

# Model T



# Introducing the BRYSTON Model T Loudspeaker

Since Bryston was founded five decades ago, our electronics have been mated with many reference quality loudspeakers from around the world. Our ongoing challenge has always been to find a loudspeaker that has both accurate reproduction and the ability to play the dynamics our amplifiers are capable of reproducing without distortion or compression.

While developing great electronics during this time, we've experienced what great audio sounds like with many of these reference quality loudspeakers. Essentially, we learned a thing or two about loudspeaker excellence. Consequently, we felt the time had come to put our experience together with **Axiom Audio** to design an affordable reference quality loudspeaker made in North America.

## Introducing the Bryston Model T

Considerable effort was devoted to new driver design, enclosure vibration analysis, crossover refinement, anechoic chamber testing, and countless hours of blind listening tests.

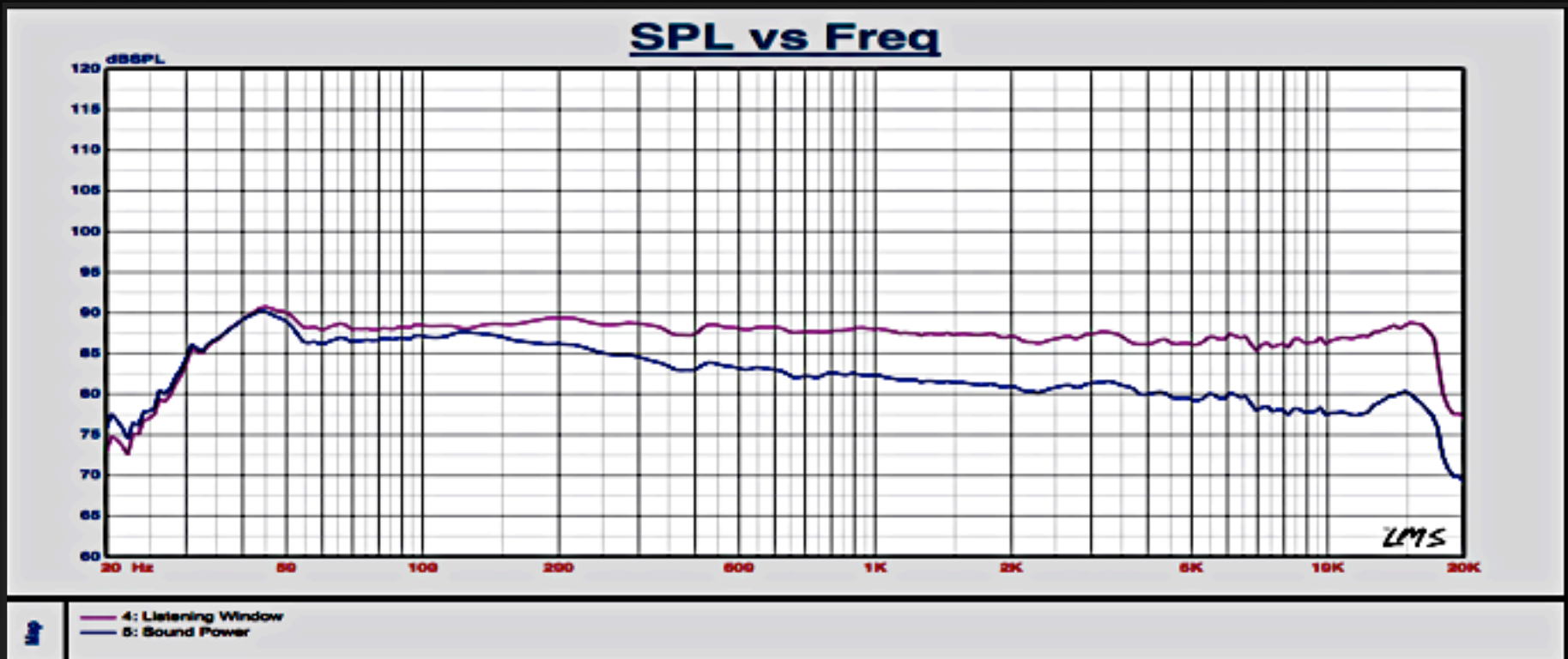
We invite you to bring your favorite music to a nearby Bryston dealer and give Model T an audition.



