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It Isn't Here to Stay: A Study of the Magnecorder PT-6 Series

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Introduction

In the progression of audio-visual technology over the past century, there are names to be remembered by generations, as well as those to be forgotten in a decade or two. Magnecorder Inc. perhaps is the latter. In this paper, I looked into the history of this once-prominent tape recorder, investigated its properties, users, and competitors to answer the question: what is the Magnecorder?

Magnecord, Inc. was founded in Chicago in 1946 by R.L. Landon, John S. Boyers, R.J. Tinkham, and C.G. Barker. They all worked for the Research Division of Illinois Institute of Technology. Magnecord's first product was the professional wire recorder SD-1, while SD stands for "super-duper." It was not successful for reasons of high cost and poor reliability.

With the introduction of 3M magnetic tape in 1947 and the rising of the tape-recording industry in the U.S., Magnecord shifted its product direction to tape and then became one of the leading manufacturers of reel-to-reel tape recorders in the early 1950s. In 1956, the company was acquired by Midwestern Instruments, later known as TELEX. It manufactured its last reel tape recorder in the late 1960s. TELEX was acquired by Memorex in 1988 and went out of business in the mid '90s.¹

¹"Magnecord, Inc. – Reel to Reel Tape Recorders." Museum of Magnetic Sound Recording, accessed November 20, 2019. <http://museumofmagneticsoundrecording.org/ManufacturersMagnecord.html>.

Reel-to-reel audio tape recording was first invented in the 1920s. The essential structures of the recorder include a supply reel, a take-up reel, and tape heads for erasing, recording, and playback. The magnetic tape consists of a top layer containing magnetic particles that are capable of recording magnetic signals, and a supporting base made of polyester or acetate. The tape heads can convert electrical signals to magnetic fluctuations and vice versa, therefore write and read signal by rearranging the magnetic particles on the tape.

The PT-6 Series Magnecorder

Combine these units to suit your needs and your purse. For portable or studio use. Conforms to all N.A.B. specifications. Precision capstan and drive assures perfect lip-synch for 16mm sound recording.

The PT-6A Tape Recorders are now in use in hundreds of broadcast stations and recording studios. Two tape speeds: 7½ and 15 inches plus high speed forward on the PT-6AH for cueing purposes.

PT-6A . . . \$278 and PT-6AH . . . \$294

PT-6P . . . \$462

**BROADCAST
QUALITY
RECORDING
AND
REPRODUCTION**

PT-6J . . . \$221.50

Figure 1. Advertisement for the Magnecorder. (Museum of Magnetic Sound Recording)

In the research, I specifically focused on the PT series Magnecorders, especially the PT-6—the claimed “world’s most widely used tape recorder” in the early ‘50s. After two unsuccessful products, the Magnecord executives decided to build a portable recorder for the broadcast market with Bell Labs, thus became the PT-6. The model was first shown at the National Association of Broadcasters (NAB) show in May 1948. Soon after that, “a network of manufacturer’s representatives and dealerships was established throughout the country to sell

and service the recorders.” The sales proliferated and Magnecord became a leading player in the semi-professional market in the 1950s.²

The PT6-A is a two-speed, basic recording mechanism designed for use in combination with an amplifier and other units. It measures approximately 18 x 8 x 16 inches and weighs 25lbs. It uses 7-inch reels that hold up to 1,200 feet of ¼ inch magnetic tape. The units can either be used in portable cases for on-the-scene recording or mounted in a rack for studio use. It can operate in both vertical and horizontal positions.

The PT6-A consists of a tape transport mechanism, erase head, record-reproduce head, bias oscillator, and control switch, assembled into a single unit. The bias oscillator is a type 12AU7 tube mounted inside the machine. The current for the oscillator is supplied by amplifiers, and it requires certain levels of filament power and plate power if using non-Magnecord amplifiers. The oscillator’s function is to generate the alternating-current signal that is added to the recorded audio current to reduce distortion.³

As a two-head system, the record-produce head on PT6-A can be switched between read and write, thus it does not allow monitoring during recording. In ‘Building on the Magnetophon,’ Beverley Gooch described a unique feature of the heads:

“The Magnetic heads used on the PT-6 were composed of a front core section with a nonmagnetic gap, which was inserted into a rear coil assembly.

When the front section became worn, it could be removed from the coil assembly and replaced. This unique design saved the cost of replacing the entire head.”⁴

² Beverley R. Gooch, “Building on the Magnetophon,” in *Magnetic Recording: The First 100 Years*, ed. Eric D. Daniel, Mee, and Clark (New York: IEEE Press, 1999), 81.

