## The Dahlquist DQ-10 Reconsidered 2023 © Scott S. Ellis

## Preface to the 2023 Edition

Much has happened since I wrote the original edition of this article in 2010. My pair of DQ-10s were destroyed in a hurricane in 2018, and in 2023 I discovered a review and measurements of the DQ-10 in UK's *HiFi News and Record Review*, July 1975. The publisher has kindly given me permission to quote from that review, which pitted the DQ-10 against six other speakers. This is the only extent DQ-10 lab measurement of which I'm aware.

I did not attempt to re-write my entire article, so it continues in the "present tense" as was true when my set existed. Minor edits for clarity and typography were made. I have inserted the *HiFi News* excerpt in context and in **bold.** A short aftersong is provided after the entire article.

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I have owned a pair of early serial number DQ-10s for about eight years. I previously web-published an article describing my thoughts on them, which has been blended with this article. I have also published an article dealing with my re-capping of my DQ-10s.

The DQ-10s is, for several reasons, an interesting monument in audio time. It arrived in the mid-1970s when "super power" amplifiers were becoming affordable, and the influence of rock music on speaker design was beginning to displace the older classical music influences as seen in the "New England school", represented by AR, KLH, and their progeny. The rock music influence was seen in the so-called West Coast school, which featured a "hotter" upper midrange and a tubbier bass than the typically restrained "New England school" offering.

The DQ-10 had a physical resemblance to the Quad 57 speaker. From the late 1950s on, the Quad 57 was the darling of the audiophile press for its "transparency." However, being a relatively small pure electrostatic, it had a somewhat compressed dynamic range and required an outboard dynamic woofer to produce any significant bass.

Several audiophiles used a pair of Quads augmented by an AR 1W woofer to achieve their *ne plus ultra* of reproduction.

A shift in critical opinion was underway, as well. The "acoustic suspension" family tree had pretty much run its string by the early 1970s. The "polite New England school" was losing market share as younger listeners found them cold, withdrawn and bass-shy. The "hotter" West Coast offerings, frequently ported, were often derided as "boomshriek" boxes. The critics were looking for a new direction in speakers that promised more realism without "hi-fi" effects, and without the various handicaps of full-range electrostatics.

In 1974, mentored by industry patriarch Saul Marantz, Jon Dahlquist offered the DQ-10, and later, a few variations, including an outboard woofer.

The critics were, in the main, deeply impressed. Most believed that the DQ-10 offered a "musicality" that other dynamic speakers rarely offered. "I do not think this is a speaker to keep the hi-fi hounds happy" opined Harry Pearson in an effusive review in *The Absolute Sound.* <sup>1</sup> The DQ-10 was markedly different in its sonics than either New England or West Coast speakers. With the right material and the right room, it had a "depth" in the soundstage that was hard for other speakers to match. In fact, the notion of "sound stage depth" in the audio press really dates from the DQ-10.

One set of critics was *not* impressed. In the July 1975 edition of the UK's *HiFi News and Record Review*, the DQ-10 was pitted against six other speakers of similar price class, and came off badly:

"Bass performance was fair only, for such a costly speaker; it was full enough but unextended. There was an imbalance with lower and upper- middle performance; the upper middle seemed a little full, but this was less evident in the upper bass. The sound did, however, seem open in the bass and lower mid-range...High-frequency accuracy was fair only, and it was also constrained in size and lacking in presence. There seemed to be good clarity, but speech was definitely dull and rather lacking in detail. There were problems with stereo image size, due to the rather narrow distribution of the super-tweeter. This difficulty extends to the lower treble range, because there is a space of about 72 cm between the tweeter and the mid-range unit. There seemed to be a dissociation between, say, the consonants of speech and their associated sibilants. Having said this, there is an effortless smoothness and accuracy about the treble, which is a special quality one would expect from such a



loudspeaker. While signal handling was good, sensitivity was no more than usual, and there was little compensation in listening experience for such a poorly made system at such a high price."<sup>2</sup>

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Unfortunately, Jon Dahlquist's company foundered after a few years. The DQ-10s enjoy a persistent cult status due, in part, to their relatively low price, compactness, and ease of modification.

