

Synopsis of Turntable Through Comparative Analysis of Stabilizers

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Introduction

"Originally, the Technics turntable pitch controller used for changing keys in Karaoke were used by African Americans to beatmatch and blend and were the origin of DJing." The overwhelming advocacy for the Technics SL200 series turntable has made this unsupported claim almost a reality. Before the quartz locked control SL1200 MK2, the pitch controller for the Servo control model, installed for correcting uneven rotation, together with the Direct Drive mechanism, made it possible to mix sound sources without interruption. This redefined music, and from here on led to the birth of countless genres, which embody the spirit of the modern record. However, it is also true that it was too "standard" and raised no doubts about the turntable's performance. I would like to expand our horizons and seek a perspective through the history of analog vinyls to provide a better playability for the so-called turntable, specifically regarding the stabilizer.

Turntable Prehistory

The flat disc-type record, "Gramophone," was invented in 1887 by Emile Berliner, a former Sound Engineer at Bell Laboratories. As a result, it became possible to duplicate a record surface as a master recording, and mass production was implemented through the use of a compression molding. This eliminated the use of other vinyl formats, such as the wax cylinder-type vinyl, "Graphophone," and became the foundation of the music industry. From the 1912 SP vinyl to the 1948 LP vinyl. From DAT/MD subscription through to CDs, production has been continuing up to our present year. And to this day, after the electric manufacturers established label divisions, invested in the music industry, and through the twists and turns of digitization and analog re-assessment, the turntable is still manufactured for playing vinyls. Before the actual analysis of the stabilizer, I would like to identify the structure and the function of the turntable.

(Note: Bell Laboratories is the R&D division of AT&T, founded by Alexander Graham Bell; GE was founded by Thomas Edison, inventor of the cylinder-type record. "Gramophone" is used in British English, whereas "Phonograph" is used in America to refer to the same device. The former name of the U.S. Grammy Awards is the Gramophone Award. The 12-inch LP was commercialized in 1948 by Columbia, the music division of CBS Broadcasting, the 7-inch EP was commercialized in 1949 by RCA Victor accompanied with a victrola-machine, and Stereophonic was put into practical use in 1953. Broadcasters and electronics manufacturers have invested in the industrialization of music.

Structure and Function

The turntable for accurately transmitting the frequency information of sound waves recorded on the record surface to the phono amplifier can be roughly divided into two parts: the drive unit that firmly rotates the platter even at low speeds, and the arm unit that traces the recorded groove length and frequencies, and sends them to the phono amplifier. To suppress uneven rotation rate (Wow and Flutter) and implement accurate sound tracing while operating stably, the focus is on controlling the vibration of the drive unit. There are different drive methods, such as Idler Drive, Belt Drive, and Direct Drive. In other words, each has a different operating mechanism and vibration control design.

In typical models, the Garrard 301 is an Idler Drive that controls the spindle torque rotation from the inner side of the platter via the idler (rubber roller). A Belt Drive, the most common method, controls the platter rotation through belt torque, whereas the Thorens TD-521 is a floating system in which the frame housing is independent of the torque and platter components. The Nottingham Analogue Studios' Spacedeck uses a synchronized motor belt drive that is set in motion by manually turning the platter for amplitude control with minimal torque (To change the RPMs the belt position must be moved by hand). The direct-drive developed by Technics, which both generates magnetic force by passing an electric current through an electromagnet and controls platter rotation at the end/start of crystal oscillation has been adopted since the SL1200 MK2 and has become an industry standard for accurate functionality and high durability (The durability is so high that production was once actually paused due to the surging second-hand market). For direct-drive units without a mechanism for deceleration or transmission that create high torque at low speeds, there are Micro Seiki DDX-1000 and Technics SP-10, which have separate platters and arms.

These turntables all play the same sound wave signal engraved on the record surface through a phono amplifier, but it is also true that the sound output differs from turntable to

turntable depending on each drive mechanism and vibration control design, as with the phono amplifier that equalizes the sound source inverted during cutting with the RIAA curve. The lightest 7-inch (45 g) vinyls are more sensitive to the mechanical amplitude of turntable torque compared to 12-inch (140g) and 12-inch heavy records (180g); the line speed is delayed and the sound pressure is lower, so it is expected that the damping effect can be visualized by comparing the presence or absence of stabilizers.

