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Moving Image and Sound: Basic Issues and Training
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LaserJuke: The Video Disc Jukebox for the Music Video Generation

Jukeboxes: Brief History and Context

By 1980, when Japanese company Pioneer had already begun to market their own players for the new commercial video disc, LaserDisc(LD or laserdisc) (formerly known as DiscoVision), the jukebox industry had been hurting for at least a decade, and the music retail business had not been at the top of its power for a decade either.¹On the eve of 1980, at the first International Video Music Conference in November of 1979, it was widely understood that artists considered videos merely “promotional devices,” while other executives expressed disdain that they were unable to reach a younger generation whose perception of sound and vision were inextricably intertwined.²Of course, all of these fears about television and the record industry (and questions about how to profit from music videos) were about to change in 1981 with the broadcast of the Buggles’ “Video Killed the Radio Star” at 12:01am on the newly created MTV channel.³ MTV completely reinvigorated the music business by creating a viable platform for the record industry on television. With the seemingly simultaneous advent of the laserdisc and the rise in popularity of the music video, there seemed to be a small sliver of space for the jukebox to make its way back into popularity with such developments as the LaserJuke.

While the United States were rocked by MTV in the 1980s, Pioneer, a Japanese company, was focusing on developing technology that catered to its home country’s tastes. In October of

¹Kerry Segrave, *Jukeboxes: An American Social History* (Jefferson: McFarland & Company, 2002), accessed 27 November 2019 ProQuest Ebook Central, 274.

²Serge R. Denisoff, *Inside MTV* (London: Routledge, 1988), 21.

³Tom McGrath, *MTV: The Making of a Revolution* (Philadelphia: Running Press, 1996), 5.

1982, Pioneer released the LC-V10, the first commercial laserdisc karaoke system.⁴ Pioneer's development of laser karaoke continued to grow throughout the '80s, with larger rollouts in 1984 including the LC-V12 autochanger for commercial karaoke systems using 20cm or 8-inch laserdiscs.⁵ The LC-V12 would become foundational technology not only for the karaoke systems but also for the Laser Juke, or LJ-V20, which launched in 1986 and in Pioneer's words was the "industry's first jukebox that displays pictures."⁶ This statement from Pioneer is not entirely true. The idea of a video jukebox had been in play since the early days of cinema with coin-operated nickelodeon and experiments continuing into the 1940s. Indeed, experiments were not limited to film or even early video: the December 1941 issue of *Popular Mechanics* reports on experiments with sound and vision on disks with playback from these "movie records" onto coin-operated machines.⁷ Additionally, in the late '50s and early '60s, "cinema boxes" gained some popularity in Europe with the CineBox, "an Italian-made cinema box," that used 3-minute color films (probably regular 8mm with sound given the length) and featured mostly musical excerpts from Italian and British films.⁸ French company Scopitone eventually pushed CineBox out of business and moved to the United States, reporting around 1,200 machines in operation in America in 1965, 800 of which were Scopitone.⁹ Scopitone eventually went out of business and interest in sound and vision jukebox-style machines was not renewed until the same conversations around music videos that greenlit MTV also encouraged new innovation for video jukeboxes.

⁴Pioneer, "Brand/History: 1980 to 1989," *Pioneer Corporation*, accessed 24 November 2019, <https://global.pioneer/en/info/history/chronology/1980/>.

⁵Pioneer, "Brand/History: 1980 to 1989."

⁶Pioneer, "Brand/History: 1980 to 1989."

⁷"Motion Pictures Made on Phonograph Records," *Popular Mechanics* December 1941, 76:

https://archive.org/stream/PopularMechanics1941/Popular_Mechanics_12_1941#page/n129/mode/2up/search/disk.

⁸Segrave, 282.

⁹Segrave, 284.

