

VHS Stocks in Their Dotage:
An Investigation of Aging Cassettes Through
Their External Characteristics

by

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Chapter 1: Introduction

VHS – the video format once so ubiquitous that when DVD arrived on the scene it seemed unnatural to refer to the new format as “video” – is now all but a thing of the past. Excepting for nostalgia and retro novelty releases (*The House of the Devil*, *Miami Connection*, *V/H/S/2*, *Lost: Season 5*, Gorgon Video’s VHS reissues), the last major motion picture released on VHS in the United States was *A History of Violence* in 2006. It was in November of that year (and perhaps on that basis) that *Variety* rather arbitrarily threw in the towel on the format, declaring in a comic obituary that “VHS, 30, dies of loneliness”.¹ Yet consumers continued to record on the format for some time thereafter: I made at least two important personal recordings on VHS as late as 2009 and have heard that year cited as a functional endpoint from other young laggards; the latest tape sampled for this project is an off-air recording of *The Imaginarium of Doctor Parnassus* (2009) which is dated as having been recorded in 2010. Many older users are likely still using VHS,² and tapes can still be found at many stores. With such a widely adopted format, and with tapes still available to buy in some places, it is difficult to say what constitutes “dead”, and we may never know exactly what date we should tell the cemetery to chisel on the tombstone. But with no professional equipment manufactured in a decade, and standing several years past the discontinuation of standalone decks (those not integrated in the same machine with a DVD player), the reliable equipment for playback and preservation becomes scarcer by the day.

¹ Diane Garret, “VHS, 30, Dies of Loneliness,” *Variety*, Nov. 14, 2006, <http://variety.com/2006/digital/features/vhs-30-dies-of-loneliness-1117953955/>
Referenced in: Lucas Hilderbrand, *Inherent Vice: Bootleg Histories of Videotape and Copyright* (Durham: Duke University Press, 2009), 3-4.

² Emily Petsko, “Still Sticking With Tape: Some Haven’t Made the Move From VHS to Newer Technologies,” *observer-reporter*, Mar. 15, 2014 (Updated Mar. 16, 2014), <http://www.observer-reporter.com/apps/pbcs.dll/article?AID=/20140315/NEWS01/140319484>

In addition to the creeping obsolescence of VHS decks, the tapes themselves are increasingly threatened by stability issues as they age. Introduced in 1976, one bullet dodged by VHS is the support film itself: the more volatile acetate and PVC tape bases that have haunted some earlier formats were phased out by the early 1970s,³ and virtually all VHS tapes can be assumed to be on a relatively stable PET support. The magnetic coating that holds the information, however, is partially organic, contains volatile oxide particles that contribute to the breakdown of the binder that holds it to the support, and is highly variable in its exact composition. It is, therefore, susceptible to most of the “standard” threats to magnetic media⁴: binder hydrolysis (also known as sticky shed syndrome, or SSS), oxide shedding, and mold.

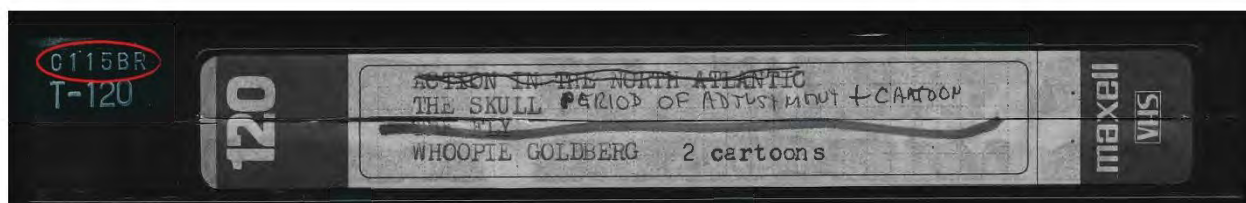
As degradation continues to increase and equipment availability continues to decrease, we will soon find our VHS collections in a state of positive crisis. Untold thousands of hours of important content – home movies, live performance documentation, trial records, instructional videos, independent and foreign films never released on DVD, obscure television programs, and any number of other works – sit on shelves on VHS. There are orphaned works that may, due to their ephemerality and copyright limbo, never again see release. Some recordings contain content, such as local television programming, that may not survive elsewhere. DVD/VHS combo decks may be acceptable for watching old store bought tapes that you didn’t want to fork out to replace on DVD, but they are not adequately reliable to risk unique recordings in them. Given obsolescence and decay, valuable recordings should be digitized for long-term preservation.

³ Richard Hess, “Tape Degradation Factors and Challenges in Predicting Tape Life”, ARSC Journal XXXIV (2) 2008, 240-274. Available online for free at:

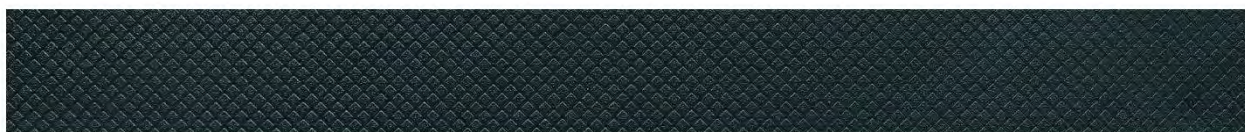
http://www.richardhess.com/tape/history/HESS_Tape_Degradation_ARSC_Journal_39-2.pdf

⁴ For an introduction to these issues see: John Van Bogart, “Magnetic Tape Storage and Handling: A Guide for Libraries and Archives” (Council on Library and Information Resources, 1995), <http://www.clir.org/pubs/reports/pub54>

Of course, the exigencies of real life often come into play. Collections can be dispiritingly large and badly labeled, and digitization is expensive. Whatever important content it may hold, a tape's lack of labeling may mean that it never receives the attention that will get that content preserved. As media ages, the feeling that it is obsolete and may be physically compromised and costly to preserve may cause owners to delay taking care of it, inevitably creating more of a problem if and when it is addressed. But in the absence of a label one could, in theory, deduce a lot about a tape from its external characteristics which could help to make informed preservation decisions. Most conspicuous are the "batch number" and the textures and designs molded in the shell of the cassette, but there are several other clues which, when correlated to other tapes, may offer important clues and avenues for investigation. Correlating this data from an



The batch number, not quite ubiquitous but very common on the spines of videocassettes, is circled in red. Image by author.



A diagonal matrix of small raised squares was characteristic of some Maxell cassettes for over two decades. Image by author.

adequately large sample of cassettes for which reliable information is available could in the first place enable the creation of a guide that would tell a user, for instance, the approximate age and brand of her unlabeled cassette. When correlated with data about the preservation status of the tapes, it could offer valuable insights into which tapes, at first glance seemingly indistinguishable from others, present particular risks of loss. Looking at the venture in the bigger picture, it has the potential to reveal telling aspects of a behind-the-scenes "secret history" of a format that

intersected with and documented an incredible amount of history in the last quarter of the twentieth century and beyond.

Naturally, the phrase “adequately large sample of cassettes” raises the question “what size sample is adequate?” The world of VHS is massive. Even within the biggest name brands such as TDK, Maxell, Fuji, and Sony, when you consider international markets, different concurrent tape grades, continual technological improvements (of binder, oxide particles, and more), and cosmetic redesigns to keep up with the times, there were an almost bewildering variety of “makes and models” of cassettes over the course of forty years. When you add in every other brand and model, from Panasonic⁵ and Goldstar on down to Trisonic and VX, from 1976 to the present day, the variety is incomprehensible. A truly “representative” sample of the entirety of the format would itself be vast and far-reaching. I have, therefore, in the course of this project, focused on a small number of sizable collections (in the hundreds of tapes) containing solid samples of tapes from major brands, as well as examples of smaller brands to serve as a base on which to build in later data gathering.

Chapter 2: The Thesis Project

From November 2014 through April 2015 I undertook a project to make useful, if necessarily limited, first steps toward a guide to VHS stocks, which will assist users in identification of tape stocks and point to observed issues with those stocks. To that end, data has been collected either in person by the author or through contributed data sets on 1,682 VHS tapes, as well as on 1,289

⁵ Panasonic points to additional layers of complexity: It was a brand name of the Matsushita Electric Industrial Co. (Matsushita has, in the current century, changed its corporate name to Panasonic), which marketed tapes elsewhere under the brand name “National”, as well as through at least one of its subsidiaries, Quasar. These connections are not always immediately obvious upon cursory (or even close) examination of a tape.

cassette of other formats for comparison.⁶ Research outside the realm of cassette data gathering was conducted with early 1980s advertisements for blank videocassettes, and in trademark registrations with the United States Patent and Trademark Office. Research will need to continue beyond the completion of this thesis, but during the stage represented by this paper and the accompanying data, images and notes have been collected by me using software on my own computers; in later stages, in order to present this data to the public and to solicit a wider representation of VHS, this guide will take the form of a wiki-style website, described further in part 2.B.iii below.

The collections from which the author has sampled are:

- The William Anderson Collection from NYU's Cinema Studies department. Recorded by an individual identified as "the librarian of the *New York Times*" over the course of a decade from 1983-1992, the collection originally consisted of some 1,588 cassettes⁷ containing primarily off-air recordings of movies (many Hollywood classics, B-titles, and films that were newly on cable when they were recorded) made in SLP mode⁸ in order to fit as much content as possible on each tape. The tapes seem to have been recorded privately, not on behalf of the *Times*, and they were donated to the department upon Mr. Anderson's death. Despite the generally low quality of the recordings, the tapes were retained by the

⁶ The non-VHS data covers Compact Cassettes, U-matic, Betacam SP, MiniDV, DVCAM, and Hi8, and it comes almost entirely from imported data sets generously provided by Ben Moskowitz of NYU's Barbara Goldsmith Preservation and Conservation Department, and Nick Pavlik of the 92nd Street Y.

⁷ William Anderson Collection inventory, NYU Cinema Studies Archive.

⁸ Briefly, VHS could be recorded in three different speeds: SP (standard play), LP (long play), and SLP (super long play, which was also known as "EP", or "extended play"). The most common consumer tape sold in the U.S. and other NTSC markets was the T-120, where "120" indicated the number of minutes the tape would hold when recorded in SP mode (though they would in practice often hold up to 122). The same tape would hold four hours in LP mode, or six hours in SLP. Early on, when recording quality was the paramount marketing concern, a T-120 cassette would be marketed as a two-hour tape; in later years, when taping was firmly established and recording quantity eclipsed recording quality in the eyes of many consumers, it would more often be labeled as a six-hour tape.

department for research purposes due to their richness in titles not then commercially available on video. They are now being deaccessioned since many more of the films have become readily available, and DVD-R copies are being made of those still not available elsewhere.⁹ Approximately 1,100 of the tapes came to NYU, of which several hundred tapes were discarded before the collection came to my attention, and perhaps 300 have yet to be deaccessioned. A sample of 195 of the tapes is in my possession, which in tandem with the tapes' official status as garbage has allowed me to perform semi-destructive research on them, to study them particularly closely, and to image them under consistent conditions. Perhaps their greatest value comes from the fact that Mr. Anderson was recording large quantities of content over a long period of time, to be kept permanently and (in general) not recorded over, and kept a scrupulously recorded card catalog of the dates and decks on which the content was recorded. Consequently, there is a very high incidence in his collection of apparent matches between cassettes and their original sleeves, and it is evident that he regularly used tapes up quickly after buying them, and they are more precisely datable than many otherwise comparable tapes that one might encounter. Collections of this character are particularly useful in establishing a timeline of stocks. Mr. Anderson's selection of stocks tended toward the big brands – TDK, Sony, and Maxell – but ventured into others, including Agfa, Chandi (a New York-based seller of photographic goods which appears to have bought Konica videocassettes and sold them in rebranded sleeves), Konica by its own name, and Kodak.

- Additional tapes discarded by the NYU Cinema Studies Department. A discarded portion of one teaching collection is very weak in specific dates, but has been particularly useful in

⁹ E-mail from Ann Harris, Mar. 6, 2015.

providing images of examples of a variety of slight variations among two versions of a TDK sleeve dating from the early to mid-, and mid- to late 1980s, as well as of various unused label sheets which the tapes' original owner retained in their original boxes.

- The recently acquired National Dance Institute (NDI) collection at New York Public Library's Library for the Performing Arts at Lincoln Center (LPA). The collection primarily documents the performances and activities of NDI, a non-profit dance education operation founded by Jacques d'Amboise in 1976. The collection contains over 700 VHS tapes recorded between 1980 and 2006. The particular strength of the collection for the project at hand is that the author rehoused the tapes in the autumn of 2014 during an internship at LPA, and was allowed to retain many of the sleeves that would otherwise have been discarded. Consequently, many images were gathered, and it was possible to examine the sleeves in more destructive ways than would ordinarily be permissible with an archival collection. Additionally, I was able to collect data on many of the tapes in person both during the inventory, and in subsequent visits to LPA.
- Metadata spreadsheets on the Mikhail Baryshnikov Archive at LPA. These provided data (frequently including stock lengths, batch codes, brands, dates, and recording standards) on 194 cassettes, including several PAL tapes and a number of potentially illustrative non-VHS examples.
- VHS camcorder recordings documenting dance performances at the 92nd Street Y (92Y). Dating from 1985-2007, 92Y's collection of in-house dance recordings contains many interesting brands and stock types, representing a wide range of levels of quality, from very cheap stuff (including brands such as Coby, Gemini, and Saiko, which I did not find in other collections) to broadcast quality Fuji and 3M stocks formulated for use with the short-lived

broadcast-quality M-format. The correlation between tapes and their original sleeves is also quite strong at 92%.

- A small number of recordings from the Manny Harriman Video Oral History Collection held by the Tamiment Library and Robert F. Wagner Labor Archive at NYU's Bobst Library. These presented helpful samples of certain Scotch and Maxell stocks dating from the mid-1980s.
- Several small groups of privately held tapes, including several of my own and my wife's families' home videos and off-air recordings, four tapes of a friend's home movies from Ireland dating from the late 1980s and early 1990s, and an assortment of late-model name brand and unusual off-brand tapes acquired at the Omega Thrift Shop near my apartment in Woodside, Queens. These collections injected some extra variety into the sample and the image collection, providing some representation of tapes manufactured for the PAL market, as well as a few useful examples of tapes falling later than the date range generally represented by the institutional collections.
- A large set of data from NYU Libraries's Visual & Playback Inspection Ratings System (ViPIRS) project. Strong in brands, formats, and batch codes, ViPIRS provided by far the largest representation of non-VHS tapes for comparison, and filled in many thin areas of batch code collection.

Building a comprehensive picture of the VHS format over the course of its history is a project that will keep me working for years to come, but in this smaller thesis project, a ground has been laid for that work. Activities performed on the project so far, reflected in this paper and its accompanying appendices and attachments, have been:

1. **Imaging of exemplifying cassettes and sleeves.** All surfaces of representative cassettes, their sleeves, any apparently original inserts (usually sheets of labels, but in one interesting case there was a sheet of coupons for “great snack products for you to enjoy while watching shows you’ve taped on your Sony Videotape”), and any intact printed wrappers. An article was deemed “exemplifying” if one just like it had not yet been scanned. Minor differences in print quality on sleeves were not deemed to be “differences”, but any changes in text or layout were.
2. **Gathering data from cassettes and their boxes.** Where practicable very detailed data was collected, with fields provided for local and data set ID numbers, brand, stock numbers, plastic colors, part numbers, descriptions of cassette exteriors, and more.
3. **Working Toward a Guide to/Timeline of VHS Stocks.** The images made, data collected, and difficult-to-quantify observations have been synthesized into appendices to this paper, which take steps toward a functional guide to dating and branding tapes.
4. **Preliminary testing of different stocks in one collection, looking at how they have held up over the years.** Tapes from the Anderson Collection were monitored for two minute periods at the head, middle, and near the end of the tape on a Panasonic PV-9450 VCR, the heads of which were regularly checked for residue and debris from the tapes. Detailed notes were taken on the incidence of video errors occurring onscreen. These notes were added to the entries for these tapes in the data set, and thereby associated with the stock type through their linkage to the exemplifying images. In order to build a completer picture of those stock types and their performance under different circumstances, a full-length and better-equipped analysis of tapes from a broader-base of collections is to be looked to in the future.

