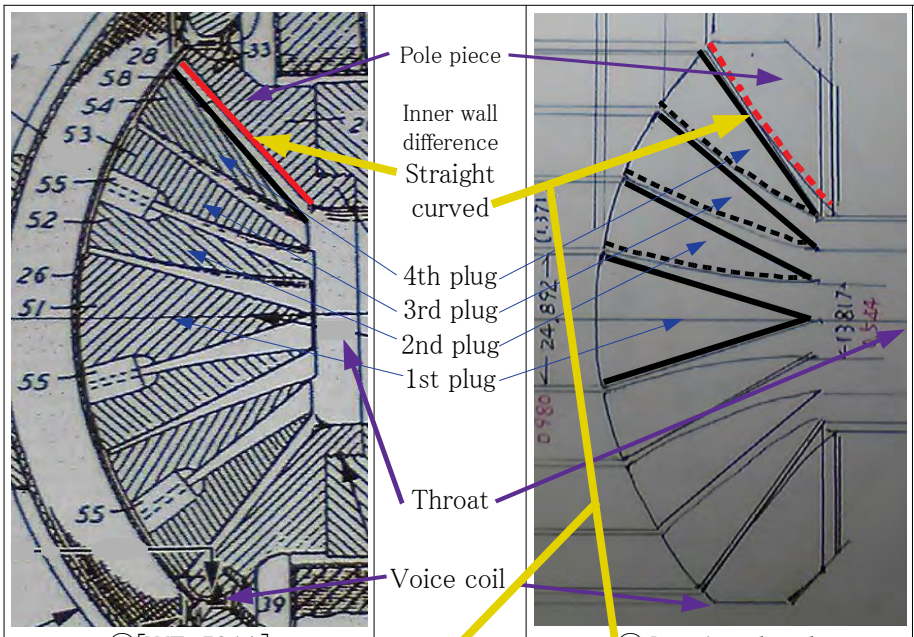
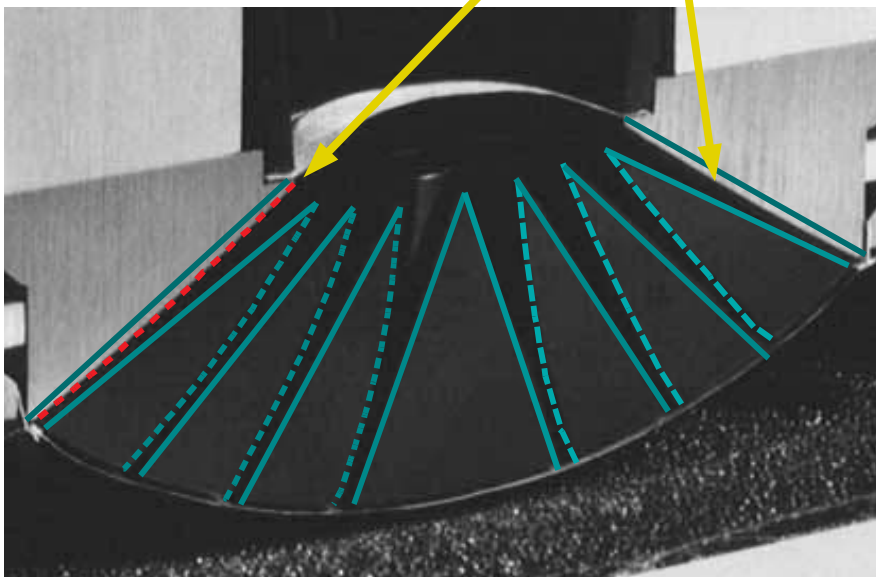
The mystery of James Bullough Lansing [375] vol.1(⑰)

The compression drivers related to JBL- [375] include Western Electric's [WE594A] and [T530A], which Bart Locanthi made Alnico magnet at Westrex's request. This [T530A] is the same as JBL's [375]. However, looking at the cut model of [375], there is clearly a different part from [WE594A]. It overlaps with others, but I would like to explain it in detail again.