In 1979, a jukebox using video disks by Show-Time Systems International showed at the Amusement and Music Operators Association Expo that cost about three times as much as a conventional jukebox, which at this point, was not in nearly as much use as it had been in the '50s.¹⁰ Three years later, Video Music International introduced a video jukebox that used video tapes also at high costs.¹¹ This enterprise also failed with limited market penetration and a failure to license material. The same year, Video Jukebox Inc. launched the first jukebox machine using laserdiscs, but it is unclear if their machine ever went into production with additional issues with licensing music.¹² It is unclear why Pioneer waited until 1986 to launch their version of a jukebox. That being said, Pioneer underwent many changes in the 1980s. In 1981, what was Yamanashi Pioneer became LaserDiscand began handling the majority of production and distribution of laserdisc titles and launched Pioneer Video, Inc. in the US.¹³ Pioneer's hold on the karaoke machine and disc market from 1982 relied on laserdisc technology and caused a huge bloom in the karaoke activity as karaoke became more accessible to a wider public through video disc technology. This move represented a stronger push to the American market for laserdiscs, and perhaps the advent of the Laser Juke in 1986 was Pioneer's way of adapting their karaoke technology for a larger, Western market.¹⁴

Video discs: essential part of the video jukebox

While the video jukebox was short-lived, we can assume that Pioneer's Laser Juke, which later gave way to the Compact Disc Laser Juke, also produced by Pioneer, was more successful than the video tape versions for several reasons. The evidence for its relative success

¹⁰Segrave, 285.

¹¹Segrave, 285.

¹²Segrave, 285-6.

¹³Pioneer, "Brand/History: 1980 to 1989."

¹⁴ It should be noted that this paper considers the Laser Juke primarily from an American perspective although Laser Jukes existed across Europe in the UK, France, and West Germany.

(which was not that successful) can perhaps be measured by the amount of discs that were produced specifically for playing in Laser Jukes. Additionally, while the Laser Juke may have been short-lived (with discs only in production from 1986 to 2001 or 2002), the karaoke technology it was built on was immensely popular in East Asia and drove the karaoke craze until CD and digital karaoke machines were built. Using video on disc was the most essential component to Pioneer's ability to release a more successful machine for several reasons. In order to show why video discs were essential technology in bringing jukeboxes into the future, it is best here to give a quick overview of how Laser Discs work.

Laser Disc was the first commercial optical discs to encode video and audio on a disc format. Video disc was developed in the 1960s, publicly demonstrated in 1972, and launched in 1978 as DiscoVision.¹⁵ In 1980, DiscoVision was rebranded as LaserDisc and became more publicly available (and affordable) with Pioneer's distribution of home LD players in 1980.¹⁶ Laserdisc technology encodes an analog video signal with an analog or digital audio signal as pits and lands on a continuous spiral. Additionally encoded are tracking, timing, framing, and the side.¹⁷ The analog video signal is encoded as pulse-width modulation, or a voltage that is represented by "pit-to-pit spacing" whereas "the audio is represented in the difference between pit/land length" in binary.¹⁸ All laser optical discs have no contact during playback, meaning they will not wear through play, unlike magnetic media. Additionally, a laser

¹⁵ Tom Howe, "1979: The VideoDisc Is Here!" *CED in the History of Media Technology*, accessed 24 November 2019, <http://www.cedmagic.com/history/discovision-marketed.html>.

¹⁶ Howe, "1979: The VideoDisc Is Here!"

¹⁷ Bob Niland, "LD vs. DVD: A Fundamental Difference – Despite Similarities, LD Technology Is Not Digital," *ReplicationNews*, published 3 July 1999, archived 2003, accessed 24 November 2019, <https://web.archive.org/web/20080513083110/http://www.access-one.com/rjn/laser/legacy/ld96.html>.

¹⁸ Bob Niland, "LD vs. DVD: A Fundamental Difference – Despite Similarities, LD Technology Is Not Digital."

disc can pause on a still frame continuously without noise because of the built-in time-base-correction, which eliminates line jitter and color errors.¹⁹