2. A. Imaging

The images collected for the project serve dual purposes: First, they serve as a sort of visual “controlled vocabulary” of stock types to illustrate tapes entered in the data set. But the image collection is also an end unto itself, reciprocally supported by the data set. It serves to build a visual guide to the history of VHS stocks. Combined with the associated dates in the data set, and with certain other informative sources (to date, advertisements in early issues of *Video Review* and news columns in the *SMPTE Journal* have been useful in dating when certain manufacturers changed their designs¹⁰), it should be possible to construct a notated visual timeline of the production history of the VHS format.

For each unique cassette or sleeve type, a set of images of every surface was scanned. The image sets were named by brand, object type, and place in the sequence in which the object was scanned. If a first example of a sleeve type was found paired with an apparently or certifiably matching first example of a cassette type, the two were given the same number in sequence. If one cassette type was found to be associated with two or more sleeve types (or vice versa), the cassette would be given only one number, but connected with all appropriate sleeve types by association in the tape data set.

In the data set, sleeve/cassette pairs were considered *certifiably* matching only in the relatively rare cases that they were found sealed and opened for purposes of this project. Far more

¹⁰ It is hoped that in the future, contacts may be made with the corporate historians of brands that once sold VHS tape, and that they might provide some documentation of this history. Inquiries to public-facing access points at major manufacturers have been dead ends, met either with silence or polite refusals by gatekeepers far from the engineering or corporate history departments who could give informed answers. One typical correspondent wrote that “unfortunately that information is confidential because of patents and can't be disclosed”. In some cases – particularly TDK which has a museum dedicated to its history at its Nikaho factory – the home bases of international corporations may be more willing and able to dig into these issues, but language barriers have thus far been a challenge to making those connections. If and when connections can be made in the appropriate departments, much may be revealed.

tapes were deemed *apparent* matches on the basis of deductive reasoning. For example, because the nine sleeves seen below contain essentially identical tapes (and, in this instance, bear many other marks of matching: many more such matching examples have been found in other collections, and these tapes and sleeves all bear detailed and matching content labels), and were used in such a way that suggests a relatively low probability of sleeve swapping, these were deemed “apparent matches”. For purposes of the image sets, this was considered adequate to number them together.



Nine identical sleeves containing nine identical tapes, recorded under circumstances that do not lend themselves to a high likelihood of sleeve swapping, these presented a strong case for being declared an “apparent match”. Image by author.

Different letters were assigned to each type of object, including tapes, sleeves, label sheets, other inserts, and wrappings, and separately to each surface of each type of object. For example, the filename for the front of a certain sleeve is Agfa-00001S_A.jpg, and that for the right edge of the tape contained in that same sleeve is Agfa-00001T_E. “Agfa” indicates the brand, “00001” indicates the sequence in which these images were taken in the collection of Agfa image sets, “S” and “T” denote “sleeve” and “tape”, and “A” and “E” indicate the front of a sleeve and the right edge of a tape, respectively. This system is fully documented in appendix F. When destructive examination of non-archival samples turned up valuable information concealed under flaps,¹¹ additional scans were taken of those areas. These images are associated with the image sets for complete data gathering, but do not have a designation as a part of the exemplifying image set.

¹¹ Some tapes – including early JVC and Panasonic stocks, and some Sonys from the mid- to late 1980s – have printer’s keys (discussed further below) printed on the concealed flaps. The names and locations of the printers of the sleeves are also not uncommon.

Due to the nature of the samples – the vast majority of them are used tapes, and boxes are often scuffed and labeled – exemplifying images have occasionally been superseded by cleaner samples. When identical tapes have been found associated with differing sleeves (and vice versa), the same exemplifying tape image set is associated with the different sleeves. In other cases, additional images of equal quality may be captured of the same tape or sleeve design, but which better show some aspect of the object, or perhaps show a variation in labeling but not in the item itself. For instance, if a sleeve in pristine condition but with a label obscuring the spine is imaged, an identical but badly scuffed sleeve with no spine label may be found. In such a case, the second sample may be scanned and the images given the same name as the first set, but with a lowercase letter to designate the additional sample following the capital letters designating the surface pictured.

2. B. Gathering Tape Data

i. In Person

As discussed above, data on tapes and sleeves was gathered from several sources. Initially a FileMaker database was built to house this data, both to assist in maintaining controlled vocabularies, and to enter data separately on tapes and their sleeves, due to the uncertainty of their original connection in many collections. It was realized in the course of this data gathering, though, that the amount of information on many sleeves (sometimes including large amounts of text, scientific charts and figures on the size of the oxide particles on each tape in the company's line, recommended uses, and much more) did not lend itself to adequate description in the database, and that to enter that information repeatedly for identical sleeves was senseless when a completer picture could be gathered from the image. For this reason, data gathering on sleeves

was limited to exemplifying sleeves, with a separate document maintained to describe each by the identifying number of its image set. The “Contained by” field, initially created to designate the specific sleeve which contained a cassette, was thus adjusted to indicate the image set of the exemplar of the containing sleeve. Additionally, it was found that for manually inputting and manipulating large quantities of data, the use of Excel spreadsheets, which seemed at first primitive and inadequate, provided a simpler and more flexible interface than at least this author found in FileMaker.

While it was decided to individually describe only exemplar sleeves, data has in many places been entered on individual cassettes. It is true that detailed descriptions of tape textures become both redundant and difficult to manage consistently (some sample descriptions for top-side textures: “Traversed above and below window area by five sets of five indented lines each, and across window area by a wider-spaced set of eleven indented lines”, “Pebbled”, “Vertical columns of small raised horizontal rectangles, each two rectangles wide except for at the center [three wide] and on the edges [one wide each]. Horizontal matrix of larger rectangles in an indented field in hand grip area.”), but these descriptions do communicate certain distinctions that are difficult to grasp from two-dimensional images, such as whether a grid of shapes is raised, indented, or raised in an indented field. Additionally, with all of the batch and part numbers collected from the cassettes, there is such a preponderance of non-repeating data that it was deemed necessary and worthwhile to describe each tape individually. Now that a great deal of descriptive data and images have been captured, it may be worthwhile in the future to create a table of exemplifying cassettes much like that for the sleeves, incorporating the textural descriptions, so that when associating a tape with a collected image one can compare it to both the photograph and a written description.

The key identifying data points captured when possible were the earliest apparent recording date on the tape's content, any dates on the media itself (these would come almost exclusively from sleeves or inserts), the standard stock number (the T- or E- numbers¹²) and variant or branded expressions of the stock number, the place of manufacture, the batch number, and numbers molded into the reels, under the gate, on the underside of the cassette, and in holes in the underside. Along with batch codes, these last – the numbers in the underside hole – seem the most potentially telling of all of the “part numbers”. Those on the gate and other parts of the cassette body often appeared to match one another in a way that suggested that they were simply numbers placed to denote that the parts went together in a certain way. The numbers on a given tape's two reels are almost always of a similar structure to one another, but seldom bear any apparent relation to numbers on the rest of the cassette. All of these numbers may be telling of where the parts were manufactured, and are perhaps all the more valuable for the fact that the structures of the numbers, particularly on the reels, are often shared in common among tapes of different brands. But the numbers in the underside hole seldom seem to correspond to other part numbers on the cassette body, and often hew to specific structures of their own. The form shown here – numbers over letters with a line in between, and with an “L” to the right of the line, is

$$\frac{223}{AS} L$$

A common structure for a number
in the underside hole. Illustration
by author.

¹² Though none appear yet in this data set, VK- numbers – used by some brands in the early years of VHS and denoting the tape's approximate length in meters rather than its estimated recording time – would also be entered in this field.

Particularly common. One possibility, given the “L” and the somewhat frequent presence of license numbers on other cassettes, is that some of these numbers may denote the license from Matsushita under which the tapes were manufactured. Whatever they denote, the numbers typically seem unrelated to any others on the cassettes, and it is hoped that they may prove informative. The dates on media itself, indicated above, were exceptionally helpful, and with the exception of copyright dates (which are not necessarily precise, since a sleeve that is ©1985 may still have been printed for tapes manufactured in 1988) were almost always found in hidden or surprising places. The most common and most precise dates were found in the form of printers’ keys¹³ concealed under the flaps at the top or bottom of a sleeve, as seen here:



Printer’s key concealed under the flap of a Panasonic sleeve, evidently printed on February 6, 1986. Image by author.

The connection between a sleeve and the tape it contains is obviously not assured – perhaps a shipment of sleeves covered six months’ production of videotapes! – but since both are used up and replenished, some proximity can be expected in normal cases.

The colors of the reels, hub locks, gate, gate lock, and cassette body were recorded as well. Also collected, but less frequently containing much variation, was the language of any text on the cassette. Identifying information on the collection from which the tape came, and on the tape both within the collection and the data set, were recorded as well, along with a ranking of the certainty

¹³ A printer’s key is a section of print, most famous as a tool for determining if a book is a “true” first edition, in which printers identify print runs or dates by successively removing pieces of type. The lowest piece of type remaining indicates the run or date of the item printed; in this illustration, “86” is the lowest year remaining, “2” the lowest month, and “6” the lowest day, indicating February 6, 1986.

of a tape's match with its sleeve ("verified", "apparent match", "uncertain", "mismatched", or "no/generic sleeve"). Finally, the descriptions of cassette textures discussed above were entered for both the top and bottom surfaces of the cassette. All number fields were free text, while colors, place of manufacture, and language drew from controlled vocabularies (found below in appendix G). Language and place of manufacture were initially planned as repeatable fields, but for ease of display in both Excel and FileMaker's table view (which was used almost exclusively for early data entry), combinations were added to the controlled vocabularies. The descriptive texture fields were free text, but for consistency a .txt file was maintained with a list of many common descriptions.

Though much effort was spent modeling¹⁴ and building the FileMaker database (the conceptual framework of which was carried over into the eventual Excel spreadsheets) so that tapes could be described in a way that was at once quite detailed and rigidly structured for consistency, and though it was successful in most respects, the practice of fitting real-life objects into the form of a data set was not without its headaches and shortfalls. The first difficulty encountered was in the area of colors. It is hoped that in future phases of this project, this data will be moved into a wiki-style database to which others can contribute; as such, many users must be able to enter data in a consistent manner. One common color for hub locks, particularly in tapes manufactured by TDK, was cadmium red, a vivid red hue that pushes toward orange but never quite crosses that line. Less common but by no means unheard of are "scarlet" and "fire engine red" hub locks. It is tempting to make those distinctions – they are objective differences, and the three colors almost certainly indicate different things in a tape's history – but it may not be recognizable from the images, viewed on differently calibrated monitors everywhere, and it would likely be

¹⁴ The initial data model for this project was developed by the author as a project in Kara van Malssen's Digital Preservation class in the fall of 2014.

confusing to users whose conception of “scarlet” is different from my own. Still more difficult are the gradations of white. There are countless shades represented in the VHS reels and hub locks of the world, and the distinctions between “eggshell”, “cream”, and “bone” may be worthwhile if one could bring those reels and hub locks together in a room and arrange them by shade. But remembering what one called each shade and reliably mentally placing each emerging object among all the ones that have gone before is a highly specialized talent that I do not have, and that users of and contributors to a guide of this kind could not be expected to have. It was decided early on to make a distinction between “white” and “cream”, but even those began to drift dangerously into subjectivity, and the two were eventually collapsed and both called “white”. Data collected using the “cream” descriptor has been retained in a separate document, in case the day should come when that distinction proves useful. The matter is compounded by the fact that the current state of the whites and creams of many reels appear to be the result of discoloration. Indeed, certain reels are quite yellow, and one might guess that they were not always so. Much scientific research has been done on the discoloration of plastics,¹⁵ and it would be interesting to have cream-colored reels chemically tested to learn which are actively degrading and which were probably off-white in the first place, but for data entry purposes the decision was made to describe all white and off-white pieces “white”. For yellow pieces that appear originally to have been white, “Yellow(ed?)” has been added to the controlled vocabulary of colors in order to adequately distinguish them from parts that were clearly intended to be yellow.

¹⁵ For an advanced treatment of the subject see: D.A. Holtzen, “Polyolefin Discoloration”, *Plastics Compounding*, Nov./Dec. 1991, 38-44.

For an easy and highly Googable crash course, look to: Benj Edwards, “Why Super Nintendos Lose Their Color: Plastic Discoloration in Classic Machines”, *Vintage Computing*, Jan. 12, 2007, <http://www.vintagecomputing.com/index.php/archives/189>

Another regrettable difficulty comes with the batch numbers and alternate stock numbers. While the data set serves to collect these codes in such a way as to help draw correlations and enable patterns and meanings to be found, it does not account for font and style. That some are printed in difficult to read black ink, some in blazing white, and some etched almost crudely, is not captured in the transcription of characters, yet it might say as much about when or where a tape was manufactured as the characters themselves.

Finally, while fields for language and place of manufacture do reflect molded text saying “Made in ...” and the common **“Insert this side into recorder ↑ Do not touch the tape inside”** text, the very presence or absence, and exact phrasing and capitalization of these phrases could be significant. Likewise, many tapes have a cartouche on the bottom surface, sometimes with “Made in” text, sometimes with a license number, occasionally with a brand, and sometimes either filled in with blocks or left blank. Going forward, it would be better to transcribe or describe the contents of the cartouche exactly, rather than only using the information contained therein to populate other fields.

These challenges point again to the difficulty of conforming highly variable real-life objects to a consistently structured data set. It is fortunate that the information the exclusion of which I have here bemoaned is not in fact lost, for it appears in the image sets. Nevertheless, going forward it may be useful to add additional fields to account for these situations.

The deaccessioned sample of the Anderson Collection that is in my possession has been perhaps the most comprehensively useful. The detailed records of the dates of tapes’ use, and the strong surviving tie between them and their sleeves, make this collection a treasure trove of reliable information on the stocks represented therein. Its deaccessioned status has allowed me to slit open the flaps on many sleeves in search of hidden information, and to use the tapes for a pilot

project in error monitoring. It has also allowed the tapes to reside in my apartment, granting me unlimited access to them for all of these purposes, as well as to scan them. Because of this unfettered access, and the variety of brands, years, and stock types represented, these form a plurality of the tapes and sleeves scanned to date.

Another smaller group of tapes (24 in number), also deaccessioned from the Cinema Studies Archive, is believed to be from the Robert Sklar Collection. These supplement the Anderson Collection tapes nicely, dating from a similar period and adding certain stocks missing from the Anderson tapes. Dates for use on the Sklar tapes are not as strong as the Andersons, but there does appear to be a very strong correlation between the tapes and their original sleeves, and many contain complete original sheets of labels (the tapes themselves are labeled with yellowed masking tape).