①[WE-594A]　　② Lansing sketch

As described in detail in my "Lansing Study", in [WE594A] and the Lansing sketch, the cross section of the slit between the 4th plug and the pole piece on the pole piece side is different on both machines. That of ① is a straight section, but ② is a curved section (red →). This difference means a lot. The curved section allows the airflow to flow more smoothly and concentrates on one point. This figure proves that the theory that Locanthi removed the exciting coil of [WE594A] and replaced it with an alnico magnet is wrong. Looking at the cross-section photograph of the phasing plug in [375], it is close to the sketch left by Lansing.



③ [375] cut model, from Lansing Heritage

If Locanthi requested Westlex to make the [594A] permanent magnet as it is, he did not touch the phasing plug, so the left [375] phasing plug pole piece The inner wall does not have a curved shape (red dotted line) like the sketch of Lansing. The left is an enlarged photograph of the cut model of [375], but when looking from the center to the right, the cross section of 1st, 2nd, 3rd and 4th and all slits is a straight line section and a dotted line section is a curve. It is a cross section. Just like the tip of a Japanese sword. However, the point that Western [594A] in the above figure is different from [375] is that the outermost line is a straight line (blue line).
In other words, [375] is closer to the sketch left by Lansing than Western [594A]. After discovering this fact, I realized the correctness of my theory.

Regarding the above problems, Mr. Saeki's view is as follows.

[Up to now, multi cellular horn and sectoral horns have been used to improve the directivity of the high range, but the high range using acoustic lenses announced by Bell Telephone Laboratories (W.E. Kock) and Harvey (F.K. Haevey). In 1949, the speaker in Photo 5-184 was announced from a study on the improvement of directivity.
Although the progress in the middle is unknown, JBL worked on a new development project to develop a high-performance high-frequency speaker with improved directivity by applying this technology. The progress is unknown, but JBL has been working on a new development project to apply this technology to develop a high-performance loudspeaker with improved directivity.
To this end, Westrex's Flein (JGFrayne) and California Institute of Technology Locanthi have joined the project to develop a treble horn speaker with an acoustic lens. became. Bart Locanthi , who was in charge of

development, paid attention to the 594-A type horn driver that was previously used at WE as the horn driver used for the high-frequency speaker with acoustic lens, and changed the magnetic circuit of this driver from the field coil method to the alnico magnet. Improved to a permanent type. Even if they attach an acoustic lens to this driver and diffuse the energy of the high frequency sound the frequency characteristic must be flat on the axis, so they thought about improving the driver's own high-frequency characteristics by slightly raising it.
For this reason, the 594-A type voice coil, which had a diameter of 4 inches, was changed to a slightly smaller size of 3.15 / 16 inches, and the outer diameter of the roll edge was slightly increased to 4.3 / 8 inches to change the resonance frequency of the edge and achieve the purpose. High limit frequency is about 10000Hz. (Tamon Saeki, "100 years of speaker technology" 299-300P)

There is a point in the text of the above column that doesn't seem right. At the request of Westlex, if the Locathi removes the [WE594A] excitation coil and replaces it with an Alnico V magnet, the red line in the previous page must be the same as [375] and [WE594A].

Also, when the diameter of the voice coil is reduced by 1.6 mm, there is almost no change in the sound. Moreover, changing the size of the voice coil requires a redesign of the pole piece and the entire phasing plug, which is a hassle and waste. To redesign the phasing plug, it would be faster to make the whole thing separately, and Lansing made it by [284] in 1934.

Also, when making the voice coil small for the purpose of improving the high frequency characteristic, it is necessary to downsize to 3 inches to avoid distortion of the 4 inch diaphragm, as can be seen in JBL research. The distortion remains almost unchanged when the size is reduced from 100.66 mm to 999.99 mm by 0.67 mm.

The reason for this is cited below from the "Lansing Research Text".