# Background

The Model T was subjected to over 200 separate anechoic measurements during the design phase to ensure the highest level of reproduction accuracy. This is necessary to get the precise balance required between the direct and reflected energy in your room.

Model T is a very wide dispersion design. Both the on axis and off axis are very linear in their own right. This ensures a very wide and balanced soundstage. The 'listening window' is an average of a front set of curves whereas the 'sound power response' is an average of all the curves right around the whole Model T. What we actually hear is heavily weighted to be a balance between these two conditions. The listening windows frequency response should be very linear (i.e. flat) across the entire audio band. Additionally, the sound power should fall off by 8-10dB by the time it gets to 10kHz (see below graph) while still remaining linear in its march down from the bass frequencies.



# Driver Technology

Coupled with our design goal of the highest level of accuracy is also the ability for the Model T to play high levels of SPL without distortion or compression. By using multiple drivers and working with Axiom to custom design each one, we were able to accomplish this goal. All the drivers for the Model T are custom made by Axiom.

The advantage of custom made drivers, crossovers, and cabinets is the total control we have over the system design. Using off-the-shelf drivers severely restricts design options because it creates the need for compromises to be made to work with the pre-established driver characteristics. Our drivers use die-cast aluminum baskets, substantial magnet assemblies, and custom motor systems. Also, Finite Element Analysis (FEA) design software was used to optimize the design of the drivers.

## **Unit To Unit Matching**

One of the critical requirements for creating a quality three dimensional image in your room is that each loudspeaker must be matched as closely as possible in all aspects of their performance. Unit to unit variances in performance can inhibit the sound. For example, the ability to place instruments in the proper location and create a believable soundstage where the speakers disappear and the performance fills the room with a convincing performance. We take great care in making sure this continuity is maintained for each and every loudspeaker we manufacture.

## **Dynamic Compression**

One of the major issues with many speakers is dynamic compression. If you hear a very loud sound such as the 1812 Overture cannon shots, there is a huge dynamic range associated with the sound. Small 2-way and 3-way loudspeakers fall short trying to recreate the huge dynamics range necessary to produce realistic sound pressure levels. With Model T, one of the foremost priorities was to create a speaker that could truly reproduce these real world dynamics without compression.

## Driver Technology (continued)



### Tweeters

After evaluating several tweeter technologies including domes, horns, magnetic planers, ribbons, and ring radiators, we ultimately preferred properly executed titanium dome tweeters. The titanium dome tweeters provides the most natural sound, superb measurements, and high power handling.

### Midrange Drivers

Extensive tests were performed on highly respected midrange drivers in other very expensive reference level speakers. We were able to get the most natural sounding midrange drivers using a combination of ceramic coated aluminum/magnesium cone material with robust cast aluminum speaker baskets.



# Driver Technology (continued)

## Woofers

The woofers are also constructed with custom ceramic coated aluminum/magnesium cone material, extremely robust cast aluminum speaker basket, and oversized motor assembly.



## Crossovers

The crossovers are specifically designed as an integral part of the overall system; controlling not just the dividing of the frequencies between the drivers but also tailoring the overall amplitude response.

Bryston crossovers are also designed to be high power to integrate perfectly with Bryston amplifiers; capable of delivering real world dynamics.

# Cabinets

Model T cabinets are designed to reproduce extremely high SPL without introducing any cabinet resonances.

Bracing in the correct areas is critical and, contrary to popular belief, it is not a simple more is better. The Model T has a complex internal cross bracing system that eliminates cascading resonances.

In addition to the complex brace design, the unique non-parallel cabinet shape also aids in eliminating resonances and internal standing waves.

The front baffle is a laminated 1.5 inch thick material to provide for ridged mounting of the multiple high powered drivers. The drivers should move, not the front baffle.

Model T standard vinyl wrapped finishes are black ash, natural cherry, and Boston cherry. Hardwood veneer finishes are also available at additional cost.



**Black Ash**



**Natural Cherry**



**Boston Cherry**

# Anechoic Chamber



Our Canadian speaker design and manufacturing facility has a very unique advantage... an on-site anechoic chamber!

Anechoic chambers are reflection free rooms that are used by the superior speaker manufacturers to do all the loudspeaker testing in an environment where early reflections and outside noise issues are eliminated from the measurements.