So much for history. What about my perceptions?

After over 50 years of speaker building, I have concluded that there are really, in sum, just two types of top-class speaker. One type is They Are Here and the other is You Are There. <sup>3</sup> Both involve the "suspension of disbelief" by an otherwise worldy (and often cynical) audiophile. This is called "verisimilitude", which roughly translates into "a quality of realism" or "an approach to the truth". In this case, we intellectually "know" that what we are hearing is a reproduction, but that reproduction is so close to our memory/expectation of "live" music, that we can "suspend" our critical faculties to accept the reproduction to be "as good as real."

They Are Here speakers are those with large presence in the room, a wide dynamic range, and an overall "big" sound. It is easy to convince yourself that your favorite band, or even an orchestra, is now in your living room. These speakers have the power to overwhelm most room acoustics, not with sheer "loudness" but by wide bandwidth and

ample dynamic range. In my experience, most They Are Here speakers are horn loaded in at least the midrange and treble, if not the bass. The Klipschorn is the prime exemplar of this genre, since it has a dynamic range and lack of distortion rarely matched by other home speakers.

You Are There speakers, by contrast, achieve their verisimilitude by sheer "transparency." I need to define this term, since like most audio adjectives, it is an appropriation of a term from another discipline. Transparency in audio is the impression, and therefore, illusion, that the listener is hearing instruments and vocalists as if he were present at the recording. Being an illusion, it cannot be measured quantitatively as can true "transparency" of, say, a piece of glass. Audio transparency is a happy (and uncommon) combination of recording technique, amplifier and speaker guality, room acoustics, and listener expectations. That latter factor is possibly the most important. Transparency tends to be limited to solo instruments, solo vocalists, small groups, and certain electronic music. It is difficult-but not impossible-to "suspend" disbelief in this regard for symphonies that have dense crescendos or pipe organs, since most You Are There speakers have limited dynamic range, and some also have limited (or no) deep bass. It is also hard to "accept" symphony orchestras in an average room in a residence, as opposed to a medium-sized auditorium with a good reproducing chain and suitable acoustics. This is not to say that They Are Here speakers lack transparency. However, to extend the optical analogy, a typical They Are Here speaker has a much larger, but somewhat hazy window on the sound. A You Are There speaker has a smaller, sometimes much smaller, aural window, but it is often clearer.

The DQ-10 is very much a You Are There speaker. It can, under the right circumstance, produce a verisimilitude that few other speakers can match. And it can do so with more consistency than all but an even fewer number of speakers. That, to me, is the essential criteria for a top-class speaker. It is the <u>most frequent occurrence of verisimilitude across a wide range of program material</u>. Other speakers can occasionally produce verisimilitude, but a top-class speaker will produce it more consistently, more of the time. Every speaker has its downfalls, and even top class speakers do. The DQ-10s have extreme verisimilitude for well-recorded solo piano. In some cases, I can hear the spatial separation of the high and low strings as if the lid of the grand was open towards me, just about six feet away. On the other hand, the Talking Heads in concert over the DQ-10s is very nice, but there is no suspension of disbelief. In this case they sound like "good quality medium priced speakers." Material like that is better trusted to They Are Here speakers

A special case is music that never existed "in the air", i.e. synthesized music that is direct from output to recorder. In that case, the producer adds effects to "create" the "ambience" of the piece. In some cases, the synthesizer output is amplified via a monitor or small "stack" of amps and speakers and the resulting music is recorded with microphones in a studio. For the ultimate listener, the effect is really the same as if the music was "never airborne." In this special case, the difference between You Are There and They Are Here speakers becomes irrelevant and that difference falls into the purview of "taste."

So, how do the DQ-10s do what they do, so well? Unfortunately, Jon Dahlquist's thoughts and lab notes are not available, so we may never know the full development of his design process. However, his original (3,824,343) and subsequent patent (3,927,261) and some promotional material are extant.

