

amplifiers / preamplifiers

TWENTY-FIVE
YEARS

PASS

P a s s L a b o r a t o r i e s

PASS

Pass Laboratories

Xs Amplifiers

We began thinking about and working on a new amplifier design, initially referred to as the "Concept Amp" about four years ago. We felt that it was time for us to improve and build on the "X" amplifier design but to extend it to higher sonic performance.

Our first decision was that the amplifier should exist in a two chassis format so that we could make the power supply larger and isolate it physically from the amplifier channel for improved noise. We also decided to build it with as much heat sinking as possible so that we had a wide margin to use high bias on the output stages of the amplifier.

Desmond immediately went to work designing the physical package, very similar to what you see now and which has been exhibited at three CES displays.

Initial work on the audio circuit began with the design of high power constant current sources. The X.5 series successfully demonstrated the value of applying single-ended bias current to the output stage in lowering the distortion and shaping the transfer curve in a manner which allowed some additional control of the harmonic structure of that distortion. We felt that this could be greatly extended by dramatically increasing the amount of single-ended bias current by a factor of more than ten times, from a few watts of single-ended output power to hundreds of watts. The constant current sources were also newly designed to be far more neutral in their character than anything previously. Their DC value is controlled by an optically isolated control loop, and the AC value is run without loop feedback but is degenerated by a factor of about 20. The result is that they supply high bias current to the output stage of the amplifier but make no other contribution to the sound. Conveniently, the large heat sinks of the power



Xs 300

supply chassis were available for these high power constant current sources. They are considered part of the power supply, and dissipate slightly less than one-half the heat of the amplifier. At about the same time in 2009, Nelson Pass was examining the potential for SIT devices in his First Watt designs, which are low power amplifiers.

Through his relationship with SemiSouth he had the opportunity to commission a custom run of these power transistors whose character is very much like a Triode tube. It took nearly a year for the small quantity of these parts to arrive, and he began working on them with a view to creating a low power single-ended Class A amplifier using them.



Xs 300 Specifications

Low Frequency (Hz)	1.5
High Frequency (kHz)	150
Power at 8 Ohms	300
Power at 4 Ohms	600
Leaves Class A at pk	600
Power Consumption	1000
Temperature (°C)	53
Dimensions each (W x H x D)	19 x 11.5 x 28
Unit Weight (lbs)	298
Shipping Weight (lbs)	346

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Xs 300



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Xs Amplifiers

Work on both improvements to the “Concept Amps” and the SIT amplifiers proceeded in parallel through late 2010 and into 2011. In mid 2011 Nelson and the partners in Pass Labs heard the results of the work with the SIT devices in the form of a prototype of what would later be developed into the SIT-2 amplifier.

They found the sound of the SIT to have truly remarkable properties, and it was quickly decided “Whatever this is, we need to find a way to bottle it!”. Not only did we need to bottle it, but we needed to put it in a much bigger bottle.

In a subjective arena where engineering has limitations, it is extremely helpful if you can recognize what you want when you hear it. If you have an example of the sound you are looking for, there is great advantage.

Because this sonic quality was so striking, it became easier to discover what modifications to the circuit would make it go away, and by the process of varying the design and listening to the result, Pass was able to objectively identify the qualities of the sound—information which remains proprietary. He began to alter the circuits of the prototype Concept Amp to bring out these qualities. In the end, a new output stage topology was chosen using power Mosfets with new values of single-ended and push-pull bias. A small amount of feedback was employed around the output stage.

The front end of the amplifier also was redesigned to a new topology which employed Cascode Local Feedback newly developed by Pass. The circuit bias was raised to a much higher Class A bias. It has a



Xs 150

higher input impedance, a lower output impedance, wider bandwidth, and most important, it specifically can be adjusted to complement the sonic qualities of the output stage.

Eight months later, the listeners at Pass Labs judged the amplifier design ready, and the two versions were named the Xs 150 and Xs 300.

