



**VOX**  
**AC4<sup>TM</sup>TV**  
**Studio-Pro**  
**Mercury Upgrade Kit**

*Assembly Manual*



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If you do not know how to read a schematic, we strongly recommend that you take this project to a qualified technician for installation.

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**Mercury Magnetics** transformers and other products are in compliance with the European Union RoHS Directive 2002/95/EC with respect to the following substances: lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (CR (VI)), polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE).

**Attention: Modifying your VOX AC4TV amp voids the VOX warranty!**



## Introduction to the VOX AC4tv Studio-Pro Upgrade Kit

Congratulations! And thank you for investing in the **Mercury Studio-Pro Upgrade Kit** for your **VOX AC4tv**. You're going to love the **Tone** of your **Upgraded** amp.

### About Upgrading your AC4tv

Don't let your **VOX AC4tv** amp's compact size and price fool you. Aside from amazing **tone**, your **Upgraded AC4tv** will run both *studio-quiet* and *pedal-friendly*.

**Mercury** is well connected with both pro and studio players, and long before the **Upgraded** little amp was ready for prime-time the prototypes were making the rounds here in Los Angeles. Consider that these players have the choice of any gear they want – but they're running with the **Upgraded AC4tv** because they love the way it sounds and responds. They know it's best tool for the job!

You'll find that your **Upgraded AC4tv** may be one of the most *pedal-friendly* little amps you'll ever own. So go ahead, *unmothball* those stomp boxes, experiment and discover what new directions you can take your sound.

### Upgrade transformers and your tone

Savvy guitarists and amp techs know that tube amp design begins with *quality transformers*. The *transformers* you use determine your amp's **tone**. When you get the *transformers* right you're on the road to a great-sounding amp.

However, these days amp manufacturers are often forced into a balancing act of compromises in order to meet the low budget demands of the market. First on the hatchet list is the *transformers*. And sadly, low-

bidder *transformers* only give you low-bidder **tone**. Manufacturers may be stuck with this dilemma but you don't have to be. **Mercury** has THE solution with our no compromise **Upgrade transformer** designs. The same you'll find in the best pro and studio amps all over the world.

The bottom line is that no matter how an amp plays, it cannot achieve its full sonic potential without following the time-tested recipes of properly engineered *transformers*.

Quality *transformers* are a good investment because you're getting so much more **tone** (and amp reliability) for your money. Usually making the difference between an amp you love and are inspired to play vs. one that's orphaned in your closet.



### Why's that?

One of the most significant (and not so obvious) reasons we don't like the sound of some amps is a phenomenon known as "ear fatigue."

In nature all sounds are composed of layers of frequencies producing all sorts of harmonics and distortion. *Ear fatigue* is caused by information commingling with non-musical, unnatural noise that beat up your internal mechanisms – some of which we "feel" more than hear. These mechanisms end up working overtime trying to separate the desirable from the less desirable sounds. That's how *fatigue* happens.

A popular misconception is that vacuum tubes were designed to distort. We only enjoy the benefits of distortion by the influence of the amp's *transformers* – *not its tubes*. When it's done right you hear **tone** that's more musical, appealing, and *less fatiguing*. **Tone** that takes you in, invites and inspires

Continued on next page →

more playing. **Tone** that gives you an emotional experience. It's all about musicality that's virtually impossible without the right *transformers*.

## Kick-starting your *tone*

There's no short-cut to building quality *transformers*. That's why **Mercury** plays such an important role in your music. We provide you with the key components in the chain between your guitar and the ear. But, we can only get there with uncompromising engineering expertise, the uncommonly high quality of our materials, our unique and proprietary "recipes," and craftsmanship unlike anywhere else in the world.

It costs a lot more to produce zero-compromise *transformers*. But the result is that musicians everywhere tell us how much they *love* our products. We believe that when you've heard how **Mercury** *transformers* can improve your sound, you'll be hooked, too.

## Using this *Upgrade Kit*

Be sure to read through this entire manual before beginning to modify your amp. If you are not comfortable or unsure in any way, we recommend that you take your **Kit** and amp to a qualified **Mercury** installer. For an amp tech near you, please call, *Skype* (a popular web-based telephone service), write or email us for a referral (worldwide).