In sum, these are the key points from the patents:

1. Drivers mounted in "free" space, not on a common baffle as is the usual method.

2. Driver baffles sized to reduce loading below each crossover point, thereby increasing the effective "rolloff" at the lower crossover point without going to a higher-order network.

3. Drivers arranged so that their distance relative to each other is determined by their rise time.

4. An acoustically transparent enclosure for mids and up.

Of course, the notion of "temporal alignment" (or other phrase, pick your favorite–"time aligned" is a trademark of E.M Long Associates) did not originate with Dahlquist. It was discovered in the 1930s as single-driver curved horns were replaced in cinemas by two way systems using folded wooden bass horns and axial metal tweeter horns. At the time, it was found that most listeners in cinemas (an important qualifier) could hear no discernable "echo" between the woofer and tweeter if the "temporal mismatch" was 2 milliseconds or less at the crossover point.<sup>4</sup> That is where "temporal alignment" stood for decades as researchers rightfully sought after less distortion, less noise, and wider bandwidth in the entire reproducing chain.

Many people seized on the temporal alignment issue as the main strength of the DQ-10, and several grotesque imitations were rushed to market. Most of these had drivers on stair-stepped (but otherwise conventional) baffles that looked like ziggurats, and their advertising loudly claimed that they had "solved" the "time alignment problem."

We now know that this notion was overemphasized, on two counts. The first is that the lateral offset between drivers in the DQ-10 meant that "temporal alignment" would happen in a narrow sweet spot. Any significant lateral displacement off-center and the "coherence" was no longer "perfect." Dahlquist himself addressed this in his follow-on patent and second opus, the DQ-20, which used one midrange and one tweeter, vertically arrayed above the woofer. Also, as Richard C. Heyser showed, <sup>5</sup> the "emitting plane" of a conventional driver is not a fixed point one can quickly find by determining the edge of the voice coil. It is actually a continuum of points forward of, at, and behind the plane of the voice coil edges" is not the entire answer. The rise times, as Dahlquist noted, must also be considered. The phase contortions imposed by the crossover are often overlooked but also critical.

Secondly, and most importantly, is that temporal coherence has little to do with the DQ-10s perceived quality.

The DQ-10s quality comes from, in order of importance:

1. Very good (if not exceptional even by 1974 standards) quality of drivers.

2. The semi "free-space mounting" of these baffles that reduces (but does not eliminate) edge diffraction, and, more importantly, <u>allows echoes to pass back through the array in the same plane.</u> This is a very important contribution to perceived "sound stage depth."

3. The use of segmented baffles that enhance the roll-off characteristics of the crossover.

4. The division of sound into five bands with dedicated drivers. Setting aside the woofer and supertweeter for a moment (and some might prefer that to be a long moment), this means the band between 400 and 12,000 Hz is covered by three drivers, whereas in most systems it is covered by two. It has been said that Dahlquist could not find

adequate drivers to use a two-way top end in 1974. This is simply not true. They certainly existed, but their unit cost and licensing fees would have raised the price of the DQ-10 many fold. So, Dahlquist did his best within the price point, a feat of skill not appreciated by those who've never worked in the market. Additionally, the argument can be made that the division into five bands decreases intermodulation distortion.

Again, in the subsequent DQ-20, Dahlquist used one midrange and one tweeter.

5. The use of a pad of felt at the back of the midrange. This acts something like a transmission line to eliminate the front to back "leakage" of sound between the sides of the midrange cone, without the inherent cavity resonance of the typical midrange subenclosure.

6. The effort to align the drivers to common plane. This is the "temporal coherence" discussed above.

7. The use of a prismatic woofer baffle vice a conventional box. This has the effect of reducing internal standing waves that would color the woofer's upper response.



Solid Stands

Overarching all of these is Jon Dahlquist's skill in refining the design.

As we can see, the "temporal alignment" is only factor number 6 of 7. It is a synergetisic part of the whole, but it is not the *primus inter pares* many thought it to be.

I'm not going to "pile on" about the woofer. It was a very good acoustic suspension woofer for its time. Thiele-Small theory was little-known in America in 1974, so there was no chance of

applying that to the bass design.