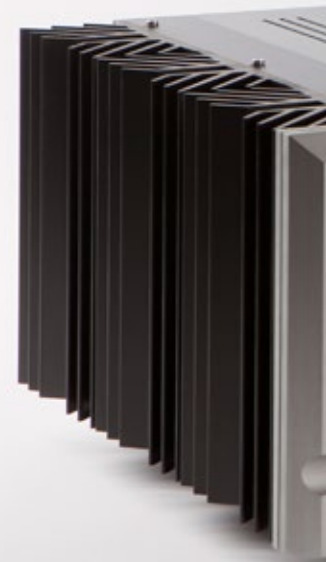


Xs 150 Specifications

Low Frequency (Hz)	1.5
High Frequency (kHz)	150
Power at 8 Ohms	150
Power at 4 Ohms	300
Leaves Class A at pk	300
Power Consumption	700
Temperature (°C)	53
Dimensions each (W x H x D)	19 x 11.5 x 22
Unit Weight (lbs)	230
Shipping Weight (lbs)	270

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Xs 150



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Xs Preamplifier

There are people who do not know that Wayne Colburn has designed the Pass Labs preamplifier products for the last 20 years. Wayne's modesty has tended to keep him out of the spotlight. When we began development of the Xs power amplifier five years ago, we knew that we would also need a companion piece. Of course, back then we thought we could have this done in a year or so... Wayne was given carte blanche on the design and an unlimited budget, and lots of time to play with many exotic parts and materials.

Naturally the comparison will be made with its predecessor, the XP-30 line stage preamp. The most obvious difference is that the Xs comes in only two chassis, where the XP-30 had at least three chassis, one for supply and control, and one chassis per channel for as many channels as you might reasonably want.

The Xs is designed solely for two-channel operation, and it fits in two (larger) boxes. The volume controls are improved in performance with 0.5 dB steps, expanded dynamic range and lower noise.

The buffer stage for the volume control has been eliminated, giving an even simpler gain path. Improved circuit boards layout puts the cherry on top. Some of the materials are more exotic—the gain stages are mounted on ceramic circuit boards with gold plating.

The channel motherboards are made of Panasonic Megtron with immersion gold, which performs about as well as Teflon or Polyamide but without the adhesion properties. The power supplies use 4 ounce high temp FR406. While the two channels share a chassis, they are isolated on separate board systems with distance between them, crosstalk figures between channels are as good as the XP-30 separate chassis.



Xs Preamp

The three separate power supplies use the lowest noise transformers available and they incorporate filters on the AC line input, fast/soft recovery rectifiers, large storage capacitance and extensive regulation. The active regulation is followed by passive filtering using polypropylene capacitors. All this in machined aluminum cases. If like me, your eyesight is not what it once was, you will also appreciate the larger display. It does not automatically follow that more money and more exotic parts and such will result in a better sounding product. Fortunately there was lots of time available, and the back-and-forth process between Wayne and the four other listeners assured the finest product we could possibly make.



Xs Preamp Specifications

Overall Gain (dB)	-90 to 10
Frequency Response (dB) .2 and 60 kHz	-3
Impedance (Ohm)	
Input, Balanced	42,000
Output, Balanced	120
Single Ended	120
CMRR (dB) 1 kHz	-65
Cross-Talk (dB) 1kHz, Ref 1V	-100
Signal to Noise Ratio (dB) 1kHz, Ref 5V	-110
Power Consumption (W)	55
Dimensions (W x H x D)	
Control	19 x 6.25 x 14
Supply	19 x 6.25 x 14
Shipping Weight (lbs)	80

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Xs Preamp





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Xs Phono

Dual-Chassis, dual-mono phono preamplifier.

The Xs Phono is an all-out assault on the state of the art in Vinyl, perhaps the most intensive and difficult design effort we have made. Paradoxically from the company priding itself on simplicity, it appears to be very complex, having circuits which contain a total of about 1,500 components. However, this massiveness is used to extract the utmost performance from a simple topology operating with the extremely small and delicate signals coming from the wide variety of phono cartridges.

The job of a high-end phono stage is made more complicated by the requirements for high gain and accurate equalization. More difficult yet is the incredible dynamic range that it must address – phono cartridges with rated outputs as low as 0.2 millivolts offer information at levels 10,000 times lower at about 0.00002 millivolts (20 nanovolts, or billionths of a volt). The Xs phono stage inputs achieve a noise floor about 35 dB below this figure using paralleled NOS Toshiba 2SK170 Jfets (all told each Xs Phono uses about 100 of these very expensive and hard-to-get parts).

It is not just a matter of input noise. Our experiments with switching signals at these levels demonstrated problems even with relays design to switch at microvolt levels. For this reason, we have chosen to minimize switched connections by using three separate dedicated input systems.