Anechoic chambers are extremely expensive to build however; they are invaluable when designing a quality loudspeaker. Measurements can be made showing exactly how the on and off axis responses of the loudspeaker are performing.

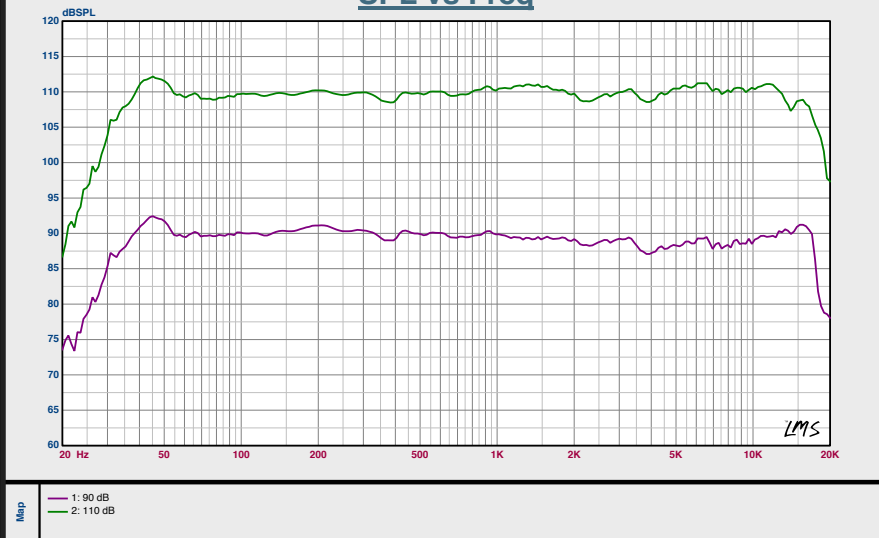
The Anechoic Chamber can also be utilized for more accurate distortion detection. Using state of the art B&K accelerometers and measurement microphones, minute levels of distortion do not go undetected.

Model T loudspeakers are meticulously designed utilizing a combination of the measurements taken in the anechoic chamber combined with results from double blind listening tests to provide our customers with as accurate a loudspeaker as is currently obtainable.

