



# PRESS RELEASE

## Accoustic Arts Reference-Series TUBE-DAC II

¥1,732,500 (¥1,650,000/税別) 2007年10月21日発売

- Accoustic Artsの技術を集約した、Tube-Hybrid コンセプト
- 同時デジタル信号処理を、独特な 2x32 Bit技術で、左右2chに分けて処理
- 独特な 32 Bit コンピューターによってサポートされた、非常に精巧なデジタル信号処理
- 32ビットマイクロコンピューターの内容:
  - 高精度の水晶発振子
  - 32ビットデジタルフィルター(ディエンファシス技術を含む)
  - マルチプロセッサ(32ビット)を、26台の並列駆動
- Tube-Hybrid「技術の利点:
  - 非常に高いインピーダンス
  - 非常に広い帯域幅
  - 非常に低い歪みと自然なスペクトル
  - アナログおよび非常に精密なサウンドパフォーマンス
- 調整を必要としない、プラグアンドプレイのチューブ交換
- スタジオ技術に培われた、プロ用ClassA出力段
- 最高クラスIC「BurrBrown OPA627」を選別し、10個も投入
- 2台の電磁シールド・封入型トロイダル・トランスフォーマーを採用
- 2個のインプットセレクターは、金メッキされ、銀接点を持つ、最高品質のドイツ製
- 非常に強力な電源供給キャパシター(84,000  $\mu$ F)
- フロント・パネルおよびカバーは大きく、厚いアルミニウムによる筐体構造
- Handmade in Germany

■入力: 1x AES/EBU(バランス/110  $\Omega$  /XLR), 2x S/P-DIF(アンバランス/75  $\Omega$  /RCA+BNC) ■デジタル出力: 1x AES/EBU(バランス/110  $\Omega$  /XLR), 1x S/P-DIF(アンバランス/75  $\Omega$  /RCA) ■アナログ出力: 1x バランス/XLR-2x33  $\Omega$ , 1x アンバランス/RCA-33  $\Omega$  ■入力データフォーマット: 16-24bit/32, 44.1, 48KHz ■クロストーク: 107dB@digital0dB ■THD+N歪: 0.003%@24bit, 22Hz-22KHz ■チューブ(選別): 12AX7/ECC83/7025 ■電源トランス: 1x100VA, 1x50VA ■消費電力: 最大20W ■サイズ: H100xW482xD375 ■重量: 12Kg



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# The new ACCUSTIC ARTS® TUBE-DAC II

## A) The philosophy of the TUBE – DAC II

The ACCUSTIC ARTS **TUBE – DAC II** is an outstanding, highly precise digital to analog converter layouted in a so called “**Tube-Hybrid**” **concept**.

This concept combines the advantages of the solid state technology with the advantages of the tube principle, however without the specific disadvantages of tubes.

To use the advantages of this concept to full capacity, a very elaborate, digital signal processing was integrated, which only enables the extraordinary precision and musicality of this Tube-Hybrid concept.

The TUBE – DAC II is the **ACCUSTIC ARTS reference** in the high end D/A converter segment and intended for the music lover who appreciates the precision of digital sources, yet doesn't want to abandon the outstanding sound of top analog units. The TUBE – DAC II is therefore the perfect solution for “audiophile gourmets”, who do not so much care about superficial grandstanding but are looking for a maximum of precision, authenticity and musicality.

Preferably the TUBE – DAC II should be operated with a high quality CD transport, for example the ACCUSTIC ARTS DRIVE I – MK 2.

## B) The digital signal processing of the TUBE – DAC II

### **1. A brief overview**

During the development of the digital signal processing great importance was attached to highest precision and attention to detail, which is why an improved method compared to the currently common “upsampling principle” has been implemented. You will learn more about it in the next chapter.

Digital signal processing:

First of all an extraordinary precise digital receiver is being used for reception of the incoming digital signal (for example from a CD transport), processing and routing of same to an elaborately designed **32 bit Microcomputer**.

This excellent Microcomputer is the heart of the digital section in the TUBE – DAC II and, apart from a high precision quartz crystal-oscillator, also contains a 32 bit digital filter and **26(!) parallel operating processors** (so called multiplying processors). The multiplying processors are scanning the incoming signal and finally calculate **two digital 32 bit** signals, one for the right and one for the left channel. All digital operations are therefore taking place with the accuracy of true 32 bit instead of the otherwise standard 16 to 24 bit.

The following conversion of these two 32 bit signals into analog signals is taking place in two separate D/A conversion chips, and therefore also completely discrete by channel and of highest precision.

The resulting two analog signals are finally processed by an elaborate filter circuit in accordance with the tube-hybrid-concept and leave the TUBE – DAC II either via balanced XLR-outputs or unbalanced RCA outs.

