



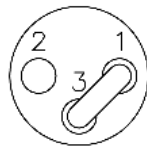
## Read Me First

I fully realize that many, if not all, owners will rush to hook up the amplifier without reading this operating manual. I don't blame you – I don't read them either. However, this amplifier is different in a number of ways, and if you only read this page you will probably save us both some time and trouble.

**Heat and Ventilation** - These amplifiers consume a lot of power (around 1000 watt for the Xs 300 & around 500 watts for the Xs 150) and most of this is converted 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. It is expected that you will probably place the channel chassis on top of the power supply chassis. You don't have to, but this is how we use them ourselves.

**Power Connection** – The power supply and channel chassis are connected by an umbilical cable with Neutrik Powercon connectors. These connectors have a locking mechanism which requires a clockwise turn after insertion. **Be certain that this connector locks properly.** The little lock button will click upon locking. After it has been turned and locked it will not rotate back unless you push the locking button. Do not attempt to make or undo this connection while the power supply is plugged into the AC outlet.

**Input Connection and Input Impedance** - The Xs amplifiers takes either a single-ended (RCA) or balanced (XLR) input connection. The input impedance is 100 Kohms single-ended and 200 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 – neither is to be treated as if it were ground. This can be important when you are hooking up active sub-woofers to the output of the amp – if you need a ground connection then use the white ground terminal provided on the rear panel.

**Operation** - After connection you can turn the amplifier on via the breaker and switch on the power supply front panel or by placing a positive voltage on the remote turn on terminals on the back of the power supply. The power supply LED will light up, the meter will light up, and the meter will slowly move to near the center position of the dial. The Xs 150 takes a while to fully warm up.

The button on the power supply faceplate is *STANDBY*, the button on the main faceplate turn the white meter LEDs on / off. The small blue LED in the meter remains on as long as the amp is on.

**In Summary:**

Place the amps

Connect power supply and main chassis

Plug in AC

Turn on breaker

Turn on amp (standby switch on power supply faceplate)

**OK! You can go play now.**

## Comments by Pass

*It seems like yesterday...* No, actually it seems like eighteen years ago that I got a patent on the “Super-Symmetric” circuit. That’s actually a pretty long commercial run for an amplifier design - how many do you know that are still on the market after that much time?

We (Desmond, Joe, me and Wayne in alphabetical order) believe in progress, but also appreciate where our success has really come from - happy customers. Every innovation that we consider has to address how it will improve the customer’s experience with the product.

Technical excellence is a virtue by itself, but it will be the *sound* that determines the long term success of a new design after the novelty has worn off. The audio marketplace is littered with products that measured spectacularly well but which did not go down as “classics” because they lacked the subjective qualities that kept listeners happy beyond the initial excitement created by a technical innovation.

With this uppermost in mind we set out to create a new generation of amplifiers that measure well enough, but only in a manner that serves the subjective perception of listeners. Oscilloscopes and distortion analyzers are excellent and helpful tools, but they make lousy customers.

It has been argued that the power amplifier should maintain some sort of sacred neutrality - *“Let the artist be the source of musical coloration, not the amplifier!”*

As if the power amplifier is the only thing altering the music. In the old days (late 50’s, early 60’s) there was some reasonable technical excellence in recording equipment, but it was fairly simple – a couple of level controls. And the people involved were few and usually had some taste. Nowadays, there are too many people in the reproduction chain with too many knobs. It is no surprise that new vinyl issues of Jazz from that era fetch high prices.

Meanwhile the customer is the guy with the most rights, being that he is the one paying for it.

### **That Would Be You.**

If you are concerned that your power amplifier (or anything else for that matter) is as objectively and technically accurate as possible, that is a perfectly legitimate criterion. You will certainly find many products in the marketplace that excel at conventional objective performance, and most of them are much cheaper.

Our real customers care most about the experience they get when they sit down to listen to their music. We create amplifiers that we like to listen to, on the assumption that we share similar taste.

We want our products to invite you to listen. We want you to enjoy the experience so much that you go through your entire record collection - again and again. This, by the way, is a very strong indicator.

A simple survey of really successful audio amplifiers shows that objective performance numbers by themselves are not that important. For example, there is some level at which harmonic distortion is subjectively intrusive – we could probably stipulate that 10% distortion is too much, and would probably accept that 1% would be audible.

Conversely, we should accept that distortion becomes inaudible below some arbitrary level. Is it at 0.1%? 0.01%? 0.001%? We actually don't know, because there has to be a much larger context of performance to which a single number only alludes.