Working on any electronic device is potentially hazardous. To perform this **Upgrade** you should have at least completed a basic electronics assembly class, or know someone who can safely guide you.

It's easy to damage your amp. While most things are repairable the "learning experience" could cost you.

That said, we've attempted to break this manual down into a series of easy-to-follow, sequential steps – almost "paint-by-number." We're aware that this style may put off someone with old-school training, but our intention is to help the broadest possible

spectrum of those wishing to make the **Upgrade**. The photos and illustrations in this manual will minimize guesswork or interpretation issues.

There's a lot to be said about rolling your own, but if you have a case of *tinkertitis* we recommend that you install the **Upgrade** as documented here – do it **first** – before considering or experimenting with any other modification. In this way you'll have a good **tonal** reference for other mods you may choose to make.

The **Upgrade** requires a radical modification of your amp's main PCB (printed circuit board), replacing the *power* and *output transformers*, with the addition of a **Mercury** "Mini-Choke." Our *Mini-Choke* replaces a resistor on the original PCB and adds a noticeable amount of **dynamic headroom** (WOW! factor) to the circuit.

Note that all amps of this type are divided into three sections: power supply, preamp and power amp. Learning about and understanding these fundamental principles, along with how the amp's *transformers* and *choke* interact, will take you a long way to wringing the most from any tube-based amp.

## Your feedback

Would you like to help us make even better **Upgrade Kits** in the future? Or, would you like to share your ideas, experiences or perhaps a sound clip or Youtube? Your friends at **Mercury** care about what you have to say, and welcome your feedback and contributions to this project.

Send comments, suggestions, video, relevant links, photos and sound samples to:

**Kits@MercuryMagnetics.com**  
or call us at **(818) 998-7791**

On behalf of the staff of **Mercury Magnetics**, thank you again for putting your trust in us.

You've made the **Mercury Upgrade** – now you're ready to play! 

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**CAUTION!** The voltages in your amplifier can be dangerous. Transformers and chokes are not user serviceable parts. Installation of these components should always be performed by an experienced technician. The simple ability to use a soldering iron is not enough to qualify a “do-it-yourself person.” Those who are inexperienced in working with electronic circuits should never attempt to service their amplifiers. Household line currents can be deadly!! Transformers, chokes and large filter capacitors can store dangerous charges for several days, or longer, after the amplifier has been unplugged. Never touch the terminals of these components without being certain of their charge status. Risk of shock and damage to equipment may result from mishandling and/or improper use of these components. Please use common sense and always think safety first. After all, great tone is most enjoyed when you are alive to hear it.

**SOLDERING NOTE:** VOX's AC4tv is assembled using RoHS compliant, lead-free solder. Working with lead-free solder is different than standard solder. Generally a hotter iron is necessary. For more information we recommend doing a web-search for “lead-free soldering techniques.”

**PULL TEST:** After reassembly, make sure that all of the clip connectors from the transformers to other amp components are secure. To be sure, give the clips a tug with a set of needlenose pliers. If a clip slips off relatively easily, you'll need to reshape or crimp it so that it'll hold securely.

**DO NOT POWER UP THE AMP WITHOUT TUBES!**

**CAPACITOR DISCHARGE WARNING:** Safe discharging of filter capacitors matters. It is essential for your safety and to prevent damage to the amp's circuitry, that large or high voltage capacitors be fully discharged before measurements are made, soldering is attempted, or the circuitry is touched in any way. For information on how to do this, web-search “capacitor discharging.” Also see the appendix for additional information.

**CAPACITOR POLARITY:** Note that many capacitors have positive and negative polarity, and are stamped accordingly. Be sure that their polarity is correct when soldering to a PCB.

**BRAIDING, TWISTING AND COILING LEADS:** Do not braid, twist or coil the power transformer's B+ lead wire. Check our reference illustrations and photos to see which leads are twisted together. Typically only the filament leads of the power transformer. Other positioning of leads may be necessary to minimize amp noise. Follow are diagrams and instructs for optimal performance.

**TRIMMING TRANSFORMER LEADS:** To minimize noise, measure and trim the solderable lead lengths of the transformers and **Mini-Choke™**. Route all wires cleaning around the tubes, chassis, etc.

