

## BRYSTON BCD-1 CD Player

The Bryston BCD-1 is a State-of-the-Art Redbook CD player using fully discrete analog Class-A proprietary Bryston circuits, a quality Drive, and a 192K/24Bit Crystal DAC.



### BCD-1 FEATURES:

- Redbook CD and CDR playback
- Fully Discrete Bryston Class A analog output stage
- Crystal 192k/24bit DAC
- 128 times over-sampling
- Independent Analog and Digital power supplies
- Balanced XLR and Unbalanced RCA Stereo outputs.
- Transformer coupled SPDIF and AES EBU Digital outputs.
- Optical output
- RS-232 software upgrade
- Remote 12 Volt Trigger
- Full function IR remote control
- CD remote operates other Bryston products volume up/down
- Cosmetically matches C-Series BP26/MPS2



### ADVANTAGE:

The advantage of an all in one box solution for a CD Player (as opposed to a separate outboard DAC and Drive) is the elimination of jitter. For optimum performance the Drive and DAC must use the same MASTER CLOCK. If the clock signal of the drive is not synchronized with the clock signal from the DAC then jitter develops. In external DACs the digital input must be re-clocked in order to reduce the jitter. Jitter is defined as mistiming of the digital signal. The timing of all those ones and zeros is of extreme importance. It isn't enough to get the bits right; those bits have to be converted back into music with the same timing reference as when the music was first digitized. These timing errors (jitter) are the bane of quality audio. With the Bryston CD player the master clock and the drive are synchronized perfectly to eliminate any possibility of jitter affecting the sound quality of the player.

### **BRYSTON DAC:**

The DAC integrated circuit (chip) provides the conversion of the digital signal to the analog domain. The chip used in the BCD-1 CD Player is a Crystal CS4398. The CS4398 is a hybrid multi-bit delta-sigma DAC. This is a rather tongue-twisting description that refers to an advanced generation chip using a combination of several different methods to optimize the conversion process. This DAC uses a process to over-sample the digital input 128 times. Over-sampling is when the samples are re-read (2x, 4x, 8x, etc.) to create a new sampling frequency. The new samples are then run through an interpolation filter to create a more analog-like waveform. The output of this process is a very sensitive analog signal and it is critical that the timing of this process is very closely controlled by a low jitter clock.

DAC chips also require a very clean digital power supply if they are to function at their optimum. Noise on the digital supply may cause added jitter, noise, and distortion. Incorrect circuit trace routing of the digital power supply or ground may introduce digital noise into the analog circuits. This digital power supply is provided from a separate closely regulated and filtered source. The DAC also requires a high quality analog power source because the analog signal is at its lowest magnitude when it enters and leaves the DAC. As a result, any added noise or distortion will be greatly amplified by later stages. Again a separate, heavily regulated and filtered power supply with carefully routed grounds is provided. Finally, if a digital trace, signal or power, is routed in a layer above or below an analog trace it can induce noise via capacitive coupling. Careful trace routing eliminates these problems and provides the extra dB's of noise and distortion reduction which separates good from outstanding equipment. This attention to detail with the power supplies is one of the reasons for the superior sound of the BCD-1 Bryston CD Player.

### **DISCRETE CLASS-A ANALOG STAGE:**

Getting the Digital side of the equation correct is only the start. Once the signal leaves the DAC it is buffered and increased in strength by operational amplifiers. In the Bryston BCD-1 CD Player these are constructed from discrete devices (individual transistors, resistors, and capacitors) instead of the commonly used integrated circuits. The use of discrete devices allows the design of a circuit that exactly matches the needs of the DAC. The use of integrated circuits always involves compromises since they are designed as general-purpose devices. Discrete devices also allow for more powerful outputs from operational amplifiers since the heat from the output driver transistors is separated from other devices. In an integrated circuit op amp this heat can affect the rest of the circuitry since it is all on one chip.

Discrete devices also allow specific matching of important characteristics such as input and output impedances based on the specific in-circuit requirements. Discrete operational amplifiers can also be designed to more closely match their power source leading to additional reduced distortion and noise. Discrete devices can be tested very closely to meet specific tolerances and can be matched against each other when a desired performance design is critical. Circuits can be and are designed to require closely matched devices for optimum performance. Integrated circuits have large numbers of components on one chip and it is not practical to do more than high-level sorting of device characteristics. Bryston does sorting and grading with its DAC chips but does so to a much finer level with the discrete devices, which leads to superior sound quality.

**HAND ASSEMBLED WITH CARE:**

Bryston hand assembles and individually tests each and every product we manufacture. We exclusively use only the finest components in our products, such as 1% metal-film resistors, polystyrene capacitors, and hand selected and matched transistors, in order to reduce noise and distortion to the absolute minimum. Bryston applies techniques and employs custom materials in our everyday construction of electronic equipment that are more typically utilized by military and aerospace industries. Our traditional adherence to the use of proprietary parts, sophisticated construction, and refined testing techniques, guarantees that your Bryston CD Player will perform superbly, without any problems, for many, many years. It also prevents any unit-to-unit variance which inevitably is the result of any mass produced product.

**PERFORMANCE WITHOUT COMPROMISE:**

With today's increased clarity and dynamic range in recordings you need equipment that not only equals but surpasses the parameters of the most demanding material available. The Bryston BCD-1 CD Player is without peer in meeting this performance challenge.