In the process of developing the Xs amplifiers, we paid a lot of attention to the harmonic structure of the amplifier's transfer curve. It is apparent that reducing the numerical distortion numbers is not as important as controlling the relative amounts of the harmonics and their polarity. Even at low distortion levels, these harmonic relationships are important to the perception of musical quality, but they are not reflected in ordinary specifications.

In an amplifier of this sort, the power output stage is where most of the action is. Playing with developmental tube and SIT designs, we concluded that it is the character of the power output stage itself which is most influential in shaping the sound of the amplifier. To understand what we were looking for, imagine the sound of a low distortion direct-coupled Triode operated in single-ended Class A. Then imagine it with lots more power and control.

The original Aleph 0 from 1991 used an output stage which consisted of a push-pull Class A output stage operated in parallel with a high constant current output stage. The bias currents were high enough to operate to rated power in single-ended Class A, giving it a second harmonic signature, and as a push-pull topology at higher power levels.

The X.5 and XA.5 amplifiers incorporated the single-ended bias approach in balanced output stages, but for efficiency reasons did

so at a lower current level. This improved the performance at low power levels, but allowed the higher dynamics afforded by balanced push-pull operation at higher power levels.

This approach was so successful that we naturally looked to a greatly expanded version for the Xs amplifiers. Initially we created a large two chassis format that allowed more hardware for a larger power supply and greatly expanded output stages and heat sinks. The four massive banks of output devices used in the X and XA series became six massive banks, with the bias current provided by the constant current sources increased by a factor of ten. This expanded the single-ended power range by a factor of 100. Of course this created a need for more and better power supply, so we created a supply with larger power transformer, paralleled fast/soft recover rectifiers, and double the storage capacitance. The separate power supply also holds the huge constant current sources used to bias the output stage of the amplifier. It dissipates approximately half the energy and contributes further to the performance by isolating the radiated power supply noise from the main amplifier. The extra heat sinking is very convenient, as the amplifier dissipates about three times its output power rating.

It is not actually that difficult to gather the massive hardware and fifteen kilowatts of output transistors. What is difficult is carefully shaping the relationships between six banks of parallel transistors so as to create the exact transfer curve that delivers just the right harmonic structure, giving a palpable sense of life and realism to music.

The question is inevitably asked, “Is this *pure* Class A, and where does it leave Class A?”. I expect such questions insofar as I have probably been the biggest contributor to that sort of discussion. Let me first say that this consideration is only in service to the sound – if it improves the experience of the sound, then it is a virtue, otherwise it has little value.

To answer the question, first we note that the bias is achieved solely by constant bias values and there are no tricks. The topology of each half of the balanced output stage is that of a push-pull follower which is biased into single-ended Class A by a constant current source placed in parallel. The resulting efficiency is about 33%. For a balanced version, we see that four out of the six output banks remain in Class A to the output power rating into 8 ohms, and the remaining two output banks are there to supply additional current when necessary.



Initially our prototypes used the conventional X series front end, but as we tweaked the output stage we slowly worked up newer circuitry for the voltage gain system. We continued to use cascoded NOS (*New Old Stock*) Toshiba Jfets that still set the standard for input devices, but for the heavy voltage lifting we switched to better Toshiba Mosfets (NOS, also discontinued). Much more heat sinking was allowed for these, and we were able to increase the bias current of the front end by a factor of about three, giving much better linearity and much higher drive current capacity.

A new topological wrinkle was introduced for the first time in this front end, CLF (Cascode Local Feedback), an alternative method of controlling linearity around a single stage without the usual trade-offs. This innovation allows arbitrary shaping of the relative distortion harmonics and was tweaked to precisely complement the character of the output stage.

This new front end has a 100 Khz open loop bandwidth and a gain figure which allows about 10 dB of feedback around the output stage. The output stage could easily be operated without feedback, but it sounds better with this little bit. As an aside, all this was accomplished without frequency compensation – there are no little capacitors in the circuit to trim or stabilize the response. For that matter, the circuit is also DC coupled. The only non-power-supply capacitors are across the DC bias voltage generators.

Also, some of you will be delighted that the new front end has a 200 Kohm input impedance (balanced) with very small capacitance. Anything will drive it.

Some things remain the same. The amplifiers still run hot, and the meter on the front panel still reads the current draw of the output stage. Normally it sits there contentedly in the center position, but when the output current of the amplifier exceeds the Class A bias setting, you will see the needle bounce upwards.

I think though, that the Xs amplifiers will set a new standard for musical reproduction.

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## 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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