-board phone mics will be turned off, allowing you to capture audio through the adapter only.



This adapter works on most newer smartphones. Your smartphone jack must be compatible with the CTIA/AHJ standard which designates the sleeve as the microphone conductor, as opposed to the OMTP which designates ring 2 as the mic and the sleeve as ground. Nearly all newer smartphones use the CTIA standard, but some older phones may not. Check your phone’s specs to make sure this adapter can work with your phone.

There are several good apps capable of recording on a smartphone; many of them are free. Generally, any voice recording app should work fine. Some may allow you to monitor the microphone signal live through your headphones; some may only allow monitoring of playback after recording.