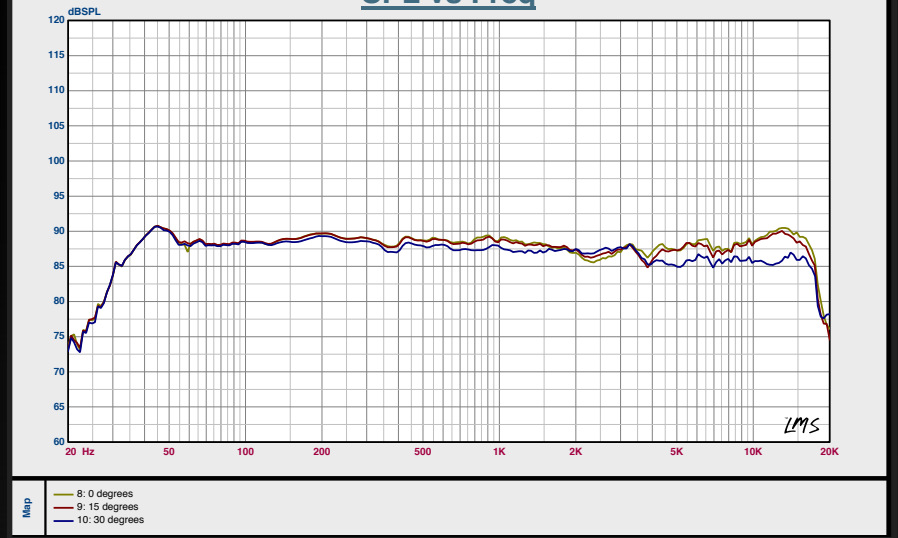


# Measurements

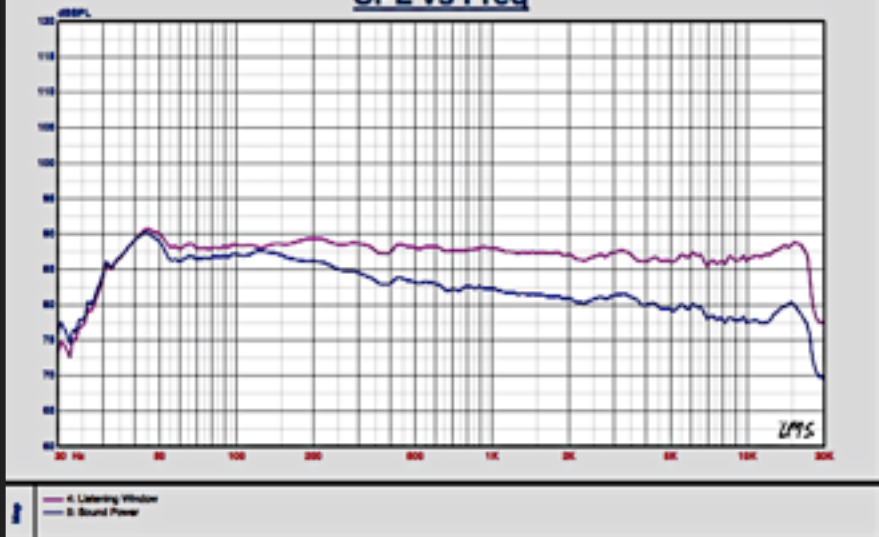
SPL vs Freq



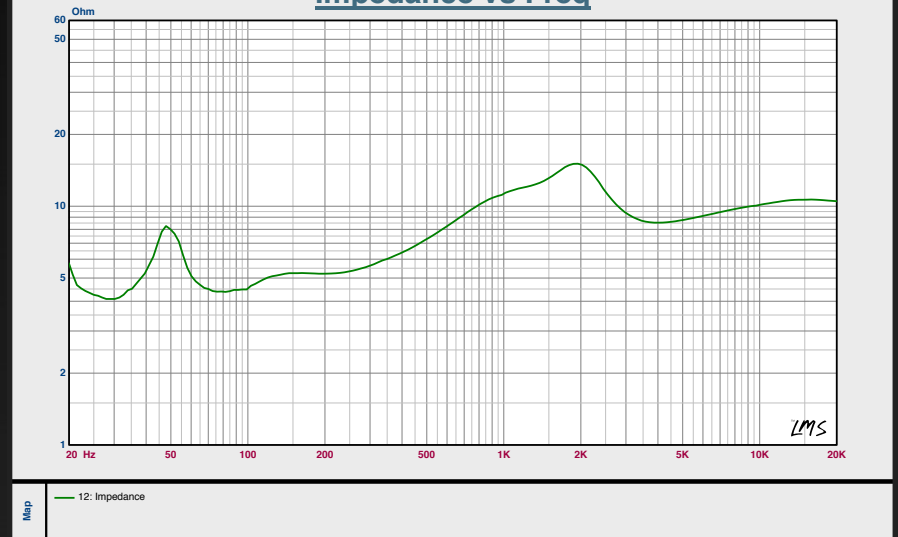
SPL vs Freq



SPL vs Freq



Impedance vs Freq



# Specifications

Frequency Response	25Hz to 22kHz (+/-3dB)
Impedance	4 Ohms (nominal)
Sensitivity	91 dB SPL @ 1 meter with 1 watt (anechoic)
Maximum SPL	118 dB SPL @ 1 meter
Recommended Power	10 watts to 500 watts RMS
Tweeter	1.0" (dual)
Midrange	5.5" (dual)
Woofer	8.0" (triple)
Crossover	160Hz & 2.3kHz
Dimensions	52.5" H x 10.5" W x 16.5" D 1334mm H x 267mm W x 419mm D
Weight	108 lbs. (each) 49 kgs. (each)
Finish	Black Ash (Vinyl) Optional wood veneers & high gloss painted finishes available



# Signature Series (Passive Version)

The Signature Series version of the Model T has a upgraded external crossover with the ability to upgrade to a fully active version. Optional wood veneers are available.

Model T Signature external passive crossover is meticulously engineered to achieve extreme tonal neutrality. It is constructed with high quality, tight tolerance components.

The crossover board is mil-spec quality with thick copper traces.

Premium silver solder is used for all solder connections.

Proper integration of the drivers, crossover, and cabinet is critical in determining uniformity of the speaker's output in all directions (power response).

The crossover, drivers, & cabinet were designed with a Systems Engineering integrated approach, not independently.

