



## READ ME FIRST

I fully realize that many, if not all, owners will rush to hook up the amplifier without reading this operating manual.

However, this amplifier is different in a number of ways, and if you only read these pages you will probably save us both some time and trouble.

**Heat and Ventilation** - The X.8 and XA.8 amplifiers consume quite a bit of power during operation and convert most of it into heat. Pick a location where the amplifier can get some fresh air to remove the heat. Do not enclose the amplifier in a closed cabinet. **Give it lots of space.**

### CAUTION!

*Before operating this amplifier, verify that the voltage label near the AC input connector on the amplifier indicates an operating voltage compatible with the voltage level of the electrical outlet you intend to use. In all instances the amplifier requires a 50Hz- 60Hz supplied electrical service.*

*Do not defeat the safety purpose of the polarized or grounding type power plug supplied with this product. A grounding type plug has two blades and a third grounding prong. The grounding prong is provided for your safety. If the provided power cord plug does not fit your outlet, consult an electrician for replacement of the obsolete outlet.*

*The mains power cord is intended to be the safety disconnect device for this apparatus and shall remain accessible and operable at all times.*

*Unplug this apparatus during lightning storms or when unused for long periods of time.*

On the rear panel is a master switch and additionally a fuse holder on the smaller amps. The fuse holder accepts type 3AG (6.3mm x 32mm) 250 volt glass fuses of the slow blow variety.

Please consult the Pass Laboratories factory if you have any question on these fuses or need replacements. The larger amps do not have any user serviceable fuses. On these larger amplifiers the rear panel switch is a thermal magnetic circuit breaker.

## Input Connection and Input Impedance

The amplifiers take either a single-ended (RCA) or balanced (XLR) input connection. The input impedance is 50 Kohms single-ended and 100 Kohms balanced, and the input capacitance is just a few picofarads so anything will drive it. If you are using RCA inputs, then you want to use the gold input jumper to short the (-) input (pin 3) of the XLR connector to ground (pin 1) as shown:



## Output Connection

You can hook this amplifier up to any normal loudspeaker without danger of damage. Note, however that both the (+) Red output connection and the (-) Black output connection are live. There is no ground reference at the speaker terminals. The black (-) speaker terminal must never be treated as ground.

This can be important when you are hooking up active sub-woofers to the output of the amp – if you need a signal ground connection then use the white ground terminal provided on the rear panel.

The white signal ground connection is not a safety ground. Safety ground is provided only by the detachable power cord. Never defeat the safety purpose of the power cord.

### NOTE

*The Audio outputs of this power amplifier are considered class 2 (CL2) circuits in North America. This means the wire connected between the amplifier and the speaker(s) shall be rated at minimum Class 2 (CL2) and shall be installed according to the U.S. National Electrical Code (NEC) Article 725 or Canadian Electrical Code (CEC) section 16.*

## Operation

After proper connection you can turn the amplifier on via the switch on the front panel or by placing a 12VDC voltage on the remote turn on terminals on the back panel; once the rear panel circuit breaker is on. The stand-by LED will light up, the meter will light up, and the meter will slowly move to near the center position of the dial. The amplifiers take a while to fully warm up, usually about an hour or so.

## Introduction

For many years there has been considerable faith that if we simply keep improving the measurements of components such as amplifiers then they will sound better. Initially this was truly the case – equipment was sufficiently flawed from an objective standpoint that better measurements matched up with subjective experience.

At some level of objective quality there started to be a disconnect, and some audiophiles began to lose the faith. One of the responses to this was to examine more exotic sources of distortion in the equipment while some others simply worked to continue to reduce the flaws that were already understood. There's no doubt that some real progress resulted from these efforts, and now you can purchase products at reasonable prices which measure far better than the old stuff.

But the disconnect between the customer's perceptions and the measurements persists, and there have been cases of state-of-the-art engineering resulting in economic failure, apparently because people didn't care for the sound.

Well, of course you are dealing with people, and that will complicate any endeavor. The customer wants what the customer wants. I have heard arguments that audiophiles are irrational, that decisions are based on appearance or cost or advertising. Certainly there is plenty of that, and there have been plenty of blind tests that have demonstrated that “audiophiles can't hear the difference”, *at least in the context of that test.*

But I don't think that's the whole story. My experience is that under the right conditions the customer can often hear the difference, and his observations are not to be ignored.

First, it has to be acknowledged that the science of cognitive perception is still in its infancy, and the ear is not really a microphone and the brain is not a tape recorder. The data we do have on this subject is a little like quantum mechanics – we have to change our view to make sense of the illusions and paradoxes that accompany the interpretation of sensory input.