When you are amplifying low frequency signals by about 100,000 times, long term connection quality and resistance to mechanical vibration become more important than ever, so we have not only gone to gold plated high temperature ceramic circuit boards, but suspended them on elastomeric mounts and mounted them in a heavy machined aluminum chassis.

Xs Phono

All important to the performance, the power source for the Xs Phono is housed in a separate chassis, with an actively regulated and passively filtered supply system which draws a constant 75 watts.

It goes without saying that the distortion is very low and the RIAA equalization is very accurate. While the measured performance of the Xs Phono reflects the quality of the parts and the high standards of assembly and testing, behind this is many man-years of experience with high-end phono amplification and years of prototyping and listening to all the elements that sum to the Xs Phono Stage.



Xs Phono Specifications

Capacitance	100 pF to 750 pF, selectable
Gain	56, 66 or 76 dB @ 1 KHz, selectable
Impedance (Ohm)	
Input	30 - 47,000
Output, Balanced	300
Single Ended	150
Output Voltage (Volts)	
RMS Balanced	38 @ .1% THD
RIAA Accuracy	± .1 dB
Distortion	
	0.005% THD @1mV in @1KHz Input
Dimensions (W x H x D)	
Control	19 x 6.5 x 13.75
With Knobs	19 x 6.25 x 15
Shipping Weight (lbs)	80



Point 8 Amplifiers

We're excited! Because we're celebrating our 23rd year by presenting the best amplifiers we've ever made. Our New Point 8 Series, X.8 and XA.8, operate "higher" into Class A than ever before and bridge the gap between measured performance and subjective experience.

Designed for audiophiles by even more demanding audiophiles, they invite listeners into the music as never before. Even more, they represent a summation of our expertise in designing amplifiers, while elegantly expressing our philosophy of more amplifier, more progress and more music. Seven years in the making, the Point 8 Series demonstrates our belief that the best products must be carefully adjusted until their components operate in harmony—then subjectively fine-tuned. Not satisfied with measurements alone, we put the amplifiers' state-of-the-art engineering through an extensive, rigorous listening process using six different sound systems to deliver peak musical experiences.

As a result, the amplifiers glow with innovation. For example, the output stages of the larger Point 8 amplifiers bias more deeply into the Class-A operating region. Their larger push-pull Class-A operating envelopes deliver low distortion and additional loudspeaker control at ordinary listening levels. And higher power MOSFETs, many more than usual, increase the amplifiers' Class-A operation while running at fractions of their stated specs to enhance both performance and reliability.

Still not content, we uniquely molded each model's front end to the specifics of its output stage so that the nine amplifiers' front ends vary in size, voltage, bias current, dissipation, and single-ended vs. push-pull bias distribution. The directly coupled front ends, which house the input and voltage gain stages, maximize each model's output stage performance, while imparting to each model its own subtle and unique sonic signature.



Point 8 Amplifier Specifications

Model	Class	Channels	8 Ohm Power	No. Output	Power Consumed	Dimensions	Weight
		Number	RMS / Chanel Watts	Devices	Idle / Standby Watts	W x D x H Inches	
XA30.8	A	2	30	40	400 / 0.5	19 x 21.2 x 7.6	88
XA60.8	A	1	60	40	400 / 0.5	19 x 21.2 x 7.6	88
XA100.8	A	1	100	56	420 / 0.5	19 x 21.25 x 9.1	99
XA160.8	A	1	160	72	580 / 0.5	19 x 21.5 x 11.1	123
XA200.8	A	1	200	72	760 / 0.5	19 x 27.5 x 11.1	152
X150.8	AB	2	150	40	420 / 0.5	19 x 21.2 x 7.6	88
X260.8	AB	1	260	40	390 / 0.5	19 x 21.2 x 7.6	88
X250.8	AB	2	250	56	440 / 0.5	19 x 21.25 x 9.1	100
X350.8	AB	2	350	72	580 / 0.5	19 x 21.5 x 11.1	127
X600.8	AB	1	600	72	580 / 0.5	19 x 21.5 x 11.1	123

.8 Series



There's more — including larger power supplies, more storage capacitance, more precise reference voltages, and new, larger heat sinks — but suffice it to say that with the Point 8 Series, we move beyond cookie-cutter circuits.