The DQ-10 has been described as bass-shy. That has less to do with the woofer than with the esthetic choice of the base, which initially used three small feet and later a "triple pylon". Decoupling the bass unit from the floor, the most rigid boundary of most rooms, is always a bad idea. <sup>6</sup> In my case, I made solid stands that maintain the coupling of the bass unit to the floor, with no gaps. They also elevate the speakers to an acceptable height to clear the edge of my desk. I strongly recommend that anyone

using the DQ-10s make similar stands and discard the feet or pylon mounts.<sup>7</sup>

The piezo supertweeter has been much maligned. What nobody, including Dahlquist, knew in the mid 1970s is that the response of the piezo narrows with greater input. At "average" listening levels, the piezo is adequate-not stellar, not bad. At higher inputs, the "glare" or harshness is evident. Try a good recording of *Fanfare For The Common Man* to hear this effect. Various alternatives have been tried by subsequent tweakers, including removing the piezo and converting the DQ-10 to four-way operation, or replacing the piezo with ribbons. I have not tried any of these approaches, so I can't comment on them.

The DQ-10's division of frequency is presented in two ways. First is on a logarithmic chart, as typically used for frequency response. The usual 500/5000 Hz spans of typical 3-way systems are overlaid for contrast in red, white and blue:



The second is a linear octave chart, which is musically more meaningful:

Octave									
1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>
Frequency in Hertz									
20-40	40-80	80-160	160- 320	320- 640	640- 1280	1280- 2560	2560- 5120	5120- 10240	10240- 20480

What of the DQ-10s legacy? It is impossible to say what might have been because Jon Dahlquist's career was cut short. After the "temporal alignment" fad of the mid to late 1970s, most manufacturers quietly dropped the idea and went on to other marketing ploys. The correction application of temporal alignment has figured in certain other speakers, notably Bag End and the Duntech/Dunlevy series.

It is a rare speaker today that is "more" than three-way. A handful of commercial speakers are four-way, none to my knowledge are five-way. There is a feeling that midrange and tweeter drivers are available that no longer require the "help" of a fourth (let alone fifth) driver. However, supertweeters have made a degree of a comeback. Firstly, we can (if we choose) be free of the constraints and noise of the LP. CDs, theoretically, can record sound up to 22 KHz. What is there to hear "up there" is debatable.

Secondly, and of no small importance, is the nature of the buying public for high-end speakers, and of second-hand classic designs (like the DQ-10). Many of these buyers are middle aged men, with middle-aged disposable income and middle-aged, male, hearing.<sup>8</sup> There is a desire, nay, a need, for us guys to compensate for the falling curve of our hearing in the top two octaves, and having spent kilobucks and maybe sweat equity on top-shelf audio, we feel entitled to turn up the treble so we still perceive the fleeting treble tones of youth.

The DQ-10 in sum, is a very good to excellent speaker for many, but not all, kinds of material. It can use the help of a subwoofer for today's program material. It needs proper stands to realize its' intrinsic bass potential and match its height to the ear-altitude of the listener(s). The capacitors need replacing. The inputs must be fused.

## It bears repeating:

The DQ-10 can, under the right circumstance, produce a verisimilitude that few other speakers can match. It can do so with more consistency than all but an even fewer number of speakers. And, furthermore, it does so at a price point, and within a modest size envelope, that is extraordinary by even comparison to the current high-end speaker market. That is legacy enough for any speaker and any speaker engineer.

What about a re-imagining?

What if we were to attempt to recapture the essential traits of the DQ-10 using today's materials and techniques? There are huge number of variations that could be tried. Here is one that I believe is true to the original vision.

The Bass section:

A 12 inch woofer using current best practices, including proper venting of the voice coil and shorting rings. A sealed enclosure of somewhat larger depth than the DQ-10 to provide the appropriate Vb for the larger woofer. F3 point of 35 Hz. No stand; the enclosure extends to the floor for proper coupling. Enclosure will be prismatic consistent with volumetric efficiency.