The NDI Collection was exceptionally useful for collection of data points on tapes – I was able to spend several days there gathering data during the 2014-15 holiday break, and the largest volume of very detailed descriptions of tapes comes from this collection. Due to their institutional-documentary nature, the tapes are quite strong in their dating. Additionally, as I rehoused the tapes in that collection in the fall of 2014, a process during which NYPL conventionally discards the original housings in preference for more protective, archivally sound cases, I was generously allowed to retain many of the sleeves for study. Consequently, a large number of sleeve images comes from this collection. Unfortunately, the scanner at LPA takes images much more slowly and of a very different visual quality than the one used for the Anderson samples and the NDI sleeves (a Canon Pixma 990), so few of the NDI cassettes themselves were imaged for this project. It is hoped that more of these tapes may be scanned in the future. Additionally, it should be noted that the correspondence between tapes and their original sleeves was weaker in this collection than in the

Anderson tapes, though it was frequently possible to make informed guesses as to which tapes had gone astray from their housings.

The recordings at 92Y represent a fascinating array of brands over quite a long period of time. Stocks range from standard grade obscure brands such as TRAC III and Coby on up to professional grade brand-name M-format tapes. Due to the nature of the tapes' use – they appear to have been purchased new, and were used to permanently document dance performances – there is in general a very strong correspondence between tapes and their sleeves, and the content is very strong in dating. As at LPA, the scanner at 92Y captures images of a disconcertingly different quality from that used for the Anderson tapes, so few images taken there appear in the image



Left: A cassette imaged on the Canon Pixma. Right: An identical cassette imaged on the scanner at 92Y. Photos by author.

collection. However, the diversity of tapes there and the future prospect of accepting data and images from many other contributors raise important questions about imaging. Since it is not reasonable to ask that all future contributors buy a Canon Pixma 990 printer/scanner and maintain the same light levels observed during scanning in my living room, it must be expected in the future that some images will vary in their visual qualities. They may be lighter or darker, and may render images in slightly different ways, and this – supplemented with physical descriptions – will need to be acceptable in order to reap the greater benefits of a collaborative process.

Some detailed data was collected in January 2015 on a selection of the 92Y tapes, focusing on file boxes known to contain some of the more unusual cassettes. Perhaps the greatest strength of the 92Y collection for this project at this stage is that when I inventoried the collection in the spring of 2014 I was able to include batch numbers, brands, dates, and stock numbers as they are stated on the tapes or sleeves (essentially the “alternate stock numbers” in this project’s data set). The archivist at 92Y, Nick Pavlik, generously supplied me with a copy of that inventory, and consequently a significant collection of meaningful batch code and alternate stock number data.

The personal tape collections have been small helps in adding detailed data and images from some otherwise unrepresented stocks. The Irish home videos provided a glimpse, however small, of tapes from a PAL market.¹⁶ The Omega Thrift Shop tapes offered rare samples of “old new stock”, with several tapes still in shrink wrap, allowing for absolutely certifiable connections between tapes and stocks. With additional offered samples hopefully coming this summer, this is an area which can and, in the near future will, expand.

ii. Importing Data

Several sources of precompiled data – the set I gathered in 2014 at 92Y, and particularly the ViPIRS tape data and the Baryshnikov spreadsheets from LPA – have been instrumental in strengthening weak areas of brands and batch codes. The difficulty in importing others’ data is that it is harder to confidently make sense of what appear to be keying or reading errors (this is particularly difficult with batch codes, in which it is frequently difficult to distinguish between 0s,

¹⁶ Given the international nature of the VHS market and the corporations that served it – a Japanese concern may have manufactured tapes at the same plants for many international markets – distinctions between tapes from these different markets may offer critical insight into distinctions in batch and part numbers.

Ds, and Os, 1s and Is, etc., and where patterns of letters and numerals can be especially telling,) but the advantages of these enlarged data sets far outweigh the drawbacks of potentially false outliers.

iii. Casting a Wider Net and Examining the Fish More Closely: A Plan For the Future

Moving into the future with this project, it is evident that if imaging and detailed description of tapes are to continue, and eventually succeed in the creation of a broad-based picture of VHS, it will not be accomplished by me alone. The diversity of tapes encountered and describable by one person, even if he were at leisure to spend a great deal of time on the project over a period of years, is simply not equal to the needs of the task. To enable broader based description, I propose to establish a wiki, seeded with the data and images from this study, to which others can contribute their own.

In order to allow for entry by people who do not have time to describe tapes down to their colors and part numbers, only a small core set of data points will be deemed mandatory, with extra groups of fields available for those with the time and motivation to describe in deep detail. The required fields for a cassette would be Date on Content, Date on Stock, Brand, Alternate Stock Number, and Batch Number. For any of these, “none” or “unknown” would of course be acceptable values.

Additional sets of fields would be available for colors (including an added field for the reel brake release, which is seldom but occasionally colored white), patterns, part numbers (with additional fields to account for numbers in the gap near the gate, and by the gate lock), and references to exemplifying images of tapes and their sleeves, along with functionality and standards for uploading images of previously unimaged models and designs. If an exemplifying sleeve is

associated with the tape, it would be required to declare a measure of certainty of the match, as set forth in section 2.A. Finally, an additional set of optional fields would include Place of Manufacture, Branding Words, Intended Recording Standard, Language, and four new fields which, in retrospect, I wish I had collected on. The first is weight: I have observed tapes weighing more than 9 ounces, and as little as approximately 6, and this may be a very useful indicator of both a tape's identity, and its likelihood of mechanical failure.¹⁷ The second is brittleness: when removing a tape's record tab, some break "softly", hanging on to the cassette and requiring a twist to finish removing, while others snap and fly across the room. A seemingly minor detail, this is a unique opportunity to gauge a significant variable in the composition of the cassette's plastic. Third and fourth are the previously discussed fields for cartouche and gate text.

Finally, in implementing this collaborative database, it would be a great boon to incorporate machine learning algorithms to mine richer, less obvious trends from the collected data. Even in the data set as it stands today, there may be findings lurking unfound among the part numbers and places of manufacture. It is hoped, and indeed expected, that the power of modern computing will be able to uncover this knowledge more effectively than the eyes and brains of one graduate student.¹⁸

¹⁷ Interestingly, a lightweight tape may not quite always be a sign of mechanical instability: U.S. Patent number 6,302,344 is for a "videocassette that is lightweight and has a virtually indestructible housing", with the concept that a very light, durable cassette could be made to be sent cheaply through the mail. A fun and potentially productive future project could involve controlled impact testing to find how these and other tapes hold up under trauma.

USPTO, Patent Full-Text and Image Database (hereafter "PatFT"), "Lightweight Video Cassette", pat. no. 6,302,344.

¹⁸ Conversation with Melissa Egan, Dec. 13, 2014.

E-mail from M. Egan, Jan. 16, 2015.

2. C. Coming to Conclusions

With the data and images collected – and sometimes the simple benefit of half a year’s immersion in VHS – a number of tentative conclusions have been reached so far. Some are ways in which it is seemingly possible to date certain tapes; others draw apparent connections between brands both large and small which appear to have bought cassettes from other manufacturers to rebrand and resell. Some of these findings are written up below in chapter 3, and more are to be found in the appendices.

2. D. Research Outside of the Tapes

While gathering data on the uses of branding words and correlating them with images of sleeves and tapes should eventually net strong real world results in datability, it seemed desirable to lay the groundwork of a chronology by researching brands’ public presentation of themselves. Two major sources were used for this research: advertisements for and illustrations of blank tapes, which I had found to be abundant and very regular in early issues of *Video Review*, and trademark registrations of tape brands and features. Since certain brands, particularly Fuji, Maxell, and TDK (as well as Sony, though they were at that time manufacturing cassettes exclusively for their competing Betamax format,) advertised every month, the advertising angle revealed during what periods brands actively publicized which of their sleeve, cassette, and label designs. Images were collected of advertisements dating from 1980-82, and have been useful in building a picture of years not heavily sampled for this project. Chronologies of representations of and by the three above-named brands during those years can be found in appendix B, and additional images are included along with the collection of tape and sleeve images that accompanies this paper and data set.

As for the trademark registrations, trademarks are only legally protected as long as they are in use, and the USPTO pronounces “dead” those that are not maintained. A registration declares both the “first use” and the “first use in commerce” of trademarks, as well as the dates on which registrations are declared to be dead. In some cases, registered trademarks are never used or are only used in the short term, and these are usually declared dead with good speed.¹⁹ Sometimes, however, a brand name may be used for a long time and eventually phased out, but not formally cancelled for a long time thereafter.²⁰ Sony’s Dynamicron tape branding word, for instance, was only declared dead at the end of 2002, though it had not been used for many years before that. Consequently, while registrations do provide reliable parameters within which to declare tapes bearing these brands to fall, first use dates are often more meaningful limits than cancellation dates. See appendix C for a number of these entries.

Also in the realm of intellectual property claims, patent numbers listed on sleeves were investigated to see what might be learned from their descriptions and illustrations. It was at first promising to find that companies only seemed to list their *own* patents for proprietary improvements on VHS, and not the original bundle of patents which constitutes the central format. This suggested that finding a tape with those features would suggest that it was made by the company that held the patent, or at least one of a limited set of manufacturers who paid that company to use its improvement. Most of the patents were for internal parts, however, making it

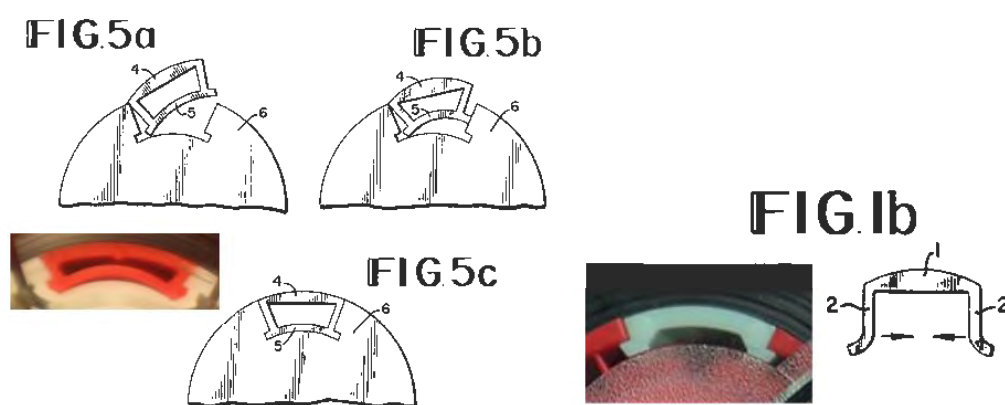
¹⁹ For a funny but illustrative example, see registration 75306948, which granted Lucasfilm Ltd. the exclusive right to market Qui-Gon Jinn-brand candied fruits, fried pork rinds, processed corn nuggets, taco salads, cooked chicken, cole slaw, cooked potatoes, and three bean salads, among approximately eighty other assorted food items. This registration was abandoned and declared dead in February 2000, less than a year after the release of *The Phantom Menace*, the film which would have been the referent of all those branded foods.

USPTO, Trademark Electronic Search System (hereafter “TESS”), reg. no. 75306948.

²⁰ Trademark registrations are declared “dead” or “abandoned” variously when registrants actively declare their abandonment, through a challenge by another entity wishing to use a disused but registered trademark, or through failure to adequately respond to maintenance correspondence from the USPTO.

USPTO, Manual of Patent Examining Procedure, Chapter 0700, Section 711, “Abandonment of Patent Application [R-11.2013]”, <http://www.uspto.gov/web/offices/pac/mpep/s711.html#sect711.01>

difficult or impossible to use their information for identification without disassembling tapes. That would not be impossible for research, but would be highly undesirable as a way of identifying tapes of enduring value. One patent granted to TDK, however, shows that their hublocks are distinctive not only for their red color, but for their patented design. Where earlier and competing hublocks, the patent says, have only a web across the top, TDK has an additional structural web across the bottom, reducing stress on the upper web and reducing risk of breakage.²¹



Left: Drawings from U.S. Patent 3,990,733, for TDK's signature hublocks, alongside the actual hublock.

Right: "Prior Art" shown in TDK patent, alongside corresponding non-TDK (3M) hublock. Photographs by author.

2. E. Testing

The timeline of sleeves and cassettes, and the history of the VHS format that this project's imaging and data gathering begin to outline are worthwhile ends in themselves, offering clues to help reveal otherwise hidden facts about tapes, and building tools and context with which to measure and understand institutions' and individuals' uses of VHS. But if this project is to be maximally useful, able to inform users not only of a tape's age and manufacturer, but also of the

²¹ PatFT, pat. no. 3,990,733.

preservation challenges it is likely to face, another major step is needed to collect data on the performance and preservation status of cassettes.

One of the greatest challenges in estimating the preservation risk of a given videocassette is the inherent duality of the object. If you have 50,000 Maxell cassettes of the same shell and sleeve designs, all dated with reasonable certainty to the same year, but if out of that group one batch of 10,000 was manufactured using a shipment of a chemical which proves over the course of decades to be more volatile than other batches of the same substance, that fifth of those tapes may prove to have problems not found in other tapes of the same type. Additionally, if one manufacturer was running short of stock and bought overrun stock from another manufacturer, it is possible that the tape in two identical cassettes may originate from completely different places, and be of entirely different formulations. This is especially true of smaller labels, which did not themselves even manufacture, but merely bought and resold stock.²² In some cases they may have purchased and rebranded preloaded cassettes; in other cases, companies bought shells and tape separately, loaded the cassettes, and sold them.²³ In such cases, one can obviously say very little about the

²² It is worth noting that anecdotal evidence regarding Kodak tapes, and a claim made on some Polaroid sleeves (see Polaroid-00001S_B), indicate that tape was manufactured “to the specifications” of those brands. Whether this means that those companies requested stock of a certain quality, and their suppliers provided a premade grade of stock that matched those demands, or that the suppliers actually manufactured according to those brands’ instructions, is not clear, but is a matter worth investigating.

²³ This is similar to the way in which many pre-recorded tapes were duplicated. While some mass-duplicated tapes were made by sending a signal to many VCRs, each containing and recording to a tape, larger orders were handled by using a thermal contact printing technique by which blank stock was run past a heated “magnetic mirror master”, which is a sort of metal videotape negative. This is done many times in a row on a long “pancake reel” of blank stock, with tones recorded between iterations of the recording, so that in the next step when the tape is wound into the shells, a machine reads the tape, and knows by the tone when to cut off each successive copy. (Conversation with Maurice Schechter, February 19, 2015.) Because so many duplicated tapes were made in this way, introducing a high probability of difference between the sources of tape and shell, these tapes were not sampled for this stage of research. It will be interesting in the future to examine collections of commercial recordings to find ways of deducing the sources of stock in different shells.

An article by Robert Angus in the July 1981 issue of *Video Review* asserted that “until recently” low quality stock was difficult to come by, but that by then cheap tape manufacturing facilities had begun to pop up in Hong Kong. (Robert Angus, “From Cartier to TDK: Watch Out For Counterfeit Blank Tape!”, *Video Review* [hereafter cited as *V.R.*] [New York: CES Publishing], July 1981, 42-43.)

quality of the tape based on the external characteristics of its cassette. For this reason, the wisely cautious way has long been to treat with suspicion any tape in an unlabeled shell, or bearing a non-name brand. As Peter Brothers put it, “Since millions of unmarked VHS shells were loaded with inferior knock-off stock, whether the stock inside the shell is actually from a major manufacturer or from a knock-off company, if the shell has no markings, you don’t know what stock is inside and it is an indication that it ‘may’ be of inferior quality”.²⁴ But by gathering and correlating performance data on enough cassettes, perhaps it will be possible to draw connections between certain off-brands or specific unlabeled shell designs and risky tape, and even to find what name brand tape has held up more and less well over the years.