³ “PT6-A Instruction Manual,” Magnecord Inc. PDF.

⁴ Gooch, 82.

The PT6-A comes with two sets of interchangeable capstan-pressure rollers: one set for operation at 15 inches per second (ips) and the other for 7 ½ ips. The combination of the large capstan and small pressure roller allows higher tape speed and vice versa. One reel of tape could record 32 minutes of audio at 7 ½ ips or 16 minutes at 15 ips. The rewind of 1,200 feet of tape takes 40 seconds.

The PT6-A uses one motor on the supply reel for rewinding and a synchronous main drive motor that drives the capstan rollers. The capstan supplies power to the take-up reel through a “rubber-coated wheel mechanism.”⁵In the book, Gooch pointed out that there is a slipping problem with the rubber-coated capstan drive system in the PT series recorders. Later Magnecorder models were developed with non-slip capstan drive mechanisms that provided better reliability.⁶

Instead of using pressure pads (as Brush Soundmirror did), which are subject to wear and pollution, the recorder maintains head-to-tape contact by using “a mechanical friction mechanism attached to the rear of the rewind motor[...]to apply a small drag force to the supply reel.” The contact is therefore maintained by the back tension of tape stretched over the heads. It is the most widely used method by professional tape recorders.

The ‘wow and flutter’ figure measures the amount of frequency wobbles caused by speed fluctuations of the system. When this measurement is above 0.2%, the human ear may be able to detect a very small change in pitch on a constant test tone. The PT6-A has a wow and flutter figure of 0.2%, which was quite standard among professional recording tools at that time. At 15 ips, the recorder responds to a frequency range from 50 Hz to 15 kHz ± 2dB; at 7 ½ ips, the frequency response is reduced to 50 Hz to 7.5kHz± 2dB. Both ranges are narrower than the

⁵*Ibid.*, 81.

⁶*Ibid.*

standard human hearing range, which is 20 Hz to 20kHz. The signal-to-noise ratio (SNR) measures the ratio of the desired audio signal to the level of background noise; the higher the measurement, the more useful information in the recording. The PT-6 series has an SNR of 50 dB.

The PT6-A was initially introduced with three compatible amplifiers in 1948: the PT6-P, PT6-R, and PT6-J. PT6-P is a portable field amplifier with three microphone inputs, a built-in monitor speaker, and a headphone jack. Pre- and post-emphasis cuts in according to use. The PT6-R has similar features but was designed for studio rack mounting. The PT6-J is more basic than the other two; it has single microphone input with gain control, a monitor speaker, and a jack for an external speaker. It has a 3-position switch that can be used to select either erase/record, playback, or public-address.

Magnecord stated that, by 1949, hundreds of broadcast stations and recording studios were using the PT6 system. Magnecord then launched an upgraded version based on its popular recorder—the PT-6AH—with added high-speed forward function at a higher price. In 1950, Magnecord introduced PT63-A, which has the features of PT6-A but was built with three heads that allow recording and playback at the same time for monitoring purposes. The compatible amplifier PT63-J also has separate playback and recording amplifiers. A new PT-7 Magnecorder was launched for the higher-end market. It was built with the three-heads system, a new positive drive, and is compatible with both 7 inch and 10 ½ inch reels. Magnecord also marketed a conversion kit that can be used to “modernize” the previous PT6-A to three heads. In 1953, Magnecord produced PT6-VAH, also named the Magnecord Voyager, which is a suitcase unit with the standard PT6-AH system. The combination of PT6-A and PT6-P unit weighs 57lbs in total; the Voyager weighs 42lbs.

The Magnecorder was used by General Motors to analyze automobile noise; however, the recordings “lacked spatial perspective.” In 1949, under GM’s suggestions, Magnecord modified the recorder by using two record-reproduce heads about 1.5 inches apart, along with an additional amplifier, to make one of the first stereo recorders. This recorder was demonstrated at the 1949 New York Audio Fair, but it was not widely used because there was no stereo broadcasting.⁷ In 1953, Magnecord launched its stereo recorder PT6-BA and amplifier PT6-BN along with the increasing number of stereo radio stations across the country.