**CLIPPING vs. UNSOLDERING PCB COMPONENTS:** To make this **Upgrade** it will be necessary to remove several components from the Main PCB of the amp. Due to quality issues with modern off-shore PCB manufacturing, it can be difficult to unsolder an item without creating other problems, the most typical of which is an eyelet detaching from the PCB. Therefore we've indicated which components should be clipped vs. unsoldered. To unsolder heat your iron to 800°F, then very quickly heating up one side of the existing solder connection while pulling it through on the other. If the iron is not hot enough, or you linger too long, the eyelet will get damaged (or fall off). If this happens you'll have to fabricate a repair, or created a jumper to a trace. See this manual's appendices for tips.

**POWERING UP A GUITAR AMP:** After making any modifications to an amp's circuit (e.g. this **Upgrade**) use a **Variac** along with an current meter (some have both) to slowly apply power to the amp while checking for warning signs of circuitry errors or shorts. See the section on “Using a Variac” at the end of this manual.

**LOADING OUTPUT TRANSFORMERS:** You must connect a speaker or speaker cab to your amp before powering it up. Without a load the output transformer will blow.

**MINI-CHOKE FACTOID:** A **Mercury Mini-Choke™** replaces a resistor and adds a discernable amount of tonal dimension to the circuit.

**TRANSFORMER BREAK IN PERIOD:** As a general rule, transformers require approximately 30 hours of **playing time** to be fully broken in. Please refer to **Mercury's** website for more information.

**BE SAFE! ALWAYS USE PROTECTIVE EYEWEAR!**



## Parts List

### Transformers:

- **Mercury Axiom** 120V power transformer (part #: VXP-AC4-RE REV. 3) or ..... 1
- **Mercury Axiom** 240V power transformer (part #: VXP-AC4-RE-240) ..... 1
- **Mercury Axiom** output transformer (part #: VXO-AC4-95) ..... 1
- **Mercury Axiom Mini-Choke™** (part #: VXO-AC4-CH) ..... 1

### Power Diodes:

- IN4007 (black with white band) ..... 2

### Capacitors:

- 47 $\mu$ F (electrolytic / radial / 35V 85°C) ..... 1
- 10 $\mu$ F (electrolytic / radial / 50V 85°C) ..... 1
- 10 $\mu$ F (electrolytic / radial / 350V 85°C) ..... 1
- 47 $\mu$ F (electrolytic / radial / 350V 85°C) ..... 1
- 22 $\mu$ F (electrolytic / radial / 350V 85°C) ..... 1
- 22 $\mu$ F (electrolytic / radial / 25V 85°C) ..... 1
- 47 $\rho$ F (silver mica / 500V) ..... 1
- 680 $\rho$ F (silver mica / 500V) ..... 1
- 0.047 $\mu$ F (mylar / 400V) ..... 1

### Resistors:

- 2.7K $\Omega$  (1 watt / metal oxide (flame-proof) / color code: red, violet, red) ..... 1
- 47K $\Omega$  (.5 watt / carbon film / color code: yellow, violet, orange) ..... 1
- 470 $\Omega$  (.5 watt / carbon film / color code: yellow, violet, brown) ..... 1
- 470K $\Omega$  (.5 watt / carbon film / color code: yellow, violet, yellow) ..... 1
- 3.9K $\Omega$  (.5 watt / carbon film / color code: orange, white, red) ..... 1
- 15K $\Omega$  (.5 watt / carbon film / color code: brown, green, orange) ..... 1
- 2.2K $\Omega$  (.5 watt / carbon film / color code: red, red, red) ..... 1
- 68K $\Omega$  (.5 watt / carbon film / color code: blue, grey, orange) ..... 1
- 100K $\Omega$  (.5 watt / carbon film / color code: brown, black, yellow) ..... 1
- 22K $\Omega$  (.25 watt / carbon comp / color code: red, black, orange) ..... 1

### Misc. Components:

- Audio taper potentiometer (A1M) replacement for "Volume" control ..... 1
- Coil of shielded filament wire 20 gauge ..... ~12"
- Coil of clear insulation tubing spaghetti ..... ~12"
- Coil of unshielded filament wire for jumpers ..... ~12"
- Stand-off assembly ..... 1
- Cable ties – 6" ..... 5
- No. 8 – 1/2" wood screws (to mount **Mini-Choke**) ..... 2
- Instructional CD-ROM ..... 1
- **Mercury** metal badge ..... 1
- **Mercury** guitar case sticker ..... 1