This concept was one of the key reasons for choosing to work with the NDI collection at LPA: having been inventoried, rehoused, and assessed on the basis of their content, the tapes were immediately scheduled for digitization by NYPL’s preservation team, and the metadata spreadsheets for those transfers, which were generously provided to me by Tom Christie, would ostensibly report problems that came up with individual tapes during digitization. Similar sheets were provided for the Baryshnikov Archive, and it seemed that a good basis of preservation metadata was about to be laid down. Upon examination of the data, however, I found that it was very sensibly geared toward getting acceptable transfers of flawed tapes. Major oxide shedding, or the practical inability to transfer a tape at all, would be reported, but the description of more

This possibility of tones recorded in the area of tape between the leader and the first point that reaches the record head of the VCR presents an interesting avenue for future exploration: It may be profitable to use magnetic developer to examine that area on tapes for which the cassette seems to be manufactured by a company other than the one whose name is written on the cassette, searching this area for factory-written information. If it is found, a comparison of the written tracks on different tapes may be revealing at least of what plants may have recorded what tapes, and correlations between that information, shell designs, and preservation status may prove useful in assessing off-brand and mass-duplicated tapes. I am grateful to Ben Fino-Radin for bringing this concept to my attention in the context of the use of magnetic developer to examine factory-written, drive-inaccessible sectors on floppy disks.

²⁴ E-mail from Peter Brothers, Feb. 20, 2015.

pedestrian errors – some dropout in the first several minutes, or a generally noisy picture – were not usually reported. This kind of data might tell you on a very high level which kinds of tapes were utter disasters, but would not give anything like a complete picture of the state of a multitude of stocks.

With VHS all but an obsolete format today, and with so much valuable content recorded on the format in so many ways lying unpreserved, the field of study here is ripe for the picking. It is anecdotally understood that certain brands (such as Ampex) have not held up well, and that recordings made at lower tape speeds were of comparatively poor quality in the first place, but in order to learn that x type of tapes used in q manner and kept in n -type conditions for b period of time often show z deterioration, I propose to systematically collect information on tapes described for this project, and append it to the images and data collected on those cassettes. This could enable owners and stewards of all kinds of collections to better understand what likely preservation challenges lurk in their holdings.

To perform this data gathering, I propose to follow the lead of Brecht Declercq and the Flemish national broadcasting agency VRT (Vlaamse Radio- en Televisieomroeporganisatie), who in June 2012 published a report in the *IASA Journal* entitled “DAT-error statistics: age and brand correlations as registered in VRT’s DivA-project”. Mr. Declercq’s team looked at 1,000 fully recorded two-hour DAT tapes containing recordings of the daily radio program *Het Vrije Westen*. The sample spanned the broadcasts of January 8, 1992 through May 2, 1996, and contained tapes of three different brands. The contents of the tapes were transferred to digital files for preservation, and when VRT documentalists listened to the tapes for cataloging purposes, they noted the timecode, duration, and nature of each error that appeared on the digitized recording. When errors were discovered, the tapes were revisited to find whether the error was native to the

original, or occurred during digitization. Thus, informative data was generated on the state of fully recorded c. 1992-96 Sony, BASF, and Ampex tapes stored in a broadcast archive.²⁵ While these are not universally applicable results, they do serve as useful guidance and, when combined with other data on DAT brands over the years, may form a very nuanced portrait of the format's preservation issues.

To apply a similar technique to VHS in a way that could simultaneously sustain itself and actively preserve at-risk video collections, I propose the following methodology:

1. Seek a partnership with the archives of an organization that holds high-value collections that are, due to budgetary realities and/or institutional priorities, unlikely to be properly preserved. Ensure that the institution is prepared to commit to appropriately rigorous storage and maintenance of digitized assets.
2. Write a cooperative grant to fund the acquisition of equipment for, and assembly of a VHS digitization station,²⁶ and for a staff person to perform data gathering and digitization.
3. Gather images and data on the videos in the institution's collection, to be added to the wiki which is planned as an immediate outgrowth of the data set and image collection begun for this thesis project.
4. Digitize videos in the institution's collection, fully monitoring transfers and carefully notating the tape count and nature of all errors that occur. For the sake of the quality of both data and transfer, investigate errors to ensure that they are not being caused by the deck. If an error recurs on replay, and is determined to originate on the media rather than because of a deck error, but there is some suspicion that the error may originate in the

²⁵ Brecht Declercq, "DAT-Error Statistics: Age and Brand Correlations as Registered in VRT's DivA-Project", preprint copy provided by Mr. Declercq, 1-2.

²⁶ Plans and wiring diagrams for such a station were researched and drawn up by me for Peter Oleksik's Video Preservation class at NYU in the spring of 2015. See appendix D for the proposed equipment and diagrams.

source from which the tape was recorded, analyze the video in QCTools to see whether the error appears as an irregularity in the signal, or is recorded into the picture.

5. Append these error reports, along with descriptions of the nature of the recordings – including their general purpose, record speed, recording devices (if known), and known storage conditions – to the records for the appropriate stock types.

With the intention to perform this experiment as a next stage of this project, I have undertaken a sort of low budget “test test” to explore the concept underpinning the testing, and as a proof of concept for the idea behind it.

For this proof of concept, a random selection of tapes was taken from the Anderson Collection for testing. If they were not found to be fully rewound, they were rewound to the beginning, and at least two minutes of video were monitored at the head, middle, and near the end of each tape. Any video errors observed were recorded, along with their time and duration, and these notes were transcribed and put into the Notes column of the tape data set. This testing was carried out using a 26" Sharp 25K-S100 CRT and a Panasonic PV-9450 VCR, which was closely monitored for head build-up and cleaned with 99% isopropyl alcohol as needed.

Given the built-in limitations of this test test – the sample was not large, the portion of each tape viewed was very small when considered as a part of the whole, and the deck was reliable but not all one might wish for in terms of signal output (it is limited to RF or composite [composite was used for the testing]) – it was performed with at least as much of an eye to discovering how better to perform the more comprehensive testing as to providing firm data that would be informative in a major way on the qualities of different stocks. Nevertheless, what appear to be some tender shoots of information did grow up along with lessons to inform future testing.

In the end, 22 tapes were monitored for the test. Notes on the monitoring of each can be found below in appendix H. First, and perhaps unsurprisingly, the tapes with the clearest pictures were from among the best represented models in the Anderson Collection. These were two TDK T-120HSNs (of the sleeve and cassette types represented by image sets TDK-00002T and TDK-00002S) and one Sony T120 (represented by Sony-00002T and Sony-00001S). The recordings date from 1990-92, and all performed well for most of the time sampled. One of the TDKs began with a somewhat noisy picture, the other ended with some wavering vertical rainbow banding, and all three had brief moments of vertical instability. The Sony tape had a noisy picture during the sampled tail portion, but it is worth mentioning that the ends of many of the Anderson tapes are filled with cartoons, which appear to have been taped over whatever incomplete content may have come after the last recorded movie, and this may account in part for the noisiness of the ends of some cassettes.

Another TDK cassette, a T-120HS dating from 1987 and represented by TDK-00014T and TDK-00015S, was of almost comparable quality, but in addition to minor vertical instability and noise, also suffered from many dropouts at the very head of the tape, and some continuing through the first two minutes. One more of the same type, represented by the very similar TDK-00001T and TDK-00001S, suffered from a noisier picture throughout, and a band of rainbow discoloration in the top quadrant of the screen during the middle sample.

The one Agfa tape from the Anderson sample was tested, and it gave a middling to poor performance. It had a noisier than usual picture during the first two samples, tracking issues during the first sample, and notable dropouts and head switching (even though the CRT used is a conventionally masked consumer television). It cannot be concluded with certainty that the tape's

poorer performance was due to its brand, but a tape of a somewhat unusual brand performing worst of the sampled cassettes does raise a flag that there may be a correlation.

Perhaps most interesting was a look at three contemporary Fuji tapes types (represented by Fuji-00008S/Fuji-00008S, Fuji-00006T/Fuji-00006S, and Fuji-00007T/Fuji-00007S) from the late 1980s and early 1990s with nearly identical packages, but with manufacturing statements, textures, and batch code fonts that seem to suggest that some cassettes may have been purchased from Sony, some from JVC, and some either manufactured by Fuji or perhaps obtained from a third source. While the results are not conclusive, tapes from these three types did show different errors: At the heads of the tapes, one (“the Sony”) had tracking difficulty and some dropouts, while another (“the JVC”) had only momentary vertical rainbow banding at the very head, and the third (“the Fuji”) showed a slightly noisy picture, clearing by the end of two minutes, with very few dropouts. The JVC kept up with dropouts and noise in both of the following samples; the Sony showed no notable errors in the middle, but was noisy at the end; and the Fuji showed a clear but lo-fi picture in the middle, but at the end suffered from a very noisy picture, dropouts, and stability trouble in the bottom part of the screen.

Many variables – including the possibilities of different recording decks or of varying levels of use and abuse to the tapes over the years – may be at play in the Fuji sampling, but the existence of these differences gives hope that more comprehensive and more scientifically rigorous testing may yield important results.

Some less technical observation-based lessons for future testing that were taken away from the test test included:

- If funding renders full-length monitoring and/or digitization impracticable, it may be advisable when dealing with off-air recordings to check the middle of the tape in a

place not immediately proximate to the exact midpoint of the tape's advertised recording time, since standard broadcasting blocks make it likely that you will find the beginning of another recording at the center of the tape, with all of the deck-induced errors that that may entail. If resources dictate the need to sample only ten or fifteen minutes of a cassette, it is more usefully illustrative to look at a more representative part of the middle of the tape, the errors of which can more likely be ascribed to the tape alone.

- Caution must be used to distinguish as best as possible between errors in the recording of the tape and errors in the *source* of the recording. Some very dynamic video errors were observed in off-air recordings of PBS's *Matinee at the Bijou*, but they occurred at moments of changeover in the content of the show, where a sudden error at the broadcasting end made more obvious sense than one in the VCR. As indicated above, such errors should be inspected with QCTools if the video is digitized, but again, if full funding is not forthcoming, a cautiously observant eye must observe and record such ambiguities.
- Fuller monitoring is, as one would expect, more effective. Though at most times no more than three minutes were observed at each stop on a tape, on some occasions I seized upon the rare opportunity of watching a movie in this thesis-writing semester, and stopped to watch a one-reel short or two. In these cases, more complete data was gathered, and it was therefore possible to record if errors observed near the head recurred soon after, or ceased almost entirely.

Chapter 3: Some Findings So Far

More of this project's findings so far are chronicled in the appendices below, but it is worth taking a page or two here to look at a few of the tentative findings.

- Tracing the textures and batch codes of TDK cassettes over the years has revealed what seem to be useful markers for dating. It appears that TDK's familiar matrix of small rectangles all over their cassette bodies gave way to their equally remarkable faux wood design in the early 1990s, which in turn appears to have given way to a highly generic design in the early 2000s. Additionally, batch codes beginning almost always with the letter 'A' appear to give way to codes beginning with 'B' almost exactly at the turn of the century.
- Maxell has two similarly notable shell designs, one of which seems to have begun earlier while the other persisted longer, but the two coexisted for a period of approximately two decades. Some conclusions appear to emerge about what grades of Maxell tape went into which shells. More notably, it has been found that Maxell batch codes may be highly useful in dating: All sampled Maxell codes begin with the same five-character structure (one letter, three numerals, and another letter), and they appear to have become progressively longer as the years have passed. With very few outliers, the sampled codes from the mid-to late 1980s are six-characters in length, and a character is periodically added until approximately 2003, when codes reach nine characters in length.
- For a time in the late 1980s and early 1990s Fuji tapes with largely identical sleeves had varying shell designs and statements of place of manufacture (variously "Made in Japan" or "Videotape Made in Japan" printed on the sleeve and no statement on the cassette, or no statement on the sleeve and "MADE IN U.S.A." on the cassette). The different shell

textures matched in places with textures more commonly associated with Sony and JVC, and the manufacturing statements did not contradict (and even seemed to corroborate) those implications. While the bifurcation of the cassette and tape is not entirely resolved by this, and Fuji may have been buying only shells from other companies and loading them with its own tape, there is hope in this case of overcoming that challenge. The correlation of the patterns to the manufacturing statements and the demonstrated fact that Fuji would at times specify only the location where its tape was manufactured are promising, and the observation in the test test (as indicated above) that the tape in the different shells appears to show different errors is suggestive that with further tape testing, these questions – regarding Fuji and other brands – may be able to be answered satisfactorily in the future.

- Very precise matches of shell and reel design suggest that Kodak cassettes in the 1980s were rebranded TDK product, and that some from the mid-1990s were housed in Raks shells. The latter fact was deduced from the Kodak sleeves' statement that the cassettes were assembled in Turkey (with tape made in Germany), knowledge that Raks was a major Turkish manufacturer of tapes, and consultation with Gough's Tech Zone,²⁷ a website that posts scans of tapes in a manner not dissimilar to this project. The comparison of the Raks E-180 and the Kodak T-120 is striking:



Left: Kodak T-120, photo by author. Right: Raks E-180, photo from Gough's Tech Zone.

²⁷ "Raks SQ", *Gough's Tech Zone*, <http://goughlui.com/the-vhs-corner/vhs-cassette-library/raks-sq/>

- Similar detective work was done on a late model Maxell tape. Seeing that the cassette, which I purchased new myself on a very specific occasion in 2009, did not match the distinctive cassette depicted on the front of the sleeve, I examined the package and cassette more closely. The sleeve states that the tape was a “product of Korea”, and has the item number “PN: 060104/SKC” by the bar code. Knowing SKC to be a major Korean manufacturer of magnetic media, I looked to the one SKC cassette sampled for this project (conveniently also in my family’s collection), and found not that the cassettes were identical, but that where the Maxell tape had two strange interruptions in its top texture, the SKC tape had a logo and a “this way in” arrow (which the Maxell had on its gate instead). Taking this for a clue, I looked and found – again at Gough’s Tech Zone²⁸ – an SKC cassette identical to the Maxell tape in every way but some printing on the gate. Under the circumstances – so late in the history of VHS, when many manufacturers have ceased to deal with the format – I would tender a theory here that Maxell is buying cassettes and tape both from SKC and selling them under the Maxell name.



Left: Maxell T-120, photo by author. Right: SKC E-180, photo from Gough’s Tech Zone.

²⁸ “SKC HQ Maxplay Grade”, *Gough’s Tech Zone*, <http://goughlui.com/the-vhs-corner/vhs-cassette-library/skc-hq-maxplay-grade/>

Chapter 4: Concluding For Now, and Going Forward

In this first stage of research, much useful work has been done. Batch codes, often regarded as hopelessly inscrutable, have in places begun to show patterns that give hope that we may be able to scrute them after all. And while some brands' (namely Maxell's and TDK's) most commonly used cassette textures are sufficiently common and conspicuous to border on the obvious, the ability to connect, even if somewhat tentatively, certain less flashy or less commonly seen textures (Sony's raised squares, Matsushita's indented dots, JVC's rows of diagonal lines and their early pebbled tops, et cetera) offers key clues to the origin of cassettes sold from company to company, rebranded, and resold. The parameters found in trademark registrations and advertising also represent valuable guides to use in limiting the possible age of a tape. But there is much more to be done, and this is only the first stage of a much larger project. Next and near term steps include:

- Acquiring offered samples of cassettes – one group of various still-sealed tapes offered by Taylor Whitney of Preserve the Past, LLC, and one entirely of early 1980s Fuji stock offered by Janice Allen of Allen Archives – and gather data from these potentially very rich sources.
- Applying to present this work at the Association of Moving Image Archivists's conference this fall in Portland, OR, with the aim to present the concept and findings to interested and knowledgeable professionals in the field, and stimulate a fruitful in-person exchange of ideas and information.
- With the help of a competent webmaster, building and running a wiki, enabling others to contribute data and images to this project, so that it might produce richer and richer findings, and approach nearer and nearer a complete representation of the VHS format.

