

Pass Laboratories

D1 D/A Converter

Owner's Manual

Introduction

The Pass D1 D/A Converter is a high performance D/A Converter for use with digital sources. It uses a new innovative design and some very expensive parts to deliver the highest quality performance obtainable from today's state of the art.

The Pass D1 D/A Converter contains several functional elements:

The input system offers AT&T, AES/EBU, SPDIF, and Toslink inputs. These are switched by low capacitance relays through a Scientific Conversions digital transformer to a Crystal CS8412 digital receiver.

Please note that initial shipments of the D1 show 96 KHz operation on the front panel frequency indicator, however this feature is not as yet enabled as the receiver chips are not yet available. This upgrade will be made available as a "drop in" as soon as the chips become available. Contact your dealer, distributor, or Pass Labs for availability and pricing. (If the 96 KHz indicator lights up on your D1, then the newer receiver chip is installed.)

The Crystal's clock is used to feed a special phase lock loop system that removes the jitter and clocks the digital filter and D/A Converter circuits. Jitter is reduced to a typical 35 picoseconds for high swing signal and as low as 20 picoseconds at digital "0". This is achieved through the new Fujitsu PLL with the Lithium Tantalate crystals designed for DVD and 96 KHz data rates, and incorporating our proprietary loop filter.

The digital receiver and the phase lock loop both drive an NPC digital filter with 24 bit input and output. The digital filter provides 8 time oversampling of the digital signal with 32 bit internal precision.

The digital filter sends digital signal through impedance matched buffers to four Burr Brown PCM-63 (K) D/A Converters in a fully balanced configuration. The D/A Converters are selected for matched characteristic to minimize distortion and noise.

The output of the D/A Converters is fed to the most dramatically innovative current/voltage (I/V) D/A Converter in the industry. In conventional D/A Converter systems, the I/V D/A Converter consists of either an operational amplifier operated as a phase inverting summing junction or the same variety of circuit rendered with discrete transistors. The conventional approach uses negative feedback to achieve low distortion and filtering. Unfortunately negative feedback around a high gain circuit creates stability problems when exposed to the very high frequency transients generated by digital circuits.

While the energy spectrum of the transient noise is above the audible spectrum and not heard directly, the feedback loop must process both it and the desired signal, creating audible artifacts.

The I/V conversion in the D1 is accomplished with single Mosfet device operated in common-gate single-ended Class A mode. It presents the D/A circuit with the desired virtual ground, and turns the D/A output current into voltage across an output resistor. It operates entirely without feedback, and does not invert the phase. This circuit is totally impervious to high frequency transients, so that no artifacts are reflected down to the audio region.

The D1 offers fully balanced outputs lines with each of the four lines having dedicated digital and analog circuitry. The balanced and unbalanced output connections of the preamplifier have an output impedance of 150 ohms, and will drive a 1000 pF cable load flat to 1 Megahertz. The output level is adjustable through the use of a 24 position Swiss-made switch and precision metal film resistors, for precise tracking and complete neutrality.

The power supply of the Pass D1 D/A Converter uses two shielded oversize toroidal transformers, one each for the digital circuitry and analog circuits. Both sets of power supplies are at least triply regulated, with separate individual regulators for each circuit section.

Given the quality of the design approach and the parts, you expect good measured performance:

The distortion of the digital and analog stages is extremely low, with less than .02% THD and noise at full scale and from 20-20KHz. 1 bit below this figure, the distortion drops to .005%.

The noise floor is extremely low, approximately 135 dB below maximum output. The jitter floor of the clock is well below 10 picoseconds, with signal related components peaking at 30 picoseconds.

These are great specs, but are only a secondary source of pride with this product. All design decisions were listening tested extensively against the most highly regarded D/A products available, and we did not stop until the circuit sounded better than anything else on the market.

You will experience this for yourself.

The PD1 is the work of Wayne Colburn, with some analog assistance by Nelson Pass. Feel free to contact either of us with questions or comments.

Thank you for purchasing this piece. It is our sincere hope that you will enjoy its sound as much as we do.

Setup

The D/A Converter has four input connections, and two sets of output connections and an AC power connection.