### Recommended tools for this project:

- Good quality solder iron (capable of temps at > 800°F)
- Electronics grade solder
- Solder sucker and/or wick
- *Dremel Tool* with 1/16" bit, reamer and small grinder\*
- Set of screw drivers (Philips)
- *Exacto* knife for cutting and scraping PCB traces\*
- Small needle-nose pliers
- Wire strippers
- *Loctite 290* (green)
- Pure isopropyl alcohol and Q-tips
- *Variac* and current meter

\**Dremel Tool* can be used to cut traces and drill holes in PCB.



**Axiom** Power Transformer  
VXP-AC4-RE REV.3 (120V) or  
VXP-AC4-RE-240 (240V)



**Axiom** Output Transformer  
VXO-AC4-95



**Axiom** Mini-Choke™  
VXO-AC4-CH

**RESISTORS (carbon film)**

- 1x 470Ω 1/2W (yellow/violet/brown/gold)
- 1x 47KΩ 1/2W (yellow/violet/orange/gold)
- 1x 470KΩ 1/2W (yellow/violet/yellow/gold)
- 1x 2.2KΩ 1/2W (red/red/red/gold)
- 1x 3.9KΩ 1/2W (orange/white/red/gold)
- 1x 15KΩ 1/2W (brown/green/orange/gold)
- 1x 68KΩ 1/2W (blue/grey/orange/gold)
- 1x 100KΩ 1/2W (brown/black/yellow/gold)

**RESISTORS (carbon composition)**

- 1x 20KΩ 1/4W (red/black/orange/gold)

**RESISTOR (metal oxide / flame proof)**

- 1x 2.7KΩ 1W (red/violet/red/gold)

**POWER DIODE**

- 2x IN4007 (black with white band)

**CAPACITORS (silver mica)**

- 1x 680±5% 500V SM
- 1x 47±5% 500V SM



Instructional CD ROM



5x Cable ties (6 in.)



Stand-off kit



#8 - 1/2" wood screws



1M audio taper potentiometer with nut and washer



Mercury metal nameplate

**CAPACITOR (mylar)**

- 1x .047μF 400V



Mercury guitar case sticker



~12 in. coil  
20 gauge shielded wire



~12 in. coil  
Insulated wire "spaghetti"