The result is astonishing clarity, transparency, and true three dimensional realism.

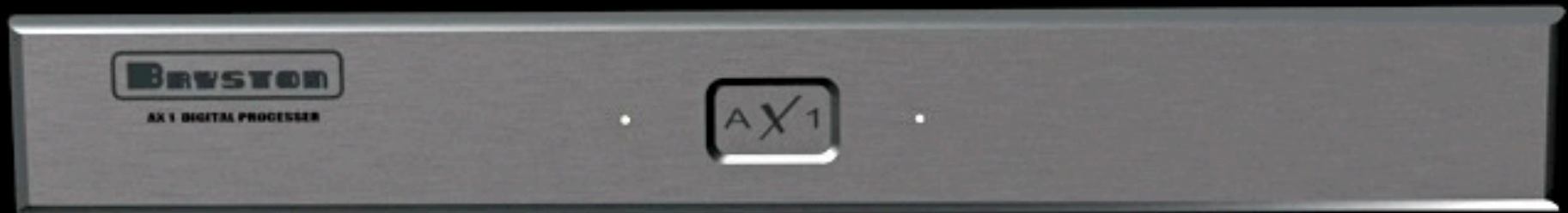


## Signature Series (Active Version)

The Bryston Model T loudspeaker is also available in a fully ACTIVE version.

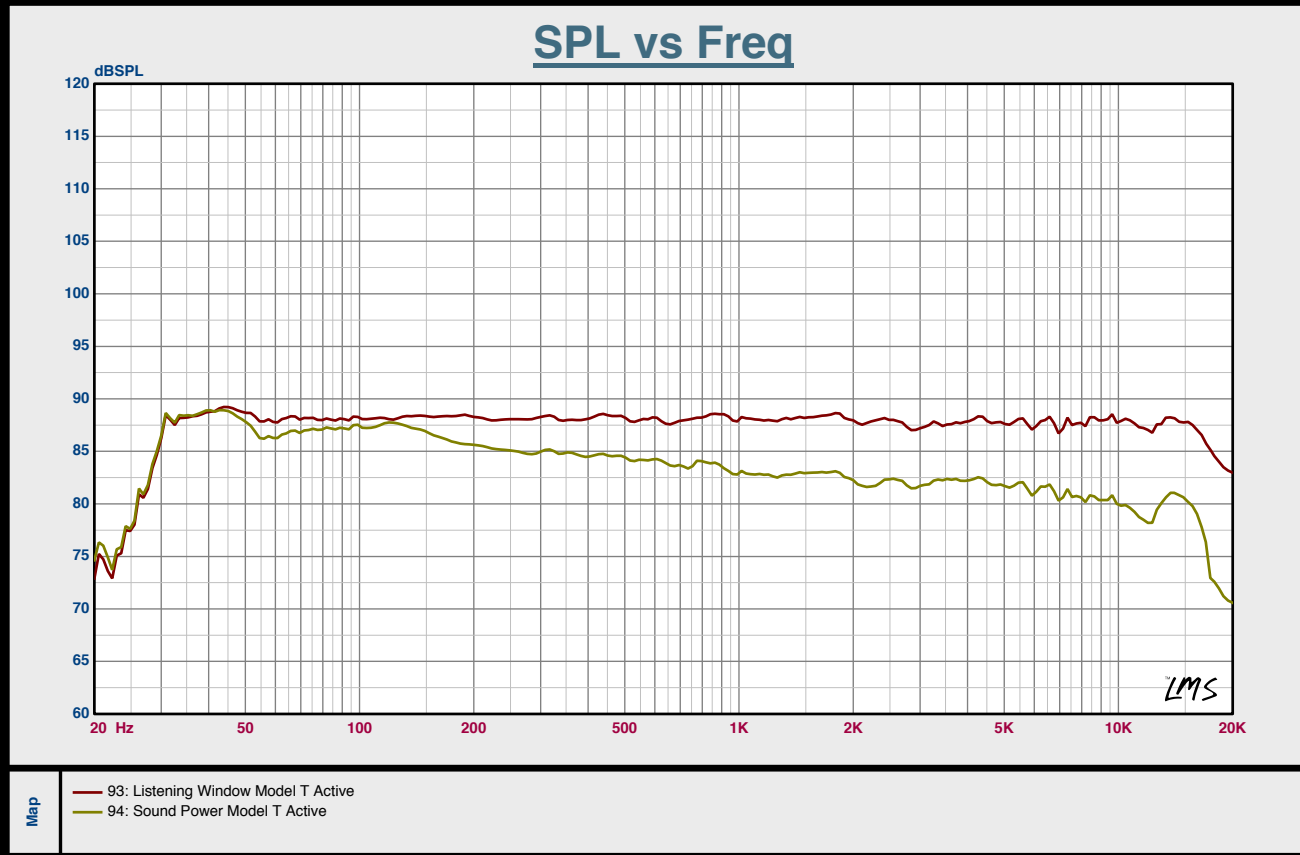
Active loudspeakers differ from Passive speakers in that the crossover that determines which drivers (Tweeter, Midrange and Woofer) get which audio frequencies is controlled by an ELECTRONIC crossover placed between the preamp and the power amplifiers rather than the passive crossover version which is typically built into the loudspeaker. Also all the drivers in the loudspeaker (T.M.W.) have an independent amplifier channel controlling them as opposed to a Passive crossover where one amplifier channel controls all the drivers in the speaker.