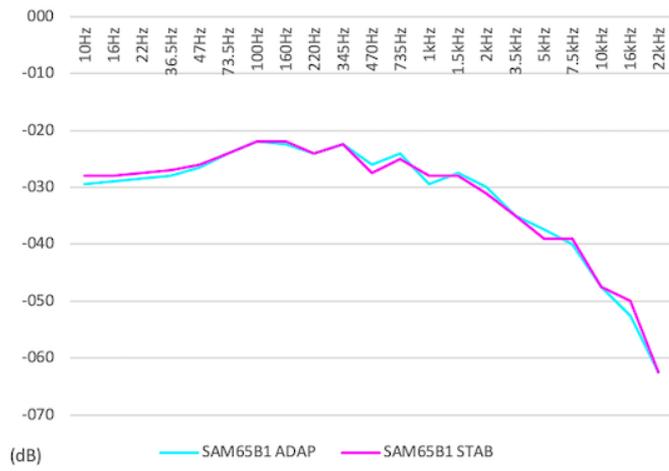
Note) Since the surface area of a record is limited, the information of the sound wave vibration stored in the grooves is processed into a curve defined by the RIAA (Recording Industry Association of America) and recorded. Since the groove (pitch) becomes wider as the lower range is recorded, and the groove (depth) becomes deeper as the volume is recorded, based on the RIAA curve established in 1953 by the RIAA, the lower range is decreased and the higher range is increased.

The Role of the Stabilizer

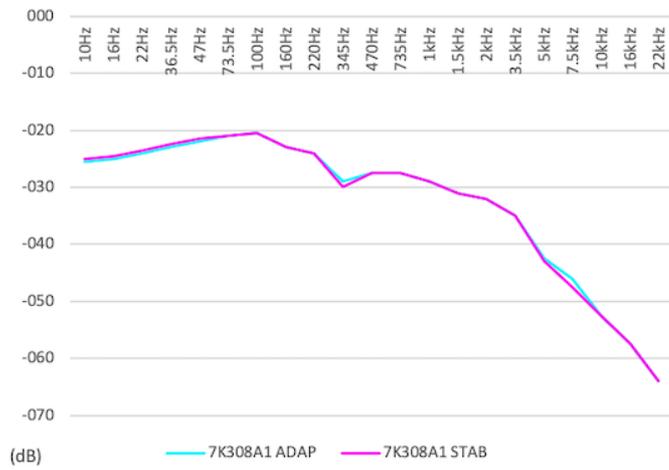
One of the plans of the stabilizer OTM80821 (Oitomi 7"/12" Dual Disc Stabilizer) is for the high resolution sound quality implemented by the vibration control and low amplitude torque by the housing of the idler drive and the belt drive to be applied to direct drive machines with the most reliable functionality and sturdiness. For that purpose, since its weight is the lightest and the drive unit is highly sensitive to mechanical amplitude, this 7"/12" dual stabilizer (540g) with an adapter function that fits into the center hole of a 7-inch record (45g) with low sound pressure due to slow linear velocity is used. The presence or absence of the stabilizer was measured under the same recording conditions by the same artist based on chronologically-released sound sources: a sound source with clearly recorded low frequencies (SAM65B1), a sound source with no recorded low frequencies (7K308A1), and a sound source with clearly recorded mid-low frequencies (FLA6A1).

Note) Small special vinyls such as 5-inch vinyls are not included due to not being commonly used.

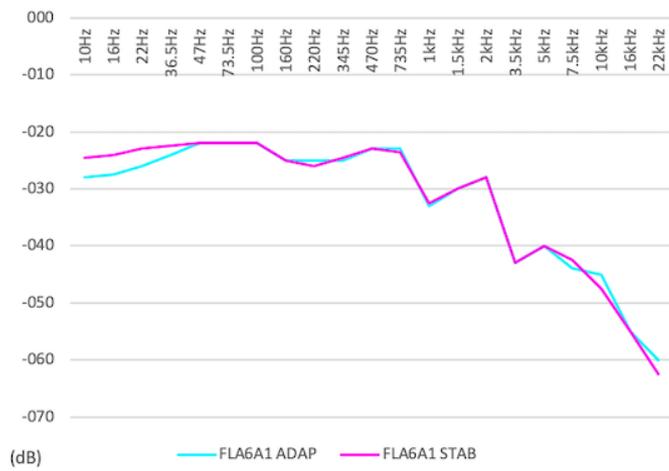
SAM65B1



7K308A1



FLA6A1



Ripping Specifications

In the graphs, the Y-axis is decibels (db) and the X-axis is the frequency (Hz) band (the highest peaks are closest to 0 dB, the lowest frequency bands are to the left), the waveform peak values measured by the spectrum analyzer are mapped, and the presence or absence of the stabilizer is layered.

The recording was done through a line input of the sound source played on the Technics SL1200MK2 / Ortofon NC-S (OM) through an XLR via the United Recording Electronics Industries Model1622 phono amplifier at CH + 7 / MAS + 7dB, to 32bit Float / 96kHz. The sound source was released in chronological order by the same artist, and the recording equipment/procedure and setting was assumed to have changed as little as possible, all using a 7-inch, 45RPM EPs and played with an official adapter and stabilizer.