Point 8 / Point 5 amp Differences :
 The Point 8 amps present a more accurate representation of the recording venue. The dimensionality of the sound stage does not change no matter how complex the material. Layering of the instruments in the orchestra allows the orchestra to seem present in the listening room. There is more space and air around instruments, which leads to a greater sense of ease and music flow. The bass goes very deep and the highs are extended with out being edgy.

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.8 Series





XP Preamplifiers

Our XP-30, XP-20 and XP-10 Line-Level Preamplifiers are the best Pass Laboratories has ever built. Their sound is dynamic, and their bass lines are exceptionally clear and clean. These ultra high-quality components accurately reproduce state-of-the-art recordings, lend more weight to highly dynamic passages, and present instruments and voices in refined spatial envelopes that reveal the nuances and details present even in loud, highly complex musical passages. The three preamps were created by Pass Labs' gifted audio designer Wayne Colburn as refined descendants of our highly acclaimed X-Series Preamplifiers. As a result, the XP Preamps, especially the triple-chassis XP-30, generate less noise, less crosstalk and less distortion, while delivering greater dynamic range, gain, output voltage and output current. The preamps' dramatically superior noise floors and fine detail retrieval make it practical to listen to and enjoy music even at very low volumes. They do not have to be played at live performance levels — although they can be played as loudly as any might dare — for listeners to enjoy the sheer pleasure of the musical experiences they create.

Our XP-25 and XP-15 Phono Preamplifiers are proud inheritors of all that Pass Laboratories has learned in nearly two decades of building some of the finest phono stages in the audio industry, from the Aleph Ono to the X-Ono. Their steady evolution represents a mature sophistication in both thinking and component development.

The result of this evolution is a pair of phono preamps that demonstrate a measurable diminishment in background noise, higher available gain, and a sonic image with improved resolution. They also splendidly address the special needs of moving coil cartridges while bringing out the best from the more conventional high-output moving magnet cartridges.



XP Preamplifier Specifications ^{1,2}

Model	Type	Chassis	Remote	Trigger Function	Input	XLR	RCA	Gain dB	Weight lbs
		Boxes	Included	12 VDC	Pairs				
XP10	Line Level	1	Y	N	5	Y	Y	10	20
XP20	Line Level	2	Y	Y	6	Y	Y	10	40
XP30	Line Level	3	Y	Y	7 ³	Y	Y	10	58
XP15	Phono	1	N	N	2	Y	Y	76	20
XP25	Phono	2	N	N	2	Y	Y	76	40
XVR-1	X-Over	2	N	N	1	Y	Y	11	36

1. All Chassis Dimensions are 17" W x 12" D x 4" H 2. Y = Yes, N = No 3. Channels

XP Series



The twin-chassis XP-25 Phono Preamp delivers a new dimension of dynamics, inner detail and spectral richness. It boasts adjustable gain, two separate inputs, a low cut filter, a mute feature, and resistive and capacitive loading on the front panel for easy access. The single-chassis XP-15 is notable for performing more dynamically, quietly and affordably than the Pass Labs legacy products it replaced.