~12 in. coil  
Unshielded filament wire

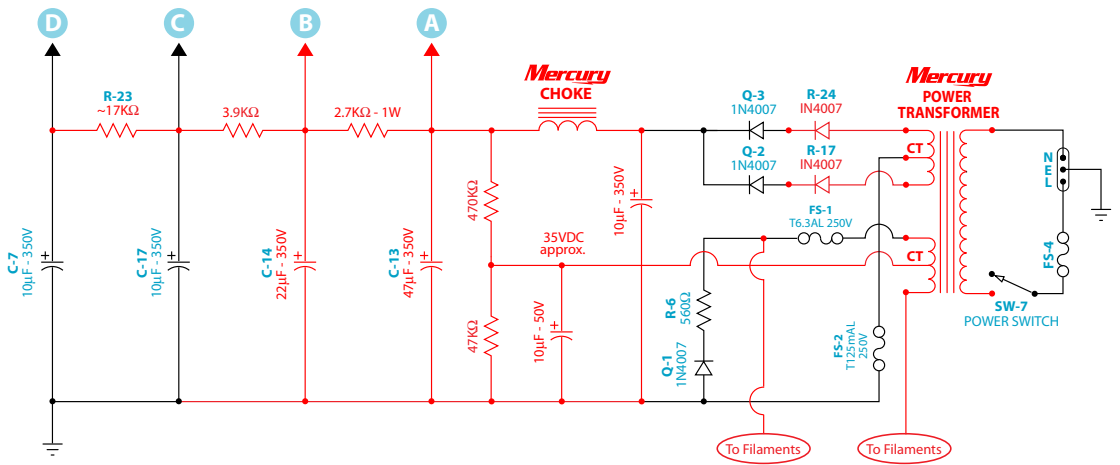
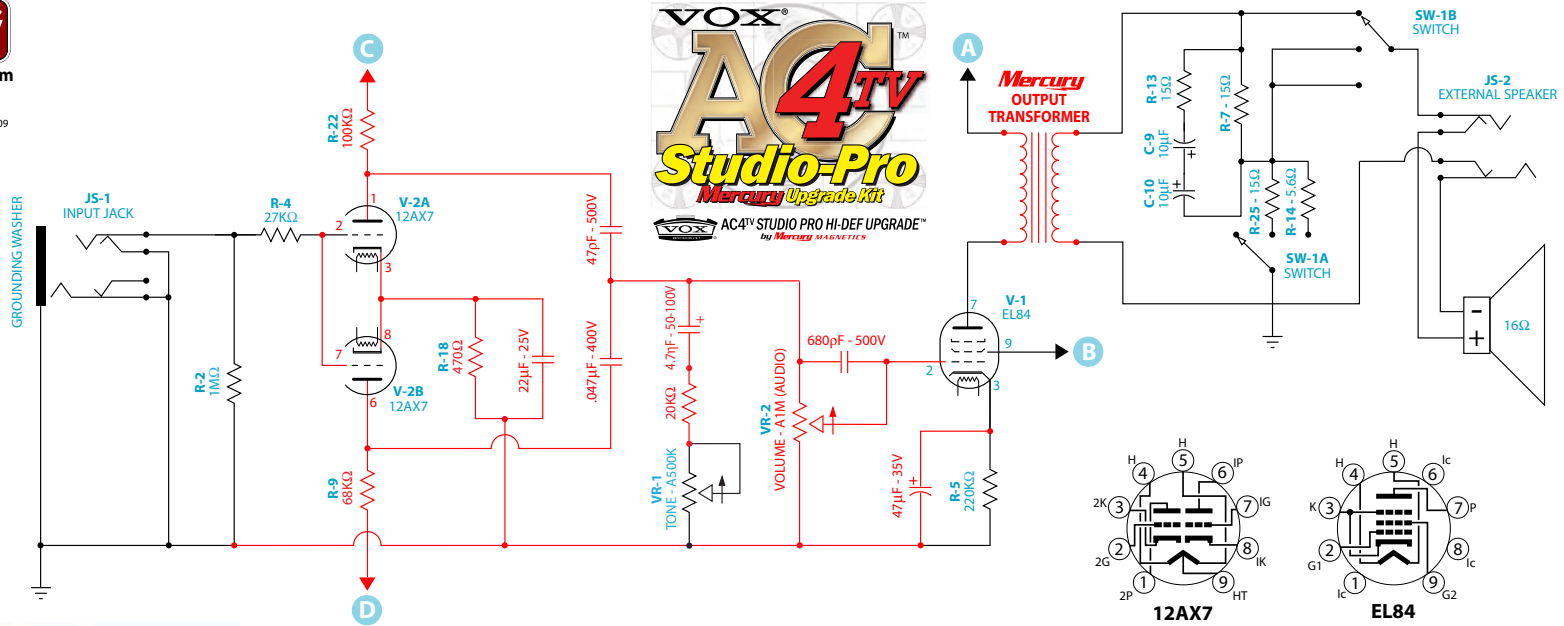
Version: 02-24-11



Schematics drawn and supplied by—  
**Mercury**  
 The Heart & Soul of Your Amp  
 MAGNETICS  
 www.MercuryMagnetics.com  
 (818) 998-7791

For the VOX AC4tv PCB version 1 / ISS2b / 03-13-09  
 Mercury versions: 09-10-09 (original),  
 02-21-11 (current)

- Notes:**
1. Unless otherwise stated all resistors are carbon film .5 (1/2) watt.
  2. RED indicates modifications to the original PCB circuit.
  3. See accompanying parts list for a more detailed specifications of the new components.