SAM65B1(JAN'88 release sound source with clearly recorded low frequencies), 7K308A1 (SEP'88 release sound source with no recorded low frequencies), FLA6A1(JUL'89 release sound source with clearly recorded mid-low range).

Note) Technics SL1200 MK2 is the earliest model of direct drive with rotation control by quartz locked and has been subsequently improved with MK3 / 3D, MK4, MK5 / 5G, MK6, 1200G / GR, MK7, not only in terms of function but also in the mechanism. In terms of aspects, each model is designed to reduce the platter weight and increase the torque. Additionally, since the sound source focuses on frequency range (Hz) and decibels (db) as material for comparative weighing, the Artist / Title in the body text is omitted.

(SAM65) Yosui Inoue- "Negative" (SAM65B1) Lyrics and Composition -Yosui Inoue / Arrangement -Yuji Kawashima (For Life Records)

(7K308) Yosui Inoue- "Konya, Watashi Ni" (7K308A1) Lyrics and Composition -Yosui Inoue / Arrangement -Yuji Kawashima (For Life Records)

(FLA6) Yosui Inoue- "Yumenemi" (FLA6A1) Lyrics and Composition -Yosui Inoue / Arrangement -Yuji Kawashima (For Life Records)

Comparative Analysis

On the whole, when vibration is suppressed by the stabilizer, the effects of increasing the lower range, decreasing the higher range, and suppressing the mid-range can be read. Although the frequency range (Hz) changes depending on the musical composition and the instruments/equipment used, starting from 10Hz (which is outside the audible range), the low range is raised, and coming from above 22kHz (also outside the audible range), the high range is threshed, so the center balance of the dynamic range is pushed downward. This matches the audible impression that the bass drum is increased and the sound image

appears to “sit down.” Although the recording environment artificially eliminates noise components, the 7-inch makes a unique rattling sound when the adapter is fitted, but changes to a deep sound like a 45 RPM 12-inch when the stabilizer is mounted. While showing the possibility that the so-called peculiar loudness produced by the 7-inch is the result of the mechanical amplitude of the direct-drive torque combined with the lightness of the 7-inch's weight, comparison with a heavier lacquer record with the same linear velocity, which is obtained by applying acetate to a copper record, along with multi-faceted analysis is required to determine the difference between the sound source used by the adapter and the stabilizer.

Note) The principle of the noise canceling function is that the phases cancel each other out and the localization is canceled when the sound source of the negative phase is mixed with the sound source of the in-phase, and the difference is also extracted by this.

Comparison of Effectiveness

The stabilizer, which has been typically used to suppress external vibration and impact in turntable playback, is effective not only for the 12-inch but also for the 7-inch playback, which is highly sensitive to the mechanical amplitude of direct drive. This effectiveness is the result of the substitution of CDs and subscriptions for the main purpose of the media called the 7-inch EP, developed for promotional use of the jukebox autochanger and RCA Victor's 45 RPM Victrola player, a product now mainly suited for the turntable era. Good results can be expected when digitally sampling/quantizing analog sound sources which are often nowadays ripped on desktops and played on mobile devices.

Also, in considering its effectiveness, I hope that the structural understanding of analog turntables will contribute to the further development of the music industry. I would like to use the modern collective intelligence in which information is updated and corrected online to make a comparison between a wide variety of 7-inch vinyls such as 33 RPM compact 33 s 7" ep, which have increased the number of recorded songs at the expense of linear speed, Styrene /injection-molded records, which differ in material and shape depending on the record manufacturing factory, and flexi, along with 12-inch heavy records, Dynaflex records from the oil crisis period, Quadrophonic records, etc., and utilize it as feedback when creating the next lot and body of work.

Music is the culmination of sound wave vibrations that resonate on multiple layers, and it is impossible to perceive the sonority of chords and tones outside of oneself. However, because music cannot be objectively visualized, I believe that it is something that can be shared beyond language, nationality, generation, and gender. It is my great desire that the effectiveness of this 7"/12" dual disc stabilizer OTM80821 becomes widely accepted and brings about new perspectives toward record playback.

Note) The drum break of The Winans- "Amen Brother" 7", released by Columbia in 1969, has been sampled on almost every jungle track but depending on the manufacturing plants of the West Coast, Mid West, and East Coast, records made of vinyl and Styrene exist with the same catalog number. This is due to the difference in the record molding methods of the time, as injection molding was being attempted to replace compression molding and each method had its own line. Vinyl was used for the California record, and Polystyrene was used for the Illinois and New Jersey records. In addition, the 7-inch records of Nippon Columbia during the 1970s also used a mixture of compression-molded EP and injection molded records with the same catalog number. Injection molding is an idea that preceded the method of molding with a 3D printer but is inferior in durability because vinyl cannot be used during the injection process.

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