The Magnecorder PT6 series was marketed towards the semi-professional customers. One of their main markets was the radio stations, such as WLS, WOR, KMBC, WHO, and many more. The Magnecorders were widely used for delayed programs and on-the-scene recordings. In 1950, Magnecord claimed that they were used by more radio stations than all other tape recorders combined. The New Haven Fire Department used Magnecord to record incoming emergency calls. The Magnecord Voyager was said to be employed by advertising agencies for airchecks, program development, spot announcements, and client presentations.

The Magnecorders were also used by the U.S. military, first in the Korean War, for communication assignments. Government reports indicate that PT-6 was widely employed by Service Cryptologic Elements (SCE), especially the U.S. Air Force Security Service (AFSS). In the mid-1950s, the U.S. military signed contracts with several electronics companies to develop tape recorders that can operate on different AC line voltages or frequency available at overseas sites. Magnecord delivered their product AFSAV-75A in 1957 and was selected as the winner. In

⁷ Ibid., 82.

1958, the model was “designated as the standard recorder for use in all radiotelephone (voice) positions.”⁸

The preservation issues around the Magnecorder were mostly around the deterioration of the mechanical parts over time. Although the formats and machines have fallen into obsolescence, The PT6 amplifiers are still highly regarded in the vintage radio collectors’ market.

Competitors

One of Magnecord’s largest competitor was Ampex Electric. After studying the German-made Magnetophons, Ampex produced high-end recorders that sold to major broadcast networks including ABC, NBC, CBS, etc. The Ampex Model 200 was the first successful U.S. implementation of the Magnetophon technology and was “the key to the acceptance of magnetic recording as the new medium for the broadcast and recording industries.”⁹ In 1947, Ampex developed heads that outperformed the Magnetophon head, an innovation that laid the foundation for their success. The Model 200 is a massive, precision-constructed recording console. It has three motors driving the take-up reel, the supply reel, and the capstan shaft, which allow the tape motion functions to be controlled electrically with push buttons, offering “greater speed and reliability than mechanical linkages.”¹⁰ Model 200 is also one of the first recorders using stretching tension of the tape to maintain heads contact. It uses a three-heads system, 14-inch-diameter reels, and ¼ inch tape. It records at the speed of 30 ips, and has a frequency response range of 30 Hz to 15kHz ± 2dB.

⁸Jules, Gallo, “NSA Signal Collection Equipment and Systems The Early Years – Magnetic Tape Recorders,” National Security Agency, September 3, 1991.

https://archive.org/details/NSA_Signal-nsa.

⁹*Ibid.*, 84.

¹⁰*Ibid.*, 86.

In 1948, Ampex developed the Model 300. With improved mechanism and design, it uses 10 ½ reels, and runs at 15 ips or 7.5 ips, but retains the same recording time as Model 200; its size was also reduced, and the price was lower. The Model 300 was well received by the broadcast and recording industries. In 1949, Ampex introduced its first portable recorder, the Model 400. In 1954, the Model 600 was launched and used extensively as a broadcast on-the-scene recorder. It is a one-unit half-track professional recorder in the size of a suitcase.¹¹

Another competitor of the PT6 series was Brush Development Company's Soundmirror BK-401. Launched in 1947, the Soundmirror uses a three-motor and two-head system, runs at 7.5 ips, and produces a frequency response from 100 Hz to 5kHz. The Soundmirror did not gain much success because firstly, it was over-priced for its target market. Secondly, the low quality of the components and mechanism created a lot of reliability issues. The production of the Soundmirror was stopped in 1952.¹² RCA also got into the tape recorder market in around 1948. RCA first produced some professional models but did not gain much market share. In 1953, RCA launched a Push-Button Tape Recorder SRT-301 for the low-end market. The recorder runs at 3 ¾ ips and 7.5 ips and is compatible with 5-inch and 7-inch reels, recording as half-track.

A significant factor that contributed to the success of the Magne recorder PT6 series was the price (see Appendix I). It was much cheaper than the Ampex models in the late 1940s and early 1950s. Its reliability and performance were also better than that of the Brush Soundmirror and the RCA recorder. Before Ampex 400 and 600 became popular, Magne recorder was perhaps the best choice in the U.S. market considering factors of portability, fidelity, quality, and price.

Predecessor and Successors

¹¹*Ibid.*, 88.

¹²*Ibid.*, 79.