"Ideally, the diaphragm of a dynamic speaker should have a piston movement in the same way over its entire surface.
However, since the diaphragm is not an absolutely rigid body, when force is applied, different vibrations may occur at some points on the diaphragm. This state is called the diaphragm's divided vibration, and the strain increases with it. The diaphragm of the compression driver, both aluminum and titanium, has divided vibration in most of the response band. One of the reasons is that the area of the diaphragm is large.
With a small-diameter unit such as a direct radiator type tweeter, aluminum and titanium diaphragms are capable of pistonic motion in the entire audible range. However, in a 4 inch diaphragm compression driver, whether it is aluminum or titanium, the split vibration mode is set above 4 KHz. In 1999, Doug Button began developing a new series of compression drivers. This is the later "435Be". Baton sought to solve both bandwidth and output sound pressure level issues while minimizing distortion. The goal is to develop a driver that is capable of pistonic motion in all bands and does not utilize resonance at the highest frequencies. The solution is a new diaphragm, beryllium. This is not the first example of using beryllium for a compression driver. The TAD division of Japan's pioneer has been manufacturing beryllium drivers for many years. However, the "435Be" approach and design goals were different. Baton set the diaphragm diameter to 3 inches to eliminate split vibrations. With a beryllium diaphragm of this size, the split vibration must start above 15.5 KHz. (JBL 60th Anniversary 239P)"

Mr. Tamon Saeki, the author of "100 years of speaker technology", may not have understood the principles around it. He also said, "The 594-A type voice coil, which had a diameter of 4 inches, should be made a bit smaller, 3.15 / 16 inches." [WE594A] is 4 inches = 101.6 mm. Saeki's [375] is 3.15 / 16inch = 100.0mm, and the JBL catalog's [375] 's voice coil diameter is 10.2cm = 102mm, so Saeki's "reduced 375" does not really exist.

	口径 スロート径	最大口径	許容入力 (連続プログラム)	インピーダンス	音圧レベル (新JIS)	ボイスコイル径	マグネット重量	磁束密度	奥行	重量
LE20	5cm	13.7cm	35W	8Ω	93dB(2kHz)	1.6cm	0.7kg	12,000gauss	5.2cm	1.4kg
075	7.9cm	9.8cm	20W	8Ω	110dB(4kHz)	4.4cm	1.5kg	16,500gauss	8.3cm	2.3kg
077	7.9cm	9.8cm	20W	8Ω	105dB(7kHz)	4.4cm	1.5kg	16,500gauss	8.3cm	2.3kg
LE175	2.5cm	11.4cm	30W	8Ω	108dB(1kHz)	4.4cm	3.4kg	16,000gauss	9.8cm	4.1kg
LE85	2.5cm	14.6cm	30W	8Ω	108dB(1kHz)	4.4cm	4.5kg	19,000gauss	9.8cm	5.4kg
375	5.1cm	18cm	60W	16Ω	108dB(1kHz)	10.2cm	10.8kg	20,500gauss	13.0cm	11.8kg

Voice coil diameter 10,2cm, diaphragm diameter 10,2cm

"SANSUI" catalog issued in March 1976

<375 driver>

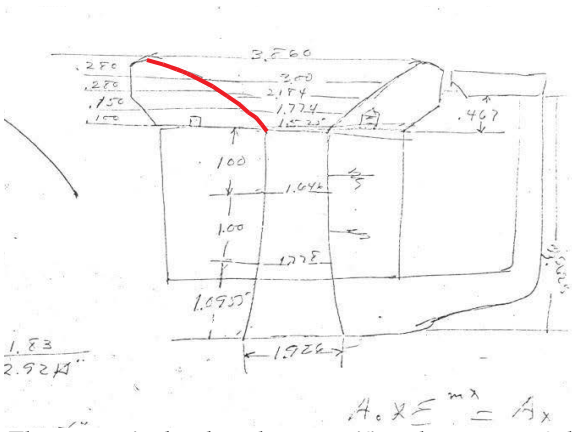
Standard price JPY 125,900-

It is the highest grade driver who has a high reputation among enthusiasts. A 10.2 cm diameter diaphragm made of ultra-thin aluminum is used, and a strong magnet realizes a sharp transient and a wide dynamic range. The 375, which reproduces purely the mid and high frequencies from 500Hz to 10kHz, is said to be one of the representatives of the JBL sound.

DRIVERS TRANSDUCER

In the Lansing Sketch, which is similar to JBL [375], Lansing specifies a curvature for the curve of the pole piece inner wall. In addition, since 3 digits after the decimal point are specified in detail, it is considered that this is not a design drawing but an actual measurement of the compression driver that he made.

Also, the numerical curve designation of this inner wall has a great meaning as "proof that it is not a straight cross section". The LANSING HERITAGE photos are hard to read, but let's explain the numbers in inches and millimeters.