- Approaching an institution or institutions regarding the possibility of writing a grant to support digitization of their collections in conjunction with detailed research on the stocks represented therein.

Many people in the field have been very helpful to me in this project, and have shown an interest in this research so far, and much good comes of openness and collaboration. The work I have done for this project has certainly invested me personally in its continuation, and in seeing it bear more detailed fruit, but it is my hope that in opening it up to others' contributions it might become a true community project and a very useful resource.

Appendix A: Findings by Brand

These findings are weighted somewhat in the direction of deciphering batch codes, and where batch codes were found each entry lists samples and structures of the codes found representing each brand. However, other findings are included here as well. Not every brand sampled is included here: some are represented by too-small samples to comment on meaningfully, and some may simply not demonstrate any patterns that allow for meaningful hypotheses.

❖ **3M/Scotch:** Discernible batch numbers of all but one tape sampled are in the spine label area, rather than by the record tab, and are seven digits and one letter long. Numbers always begin with 1, 2, or 3, and letters are always A, B, C, or D. There is sometimes a hyphen between number and letter, but more often not. Numbers are sometimes accompanied by a second number of similar length and structure (7-9 digits, 0-3 letters, occasionally a hyphen). There is no discernible correlation between any of these variables and grade, brand (3M or Scotch), or date. This structure also holds true on one prerecorded cassette of a store bought film that was examined, and which is labeled “Scotch”. Many of the sampled tapes did not show a place of manufacture, but three of four that did were made in the U.S.A. The one outlier was made in Japan, and was also the tape with a different batch number style (the number is 111132). One very early tape (recorded in 1980) had a number (D 37182) stamped on the bottom of the cassette.

Some cases have been observed of tapes on the fronts of whose gates there is a large rectangle imprinted in the plastic (this can be seen in image 3M-00002T_F), near otherwise identical tapes without the rectangle. This may prove a valuable clue in dating, or in some aspect of manufacturing, but sufficient data has not been gathered to make such findings.

Sample batch numbers: 1617318A ; 2524404-C ; 1230606D ; 2201805A ; 3205108D ; 2608903B-LT /
 2308900B ; 352111953 LT / 3321100C ; 160891905 / 1308900D ; 383440548/3434422B ; D 37182 ;
 2104515B ; 111132

Structures: 1111111A
 1111111-A
 1111111A-AA / 1111111A
 111111111 AA / 1111111A
 111111111 / 1111111A
 1111111A / 1111111A
 111111111 / 1111111A
 A 11111 [stamped on bottom of tape]
 1111111A / A11111111
 1A1111

❖ **BASF/EMTEC:** Of 11 BASF tapes sampled, recorded from 1987-92, the four from 1987-90 have batch numbers consisting of one digit followed by four letters, the last two letters being in all four cases “EB”. Three of the tapes were from batch 7JEB. The 7 tapes recorded from 1991-92 had no discernible batch numbers.

Of 7 EMTEC cassettes (EMTEC began as a unit of BASF, but split from its parent company in 1996/97; the last sample here was recorded in 1996, when it was still wholly owned by BASF), recorded from 1995-96, two have discernible batch codes: one an eight numeral string, the other one like the BASF tapes, one numeral and three letters, but here with a space between the first two and last two characters.

Owing to the small size of the sample and the varied nature of the cassettes, it is difficult to draw meaningful conclusions from this data.

Sample batch numbers: BASF: 6NEB ; 7JEB

	EMTEC:	11190151 ; 1F NB
Structures:	BASF:	1AAA
	EMTEC:	11111111
		1A AA

❖ **Chandi:** Only two Chandi brand tapes were found, both in the Anderson collection, and I could find no reference to tapes of this brand elsewhere. The company was a photographic film concern based in New York City. The name and logo of the company were found in the U.S. Patent and Trademark Office's Trademark Status and Document Retrieval database. The trademark is listed as having been first used on November 6, 1985, and was cancelled on February 28, 1994. The sleeves bear labels that say "MADE IN JAPAN by KONICA MAGNETIX CORPORATION", and the cassettes have the Konica wordmark printed on the gate, and display the plastic pattern distinctive of the top of Konica tapes (a horizontal matrix of small raised squares in square sets of four in an indented field.) The tapes were recorded on June 29 and July 4, 1987, and both have the batch code L056C, which also matches a structure of batch code common among some other Konica tapes of the mid-1980s. Notably, the cassettes are fastened with shiny metal tri-wing screws, unlike the matte black Phillips head screws used for other sampled Konica tapes.

❖ **Fuji:** Of 181 Fuji cassettes sampled, the great majority have batch codes of eight characters of mixed letters and numerals. The most common arrangement is five numerals followed by three letters, the last letter most often being A, but other 8-character strings abound. 6 tapes occur with the code 6098 1BZA. The recordings on these date to 1989, and the tapes are formulated specially

for M-format and are the only sampled Fuji tapes to have a space in the standard 8-character string.

Other batch numbers' resemblance to the structures and fonts of other manufacturers' cassettes (particularly Sony, JVC, and Matsushita) raise the suspicion that these may be cassettes bought from other manufacturers and sold under the Fuji label. Whether only the cassettes were bought up and resold, or the tape as well, is not ascertainable from the data, but may hopefully be deduced through testing.

Sample batch numbers: 11N712AA ; 1212G4MA ; 12D25TGA ; 12D85TGA ; 6098 1BZA ; 62781KAA ; AU71- ; BHEHU ; 20045XGA ; BOVRU ; B-UWEU ; C0613EN ; CJNEU ; D04181N ; D04181N ; KKRUFU ; 71345XGA ; P3H44H ; XJNEU ; 4288911146 ; 107411AA ; 4 064 97 0835 / 7 064 97 0350 ; 3104FP AE

Structures: 1AAA1AAA

11A11AAA

11A111AA

1111AAAA

1111A1AA

11111AAA

111111AA

1111 1AAA

AA11-

AAAAA

A-AAAA

A1111AA

A11111A

A1A11A

1111111111

1 111 11 1111 / 1 111 11 1111

❖ **Keystone:** Marketed by the Keystone Camera Corporation of Clifton, NJ, only one tape of this brand tape was found, for sale at the Omega Thrift Shop. It is unusual for its faux wood grain (bigger and more ostentatious than the “grain” that appears on some Maxell tapes), and has an unusually short style of batch code (the one code sampled is M54S). A tape marketed by RCA and dated to 1984, found on Vintage Videocassettes,²⁹ appears to have similar wood grain, and has “T-120” printed in the same unique serif-heavy font. Both tapes are made in Korea, which may suggest that they were bought and resold by both companies from one manufacturer.

❖ **Kodak/Eastman:** Discernible batch numbers for both Eastman and Kodak tapes with recordings dating from 1986-88 hew to the standard TDK model – four letters, usually beginning with A or B (all A’s among the Kodak and Eastman tapes sampled), followed by three numerals – and bear the characteristic marks (a horizontal matrix of small raised rectangles on top, and the same on the bottom except for larger rectangles in the hand grip area) and hub locks (red, and of a certain patented shape) of TDK tapes of that era, and are alternately made in Japan or assembled in the U.S.A. with Japanese tape. Anecdotal evidence confirms that TDK did supply tapes (to Kodak’s specifications, so it is possible that the formulation of the tape is different) to Kodak in the 1980s.³⁰ Tapes with recordings beginning slightly later in 1988 bear either different or no batch codes (two samples from 1988, made in Korea, share the code A8211T, and one undated tape has two different codes, 090298 and 2348). Two samples dating from the mid-1990s were assembled in Turkey with

²⁹ A Russian website which, like Gough’s Tech Zone, posts images of old stock. The site tends toward sealed PAL/SECAM tapes, but unlike Gough’s and my own project, only images of the front, back, and spine of the sleeve, and the spine of the tape (or other side of the wrapper, if the tape is opaquely wrapped).

Винтажные видеокассеты - Vintage Videocassettes, 1977 - 2002, <http://videocassettes.ru/>

³⁰ E-mail from Ted Langdell to AMIA Listserv, “Re: [AMIA-L] VHS Preservation Inquiry--Tape brands made by other manufacturers--”, Feb. 22, 2015.

tape made in Germany, and have the batch number 22115F24; the cassettes and reels match exactly certain cassettes made by Raks, a Turkish company.

Sample batch numbers: ADCJ501 ; 090298 / 2348 ; 22115F24.

Structures: AAAA111

111111 / 1111

11111A11

❖ **Konica:** Ten Konica cassettes were sampled, including the two described above under “Chandi”.

All were recorded between February 2, 1984 and July 4, 1987, and seven (including the two Chandis) have the same plastic patterns (on the top, a horizontal matrix of small raised squares in square sets of four in an indented field, and on the bottom a horizontal matrix of small raised squares in raised fields in hand grip and reel areas, but not in the third of the surface nearest the gate). The other, which was recorded in 1986, is traversed by tightly packed indented horizontal lines on top, except in the gate area which is traversed by only four, spaced more widely. This is a pattern more generally associated with JVC, and raises the possibility that Konica bought cassettes from that company (indeed, it is not entirely clear in general whether Konica ever manufactured tapes in its own facilities, or sourced them from other manufacturers). There are five other tapes recorded in 1986, which are distinctive for being housed in dark blue cassettes, which have not been encountered elsewhere. The dark blue cassettes were packaged in a different design of sleeve, but their plastic patterns are the same as on other Konicas. The Chandis are notable for their shiny tri-wing screws, distinct from the black Phillips head screws of the others. Among the ten tapes there are two basic patterns for batch numbers: strings of eight characters (one letter, three numerals, three variable characters, and one numeral), and strings of five characters (one letter, three

numerals, and another letter). The longer strings belong to two cassettes recorded in 1984, and the 1986 tape in the JVC-patterned shell. The shorter ones are the two Chandis and the five dark blues.

Sample batch numbers: T173CC03 ; I185B ; K225B ; D196A ; E236A ; E1930B03 ; D013CB58 ; L056C

Structures: A111A

A111AA11

A1111A11

A111AA11

❖ **Maxell:** With data collected on 303 VHS tapes, Maxell is, numerically speaking, nearly as well-sampled as TDK. It must be noted, however, that more pre-collected data was received on Maxell (particularly from ViPIRS and 92Y), while more TDK cassettes were examined closely in person for specific purposes of this project. Consequently, there is frustratingly little data on Maxell's distinctive textures to correlate with dates and batch codes.

However, such data was collected on 64 tapes, and we may posit a few tentative hypotheses on the basis of this and other data. Two primary designs of cassette were observed: The first has on the top a diagonal matrix of small raised squares, sometimes in an indented field and sometimes not; on the bottom are two sets of raised diagonal lines in an indented field in the hand grip area, coming to a V in the center. This bottom design was reflected also in some of Maxell's early sleeve designs. This first design is illustrated by image set Maxell-00002T. The second prominent design featured a top traversed above and below the window area by five sets of five indented lines each, and across the window area by a wider-spaced set of eleven indented lines; the bottom is traversed by a variety of sets of horizontal lines (eleven across the center, five near the gate, and ten of varying shapes in the hand grip area). Much as with the earlier design, elements of this layout were featured on Maxell sleeves for a time (see the horizontal lines of image

set Maxell-00003S, for instance), and as of this writing in April 2015, is still featured in photographs on the front of new blank Maxell cassettes (see image sets Maxell-00006S and Maxell-00008S). This second design is fully illustrated by image set Maxell-00003T. As in the sample the first design is seen on tapes recorded between January 1984 and March 2006, and the second is seen on tapes recorded between April 1986 and 1998, little can be said in favor of these two external textures as an indicator of date. However, within the sample these textures do represent entirely different sets of alternate stock numbers. The diagonally oriented pattern represents tapes with STD, GX, and PRO designations³¹, whereas the horizontal one represents tapes with HG, HF, X, HX, and M designations.³²

One distinct finding comes from a tape purchased new and recorded in 2009. Packaged in sleeve Maxell-00008S, mentioned above, it may have been expected from the box that the cassette would be of the traversed-by-horizontal-lines type, but it proved instead to be covered on top with a horizontal matrix of small raised squares. The box stated that the tape was made in Korea, and showed a catalog number of “PN: 060104/SKC”. Correlating those two points, and knowing that SKC is a major South Korean manufacturer of magnetic media, I looked at tape VHS_T02969, the only SKC-labeled tape sampled, and found that while that tape had a different texture on top, it had an arrow and a logo in two spots where on the Maxell tape there are an unusually shiny square and rectangle that seem to suggest places for the injection mold to hold additional elements. Investigating SKC further, I discovered an SKC cassette at Gough’s Tech Zone with texture and reels that match the Maxell cassette precisely, leaving no reasonable doubt that in its later years of selling stock, Maxell was purchasing tapes from SKC and reselling them.

³¹ T-10 STD, T-30 STD, T-60 STD, T-90 STD, T-120 STD, T-120 GX, T-20 PRO, and T-60 PRO.

³² T-120HG, T-120HF, T-120X, T-120HX, and T-120M.

A search for Maxell's "Epitaxial" brand in the U.S. Patent and Trademark Office's Trademark Electronic Search System (TESS) provided a useful measure: The script wordmark for that brand, seen here, was first used in commerce in 1979, and its registration cancelled on November 4, 1987. The word "epitaxial" was used to market Maxell cassettes at least as late as 1990, so caution must be observed not to assign a date based on the word alone, but it would seem that tapes with the



Image from USPTO.

cursive logo can be dated between 1979 and 1987.

Maxell's sampled VHS batch codes are six to nine characters in length, and all begin with the form A111A, continuing with various other permutations of letters and numerals. Without exception among Maxell tapes for which both batch codes and dates were collected, the six-character codes represent the earliest; these tapes were recorded between January 1984 and April 1987.³³ All of the correlated seven-character codes have recording dates from 1990, 1997, or 1998; the eight-character codes from 1998 to 2003, with one outlier in 1995; and the nine-character codes from 2003 through 2006, with outliers in 1995, 1998, and 2009. It appears from this data that there may indeed usually be a direct correlation between Maxell batch codes and dates, with length the key indicator.

Sample batch numbers: L194BD ; A217AA ; J269AA2 ; D176A11 ; B089A51E ; G261A5AD ;
K182G52CP ; B061A5BI ; A186A53

³³ As well as one tape – the data for which was received from an outside source – which is dated February 27, 1974. This may be a VHS duplicate of earlier content, or misrecorded, or – most improbably – actually predate the formal launch of the VHS format in 1976, but for purposes of this analysis, the date has been put aside.

Structures: A111AA
 A111AA1
 A111AAA1
 A111A11
 A111AA1A
 A111A11A
 A111A1AA
 A111A11AA

❖ **MGM:** 9 MGM cassettes were sampled, coming from two separate collections. All were recorded between 1990 and 1995. The sleeve to at least one cassette (content dated 1995) boasts of “60 YEARS OF EXCELLENCE IN ENTERTAINMENT”, but since MGM was consolidated under that name in 1924, it is unclear whether this was old stock, or if the anniversary slogan remained on the sleeves for years after the anniversary. None of the tapes have batch codes.

❖ **Panasonic/National/Quasar:** Matsushita co-developed the VHS system with JVC, and their main VHS brand name in the United States was “Panasonic”; the contemporary Japanese brand name was “National”. One National cassette and 26 Panasonics were sampled, as well as one cassette by Quasar, another Matsushita subsidiary. The batch codes for all of the tapes dating from 1983-87 are eight characters long, and are of the structure 11111AA1. The single National tape sampled has a very similar structure, but with a letter also in the third place. Three tapes were recorded from 1996-98, and slightly different code structures as well. Some tapes dating from 1990 and 2000 have five-letter codes in the style of JVC. Most distinctive of the earlier tapes is their weight (they are quite hefty), their top-side texture (which appears in some lights to be a very fine raised grid, and in others to be a matrix of tiny indented dots), and the way their stock and batch numbers are written.