Essential to the Laser Juke and laser karaoke playback system, laserdiscs are the first moving image format to encode random access. Every single frame on a laserdisc is encoded as a 5-digit number; therefore, at home, a user can plug in that frame number on the remote and access a specific area on the disc without rewind or fast-forward time and with exact specificity.²⁰ For this reason, many laserdiscs are able to encode additional information accessible to the user during playback, which was used often for educational laserdiscs. For the Laser Juke and karaoke technology, random access was essential to playback because discs could carry multiple songs and users could select from and skip to a single disc multiple times without any lag. The VMI and US Billiards' Video Sound video jukeboxes used video tapes, which held 44 to 50 music videos on them, but it is unclear how successful these machines were in playback because of the lack of random access. Additionally, for lots of playback in a short period of time, which juke boxes can be expected to have, the video and audio quality on a laserdisc with no playback wear would have been much better than on videotape. On an aesthetic level, a jukebox using video disc connects much more easily to the nostalgia of a jukebox that uses vinyl 45s as its reservoir of content; the video tape jukeboxes were bulky and lacked the aesthetic ancestry that the laserdisc and eventually compact disc jukeboxes had.

Laser Juke: The Autochanger and the Selection Commander

The Laser Juke is comprised of two main parts: the autochanger, which represents the core of the machine and which is a carry-over from Pioneer's laser karaoke technology, and the selection commander, which the user interacts with and controls the autochanger. These two

¹⁹Bob Niland, "LaserDisc FAQ," *Widescreen Review*, published 1998, archived 2003, accessed 24 November 2019, https://web.archive.org/web/20070711005314/http://www.access-one.com/rjn/laser/ld_faq.pdf.

²⁰Bob Niland, "LaserDisc FAQ."

technologies, the LC-V20 and the LJ-V20 respectively, were directly carried over from the technology used to produce Pioneer's Laser Karaoke.²¹ The autochanger, whose patent cites other disc change technology like Wurlitzer's 1975 "Record selector mechanism for a phonograph system," is descended from other jukebox technology that had to operate with many discs.²² Pioneer's autochanger was invented to handle the demands of a karaoke machine, with the jukebox seemingly an afterthought, and the company envisioned the autochanger becoming an integral part of bring laserdisc to larger corporate environments like cable television.²³ The owner's and service manual for the Laser Juke gives an overview of how each of these important parts functions to receive a selection from the user, queue it, and then find the disc with the selection, and play it. Other essential parts of a working Laser Juke of course include an amplifier, a speaker system, and the monitor, for which the autochanger supplies outs.

The LC-V20-K/LC-V20 Video Disc Autochanger can hold a total of 25 20cm laserdiscs. It weighs 64.5 kg with 64.2 (W) x 78 (H) X 42.5 (D) cm and takes AC 220V/240V.²⁴ When given commands from the selection commander, the autochanger consists of the disc storage, the disc clamper, and the dual-pickup disc player all controlled by the microprocessors. The disc clamping mechanism the autochanger uses works well for laserdiscs which do not experience degradation from being handled on their surface. The disc clamping mechanism is attached to the arm, which moves laterally (horizontally and vertically) to select the appropriate disc from the storage. The discs must be installed in the correct order, with side A facing up. The loader also has designated space for five advertising discs, leaving 20 slots for the juke discs. The

²¹ madpioneer, "PIONEER Technologies & Innovations-LD Autochanger System," *Pioneer*, published 17 June 2009, accessed 24 November 2019, YouTube, 2:03, <https://www.youtube.com/watch?v=c8GADxWKEKM>.

²² Michael J. Corbett and Alvin S. Topolski, *Wurlitzer Co.*, 1975, "Record selector mechanism for a phonograph system," United States, <https://patents.google.com/patent/US3976301A>.

²³ madpioneer, "PIONEER Technologies & Innovations-LD Autochanger System."

²⁴ Pioneer Electronic Corporation, "Selection Commander LJ-V20/Video Disc Autochanger LC-V20 Service Manual," July 1988, 139.

autochanger then has multiple outs: headphones out and level control, audio out with two levels (for juke level control and advertising play level control), two video outs (juke play only and juke play advertising play combination; both NTSC video only), the control for a maximum of three selection commanders, and the AC outlets.²⁵ Lastly, the autochanger has a window so that users can see their discs being moved into the player.