The D1's AC voltage and current rating are indicated on the rear. It will be either 240 volts, 120 volts, or 100 volts. A .5 amp 3AG slow blow fuse is provided with 100 and 120 volt units, and a .25 amp slow blow fuse is provided with 240 volt units. The frequency rating of the power supply is 50 to 60 Hz. The D/A Converter typically draws 25 watts during operation.

The power supply of the D1 regulates down to about 100 volts on a 120 volt setting, 200 volts on the 240 volt setting, and 90 volts on the 100 volt setting.

We have provided a standard AC power cord that fits into the line receptacle at the rear. The D/A Converter is equipped for operation with an earth ground provided by the AC outlet. Do not defeat this ground. The chassis and circuit ground of the D/A Converter is connected to earth through a power thermistor, which gives a ground connection but helps avoid ground loops.

The D1 is designed to be operated continuously, and is not provided with an on/off switch. Our experience is that it takes an hour of initial warm up time for full performance, and we suggest two hours for most critical listening.

The four connections on the rear for input sources conform to industry standards for impedance of SPDIF and AES/EBU and the optical connectors are the industry standard AT&T and Toslink. The two sets of output connections on the rear are balanced XLR males with Pin1 ground, Pin 2 plus, and Pin 3 minus polarity. Also provided are RCA connectors for single-line operation which are the same as Pin 2 of the XLR outputs.

CAUTION The AT&T connectors are regarded as the highest quality obtainable in a digital connection, however, the plastic components on the connection surfaces are quite delicate and were obviously designed for professionals to handle. Use care when connecting and disconnecting to the AT&T connectors to avoid damaging this part. It is a very expensive part, and we will charge for its replacement.

The output signal of the balanced connector is twice the level of the unbalanced circuitry, by the virtue of having the same amplitude signal plus its inverse. Because the D1 is a truly balanced design we suggest using it with the balanced outputs where possible.

Full scale digital will deliver 3.6 volts rms balanced output with the volume control at maximum. The output impedance of the balanced output connection is 150 + 150 ohms. The output impedance of the single ended output connection is 150 ohms.

The front panel has switches for input selection and polarity reversal. The input switch cycles through the four inputs as labeled top to bottom. The polarity switch inverts the signal polarity digitally and the LED indicator lights up for inverted polarity.

The front panel knob on the right is used to set the output level to match your preamp. This control functions as a differential shunt between the two polarities of the analog signal on the output of the current to voltage D/A Converter. This control can be used as a volume control

when directly driving a power amp. You may feel free to set the level control anywhere you like, as there is no performance degradation (or improvement, for that matter) at lower levels.

The level control is a high quality Swiss made switch with 24 discrete precision resistors. You may notice some slight switching noise with this control when the D1 is still warming up, but this will slowly go away.