So an Active 3-way speaker like the Bryston Model T requires 3 separate amplifier channels per speaker whereas the Model T Passive only requires one amplifier channel per speaker.



The advantage of an electronic crossover placed between the preamplifier and the power amplifiers is all the speaker control (crossover slopes, crossover points, gain etc.) are performed at what is called low level signal levels whereas passive crossovers are operating at what is referred to as high level signal levels. Manipulating and adjusting signals at low levels is far more accurate than attempting the same with high level signals. So if you look at the frequency response, the crossover slopes and the volume levels per driver required the Active crossover provides much more accuracy than the passive option.

# Signature Series (Active Version)



As shown in the above graph, one darker colored plot is the 'Listening Window' and the lighter colored plot is the 'Sound Power Response'. With an Active crossover we can adjust and design these two performance areas of the speaker separately and independently whereas with a passive crossover they have to be adjusted in tandem. So in a passive system an adjustment on the listening window affects the sound power directly and vice-versa. The importance of the listening window and power response in a loudspeaker is explained in detail on page 3. So the flexibility and accuracy that Active crossovers provide cannot be underestimated from a performance perspective.

## Signature Series (Active Version)

The other advantage of Active loudspeaker systems is the fact that the amplifiers output stage is directly connected to the loudspeaker driver. So the Woofer, Midrange and Tweeter all have separate amplifiers controlling their movement directly rather than having to deal with passive components (capacitors, inductors, resistors etc.) required by passive networks. If you recognize that music is essentially a transient condition, a 'stopping and starting' as the music signal requires then any system that can control this stopping and starting of the drivers is much more capable of an accurate rendition of the input signal.



The transient response improvement with the direct connection between the amplifier and speaker in the active system, is mainly due to the fact that the main filter components in a passive crossover network, the inductors and capacitors, are energy storage devices. By definition they both suffer from forms of hysteresis where there is a delay between the energy storage and the release of that energy. This leads to a distortion of the signal's time signature and it will also be frequency dependent to some extent. The other big area of benefit is that fact that the passive filter network has intrinsic losses and these losses translate directly into a reduction in the amplifier power that actually makes it to the loudspeaker drivers. Removing those losses from the equation translates into a more efficient transfer of energy between the amplifier and the loudspeaker.

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If you are considering moving to an Active system at some point in the future then purchasing the Bryston 'Signature' version of the Model T loudspeaker is a great first step. You would simply replace the external passive crossover that comes with the Signature version of the speaker with the Bryston AX-1 Active crossover and add 4 more channels of amplification.

## Summary

A “state of the art” audio system involves what some refer to as a “suspension of disbelief”. These means the playback system transcends the recorded medium and transports you to a live venue. You forget it’s a recording and believe you are there at the live performance.

Our goal with the Bryston Model T loudspeaker is to provide our customers with a superior level of “disbelief”.

Again, we invite you to bring your favorite music to a nearby Bryston dealer and give Model T an audition.

Our sincere thanks to **AXIOM Audio** for their indispensable assistance, without which this project would not have been possible.

*James Tanner*

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