The stock numbers are “120”, with no letters, and they and the batch codes are both written in a specific font. All of these characteristics occasionally occur in other brands, particularly Fuji and JVC, suggesting that Matsushita sold cassettes to other companies for resale.

Sample batch numbers: 03159NQ1 ; 10049ED1 ; XMEHU ; 12589NE ; 0138NF1 ; 41269NJI ;
12N59ED1 ; XVAIU

Structures: 11111AA1

11A11AA1

AAAAA

11111AAA

1111AA1

11111AA

❖ **RCA/G.E.:** The right to market RCA and G.E. brand consumer electronics was sold in 1987 to Thomson Consumer Electronics,³⁴ and sleeves sampled from both brands from the mid-1990s reflect this corporate unity in the use of some of the same phrasing, such as the branding phrase “Life Test Certified”, and in shell designs (a horizontal matrix of small raised rectangles on top, and the same on the bottom, but with larger rectangles in the hand grip area. The design is superficially identical to the TDK design, but with lighter weight construction and shallower lines.) Less unity is shown in manufacturing, however, with sleeves indicating contents “Made in China”, “Made in Korea”, and “Assembled in Mexico”. One RCA cassette was sampled which predates the Thomson acquisition, and was made in Japan; the manufacturing continuity before and after acquisition is not known.

³⁴ “American Brands From a French Company,” *New York Times*, Sep. 16, 1990, F6.

Sample batch numbers: RCA: B2G242A ; 012533K ; A011RS ; XAK25DC3 ; KTJI 027 (Pre-Thomson.

Stamped in ink on bottom of tape by cartouche.)

G.E.: XJE20DB6

Structures: RCA: A1A111A

111111A

A111AA

AAA11AA1

AAAA 111

G.E.: AAA11AA1

❖ **Sony:** 146 Sony VHS tapes were sampled, and presented a wide array of different batch code structures. Some patterns appear to emerge, and confidence in their apparent implications is strengthened by the constituent tapes of each pattern coming from multiple collections. Much more data is desired, however, to confirm or deny the truth of these findings, and to clarify additional patterns. These batch code observations are as follows:

- 41 tapes were sampled with codes of seven numerals, beginning with a '2'. Dates were recorded on all but three of these tapes, and all of those were recorded between 1984 and 1991. All for which manufacturing data was recorded were manufactured in the U.S.A.
- Tapes emerged from three collections with nine-character batch codes beginning with a zero and ending with a letter (split between the structures 01AA1111A and 0AAA111AA), dated between 2000 and 2007.
- There are many tapes with eight-character batch codes, variously of the structures A1111111, A111111A, and A11A111A. Each initial letter appears to represent a certain date range. These patterns cluster quite consistently over the 44 such tapes sampled, with the

troubles of several outlying dates seemingly explained by tapes' being rerecorded, or backdated with the dates of recordings copied onto newer stock (for example, recordings on three tapes of one single batch code [K2212085] in one collection are dated to 1993, 1996, and 1998.) Speculatively discarding three such outliers, the following rough dating emerges. More data is obviously desirable to flesh out these dates, but a pattern does emerge in the aggregate that numbers of these structures appear to be dateable to the late 1980s through the 1990s.

A: 1991-94	G: 1999-2000
B: 1992	J: 1987-89
D: 1994	K: 1996-99
F: 1995-99	

Cassettes sampled from Sony's early years selling VHS are topped with a diagonal matrix of indented dots, while tapes in later years are largely covered by horizontal matrices of small raised squares, sometimes in indented fields and sometimes not. The diagonal matrix of indented dots appears in the collection on cassettes recorded through 1987, with the raised squares beginning to appear on some recorded in 1985. While the squares persisted in various forms into the current century, the indented dots appear to be a solid indicator that a tape dates to the mid-1980s (Sony came late to VHS, exclusively manufacturing its own Betamax format until economics demanded they do otherwise.)

Sample batch numbers: -215133M ; 4281438 ; A2225216 ; 4A21609 ; OECB2919C ; 2391954 ; J246172P ; 4E90918 ; 212106P ; B44A612S ; K2212085 ; 36262 ; OBBA2819A ; ODCA2703A ; HA1012305 ; 4A 10013 ; 4E01888 ; 6157 ; A2212028 ; A421813P

Structures: 1111

AAAA

11111

1111111

111111A

1A11111

1A11111

1A1111A

-111111A

1A 11111

A1111111

A111111A

A11A1111

A11A111A

11AA1111A

1AAA1111A

1AAA1111A

1AAA111AA

AA1111111

AAAA1111A

AAAA111AA

❖ **TDK:** With 316 VHS tapes sampled, along with data on 112 Compact Cassettes, TDK is one of the most looked-at labels in this study, and several useful trends seem to have emerged for dating TDK VHS. First, of the tapes for which descriptions of cassette textures were taken, two textures

predominated: A horizontal matrix of small raised rectangles on top, with a similar matrix on the bottom, except in the hand grip area, where the rectangles are larger; and a top with faux wood grain in the window area and the remaining area traversed by indented horizontal lines, with the bottom traversed by tightly packed indented horizontal lines from the hand grip to the center of the reels. The rectangular pattern was observed on cassettes dating from 1981 – February 1992, and the faux wood (in a much smaller sample) on tapes from October 1991 – August 1999. Far less distinctive patterns of small raised squares emerge in the sample on tapes recorded between 2002 and 2006; two which were scanned and which date from 2004 and 2005 match exactly the texture of a sampled Sony tape dating from 2007.

Also distinctive of TDK are their trademark cadmium red hub locks, which appear on all but seven of the tapes sampled. Of two featuring orange hub locks, one is the earliest tape sampled, recorded in 1981, and the other is a T-60 cassette (the majority of the others sampled are T-120s) recorded in 1985. Two undated wood-grain tapes have white hub locks, as do the three raised square tapes recorded after the year 2000.

TDK VHS cassettes are notable for a characteristic batch code structure of four letters followed by three numerals. More cassettes dating from the current century are needed to be conclusive, but codes beginning with the letter *A* appear from the sample to have predominated through the end of the twentieth century and fallen off rapidly after year 2000 (212 beginning with *A* were sampled from 1981 – 1999; 23 appear in 2000 and 2001, with many from 2000 represented by specific codes which also appear in 1999, and most from 2001 represented by codes appearing in 2000. After that, three stray *A* tapes appear in 2002.) Codes of the same structure, but beginning with the letter *B*, pick up in June 2000 and appear in the sample through 2002. It is tentatively hypothesized that beginning in the year 2000, the *A* codes were specifically replaced by the *B* codes.

Two tapes recorded in 1994 were found to have the same code structure and font as other TDK cassettes, but had a code beginning with *N* (NGAE326). Codes of five letters (or four letters followed by a dash), similar in structure and font to codes typical of JVC, appear on 21 sampled tapes with content dating from 1993-2003, raising the possibility that TDK periodically bought stock from other companies. Sampled tapes recorded from 2004 through 2007, which appear to correlate with the change from faux wood grain to the generic raised-square cassettes, have lengthy batch codes of eight to nine characters, of the following lettering/numbering schemes: AAA11AA1, 111111AA1, and 11111AAA1.

An examination of batch codes of TDK Compact Cassettes shows many codes of the same AAAA111 structure, and many similar structures (particularly AAAA111A), and seems to hint at distinctions: Where the great majority of sampled AAAA111 VHS tapes have *G* as their second character, the majority of Compact Cassettes with the two just mentioned structures have *K* as theirs. This presents the possibility that the second character might be eliminated as an intraformat indicator, but occasional variances in the data render this inconclusive. A larger sample, and a look at other TDK tape formats, should be informative on these matters.

Manufacturing information on the sampled tapes is thin, because after a certain point in the 1980s it often appeared on plastic wrappers that were usually discarded. Where information does exist, assembly in the U.S.A. from Japanese materials is the norm, with some earlier cassettes entirely manufactured in Japan, and at least one late model tape (recorded in 2005) made in Korea.

An examination of advertisements and illustrations in the early years of *Video Review* has provided key guidance to tentatively date tapes marketed between 1980 and 1982, a period ill-represented in this project's tape sample. The advertisements show first a change from T-120s sold as *2 or 4* hour to *2, 4, or 6* hour in 1980, showing the sleeve prior to the changeover, the subtle

alteration made for that change, and the rather dynamic debut of the first sleeve represented in the sample. Subtle changes in tape labels are also shown in these images. Samples of well-dated and strongly correlated tapes, sleeves, and labels of this era would be helpful to determine whether this presentation in print was matched by reality. See Appendix C for the timeline as constructed from these advertisements.

Sample batch numbers: AGDK013 ; AGBA 118 ; BGBK902 ; BGBC 010 ; NGAE326 ; AG8IU ; CZPG- ; XHHIU ; ZI1IU ; XEM09BB2 ; 64130ACD2 ; 25069708232

Structures: AAAA111
 AAAA 111
 AA1AA
 AAAAA
 AAAA-
 A1111111
 A2224221
 AAA11AA1
 111111AA1
 11111AAA1
 1111111111

Appendix B: Fuji, Maxell, and TDK in Advertising and Illustration, Video Review, 1980-82

Fuji:

April 1980 – February 1982. Note the “2–4 HOUR” label; it persists in some advertisements longer than others, raising the suspicion that images *may* sometimes have been reused from ad to ad even though the sleeves had changed in real life.



35



36

³⁵ “More Recorders Ask For Fuji By Name Than Any Other Brand,” *V.R.*, Apr. 1980, Jan., Mar., May 1981.

³⁶ “Beware the Generation Gap,” *V.R.*, Oct., Dec. 1980, Feb., Apr. 1981.

Design also attested in: “We Fit the Same. But We Perform So Much Better,” *V.R.*, May, Jun., Jul., Aug. 1980.

March 1981. Note that the sleeve is almost identical to Fuji-00005S, but does not state the physical length of the tape.



37

May 1981 – February 1982.



38

39

³⁷ "Exclusive: First Lab Tests of 18 Blank Videotapes" *V.R.*, Mar. 1981, cover, 36.

³⁸ "You Think You Know Your Movies? Can You Find Our Phony One?" *V.R.*, May 1981

³⁹ "See All You Imagine." *V.R.*, Oct., Nov., Dec. 1981, Feb. 1982.

Maxell:

T-120: April 1980 – March 1981. HG T-120: April 1980 – February 1982. Note the line pattern, characteristic of the bottoms of many Maxell cassettes.



40

HG T-30: April 1980 – July 1981



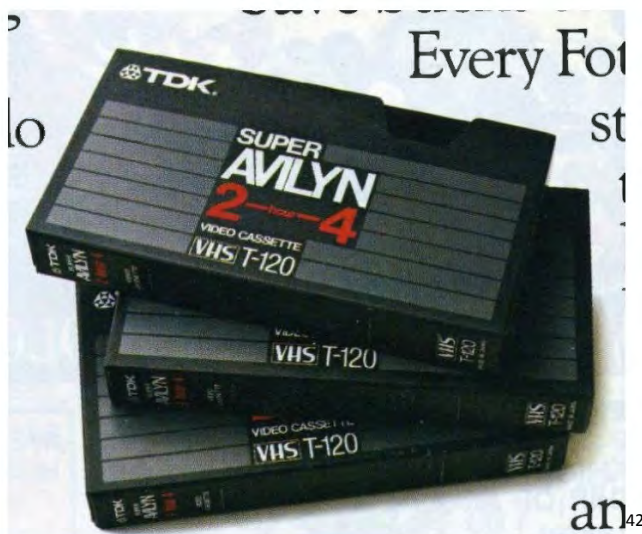
41

⁴⁰ Image: "Now Every Video Cassette Recorder Can Have the Same Advantage." *V.R.*, Apr., May, Jun., Jul. 1980. T-120 design also attested in: "Exclusive: First Lab Tests of 18 Blank Videotapes". *V.R.*, March 1981, p. 40. HG T-120 design also attested in: "The First High Grade Videotape," *V.R.*, August, October, December 1980, January, February, March 1981; "The Lower Your Recording Speed the More You Need Maxell High Grade," *V.R.*, Apr., May, Jun., Jul., Aug., Dec. 1981, Feb. 1982; "Exclusive: First Lab Tests of 18 Blank Videotapes," cover, 42.

⁴¹ Image: "This month's hardware," *V.R.*, Apr. 1980. Design also attested in: *V.R.*, "From Cartier to TDK ...," 45.

TDK:

Pre-April 1980. Used as illustration in Fotomat advertisement, December 1980:



Sleeve: April 1980 – April 1981. Note change from “2-hour-4” above to “T-120” below. Label: April – June 1980.



⁴² Image: “Fotomat. The Whole Cassette & Caboodle.” *V.R.*, Dec. 1980.

⁴³ Image: “Until this year there was no way to appreciate TDK’s six-hour picture.” *V.R.*, May and Jun. 1980. Design also attested in: “SUPER AVILYN: The future of videotape is suddenly very clear.” *V.R.*, Jul., Aug., and Oct. 1980; “SUPER AVILYN: So your videodeck won’t pay for the sins of your videotape,” *V.R.*, Dec. 1980, Mar. 1981; “Super Avilyn: It’s Always The Same New Picture.” *V.R.*, Feb. 1981; “SUPER AVILYN: After six hours you’ll see what’s so super about it,” *V.R.*, Apr. 1981.

Label: February – April 1981.

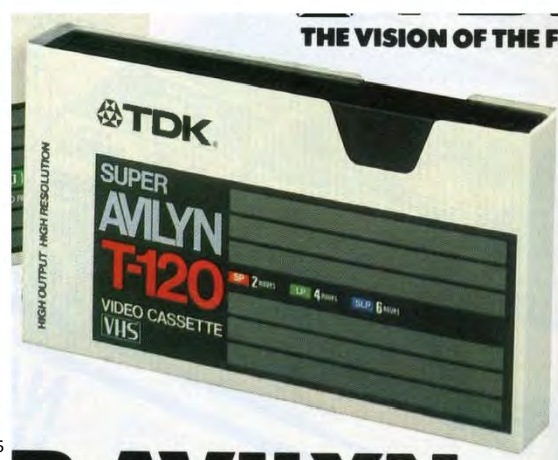


44

May 1981 – February 1982. This design is represented in image sets TDK-00011S and TDK-00012S, and appears in the sample with tapes recorded as late as July 1985.



45



46

⁴⁴ Image: "Super Avilyn: It's Always the Same New Picture."

Design also attested in: "Super Avilyn: The Future of Videotape Is Suddenly Very Clear."

⁴⁵ Image: "Super Avilyn. The Face Has Changed, But the Act Is Still the Same." V.R., May, Jun. 1981.

Design also attested in: "If Your Video Investment Is Showing Diminishing Returns, ... The Solution Is Super Avilyn," V.R., Jul., Oct. 1980; "If You're Getting A Distorted View Of Video, ... The Solution Is Super Avilyn," V.R.,

Appendix C: Trademark Registrations

Chandi

Serial Number	73611255
Registration Number	1453753
FIRST USE IN COMMERCE:	19851106
Cancellation Date	February 28, 1994

Note: Registered specifically for use of logo for photographic film, but matches logo on sleeves.



Image from USPTO.