## 2. The digital signal processing in detail:

A common upsampling D/A converter scans the digital input signal, for example from a CD with a frequency of 44.1 kHz, with a higher frequency (e.g. 192 kHz sampling rate). Indeed the individual time segments between the scans are getting very short by this means and the accuracy is increased, however as a matter of principle all upsampling methods have the disadvantage that with higher frequencies the noise is also increasing significantly. This unwanted noise has to be removed afterwards by the usage of filters, which again can lead to sonic interference of the music signal.

The 32 bit Microcomputer of the TUBE – DAC II is also recomputing the digital input signal, however with superior and more elaborate technology in comparison with the common upsampling principle.

This works as follows:

The digital input signal with a maximum word length of 24 bit which has been received and processed by the digital receiver is now first of all undergoing an 8-times oversampling (sampling frequency of the TUBE – DAC II is at a max. 384 khz). Now follows the key step, as this signal (max. 384 khz/24bit) is now scanned parallel thus exactly simultaneously by the means of the integrated **26 multiplying processors**. From these 26 single values the processors then compute an absolutely precise digital signal with the **resolution of true 32 bit** by the usage of the so called mean value method.

The accuracy achieved by this method is significantly superior to the upsampling principle. In addition to that nearly **no high frequency noise** is generated, which is why there is no need to use high frequency filters, which would interfere and change the music signal in the high frequency range and have a bad influence on the sound.

But that's not all! The integrated **32 bit digital filter of the Microcomputer operates absolutely isochronal for both the right and the left channel**. This is possible because **2(!) data lines are used for the new computed 32 bit signal** and not just one data line as usual.

(For comprehension: When using only one data line there is always a minimal time difference between right and left channel which can lead to an unnatural acoustic pattern.)

The following conversion from the digital into an analog signal is taking place completely separated for the left and the right channel and as mentioned previously 100% isochronal. To fully utilize these advantages, **two D/A converter chips** are used, one for the right and one for the left channel.

### **C) The analog signal processing: The Tube-Hybrid concept**

Apart from the very elaborate technology used for the conversion of the digital into an analog signal, the analog signal processing is based on a Tube-Hybrid concept. In this concept the tube is used only where it makes sense physically and soundwise, which is the second stage of our analog filter stage, a so called "GIC filter".

The advantages of a tube in this filter circuitry:

- very high impedance
- very high bandwidth
- very low distortion factors and a "good-natured" distortion spectrum
- "analog" and very precise sound performance

We use only tested and additionally hand selected tubes. The tubes are run in 100 hours in a special lab test prior to delivery. After completion of this lab test the unit is tested again.

During development of this concept it was additionally paid attention to the fact that the working points of the tubes are set automatically and without readjustments. E.g. even after an exchange of tubes it is "plug and play". The typical disadvantages of tubes are eliminated with this concept.

The following impedance conversion stage operates with the world-wide renowned Burr Brown amplification chip OPA 627. Totally 10 pieces of this exclusive and extraordinary amplification chips are being used in the TUBE – DAC II.

The TUBE – DAC II provides balanced XLR-outputs as well as unbalanced RCA outs. The balancing is accomplished by means of OPA627 chips.

## TUBE – DAC II highlights

- Audiophile high precision Digital/Analog-Converter with a so called “**Tube-Hybrid**” **concept**
- Special and **unique 2 x 32 bit** technology with simultaneous digital signal processing, separately for left and right channel
- Extremely elaborate digital signal processing supported by an unique **32 bit Microcomputer**
- The 32 bit Microcomputer contains e.g.:
  - High precision crystal oscillator
  - **32 Bit digital filter**
  - **26 parallel working multiplying processors (32 bit)**
- Tube-Hybrid concept integrated in an extremely precise GIC analog filter, optimised regarding pulse, phase and group delay time
- **Advantages** of this special Tube-Hybrid technology:
  - very high impedance
  - very high bandwidth
  - very low distortion factors and a “good-natured” distortion spectrum
  - “analog” and very precise sound performance
- **Uncomplicated change of tubes** without any adjustments just “plug and play”
- Professional **Class A output stage** using technology derived from studio engineering
- All used components are of outstanding quality (e.g. 10 pcs **Burr Brown**® **OPA 627**) and additionally selected; all relays have high quality gold-plated contacts
- **2 premium quality rotary switches** (“Made in Germany”) with gold-plated silver contacts for the input selection
- **2 magnetically shielded, encapsulated toroidal core transformer** („Made in Germany“) of premium quality for high output reserves
- **Very high power supply capacity** (approx. 84,000 µF totally)
- Front panel and cover are made of massive and thick aluminium
- The ACCUSTIC ARTS® TUBE – DAC II is “**Handmade in Germany**”
- ▶ **For further informations and details of the function principle of the TUBE – DAC II, please check our website: [www.accusticarts.com](http://www.accusticarts.com)**

# Block Diagramm of ACCUSTIC ARTS® TUBE-DAC II