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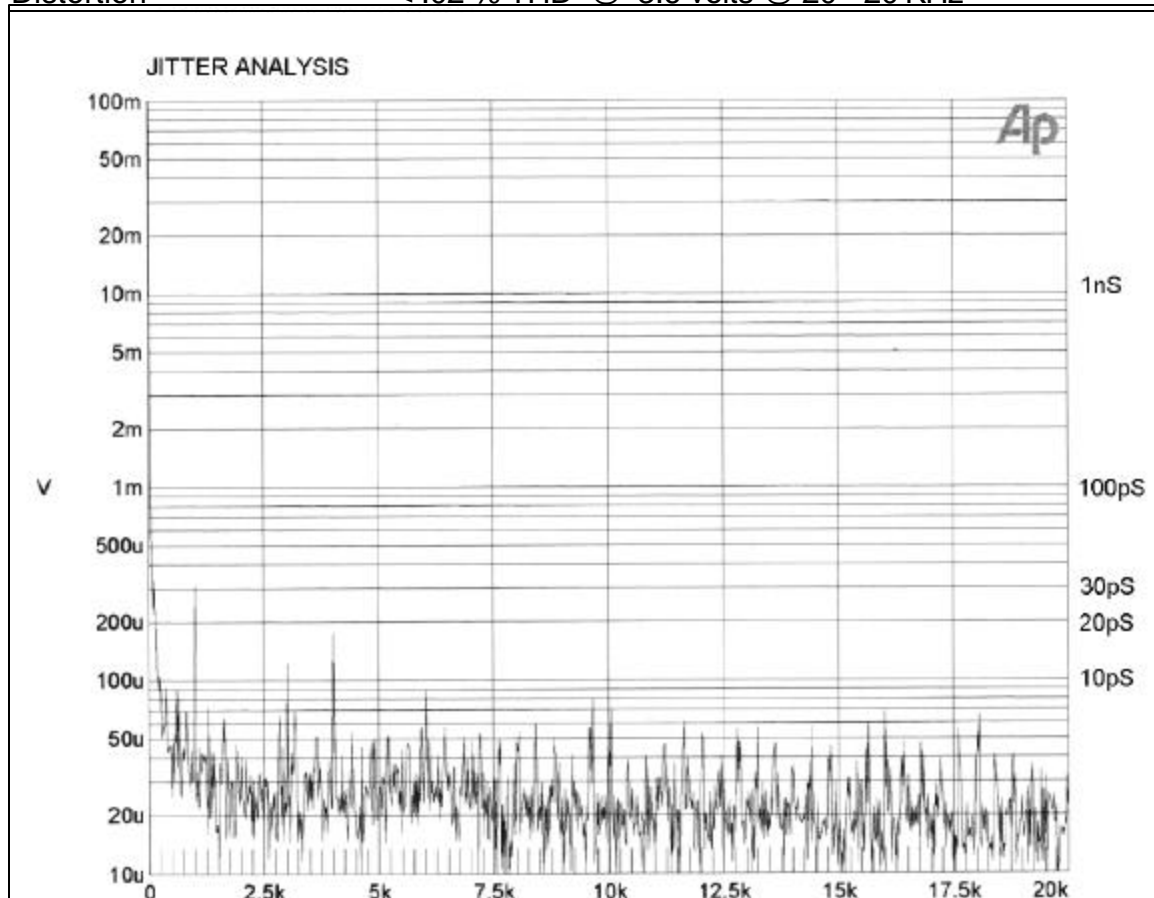
The Pass D1 DA D/A Converter is warranted by Pass Laboratories to meet performance specifications for 3 years from date of manufacture. During that time, Pass Laboratories will provide free labor and parts at the manufacturing site. The warranty does not include damage due to misuse or abuse or modified products and also does not include consequential damage.

Pass D1 D/A Converter Specifications:

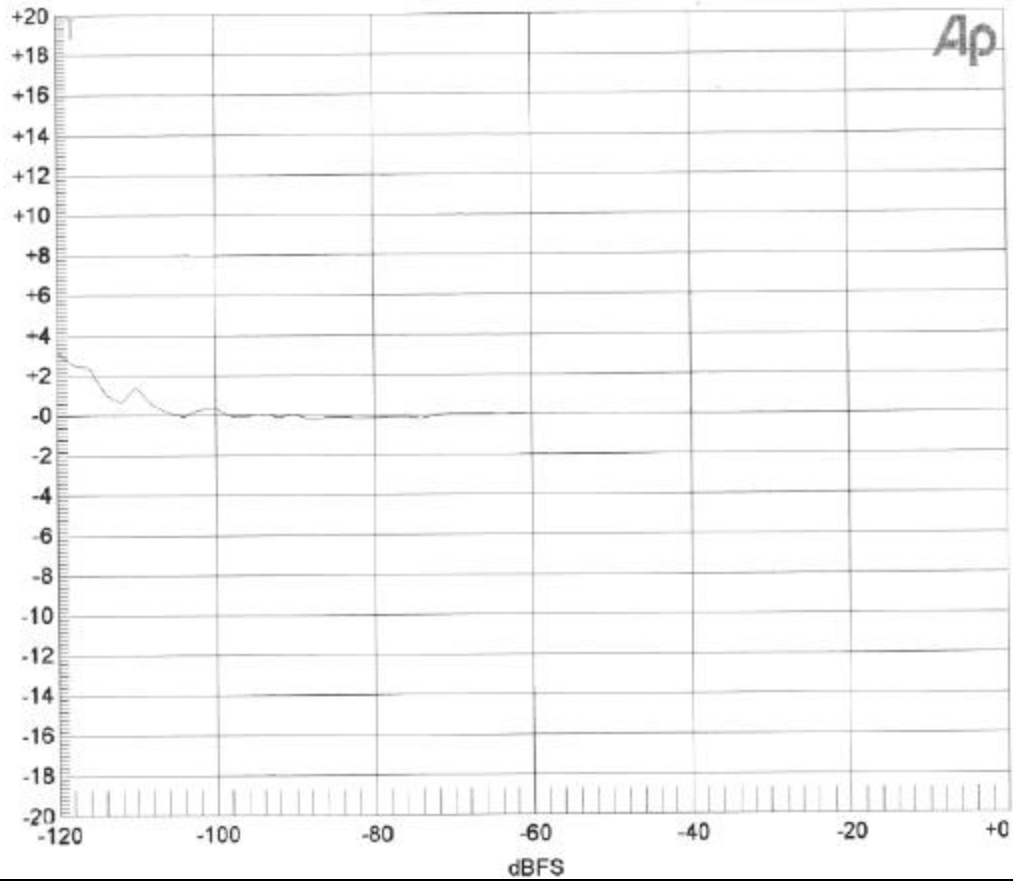
Output 3.6 volts @ digital full scale

Frequency response +0 / – 0.5 dB 20-20 kHz

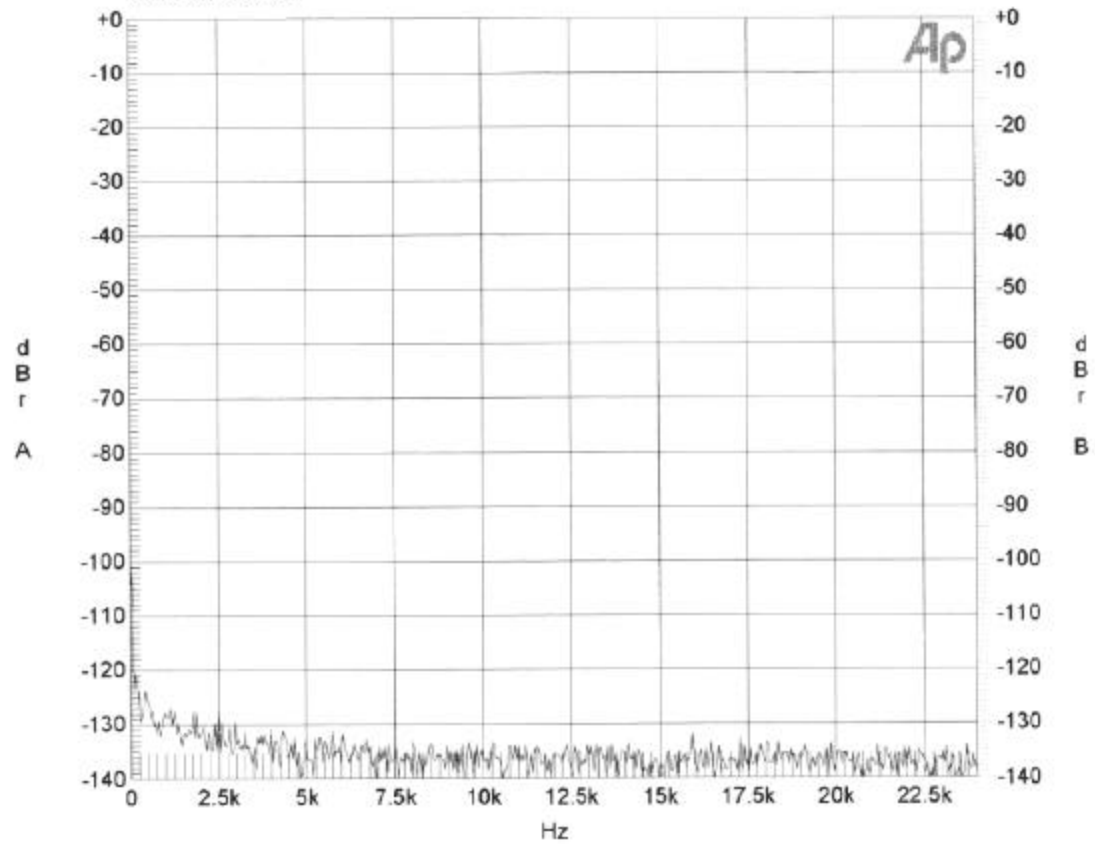
Distortion < .02 % THD @ 3.6 volts @ 20 - 20 KHz