The autochanger is essentially the same machine for the karaoke machine and for other applications, although it is branded and packaged with the selector. The selector, however, is the machine that controls the video disc autochanger and makes the Laser Juke specific to its purpose. The selection commander can be installed in the laser juke system rack on top of the autochanger, which is on wheels, or it can be wall mounted.²⁶ Additionally, the autochanger can accommodate up to three selection commanders installed all over the space. The selection commander consists of the menu board and illumination, selector and arm, and coin acceptor. On the operation display, the commander shows the “deposit coins” and “make selection” instructions, the number of “selection remainings,” the indication of which music was selected and is currently playing, and the operation keyboard.²⁷ Additionally, the selection commander has several options for play: the owner can set the number of discs present in the autochanger. They can also change the charge settings with options expansion, test, and free with additional settings for applicable coins.²⁸ The pricing is then auto-set based on those region settings (this manual, a European one, shows options for UK, France, Spain, Italy, and West Germany). The selection commander also offers several options for showing the best hits, skip, stop, and

²⁵Pioneer Electronic Corporation, “Selection Commander LJ-V20/Video Disc Autochanger LC-V20 Service Manual,” 141.

²⁶Pioneer Electronic Corporation, “LaserJuke NTSC LC-V20/LC-V20-K Operating Instructions,” 4.

²⁷Pioneer Electronic Corporation, “LaserJuke NTSC LC-V20/LC-V20-K Operating Instructions,” 19.

²⁸Pioneer Electronic Corporation, “LaserJuke NTSC LC-V20/LC-V20-K Operating Instructions,” 21.

playback for advertising play. Lastly, the selection commander can be connected to a printer which can output data about the performance of the machine.

Discs!

The last, and most essential, component of the working Laser Juke equation is, of course, the disc. The Pioneer Laser Juke model LJ-V20/LC-V20 only takes 20cm or 8-inch laserdiscs. Originally, this size of disc was produced exclusively for the laser karaoke machines popular in Japan. When Pioneer began distribution of the Laser Juke in 1986, they followed a similar model for distributing content for the karaoke machines as well as a well-established model by the jukebox industry with discs sent out on a subscription model to machine owners and operators. Users were then expected to return the discs to Pioneer, to destroy them, or to buy them for a sum (reports from laserdisc database forums estimating around £150 per disc).²⁹ The UK corporation Diamond Time also released many 8-inch “singles” on laserdisc that were also specifically for the Laser Juke.³⁰ Each 8-inch laserdisc could hold 20 minutes of analog video per side, with five music videos per side for a total of 10 videos per laserdisc.³¹ With up to 15 music video laserdiscs in the autochanger, the Laser Juke could hold 150 music videos at a time. Each disc also came with a menu transparency sheet that could be added to the selection commander display.³²

These 8-inch laserdiscs were produced mostly in Japan, with some being produced in the US and in Europe, and additionally, some produced specifically for French and Spanish markets.³³ Additional users have also reported several Laser Jukes in Australia during the 1990s

²⁹ /edwin240170, “LaserJuke 8inch – Pioneer & Diamond Time discs,” LaserDisc Database, 19 May 2006, <https://forum.lddb.com/viewtopic.php?t=225&p=7451>.

³⁰ <https://www.discogs.com/label/223555-Diamond-Time-Ltd>

³¹ “LaserDisc 8-inch disc (1983 – 2001), *Obsolete Media*, accessed on 24 November 2019, <https://obsoletemedia.org/laserdisc-8-inch/>.

³² /edwin240170, “LaserJuke 8inch – Pioneer & Diamond Time discs.”

³³ /edwin240170, “LaserJuke 8inch – Pioneer & Diamond Time discs.”

as well. Users have also noted that the picture quality is especially high with the later discs, and some laserdiscs featuring rare content that was only ever distributed via the 8-inch music video laserdisc format (i.e. Australian music videos, some rare underground material that might have been more promotional material than licensed jukebox laserdiscs, and others). Another intriguing timeline question arises in terms of the gradual obsolescence of laserdiscs in general. The last film distributed on laserdisc was *Bringing Out the Dead* (1999), and the final laserdisc titles were released in the US in 2000 and in Japan in 2001.³⁴ However, users have reported seeing very rare 8-inch laserdisc music video compilations produced and distributed in 2002. However, it is true judging by the playlists of these music video tracks (P!nk, Aaliyah, Shakira, etc.) that Pioneer was definitely still actively producing music video laserdisc compilations well into 2001, if not into 2002.³⁵ In that way, the Laser Juke laserdiscs prove that laserdisc was still fighting to be a relevant format a year after most people think it had completely stopped production. One could make an assumption about the popularity of laser karaoke and by proxy, the Laser Juke that warranted the production of these titles.