With regard to amplifiers at least, I think we already have the measurement data in hand. The problem is in our failure to interpret it with respect to human perception.

This puts some emphasis back on listening tests - extensive long-term tests with reliable listeners and familiar equipment and environments. This is not a cheap and easy procedure. Even assuming that the listener(s) really can hear, we still have the vagaries of individual taste, and not a large population of qualified listeners and systems.

In the end, even if we can design around the perceptions of a small qualified listening panel, we are still inevitably aiming at a minority audience in the real world. That's OK with me – One percent of this market is still a lot of amplifiers.

The thing is, I don't think the audiophile wants technical perfection. He wants to be happy.

Look at it this way: In the market there are rows of bottled drinking water. Some are contaminated with natural mineral content and carbonated, some have sugar-based substances added, some have been harvested from glaciers. They all appear to be more expensive than gasoline. Where is the pure distilled water? Probably on the bottom shelf, possibly even elsewhere in the store. It seems to be the least popular, even if it is cheaper than gasoline.

Since the release of the X.5 series seven years ago we began working on what has now become the X.8 amplifiers. They embody everything we know, and while I can't divulge all the details, I can tell you about some things which might interest you.

## **More is More**

There are times when “less is more”, particularly if you are building little “flea watt” amplifiers, where simple Class A circuits sound exceptionally good when the loudspeaker is easy and the musical material isn’t too complex or dynamic. Arguably I pioneered the solid state genre with the 1994 single-stage “Zen Amp” and subsequent designs.

The X.8 series is intended to deliver some of the qualities found in these little amplifiers, but with dramatically more power and accuracy. The formula is simple: More hardware for more power with fewer stages and lower distortion with less feedback. In addition, The various elements of the amplifiers have to be individually adjusted to operate in the harmony that delivers the musical experience.

## **More Class A**

The redesigned output stages of the X.8 series takes the lessons learned from the Xs amplifiers – bigger hardware biased more deeply into the Class A operating region. In turn, the Xs design was inspired by the successes of the X.5 series of amplifiers from 2006.

Two important things emerged with the X.5 series, the first being the value of a large push-pull Class A operating envelope for low distortion and good control of a loudspeaker. Even the Class AB models of the X.5’s had large Class A bias values, so that the performance enjoyed Class A operation at ordinary listening levels.

The second element is the higher level of single-ended Class A bias current applied to the output stage, allowing arbitrary control of the values and ratios of the second and third harmonic characteristic. The subtle qualities of this approach result in a sonic signature which is unique to the X.8 series, but goes back to character of previous amplifiers which have had a particularly successful sound. These amplifiers had good measurement specs – low distortion, wide bandwidth, high current, and so on, but were not “state of the art” in any particular category, simply a good balance of these qualities.

One thing they also had in common was that the distortion they did have was a balance of low order harmonics, dominantly second at low levels and dominantly third at high power.

Are we deliberately creating distortion to achieve this? No. We are optimizing the remaining distortion character of an already low distortion amplifier for a superior musical character.

### **More Heat Sink**

Part of the “more and bigger hardware” is more metal. One of the first things you will notice is that the smaller amplifier models, the X150.8, X250.8, XA30.8, XA60.8 and XA100.8 have new and larger heat sinks (and also more output devices). This upgrade was essential to dissipate the energy of the larger bias currents.

### **More Front End**

Some of the biggest improvements come from the design of the “front end” circuit which contains the first two of the three stages of the amplifier - the input stage and the voltage gain stage. In the X.5 series, all the amplifiers had essentially the same front end circuit, usable interchangeably. This is not quite true of the X.8 series, where each model has subtle differences design to most perfectly complement the differences found in each output stage. Each amplifier in the X.8 series has a individual characteristic depending on the number of devices, heat sinking, supply voltage and push-pull versus single-ended bias currents. The output stages of each model have individual transfer curves and its their favorite feedback figures which must be complemented by the front ends. This was accomplished by using measurements to set a baseline objective performance and then adjusting the circuitry through extensive listening on six different systems.

The front ends use a mix of four each of complementary Jfet, Mosfet, and Bipolar devices by Toshiba. These have been discontinued, but we had the wisdom to have a large inventory of these superior parts. We run these matched input Jfet devices undegenerated for the square-law character, followed by Bipolar cascodes and matched Common Source mode Mosfets.

We have carefully adjusted the bias and loading off the Drains of the gain devices, which selects the most appropriate load-line character and the feedback around the output stage.

The voltage gain stages of the amplifiers also sport much larger heat sinks for much higher bias currents, critical to low distortion and driving the large output stages.