The magnetic recording industry in the United States was almost nonexistent before WWII. During the war, there were developments made in wire and steel tape media, but the study of magnetic tape started later. In comparison, prewar tape recorder development in Germany was advancing at a rapid pace. Before the war, a German company, AEG, demonstrated an early Magnetophon tape recorder to some U.S. electronics companies, including General Electric. Still, they failed to recognize the potential in this device. After the war, allied military personnel obtained access to the Magnetophon recorders and magnetic tapes, and disseminated this information to industry through reports of the Allied intelligence services. The U.S. Alien Property Custodian held all patents on the Magnetophon, which allowed start-up companies like Ampex to exploit the Magnetophon technology.¹³

Two Magnetophon K4 models were brought to the U.S. by Jack Mullin, a Royal Air Force serviceman. He also acquired some German magnetic tapes. The Magnetophon K4 was the first mass-produced tape recorder of studio-quality in 1939. The German tapes were acetate-based tapes of 6.5mm (0.26 inch) width, and the magnetic material used was ferric oxide. The tape speed is about 30 ips, which laid the standards for Ampex to develop Model 200. The K4 uses one motor and a three-head system for monitoring purposes.

A unique feature of the K4 model is the use of high-frequency bias current in the recording process, which can reduce noise level and increase frequency response. The bias current basically can reduce noise when the recording current increased, and proportion to the low current when it decreased. The frequency response of K4 is 50 Hz to 10 kHz \pm 5dB. The K4 recorder was also built for its portability.¹⁴ The fundamental mechanisms of Magnetophon were

¹³*Ibid.*, 72-73.

¹⁴Don Drenner, "The Magnetophon," *Audio Engineering*, October, 1947, http://www.aes.org/aeshc/docs/ampex200a/drenner_the-magnetophon.pdf.

used in most early U.S.-made tape recorders, including Ampex models and Magnecorders. The German magnetic tapes also became the stepping stone of the U.S. tape developments for 3M and other companies.

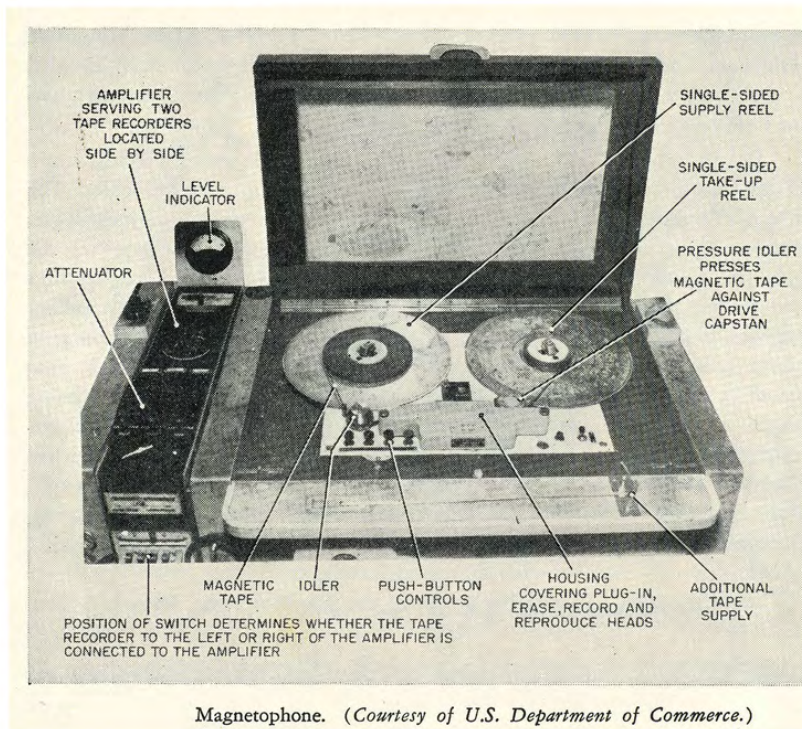


Figure 2. Magnetophon.
(Museum of Magnetic
Sound Recording.)

After the PT series, Magnecord attempted to breach into the high-end broadcast and studio mastering market by launching the M-90 recorder in 1955. This model has improved recording heads and electronics, and better performance than the PT-6. The frequency response is 30Hz to 15kHz \pm 2 dB at 15 ips and 40 Hz to 12 kHz at 7 1/2 ips. The SNR is increased to 58 dB, and the wow and flutter is reduced to less than 0.15%. The M-90 is compatible with 10 1/2 inch reels. However, by that time, Ampex had gained a substantial foothold in this market; the M-90 was still not as advanced in performance and operation as Ampex high-end models did. At the same time, Ampex also offered cost reductions, better performance and more reliability in the

Model 350, 400, and 600. These semi-professional Ampex recorders further diminished Magnecord's market share.¹⁵

Multi-track and stereo recorders were also developed in the mid- to late-1950s. RCA and Ampex worked with musicians, including Les Paul, Elvis, and Buddy Holly, to develop three-track recording systems. It allows the lead vocal to be recorded on a dedicated track, while the remaining two tracks can be used to record the backing tracks in full stereo. This development was proved extremely useful for popular music production.