Discussions on the Laserdisc Database (LDDDB) forums have been very useful and helpful in gathering both contemporary anecdotal knowledge as well as current users attempting to rebuild their own Laser Jukes for nostalgic and media archeological reasons. Because the Laser Juke lasted roughly 15 years and was never a very popular device and did not necessarily have a huge cultural impact on its own, these resources are invaluable for gathering and excavating information about the technology and the discs that accompanied it. Especially with vendors lacking an accessible archive or resource for obsolete media, these forums are essential in decoding information from the source. For example, each 8-inch music video compilation

³⁴ “LaserDisc (1978 – 2001),” *Obsolete Media*, accessed on 24 November 2019, <https://obsoletemedia.org/laserdisc/>.

³⁵/edwin240170, “LaserJuke 8inch – Pioneer & Diamond Time discs.”

released by Diamond Time was accompanied by a 6-digit serial code: XX.XX.XX. LDDDB forum user edwin240170 (Edwin) has deciphered the first set of digits as the code for the slot the disc was meant to go in in the autochanger and the last two digits as the month of release.³⁶ These clues help us identify year of release as well as how many discs were in circulation, with LDDDB attempting to compile a database of the estimated 500+ different discs in circulation during these 15 years.

Conclusion/Preservation concerns

The Laser Juke by Pioneer was a media playback system that sought to recapture the spirit of jukeboxes of old by marrying it with the contemporary rising popularity of veejays and music videos on MTV. The video jukebox in any format – VHS, Betamax, or LaserDisc – did not last long, and it is not much of a surprise that with the end of LaserDisc came the end of the video jukebox. Even with the brief success of the CD jukebox (Pioneer's own Compact Disc Laser Juke competed with the Wurlitzer One More Time CD Jukebox), these machines failed to compete with arcade games and video games that gradually moved game play completely into the home, not to mention television. It was much more cost effective for barmen play MTV on the television than to purchase and maintain a bulky machine like the Laser Juke. Additionally, another problem that the CD jukeboxes that succeeded the Laser Juke (and for several years, were its contemporaries) faced was that, unlike during the heyday of jukeboxes from the 1930s-1960s, singles tended not to be released until after the albums, meaning that licensors could not get hit songs until sometimes 18 months after the release of an album with that number on it.³⁷ CD jukes flooded the market in the 1990s, but reports still noted that in 1995, 60% of all jukeboxes in the United States were still conventional jukeboxes playing 45s.

³⁶/edwin240170, "LaserJuke 8inch – Pioneer & Diamond Time discs."

³⁷Segrave, 287.

The Laser Juke can be seen as a short-lived novelty object that attempted to capitalize off of both the MTV craze and the booming karaoke industry in Japan; however its existence still merited the production of over 500 unique laserdiscs, some with unique material. It is difficult to say how many of those discs hold music videos that are not available anywhere else, but the amount of promotional discs and complimentary discs that also went out to distributors can also represent large swathes of music videos that may not exist in a better format. In that respect, it is important to consider the quality of laserdisc video (some compare it to 16mm with VHS quality being 8mm), which may be superior to other examples of the same video that may exist elsewhere. Only a few 8-inch laserdiscs were made with a polycarbonate substrate, meaning most 8-inch laserdiscs were made of acrylic.³⁸ Bob Niland, who documented most of laserdisc information and construction from a user's standpoint posits that the protective layer's failure in laserdiscs made with acrylic substrates may be a major factor in "laser rot."³⁹ Laser rot appears as noise or snow as well as streaking and the degradation of the image over time; it can have many causes, "the most popular being oxidation of the data layer from within the disc."⁴⁰ Because the disc has no physical contact during playback, the amount of use has nothing to do with rot, and this noise can appear at any time in a laserdisc's life. For these reasons, more important than the general shelf life of a laserdisc is the shelf life of a laserdisc that has been properly manufactured as well as its storage during its life. This all being said, laserdiscs are great candidates for digitization because proper storage will only minimize chances of laser rot and not prevent it completely.