Focal

Serial Number	74365593
Registration Number	1801969
FIRST USE IN COMMERCE:	19880100
Cancellation Date	August 7, 2004

Fuji: "Beridox"

Serial Number	73040912
Registration Number	1122198
Priority Date	July 11, 1974
DEAD (no date listed)	

JVC: "Dynarec"

Serial Number	73435769
Registration Number	1288797
FIRST USE:	19791218.
FIRST USE IN COMMERCE:	19830200
Cancellation Date	May 14, 2005

Aug., Dec. 1981. ; "If Your Video Image Is Neither Here Nor There, ... The Solution Is Super Avilyn," V.R., Sep. 1981, Feb. 1982.

⁴⁶ Image: "If You're Getting A Distorted View Of Video, ... The Solution Is Super Avilyn."

Maxell: "Epitaxial"

Serial Number	73206578
Registration Number	1152994
FIRST USE IN COMMERCE:	19790100
Cancellation Date	November 4, 1987

Note: "Epitaxial" is a real word, and the trademark was only for the logo. The word was still in use to sell Maxell tapes until at least 1990.



Image from USPTO.

Philips: "ACCUCHROME HQ"

Serial Number	73605502
Registration Number	1430938
FIRST USE IN COMMERCE:	19860317
Cancellation Date	September 6, 1993

Polaroid: "SUPERCOLOR"

Serial Number	74028150
Registration Number	1671608
FIRST USE IN COMMERCE:	November 18, 1983
Filing Date	February 12, 1990
Cancellation Date	July 20, 1998 (Registration Number 1671608)
Serial Number	75434846
Registration Number	2353090
Filing Date	February 17, 1998
Cancellation Date	March 3, 2007 (Registration Number 2353090)

PDMagnetics

Serial Number	73426175
Registration Number	1317746
FIRST USE:	December 1, 1981
FIRST USE IN COMMERCE:	December 1, 1981
Cancellation Date	June 4, 1991

The logo for PDMagnetics, featuring the company name in a bold, sans-serif font. The letters are black and have a slightly distressed or textured appearance, with some white speckling around the edges, giving it a vintage or industrial feel.

Image from USPTO.

Sony: "Dynamicron"

Serial Number	73269091
Registration Number	1192465
FIRST USE IN COMMERCE:	May 1, 1980
Cancellation Date	December 28, 2002

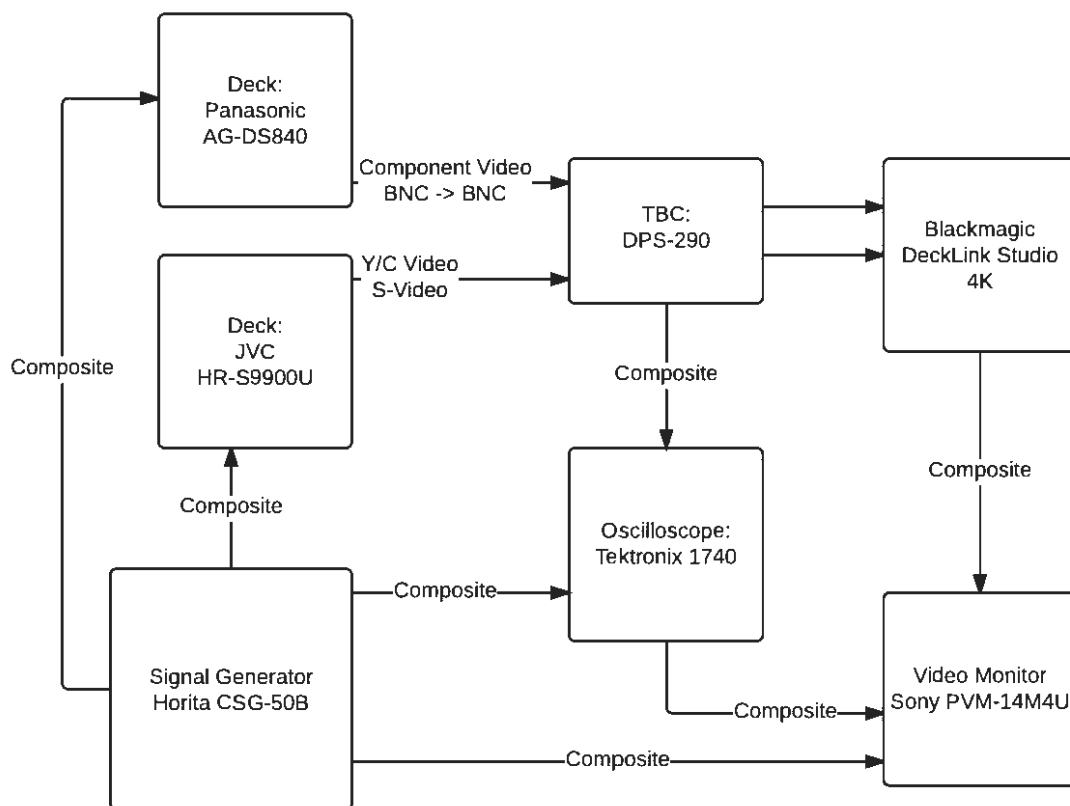
Appendix D: Equipment List and Wiring Diagrams **for a VHS Transfer Station**

These plans draw on, among advice from other quarters, diagrams of the racks at XFRSTN drawn up by Kristin MacDonough and graciously provided to me by Blake McDowell, and on “Preservation Action Plan for VHS: Additional Resources”, a document put together by the Magnetic Tape Crisis Committee of the Association of Moving Image Archivists for a presentation at AMIA’s 2013 conference, in which they presented plans for a relatively inexpensive yet archivally appropriate station VHS transfer station.

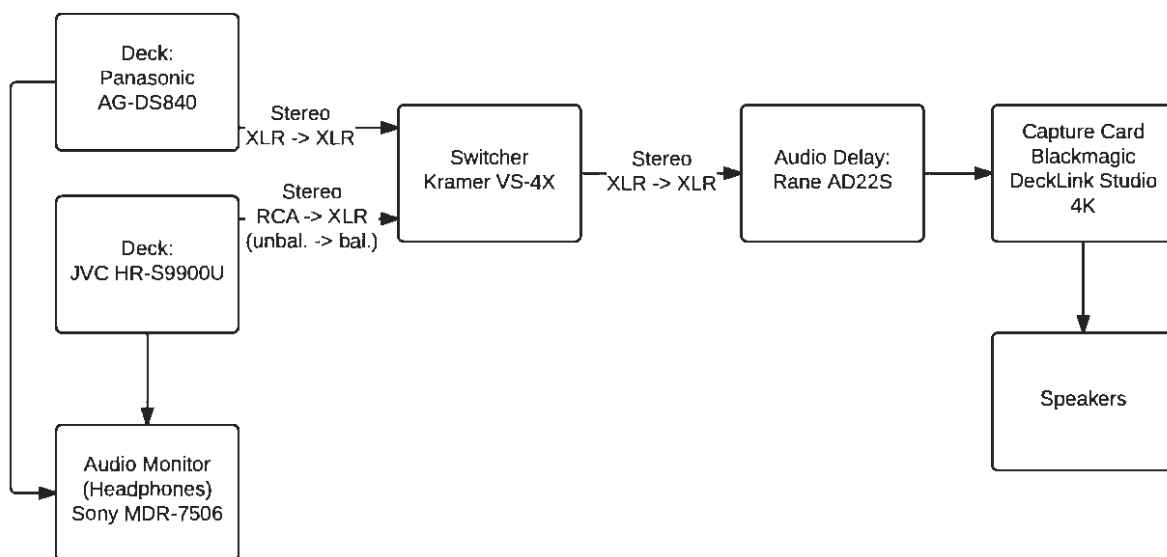
Equipment list:

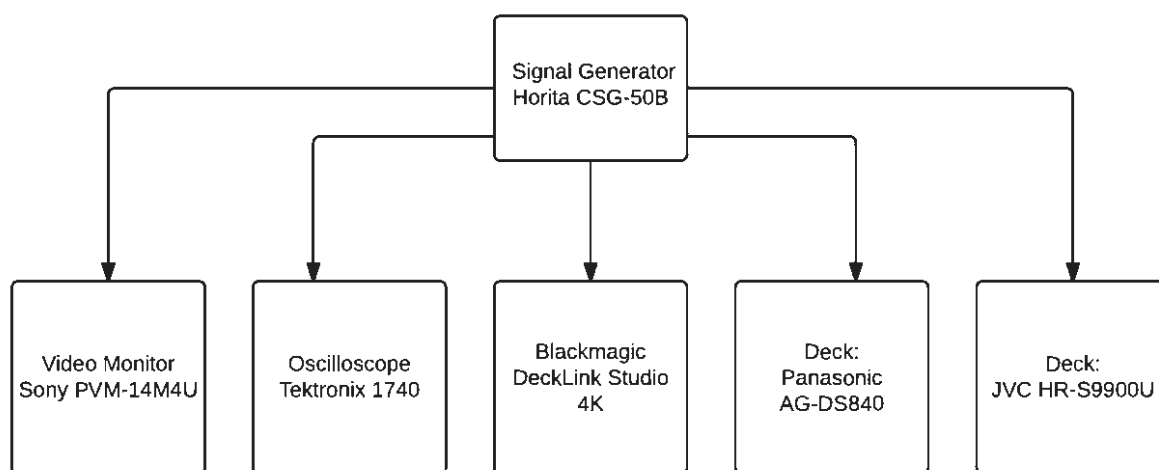
Deck:	Panasonic AG-DS840 - for S-VHS and VHS recorded in SP mode
Deck:	JVC HR-S9900U - for VHS recorded in LP and EP/SLP modes
TBC:	Digital Processing Systems DPS-290
Audio Switcher:	Kramer VS-4X
Audio Delay:	Rane AD22S
Oscilloscope:	Tektronix 1740
Capture Card:	Blackmagic DeckLink Studio 4K
Signal Generator:	Horita CSG-50B
Video Monitor:	Sony PVM-14M4U
Headphones:	Sony MDR-7506

Video Wiring Diagram:



Audio Wiring Diagram:



Sync Wiring Diagram:

Appendix E: Data Fields

Tape Data Fields

Note: “Obligatory” fields are only obligatory when data is entered by hand. It is to be expected that preexisting data sets will not always hew to the rules set forth here, but they will be “massaged” for conformity, and any shortcomings of individual data points will be accepted.

Field Name	Definition	Data Type	Sample Value(s)	Obligation (Yes/No)	Allowed Values	Comments
Unique ID (tapeUniqueID)	Unique identifying number for each entity, tape or sleeve, assigned sequentially at the time of entry. Beginning with VHS_T00001 and progressing upward.	ID	VHS_T00001	Yes	Standard structure only.	
Local ID (tapeLocalID)	Some number or description that can identify a tape within the collection or data set from which it was taken. A preexisting identifier is preferable, but new identifiers may be made as long as they can be connected to the original source. Where a number cannot be practicably assigned, a descriptive phrase is acceptable.	Text	B-085 ; DEL - Sunday Workshop - Loren Bucek ; 1474	Yes	Any structure necessary.	
Exemplified by (tapeExemplifiedBy)	Refers to the set of images illustrating a	Text	Sony-00016T ; Fuji-00002T	No	Must refer to an existing image set, which should	

	cassette identical to the one being entered.				be named according to brand, number in scanning sequence, and the letter T for "tape".	
Contained by (tapeContainedBy)	Refers to the set of images illustrating a sleeve identical to the one containing the tape being entered.	Text	Focal-00001S ; RCA-00002S	No	Must refer to an existing image set, which should be named according to brand, number in scanning sequence, and the letter S for "sleeve".	
Date on Content (tapeDateOncontent)	Earliest date indicated for recording of content.	Date	12/17/1989	No		This refers to the <u>recording</u> , not production, of content: a copy of <i>The Maltese Falcon</i> recorded from TCM in 1995 should be dated 1995, not 1941.
Date on Stock (tapeDateOnStock)	Any date evident for production or acquisition of stock.	Text	1991-01 ; 1989 (coupon insert) ; 2006-01-03	No	Dates should be entered as yyyy-mm-dd for sortability as text, and should always be entered first. They may be followed by parenthetical text explaining their source, or distinguishing them from differently styled printing dates on otherwise identical sleeves.	This will usually be absent, but could derive from a copyright date on the box or labels, dated inserts, or an invoice or receipt for purchase of the stock. Most frequently so far, printing dates have been found under the flaps of many sleeves.
Brand (tapeBrand)	This refers to the brand name on the package or cassette, not to the manufacturer. Thus,	Text	TDK	Yes	Controlled vocabulary.	May be repeated in cases where two brand names (3M and Scotch, EMTEC and BASF, etc.) appear together.

	"Scotch" and "3M" are different brands, as are "BASF" and "EMTEC", "Panasonic" and "Quasar", and "Konica" and "Chandi".					"Unknown" is an acceptable value.
Stock Number (tapeStockNumber)	Standard E-, T-, or VK-number designating stock length.	Text	T-120 ; E-180 ; VK-250	No	All length-related numbers (T-120, T-30, T-160, ST-120, etc.) are allowed, but brand- and grade-related numbers (T-120HSN, for instance) belong in Alternate Stock Number.	Multiple entries should only be made when more than one stock number is listed, with one typically designating NTSC record time and another PAL/SECAM, or two different recording schemes (VHS and M-type, for instance). Certain companies also overlapped their use of the VK- and T- designations ⁴⁷ , and these tapes may be listed with both numbers. Additionally, if/when different types of cassettes are entered, their numbers (C-90 for many Compact Cassettes, for instance) may be entered. If data is received for a collection with mixed recording standards and a field such as "stock length" is provided but contains only numerals, the

⁴⁷ http://www.videocassettes.ru/img/other/rca_001.jpg

						numerals may be entered here, even though the original tapes presumably have an E- or T- designation.
Alternate Stock Number (tapeAltStockNumber)	This field is for all nonstandard variations on the T-/E-/VK- formula, brand-related and otherwise.	Text	T-120HSN ; T120	No	Any number identifying the record time or physical length of the tape, but not adhering to the strict formula of T-, E-, or VK- followed by the length-related numerals.	
Batch Number (tapeBatchNumber)	Batch code exactly as it appears on cassette, typically in the upper left hand corner of the spine, occasionally in the space where the label on the spine would go, or potentially anywhere else on a cassette.	Text	AGCD128	Yes		“None” and “No discernible batch number” are acceptable values.
Place of Manufacture (tapePlaceOfManufacture)	Place or places of manufacture of the tape.	Text	U.S.A. ; Japan ; U.S.A. and Japan	No	Controlled vocabulary of countries and country combinations.	
Cassette Patterns (tapePatternTop) and (tapePatternBottom)	Brief descriptions of the pattern molded in the plastic on the top and bottom of the cassette.	Text	Traversed by tightly packed indented horizontal lines, except for gate area which is traversed by only three, spaced more	No	Controlled vocabulary.	Descriptions should be brief, and need not necessarily be sufficiently detailed to distinguish cassette from all other models (these descriptions should not account for all variations in the size of small molded squares, for instance). These descriptions should serve to

			widely. ; Horizontal matrix of raised rectangles in indented field in hand grip area.			help find correlations between tapes, but detail should be looked for in tape images.
Reel Numbers (tapeNumberOnReelL) and (tapeNumberOnReelR)	A number molded into the plastic of the reel that is on the left hand side when you are looking at the bottom side of the tape with the gate facing upward.	Text	GA14D ; 1 16-A 1 16-A	No	For numbers separated by “spokes”, leave three spaces between strings. For numbers on separate concentric rings, start from the center and delimit rings with “ / ”.	
Number on Cassette Bottom (tapeNumberOnCassetteBot tom)	A number (usually molded) on the bottom surface of the cassette.	Text	BD11D	No		Any number molded or printed on the bottom of the cassette.
Number in Underside Hole (tapeNumberInsideGate)	A number, typically molded in the plastic, in the approximately ½" diamater hole on the underside of the cassette near the gate; this field is also used for numbers appearing in the center gap near the gate.	Text	C31F ; 139 KG ; 101 / L / AM ;	No	If numbers in the underside hole are presented in two rows, delimit the rows with “ / ”. If the two rows are separated by a horizontal line, delimit them with “ ”. If they are separated by a horizontal line with a letter “L” to the right of the horizontal line, consider the line and “L” a row, and delimit the three rows with “ / ”. For	“None” is an acceptable value.