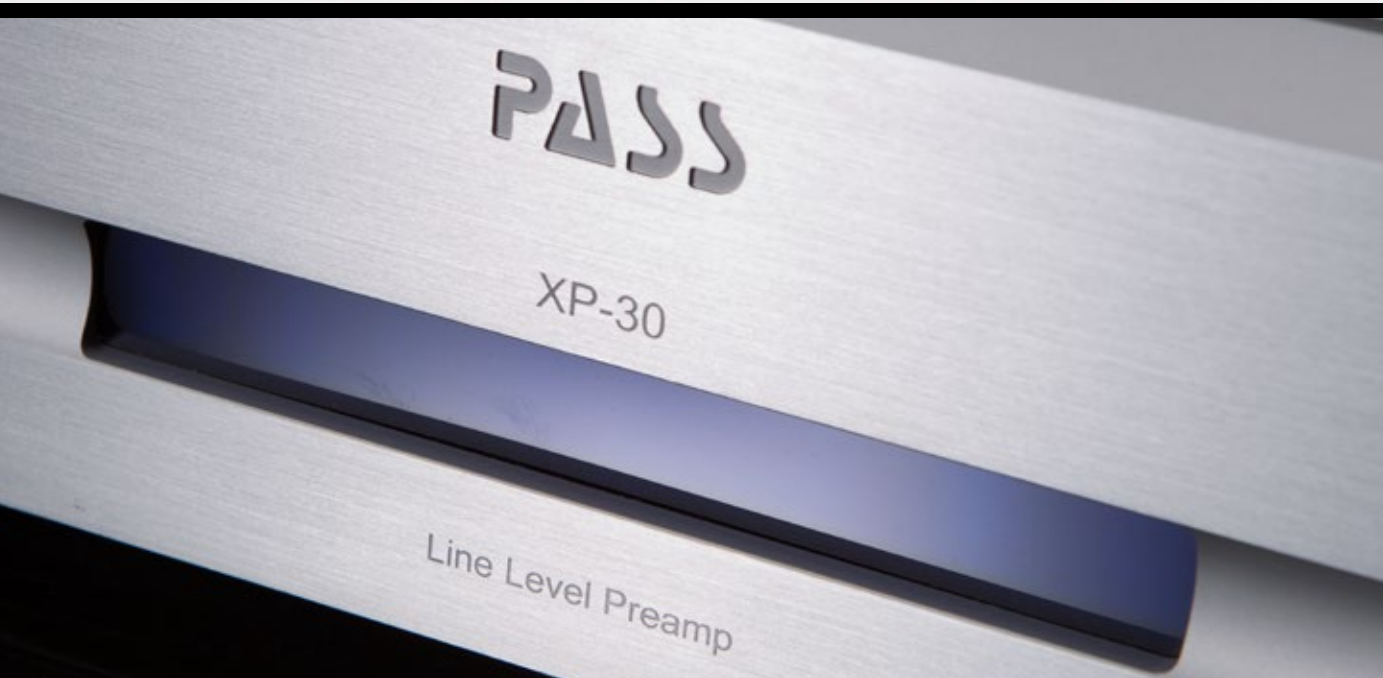
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XP Series



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INT-60 and INT-250

It seems there are two basic kinds of audiophiles. The first kind tinkers with equipment, trying tweaks, swapping stuff in and out, and playing “audiophile” reference records. Their systems are composed of many separate components, accompanied by a scatter of wires, discs, switches, and lights, taking over the living space. I am that kind.

The second kind of audiophile is more like my wife Jill. She just wants to listen to quality music in a relaxed and tasteful environment. I met her forty-three years ago at the loudspeaker company ESS (think Heil tweeters) and she has been involved in some way with every company since. Tolerant of demands of commerce, she is nonetheless clear about wanting some nice uncluttered living space where she can still hear music.

Our happy solution is a living room with a minimum of equipment, all shiny and neat, hardly any wire and loudspeakers with grill cloths.

Elsewhere there are rooms where audiophilia is pursued in a jumble of test equipment, components, parts, wires, odd smells, and you have to be careful how you walk, lest you trip and injure yourself, or worse, break a Western Electric 300B.

Success at Pass Labs has driven us a little closer to the mainstream of the audio world (or vice versa), and we have requests for product which still delivers the sound but is a little more reasonable about the price and the space required.

I was a little skeptical that there were that many of those customers out there - our first amplifiers in the '90's were a deliberate challenge to most audiophiles. In the end, I agreed that there were more of the second type of audiophiles than I had imagined, demonstrated by the popularity of the INT-30 and INT-150. These were versions of the XA30.5 and X150.5 stereo amplifiers with input selection, volume controls and even remotes.



INT Series

So here we are, actually responding to the market with a new crop of integrated amplifiers based on the “X.8” products. We have worked to capture the essence of the stand-alone components, and what you give up in flexibility and the last bit of performance you get back in physical space, simplicity and money.

The INT-250 and INT-60 are not literally identical to their stand-alone counterparts the X-250.8 and XA-60.8; in particular the INT-60 is a stereo amplifier using the hardware of a single channel XA-60.8, and it necessarily has lower bias current in the output stage and does not operate Class A to 60 watts, rather somewhat less than half that.

Nevertheless, the essential details that deliver the sound of the .8 series have been tweaked in subjective testing, and the result is very close. There are a couple new wrinkles to the “preamp” portions of these two products. The volume control circuit outputs are buffered by 6 dB gain stages whose input JFETs present many megohms of load, getting attenuator distortions down below the .001% line. The extra gain allows optimal figures for the power amp stages, and offers improvement over the previous “passive” circuits.

The output noise figures of the integrated amplifiers are a little higher than the stand alone amplifiers, but after you figure in the noise of a separate preamp external to the amplifier, it comes out about the same, so I don't think you lose out on noise performance.