The Lower Midrange:

A 6" or perhaps a 5" unit crossed over at 350 Hz with a felt pad over the back as in the DQ-10.

The Midrange:

A 2 <sup>1</sup>/<sub>2</sub> " cone or perhaps 2" dome crossed over at 800 Hz, also with felt pad.

The Subtweeter:

A 1 or 1 1/8 inch dome crossed over at 3KHz. May have to push this to 3.5 KHz.

The Tweeter:

A small ribbon crossed over at 9 Khz.

The mid and treble array will be vertical, with absorbent material on the appropriatelysized baffles and on the cavity surfaces atop the bass enclosure. Each baffle of the array will be elastomerically isolated from the bass enclosure and from each other. The front and back will be open and plastic (not resonant metal) grilles with cloth will be used.

The crossover will be first order series, with the usual care for quality of components

and layout. Separate fusing will be provided for the woofer, lower midrange, and upper units.

## Aftersong (2023)

After my set of DQ-10s were destroyed, I elected not to replace them with either original DQ-10s or my notional redesign discussed above. Instead, given the constraints of my 11 x 14 study, I built a pair of 75 liter bass units with 12 inch woofers, 12 inch "passive radiators" and Great Heil Air Motion transformers (AMTs) above 1 KHz; with those I am very pleased, and judge them better in many respects than my lost DQ-10s.

Notes:

1.*The Absolute Sound*, Vol. 1, Issue 4, Spring, 1974. This was a very important review and cemented the DQ-10's image (no pun intended) with the audiophile community. It is required reading for anyone who owns, or wants to own, DQ-10s.

2. *HiFiNews and Record Review*, July 1975, "Loudspeakers, Seven Models", pp. 103-119

3. This nomenclature is not entirely original with me. It has been used in some UK reviews as well, although I have no copies of them at hand.

4. The well-known Eleanor Powell tap dance story. "An Afternoon with John K. Hillard", by Robert Rypinski, *Journal of the Audio Engineering Society (JAES)*, Vol. 37, No. 7/8, July/August, 1989 <u>http://www.aes.org/aeshc/docs/afternoon hilliard.pdf</u>

5. "Determination of Loudspeaker Signal Arrival Times", by Richard C. Heyser, *JAES* Volume 19 Issue 9 pp. 734-743; October 1971; also published in the *JAES Loudspeaker Anthology*, Vol. 1-25, 1978. The *Anthology* is highly recommended.

6. "A Speaker System with Bass Back Loading of Unusual Parameter Values". Paul W. Klipsch, *Institute of Radio Engineers Transactions on Audio*, Vol. AU-8, No. 4, p.120-123, July-August, 1960. This was the debut of the Cornwall; I use two pair of Cornwall IIs in my main system.

"One could go so far to say that any speaker design involving legs would be more in the interest of appearance than performance" (p. 122)

Another view on this issue:

"The Influence of Room Boundaries on Loudspeaker Power Output", by Roy F. Allison, *JAES* Volume 22 Issue 5 pp. 314-320; June 1974

7. The stands were made from a stack of five 2 x 6 inch fir lumber, cut at a 30 degree angle on a miter saw. The top and bottom plates are made from 3/4 inch birch plywood. The sides are wrapped with auto headliner material (a thin foam bonded to light fabric) and covered with black vinyl. The leading edges are slightly rounded so as not to present a sharp edge. The bottom of the stand is covered with plastic shelf liner to increase traction on carpet. The DQ-10s are not mechanically attached to the stands; they merely sit atop them.

8. The intersection of the curve of rising disposable income versus falling hearing intersects for Western men between 40 and 55 years of age and it is that age cadre that is the prime buyer of "high end" audio.

Further insight into temporal alignment:

*Impulse Alignment of Loudspeakers and Microphones* by Gary Leo and Don Pearson in R.E.P magazine, 1978:

http://www.live-audio.com/studyhall/Impulse\_Alignment1.pdf

http://www.live-audio.com/studyhall/Impulse\_Alignment2.pdf