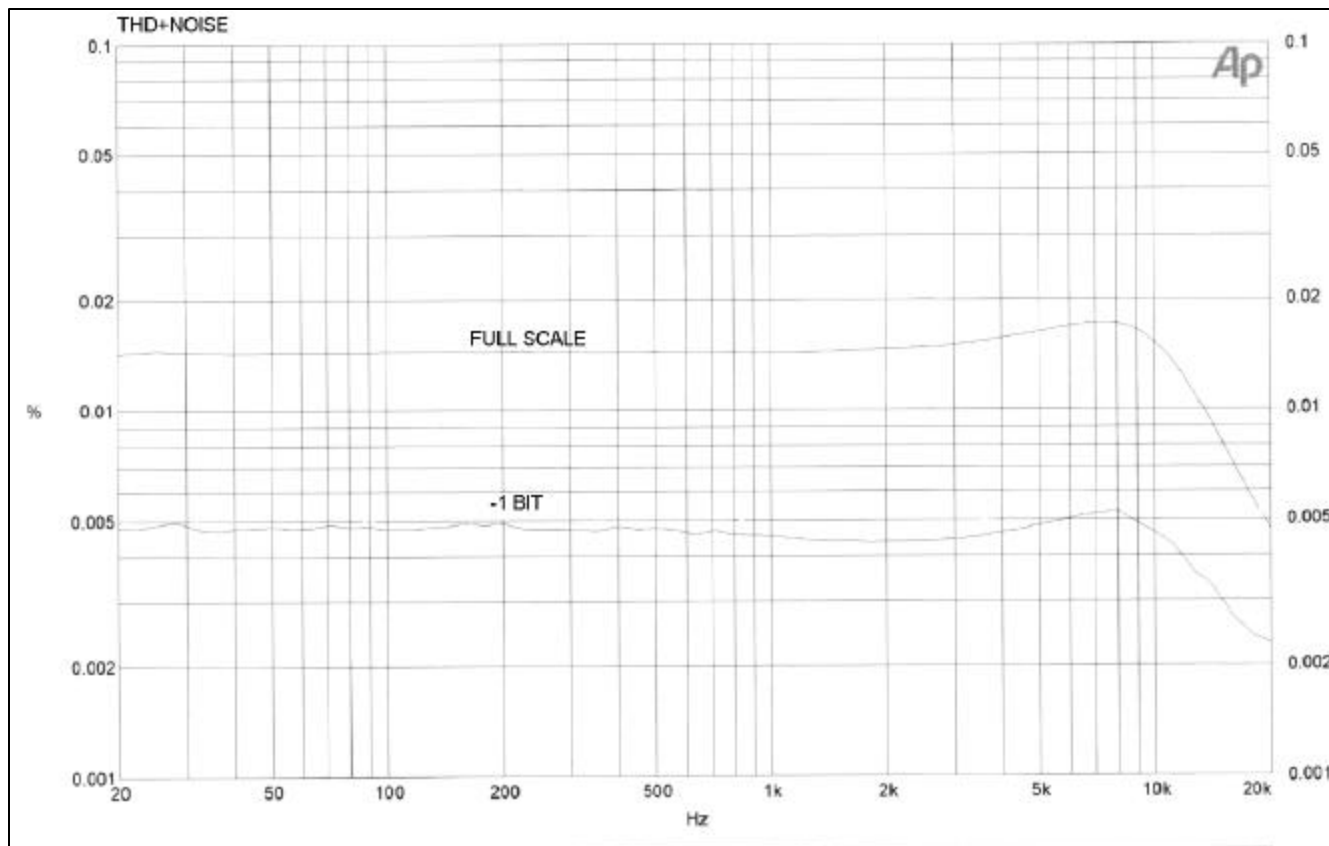


INPUT-OUTPUT LINEARITY



NOISE FLOOR





PASS

Pass Laboratories
PO Box 219
24449 Foresthill Rd.
Foresthill, CA 95631

Tel (530) - 367 - 3690
Fax (530) - 367 - 2193
Web site: www.passlabs.com