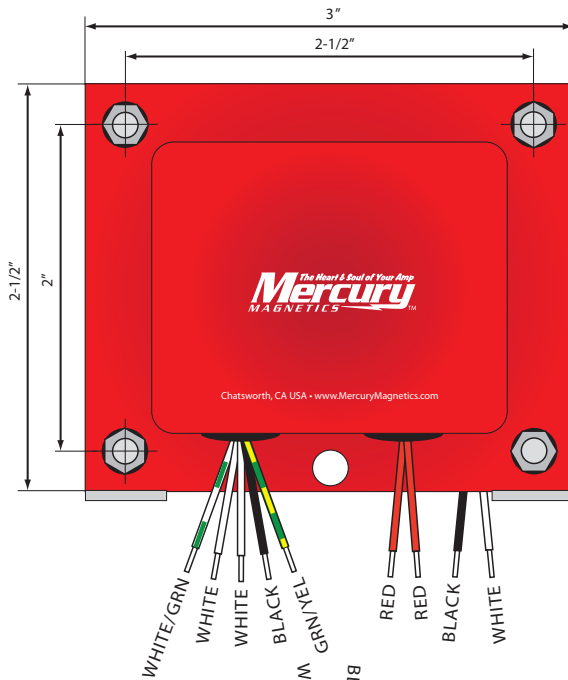


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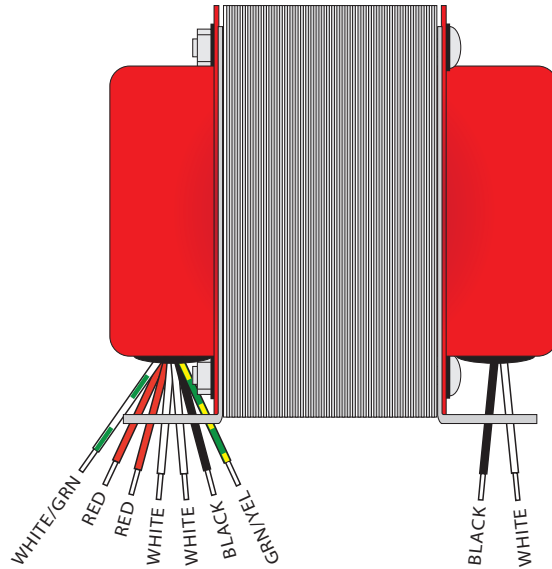


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 100% of our products are designed & handmade in So. California, USA. • Established in 1954

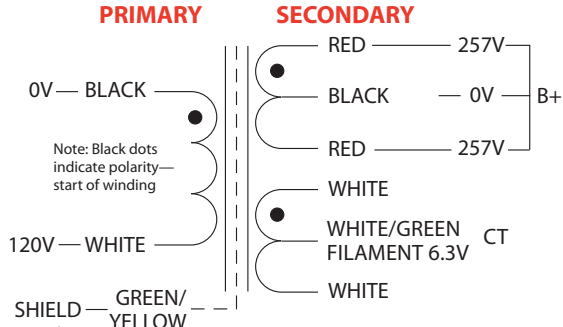
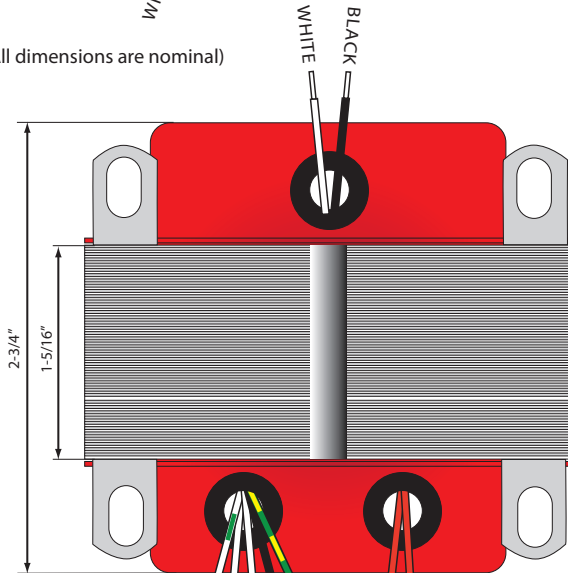
**VXP-AC4-RE**  
 REV. 3



**120V Version**



(All dimensions are nominal)



Note: Grounding of the Faraday Shield is optional. It may reduce noise depending upon the source of the ground.



For upgrading the **VOX AC4tv** combo or **AC4tvH** head  
**TYPE:** Power Transformer  
**MOUNTING:** Horizontal Mount  
**CLASS:** Axiom®

**PART NO.:** VXP-AC4-RE  
**ORIGINAL VOX PART NO.:** 076-AC4U  
**DATE:** 01-27-11 (Rev. 3)



**VXP-AC4-RE**  
 REV. 3

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