The numerical value that specifies the curve of the inner wall of the pole piece is written. Throat exit diameter is specified as 1.926 inches.

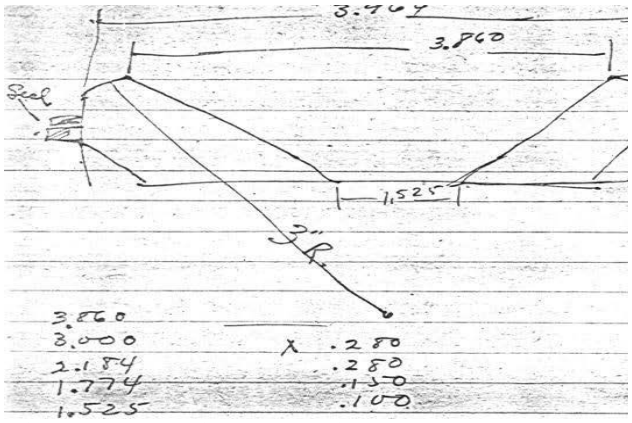


Illustration of pole pieces. The radius of curvature of the diaphragm is 3 inches. Below is the numerical value of the inner wall curve of the pole piece.

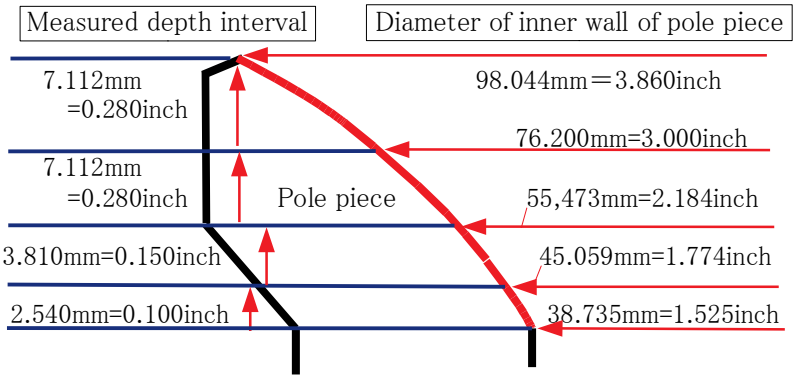
The Lansing sketch specifies that the throat inlet diameter is 1.525 (1.522) inches, the maximum pole piece inner diameter is 3.860 (3.864) inches, and the outer diameter is 3.964 (3.962) inches, but these numbers are in parentheses. Slightly different than [WE594A].

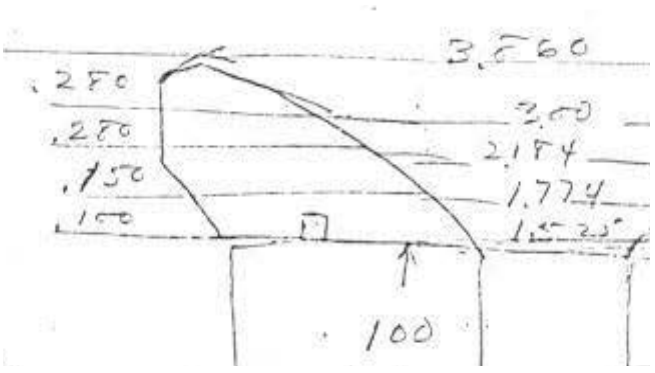
The curve of each slit cross section is an exponential curve that exponentially expands from the diaphragm toward the throat.

It has the drawback that the sound wave does not exponentially spread only in the outermost circumference in the conical cross section of the outermost circumference slit like [WE594A].

That point was revised in the sketch of Lansing.

The depth vs diameter of the pole piece inner wall cross section written by the Lansing in inches.





Curve of inner wall cross section of phasing plug by mysterious sketch

As a result of the above evidence, Burt Locanti's [T530A] in Westrex was most likely Lansing's secretly built [375] model. Moreover, there is a question why Lansing didn't make this public, but it seems that he was sticking to the two-way system. Further, this [375] is a more improved version of the [WE594A] phasing plug, adding aerodynamics smoothness. Therefore, JBL [375] is an improved version of [WE594A], and is certainly superior in principle.