Did I mention that we included the meter on these? Yes, we have the meter just like the other Point 8 amps.

Finally, credit goes to Wayne Colburn, usually our preamp designer, for the work integrating new preamp circuits into these amplifiers.

Wayne and I and the rest of the people at Pass Labs sincerely hope these products enrich your listening experience for many years.

The twin-chassis XP-25 Phono Preamp delivers a new dimension of dynamics, inner detail and spectral richness. It boasts adjustable gain, two separate inputs, a low cut filter, a mute feature, and resistive and capacitive loading on the front panel for easy access. The single-chassis XP-15 is notable for performing more dynamically, quietly and affordably than the Pass Labs legacy products it replaced.

INT-60 Specifications

Gain (db)	29 / 35
Power Output /ch (8 ohm)	60
Power Output /ch (4 ohm)	120
Input Impedance,(Kohms)	45
Power Consumption (W)	375
Number of Chassis	1
Volume Control	63
Inputs	4
Dimensions (W x H x D)	19 x 7.5 x 21.3
Remote	Yes
Ship Weight (LBS)	110

INT-250 Specifications

Gain (db)	29 / 35
Power Output /ch (8 ohm)	250
Power Output /ch (4 ohm)	500
Input Impedance,(Kohms)	45
Leaves Class A @ pk Watts	15
Power Consumption (W)	375
Volume Control	63
Inputs	4
Dimensions (W x H x D)	19 x 9.06 x 21.25
Unit Weight (LBS)	105
Remote	Yes
Outputs	2
Ship Weight (LBS)	125

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INT Series





HPA-1

Since 1991, the name Pass Laboratories has been synonymous with innovative leadership in amplifier circuit design, it comes as little surprise that what distinguishes Pass Labs' new HPA-1 Headphone Amplifier from countless contenders in the general onslaught is that the HPA-1 was designed on a clean sheet of paper as though it were to be used as a power amplifier.

Pass Labs' HPA-1 is capable of delivering full-range dynamics across the entire frequency range, even when driving headphones that present difficult loads in terms of impedance or power consumption or both.

Pass Labs' designers knew that in order to stand out from the crowd, and satisfy their demanding customer base, the HPA-1 had to establish higher standards for audio performance. That has been accomplished first, by the conceptual approach of designing the HPA-1 as a real Class-A power amplifier, and not as an accessory offering only incremental performance gains. Second, by cutting no corners in circuit design, while omitting unnecessary frills. Thirdly, by sparing no necessary expense in execution.

The foundation of the HPA-1's engineering is a custom, low-noise toroidal power transformer, feeding a discreet low noise regulated power supply for the audio circuits. The importance of the power supply is often overlooked and plays a large part in overall performance of the amplifier. The HPA-1's amplifier circuits are low-feedback, wide-bandwidth discreet designs employing a J-Fet input stage and a Mosfet output stage biased into Class A-biased direct-coupled output stage. The HPA-1 easily drives headphones presenting loads from 15 to 600 Ohms, particularly excelling on planar headphone designs. The sound is rich and detailed.

The HPA-1 has a single high-quality headphone jack on its front panel, two sets of single-ended analog inputs via RCA jacks on the rear panel, and also a set of switchable "Preamp" line-level output jacks on the rear panel. There are no compromises with the HPA-1 used as a preamp and it will compete against

HPA-1

contemporary preamps. The rear panel holds the power switch and fuse. Volume control is via a hefty rotary knob connected to an ALPS Potentiometer or circuit. The other front-panel controls are three pushbuttons, to select inputs or to engage the Preamp output.

The substantial casework is the customary and well-recognized brushed aluminum shared with other Pass Laboratories products.



HPA-1 Specifications

Dimensions (W x H x D)	4.5 x 11 x 13
Unit Weight (LBS)	14

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HPA-1





Our Goal

At Pass Labs we have one goal — to create products that invite you to listen. We want you to enjoy the experience so much that you go through your entire music collection — again and again... Each time a joyous discovery of something new. We want music lovers for the long haul.

To reach that goal, we continually strive to design amplifiers that deliver great sound, measure well and are reliable. This is achieved through ongoing R&D, and lots and lots of listening. Oscilloscopes and distortion analyzers are excellent tools, but they historically make lousy customers. Our real customers care most about the experience they get when they sit down to listen to their music.

Nelson Pass

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