³⁸"Diamond Time Ltd," *Discogs*, accessed on 24 November 2019, <https://www.discogs.com/label/223555-Diamond-Time-Ltd>.

³⁹"Diamond Time Ltd," *Discogs*.

⁴⁰"Diamond Time Ltd," *Discogs*.

Preserving the Laser Juke itself is another matter. 8-inch laserdiscs can be played by any laserdisc player (although it may possibly need to read analog sound depending on the disc), and therefore digitized without the intended playback device. Luckily, this means that the preservation of the content is not contingent on a functioning device, and, given the high costs of preserving a machine of this complexity, it may not be prudent to invest in preservation of a working Laser Juke. That being said, the Laser Juke does represent a relic of the MTV generation as other enterprises attempted to capitalize on the massive rise in popularity of music videos. It also, according to Kerry Segrave, represents the last gasp of a dying jukebox industry trying to compete with television and the mass availability of music. For enthusiasts, restoring and owning a Laser Juke, which are still available in a variety of conditions on resale sites like eBay, is like owning a part of a very niche history: the aesthetics of the Laser Juke recall arcade games and other late '80s/early '90s audiovisual nostalgia. Documentation by enthusiasts of their working machines can preserve their brief mark on audiovisual history, but otherwise, the Laser Juke is a small outgrowth in a much larger lineage of technological advances that moved Pioneer from laserdiscs to other optical discs and into the digital age.

Annotated Bibliography

Corbett, Michael J. and Alvin S. Topolski. *Wurlitzer Co.* 1975. "Record selector mechanism for a phonograph system." United States. <https://patents.google.com/patent/US3976301A>.

This patent for the Wurlitzer company's record selector mechanism acts as a precursor to the ideas behind the disc autochanger developed by Pioneer Electronics Corporation to change between many discs for a commercial setting.

Denisoff, Serge R. *Inside MTV*. London: Routledge, 1988.

Denisoff's book catalogs the beginnings of television station MTV, documenting conversations between producers, technicians, and veejays leading up to MTV's launch in 1981. These conversations through Denisoff's historical lens set the scene for the interest the music industry had in finding a way for distributing music videos in a profitable manner.

u/edwin240170. "LaserJuke 8inch – Pioneer & Diamond Time discs." LaserDisc Database. 19 May 2006. <https://forum.lddb.com/viewtopic.php?t=225&p=7451>.

The LaserDisc Database is a resource for people currently using and collecting laserdiscs. It has a record of all laserdiscs (crowdsourced information for the most part) as well as a forum for discussing various playback devices, laser rot, laserdisc anomalies, etc. This particular forum was devoted to the 8-inch laserdiscs the LaserJuke used and users exchanging information about their own laser jukeboxes and collection of Diamond Time and Pioneer discs.

Howe, Tom. "1979: The VideoDisc Is Here!" *CED in the History of Media Technology*. Accessed on 24 November, 2019. <http://www.cedmagic.com/history/discovision-marketed.html>.

Tom Howe's website devoted to the history of CED and also a variety of video discs collects information about the advent of video discs in the 20th century. This page documents an ad for DiscoVision video discs in 1979.

madpioneer. "PIONEER Technologies & Innovations-LD Autochanger System." *Pioneer*. Published on 17 June, 2009. Accessed on 24 November 2019. YouTube, 2:03. <https://www.youtube.com/watch?v=c8GADxWKEKM>.

This video is an informative advertisement or internal informational video by Pioneer documenting their development of the autochanger system and its various commercial uses, from karaoke to laser jukeboxes to broadcast television.

McGrath, Tom. *MTV: The Making of a Revolution*. Philadelphia: Running Press, 1996.

Tom McGrath's documentation of MTV contains a very useful timeline of development and distribution as well as other information about the television program.