The result is a front end with high stability, low distortion and noise. It has a very high input and is DC coupled. There are no compensation capacitors – in fact there are no capacitors in the amplifier circuit except across the shunt bias regulators and (obviously) the power supply.

### **More Power Supply**

The power supplies for the X.8 series are generally larger than their predecessors. The models X150.8, X250.8, XA30.8, XA60.8, and XA100.8 have a third more storage capacitance and some new CRC filtering to round out the edges of the supply ripple.

We have incorporated additional RF filtering in the AC primary circuits. The supplies still use paralleled fast/soft rectifiers and very large toroidal transformers from Plitron. The power on/off switching is new, with a 400 amp Triac taking the inrush surge and then paralleled by a high current relay. The new system has a stand-by draw in conformance to 1 watt requirements.

The front end circuits of the amplifiers have massively larger power supply decoupling – the ripple is now measured in microvolts. This coupled with interleaved layout techniques has reduced the output noise of the amplifiers by another 10 dB. The range between peak output and average noise floor is greater than 130 dB.

### **Conclusion**

So there you have it. Pass Laboratories celebrates its twenty-second year by presenting the some of the best amplifiers we have ever made. If you have heard the qualities of the highly acclaimed Xs series of amplifiers you will have had a taste of what we offer here – amplifiers that bridge the gap between measured performance and subjective experience: Amplifiers that invite you into the music.



## Warranty Information

All Pass Laboratories products purchased new from an authorized Pass Laboratories dealer in North America are covered by a transferable, limited 3-year warranty.

This warranty includes parts and labor charges incurred at the repair facility. Consequential damages are specifically not covered and damage due to modification or physical abuse is also not covered.

The customer assumes responsibility for shipping and insurance to and from the factory, or a factory specified repair facility.

Non-North American customers should consult with their original Pass Labs dealer or distributor for warranty repair instruction prior to contacting the factory or shipping product for repair. Non-North American product must be returned to the country of origin for warranty service. Foreign distributors are only required to offer warranty service on Pass Laboratories product that they have imported.

Conditions of warranty service and customer rights for product purchased outside the United States may vary depending upon the distributor and local laws. Please check with your local distributor for specific information.

Any modifications to Pass Laboratories products that have not received written factory approval nullify all claims and void the warranty. Should a modified product be returned to the factory for repair the owner will be required to pay all necessary charges for the repair in addition to those charges required to return the product to its original configuration.

In the case of safety issues, no product shall be returned to the customer without those safety issues being corrected to the most recent accepted standards.

Removal or alteration of original Pass Labs serial numbers voids the factory warranty. Product with altered or missing serial numbers will be suspected as counterfeit product. Pass Laboratories will not repair or in any way indemnify any counterfeit or cloned product.

Pass Laboratories does not offer products in voltages intended for international markets either to authorized Pass Labs dealers or to third parties located in the United States or Canada.

**For your protection please read the following:**

**Water and moisture:** Electrical devices should not be used near water ( as per example, near a bathtub, washbasin, kitchen sink, laundry tub, wet basement or swimming pool ). Care should be taken such that objects do not have the opportunity to fall, and that liquid is never spilled onto or into the device enclosure through openings.

**Power Sources:** An electrical device must be connected to a mains power source in strict accordance with the supplied product owner's manual. Please verify that the AC mains voltage specified in the product manual matches those requirements indicated on the unit and the AC voltage provided to your location by the power company.

**Grounding:** Adequate precautions should be taken so that the grounding provisions built into an electrical product are never defeated.

**Power Cords:** Pass Laboratories provides a power supply cord that meets all legislated requirements for the market in which the product was originally sold. If you choose to substitute an after-market product we urge you to choose one that is fully safety rated by the necessary local authority.

**Power Cord Protection:** Power supply cords should be routed so that they are not likely to be walked on, abraded, or pinched by items placed on or against them, paying particular attention to cords where they enter plugs or exit from a device. Never under any circumstance insert a cut or damaged power cord into a mains power socket.

**Power and Signal:** Cables should never be connected / disconnected with equipment powered up. Failure to heed this warning may damage or destroy equipment.

**Ventilation:** Power-amplifiers run hot, but you should be able to place your hands on them without discomfort. You must allow for this heat in installation, by providing for free air circulation around the product. Electronics should not be subjected to sources of excessive radiant heat. Excessive heat can shorten the life of the product and may cause the electronics to self-protect and shut down.

**Servicing:** To reduce the risk of fire, electrical shock or other injuries, the user should not attempt to service the device beyond that which is described in the operating instructions. All other servicing must be referred to qualified service personnel.

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