Conclusion

The Magnecorders represent a brief yet important period in the magnetic recording and radio history. The company emerged as one of the earliest U.S. tape recorders manufacturers and quickly became a prominent figure in the industry, but the intense competitions among electronic companies eventually led to its demise. This paper briefly discussed this history and studied the features, users, and competitors of the Magnecorder PT-6, as well as its related technological innovations. It might provide a glimpse of how the company fell from the top within a little more than a decade. Magnecord has had its day—but it is not here to stay.

¹⁵ Gooch, 82.

Work Cited

Drenner, Don V. R. "The Magnetophon." *Audio Engineering*, October,

1947. http://www.aes.org/aeshc/docs/ampex200a/drenner_the-magnetophon.pdf.

This article explained the characteristics of the Magnetophon in the time of U.S. tape recorder developments.

Gallo, Jules. "NSA Signal Collection Equipment and Systems The Early Years – Magnetic Tape Recorders." National Security Agency. September 3,

1991. https://archive.org/details/NSA_Signal-nsa.

This document provided information regarding choices of tape recorders in government intelligence agencies in the 1950s.

Gooch, Beverley R. "Building on the Magnetophon." In *Magnetic Recording: the First 100*

Years, edited by Eric D. Daniel, C. Denis Mee, and Mark H. Clark, 72–91. New York: IEEE Press, 1999.

In this chapter, Gooch discussed the development of magnetic sound recording devices in the US after WWII, focusing on companies including 3M, Brush, Magnecord, and Ampex. Gooch especially addressed the history of Ampex, which provided helpful information regarding the competitors of Magnecord for my paper. The writing on Magnecord also addressed many specific information that I did not find elsewhere, including the slipping problem of the PT6-A's capstan drive mechanism, as well as the special design of the tape heads. The chapter also confirmed my supposition of how Magnecord lost its market share in the end.

“Magnecord, Inc. – Reel to Reel Tape Recorders.” Museum of Magnetic Sound Recording, accessed November 20, 2019.

<http://museumofmagneticsoundrecording.org/ManufacturersMagnecord.html>.

This website provided thorough information on the history of Magnecord Inc. and the Magnecorders. It also showed a large collection of photos of vintage Magnecord, as well as promotional materials that cannot be found anywhere else. The website was also well-organized; the information was mostly in chronological order and the photos were organized by recorder models. It was an extremely helpful source during my research, as the website’s purpose is to inform and educate people of obscure recording medias. The advertisements indicated the technical features, marketing strategies, and target consumers of the recorders, which all contributed to the corresponding parts of my paper. However, as they were all made for promotional purposes, they only indicated the advantages of the recorders, but information about their flaws cannot be easily found on this website.

“PT6-A Instruction Manual.” Magnecord

Inc. http://www.thehistoryofrecording.com/Manuals/Magnecord/Magnecord_PT6-A_Manual.pdf

The manual provided sufficient information on the structure and properties of Magnecorder PT6-A. It addressed each component and the function of the recorder through writing and diagrams. It helped me understand the function of the bias oscillator and the basic operation of the recorder.

Appendix I

Features and Prices Comparison

Manufacture	Model	Year	Price	Max Frequency Response	SNR
Magnecord	PT6-A PT6-P (Amp)	1948	\$ 740	50 Hz to 15 kHz \pm 2 dB	50 dB
Magnecord	M-90	1955	\$ 1,450	30 Hz to 15 kHz \pm 2 dB	58 dB
Ampex	200	1947	\$ 5,000	50 Hz to 15 kHz \pm 2 dB	60 dB
Ampex	400	1949	\$ 985	50 Hz to 15 kHz \pm 2 dB	55 dB
Ampex	600	1954	\$ 545	40 Hz to 15 kHz \pm 2 dB	55 dB
Brush	Soundmirror	1947	\$ 250	100 Hz to 5 kHz \pm 6 dB	35 dB
RCA	SRT-301	1953	\$ 170	Unknown	Unknown