Niland, Bob. "LaserDisc FAQ." *Widescreen Review*. Published 1998. Archived 2003. Accessed on 24 November 2019. https://web.archive.org/web/20070711005314/http://www.access-one.com/rjn/laser/ld_faq.pdf.

Research quickly showed Bob Niland to be an excellent resource for all questions about laserdiscs, how they work, and various problems or issues encountered therein. This comprehensive PDF is an excellent resource of a variety of questions asked about laserdiscs from what they are made of to what causes laser rot to what the benefits of laserdisc are to what discs are rare and valuable and why.

Niland, Bob. "LD vs. DVD: A Fundamental Difference - Despite Similarities, LD Technology Is Not Digital." *ReplicationNews*. Published on 3 July 1999. Archived in 2003. Accessed on 24 November 2019. <https://web.archive.org/web/20080513083110/http://www.access-one.com/rjn/laser/legacy/ld96.html>.

This article by Bob Niland easily answers the question of how laserdisc video is analog.

Pioneer. "Brand/History." *Pioneer Corporation*. Accessed on 24 November, 2019. <https://global.pioneer/en/info/history/>.

Pioneer has semi-comprehensive documentation of their company and brand history that compiles various inventions and moments in Pioneer's history, included the autochanger, the LaserJuke, and karaoke machines (at home and commercial).

Pioneer Electronic Corporation. "LaserJuke NTSC LC-V20/LC-V20-K Operating Instructions."

The owner's manual for the LaserJuke autochanger and selection commander.

Pioneer Electronic Corporation. "Selection Commander LJ-V20/Video Disc Autochanger LC-V20 Service Manual." July 1988.

The service manual for the autochanger and selection commander used by the LaserJuke.

Pioneer Electronic Corporation. "Compact Disc Jukebox CJ-V55/PD-MV55 Service Manual." 1990.

The service manual for the CD JukeBox that was developed after the LaserJuke was in production serves as a good example of what became of the technology used in the LaserJuke.

Segrave, Kerry. *Jukeboxes: An American Social History*. Jefferson: McFarland & Company, 2002. Accessed on November 27, 2019. ProQuest Ebook Central.

Kerry Segrave's documentation of jukeboxes throughout American history serves more of a social and financial history than a technical one, but still provides crucial information about jukebox innovations, social conventions that changed them, and the ultimate demise of jukeboxes in our popular culture.

Wurlitzer. "One More Time CD K99/F91: Operating Instructions." Edition 4708. 2007.

This Wurlitzer CD Jukebox is cited by Segrave as an example of jukebox nostalgia in the compact disc age. The Pioneer CD Jukebox is a contemporary of the Wurlitzer if not a precursor.

"Diamond Time Ltd." *Discogs*. Accessed on 25 November 2019.
<https://discogs.com/label/223555-Diamond-Time-Ltd>.

Discogs is a website for users to buy and sell discs of all kinds. It also aggregates information about discs of all kinds. The information on Diamond Time discs helps to parse out the amount of 8-inch laserdiscs with music videos designed for these jukeboxes.

"LaserDisc 8-inch disc (1983-2001)." *Museum of Obsolete Media*. Accessed on 24 November 2019. <https://obsoletemedia.org/laserdisc-8-inch/>.

The Museum of Obsolete Media provides some information about obsolete media including years active, additional sources, technical, and social information. The information for the 8-inch laserdisc helps to confirm its purpose for karaoke machines and jukeboxes.

"LaserDisc (1978-2001)." *Museum of Obsolete Media*. Accessed on 24 November 2019.
<https://obsoletemedia.org/laserdisc/>.

Similarly, the laserdisc page for the Museum of Obsolete Media helps place the laserdisc in context with its contemporaries as well as provide preliminary information about laserdisc release and production.

"Motion Pictures Made on Phonograph Records." *Popular Mechanics*. December 1941: 76.
 Accessed on 24 November 2019.
https://archive.org/stream/PopularMechanics1941/Popular_Mechanics_12_1941.

This magazine from 1941 provides evidence of an interest in video disc jukeboxes as early as 1941, when jukeboxes were at their height of popularity.