					numbers in the gap, parenthetically specify “(in gap)”. When a tape has numbers in both places, parenthetically specify both “(in hole)” and “(in gap)”, and delimit the two with “;”. If there is only a number in the hole, it is not necessary to specify its location.	
Number Under Gate (tapeNumberInUndersideHole)	A number molded into the plastic on the inside of the gate of the cassette, or next to the gate lock.	Text	LM-19 ; U2G (inside gate) ; U1 / A2 (by gate lock)	No	For numbers by the gate lock, parenthetically specify “(by gate lock)”. When a tape has numbers in both places, parenthetically specify both “(inside gate)” and “(by gate lock)”, and delimit the two with “;”. If there is only a number under the gate, it is not necessary to specify its location.	This field was originally intended for numbers on the inside of the gate, but also came to be used for the numbers by the gate lock. For future data gathering, these are to be split into two separate fields.
Language (tapeLanguage)	Languages represented on the cassette.	Text	English ; English/French	No		
Intended Recording Standard (tapeIntendedRecordingStandard)	The broadcast standard or standards for which the tape was sold to record.	Text	NTSC ; PAL/SECAM ; NTSC/PAL/SECAM ; PAL (recorded as)	No	Controlled vocabulary.	T- and ST- stock numbers may be inferred to imply that a tape is made for an NTSC market, and E- numbers to imply a PAL/SECAM market. If data is received on a set of

						tapes and contains the standards with which they <i>were</i> recorded, but not necessarily those with which they were <i>intended to be</i> recorded, enter this data, but add in parentheses “recorded as”.
Colors (tapeColorCassette), (tapeColorGate), (tapeColorGateLock), (tapeColorHubLockL), (tapeColorHubLockR), (tapeColorReelL), and (tapeColorReelR)	The colors of the various plastic components that comprise a cassette.	Text	Black ; White ; Red ; Mint green	No	Controlled vocabulary.	This field is not intended to capture every nuance of color. Some distinct hues (“Mint green”, “Dark blue”, etc.) are used to distinguish from simpler descriptors (“Green”, “Blue”, etc.), but all of the fine gradations of white (“Cream”, “Ivory”, “Bone”, “Egg shell”, etc.) and black should in the interest of consistency be called “White” and “Black”.
From the Collection of (tapeFromCollectionOf)	The name of the source of the tape.	Text	NYU Cinema Studies Techno Trash ; 92Y	Yes	Controlled vocabulary.	Some “collections” may be somewhat artificially constructed, but designated groupings should denote discrete, meaningful sources of data on a tape or set of tapes. Groups of tapes from the garbage or from thrift stores, or spreadsheets of pre-gathered data, are not “proper collections”, but they may be given collection

						names for purposes of this project.
Branding Words (tapeBrandingWords)	Words used to make tapes sound superior.	Text	Super Avilyn ; EHG ; PREMIUM STD	No	Free text.	
Certainty (tapeCertainty)	The degree of certainty with which a tape is associated with the sleeve in which it is contained.	Text	Verified ; Apparent match ; Uncertain ; Mismatched ; No/generic sleeve	No	Controlled vocabulary.	A match should only be declared “verified” if the person entering it has absolutely certain knowledge that the tape and the sleeve originated together.
Format (tapeFormat)	The type of cassette being represented.	Text	VHS ; VHS - S- VHS ; VHS - M-format ; Betamax ; Compact Cassette	Yes	Controlled vocabulary.	Though the huge majority of tapes are and should be VHS, it can be informative to compare characteristics, especially batch codes, of other formats produced by the same manufacturers. All formats using the VHS cassette design should be designated “VHS - [Format]”.
Notes (tapeNotes)	Any additional notes regarding the tape described.	Text		No	Free text.	

Sleeves:

Field Name	Definition	Data Type	Sample Value(s)	Obligation (Yes/No)	Allowed Values	Comments
sleeveID	A string of characters designating the number in sequence within each brand in which a sleeve was imaged.	Text	mac-00001S ; Sony-00002S ; 3M-00004	Yes	<i>Brand-xxxxxS</i>	
sleeveBrand	The brand of the sleeve described.	Text	mac ; Sony ; 3M	Yes		
sleeveStockNumber	Standard E-, T-, or VK-number designating stock length.	Text	T-120 ; E-180 ; VK-250	No	All length-related numbers (T-120, T-30, T-160, ST-120, etc.) are allowed, but brand- and grade-related numbers (T-120HSN, for instance) belong in Alternate Stock Number.	When multiple standard stock numbers (VK-250 and T-120, or a T-120 and E-180, for instance) appear together, enter the most prominent, or, if neither is more prominent the first, as the stock number, and the other as the first listed alternate stock number.
sleeveAltStockNumber	This field is for all nonstandard variations on the T-/E-/VK-formula, brand-related and otherwise, and for additional standard numbers.	Text	T-120HSN ; T120 ; E-240HS B	No	Any number identifying the record time or physical length of the tape, but not adhering to the strict formula of T-, E-, or VK- followed by the length-related numerals. Delimit	

					multiple numbers with “;”.	
sleeveUPC	The usually twelve-digit number of the universal purchase code on a sleeve.	Text	0 12226 00011 5 ; 0 46838 00004 ; 0 46838 00150 5	No	Any numbers appearing directly below the UPC bar code, including spaces as they appear on the sleeve.	
sleevePlaceOfManufacture	The country or countries in which the tape was manufactured and/or in which the sleeve was printed, as indicated on the sleeve.	Text	Korea ; Japan ; U.S.A./Japan ; China	No	Controlled vocabulary of countries. If multiple countries are indicated, delimit with a slash. If an intracountry region appears, indicate the country (for example, for “Dothan, AL” enter U.S.A.; for “Zona Franca de Manáus”, enter “Brazil”). If only part of the production is indicated (“Assembled in Mexico”), indicate the manufacturing process in parentheses (“Mexico (assembled in)”).	
sleeveLanguages	The language or languages in which the sleeve’s text is written.	Text	English ; English/French ; Portuguese	No	Controlled vocabulary of English names of languages. When more than one language is present on	

					a sleeve, delimit with slashes.	
sleeveIntendedRecordingStandard	The broadcast standard or standards for which the tape was sold to record.	Text	NTSC ; PAL/SECAM ; NTSC/PAL/SECAM	No	Controlled vocabulary.	
sleeveBrandingWords	Words or phrases used to sell tapes.	Text	“Broadcast Videocassette ; Color Plus ; Improved Dropout Performance” ; “Extra Quality ; 30 Minutes More ; 30 Minutes de Plus ; 30 Minutos Adicionales” ; “Fine grain/Grain fin / BERIDOX”	No	Free text. When multiple phrases are used on one sleeve, they delimit with “ ; ”. When one phrase is split over multiple lines in a syntactically important way, delimit lines with “ / ”.	
sleeveType	The type of enclosure being described.	Text	Paper sleeve ; Plastic sleeve ; Plastic clamshell	Yes	Controlled vocabulary.	
sleeveCatalogItemNumber	Any catalog, item, or version number appearing on the sleeve.	Text	CAT 108 8681 ; AR8397BK02 ; PT120H Rev0201	No	Free text.	
sleeveCopyrightDate	The year appearing in a copyright notice on the sleeve.	Date	1994	No	Date. A four-digit year.	
sleeveNearMatches	The identifiers for image sets that are nearly identical to the one described, where differences are only	Text	Fuji-00006S ; Fuji-00007S	No	If there are multiple image sets to list, delimit with “ ; ”.	

	small matters of layout or of manufacturing statements.					
sleeveSleevesInSeries	The identifiers for image sets related to the one described, where the general design is continuous with the described item, except for tapes of a different stock length, grade, or recording standard.	Text	3M-00001S ; 3M-00003S	No	If there are multiple image sets to list, delimit with “ ; ”.	Image sets listed as near matches should also be listed here.

Appendix F: Image Naming

When collecting a series of images of a tape, sleeve, or other associated item, the images are named with the brand, the place in the sequence in which the object is scanned within the brand, and a letter designating the type of object, and another letter designating which surface of that object is depicted. If the certainty of association(s) between pairs or groups of items are deemed to be “verified” or “apparent matches”, those objects are given the same sequential number. If an object is scanned on its own, it is given its own sequential number. Using a “new old stock” example of a TDK tape with a plastic wrapper and a label sheet to illustrate most examples, and a Fuji tape for the clamshell “sleeve”, sample names associated with each surface of each object type are as follows:

Tape:

TDK-00010T_A: Front
 TDK-00010T_B: Back
 TDK-00010T_C: Spine
 TDK-00010T_D: Left edge
 TDK-00010T_E: Right edge
 TDK-00010T_F: Front of gate

Sleeve:

TDK-00010S_A: Front
 TDK-00010S_B: Back
 TDK-00010S_C: Spine
 TDK-00010S_D: Top edge
 TDK-00010S_E: Bottom edge

Sleeve (clamshell):

Fuji-00002S_A: Front
 Fuji-00002S_B: Back
 Fuji-00002S_C: Spine
 Fuji-00002S_D: Top edge
 Fuji-00002S_E: Bottom edge
 Fuji-00002S_F: Long edge
 Fuji-00002S_G: Inside

Label Sheet:

TDK-00010L_A: Front
 TDK-00010L_B: Back

Wrapper:

TDK-00010W_A: Front
 TDK-00010W_B: Back
 TDK-00010W_C: Spine
 TDK-00010W_D: Top edge
 TDK-00010W_E: Bottom edge
 TDK-00010W_F: Edge opposite spine

Other inserts: Designate inserts as “I”, and scan as best as possible in sequence from front-to-back or beginning-to-end, lettering each surface successively.

Appendix G: Controlled Vocabularies

Color

Black
Black with red stripe
Blue
Dark blue
Grey
Mint green
Orange
Red
Red and silver
Tan
White
Yellow
Yellow(ed?)

Place of Manufacture

Brazil
China
Germany
Germany/Turkey
Japan
Japan (videotape)
Korea
Korea/Mexico/U.S.A.
Mexico (assembled)
Taiwan
U.S.A.
U.S.A. (assembled)
U.S.A./Japan

Language

English
English/French
English/French/Spanish
English/German/Dutch/French
English/Spanish
Portuguese

Recording Standard

NTSC
PAL/SECAM
NTSC/PAL/SECAM

Sleeve Type

Paper sleeve
Plastic sleeve
Plastic clamshell

Brand

3M
Agfa
Ampex
BASF
Chandi
Coby
Eastman
EMTEC
Focal
Fuji
FujiFilm
G.E.
Gemini
GoldStar
JVC
Keystone
Kodak
Konica
LDK
mac
Magnavox
Maxell
Memorex
MGM
MTC
National

Panasonic
PLC
Polaroid
Quantegy
Quasar
Radio Shack
RCA
Saiko
Samsung
Scotch
SKC
Sony
TDK
TRAC III
Trisonic
Victor

Certainty

Verified
Apparent match
Uncertain
Mismatch
No/generic sleeve

Appendix H: Test Test Monitoring Notes

50

0:00:00-0:02:15: noisy picture. occasional dropouts. brief self-resolving tracking issues around 1:20, again at 2:00 ; 3:03:50-3:04:10: noisy picture, somewhat jittery, but that may be the film print. ;

5:46:20-5:49:02: Occasional dropouts in middle of screen, visible head switching at bottom.

Agfa-00001T Agfa-00001S 11/26/1983

58

Head: Rainbow at very head. Some vertical rainbow bands at head, and a persistent roving dropout at bottom over first two minutes. Severe stability problems, including fields separated, etc., 4 minutes in, but seems potentially recorded in.

3:05:00-3:07:20: Persistent dancing white line on bottom. Occasional dropouts occur about four times.

5:51:00-5:53:10: noisy picture, and tracking problems, only partially correctable.

Panasonic-00001T Panasonic-00001S 11/09/1983

60

0:00:00-0:02:00: Noisy picture, occasional (2), some noise at the bottom.

2:58:14-3:00:20: small noise at bottom.

5:49:14-5:51:23: Slightly noisy picture, noise at bottom.

TDK-00011T TDK-00011S 12/19/1983

64

0:00:00-00:02:00: Noisy picture with occasional dropouts (4 in 1st 30 seconds, none thereafter).

Some rainbow noise. Unstable line in middle of screen for 10 sec from 28:37 - chroma noise in bottom half of screen when film begins (maybe orig. from TV.) ; 3:04:03-3:06:10: slight persistent noise at bottom of screen ; 6:00:34-6:02:34: slight persistent noise at bottom of screen

TDK-00011T TDK-00011S 12/20/1983

66

0:00:00-2:00:00: Significant dropouts in first 30 sec. Somewhat noisy picture through 2 min. ;

3:03:08-3:05:15: Some rainbow noise at bottom screen ; 5:52:30-5:54:34: Noisy picture with surging rosy discoloration

Panasonic-00001T Panasonic-00001S 12/28/1983

186

Head: very shaky w/dropouts in first 15 sec., continues somewhat and with occasionally distorted sound through 0:02:00

Middle: persistent dropouts and stability problems

Near tail: More stable than earlier sections, but noisy picture.

Panasonic-00001T Panasonic-00004S 7/24/1984

362

0:00:00-0:17:00: Noisy & some rainbow artifacts at start, also dropouts. No problems after first 30 seconds. No complaints through 0:17:00.

2:56:49-2:59:00: One or two dropouts, slight noise. Beginning of a recording.

6:00:08-6:02:10: No errors to note.

Fuji-00005T Fuji-00005S 06/06/1985

375

0:00:00-0:02:00: Rainbow noise, a few dropouts in first 20 sec. 2 dropouts around 1:40

3:05:18-3:07:20: Correctable tracking trouble on arriving at start point

5:50:40-5:52:50: line of green discoloration at top of screen

Panasonic-00002T Maxell-00003S 06/29/1985

419

0:00:00-0:03:41: noisy picture

3:03:02-3:05:22: weak signal in lower corners of screen throughout

6:00:12-6:03:21: noisy picture. 2 dropouts occur. black edge on light shapes.

Panasonic-00002T Panasonic-00002S 09/03/1985

562

0:00:00-0:02:10: Some rainbow noise at head, noise at bottom of screen. (correctable)

3:01:49-3:04:15: no notable errors

5:41:10-5:43:30: somewhat noisy picture, correctable. minor tracking problem.

Kodak-00001T Kodak-00001S

745

0:00:00-2:00:00: Somewhat noisy picture, many dropouts in first few seconds, then very few

3:04:38-3:07:00: brief occasional vertical shake

6:00:45-6:02:50: brief occasional vertical shake

TDK-00014T TDK-00015S 04/04/1987

770

00:00:00-0:03:02: Some blips at very head where one program is taped over another, but otherwise no errors.

3:04:06-3:06:38: no errors

6:00:19-6:02:19: one dropout noted at 6:02:19

JVC-00010T JVC-00010S 05/18/1987

792

0:00:00-0:02:20: Somewhat noisy picture, 1 dropout around 1 min

3:04:10-3:06:10: No notable errors

5:59:43-6:08:40: Somewhat noisy picture, some vert. shaking; occasional self-resolving tracking noise

Konica-00002T Chandi-00001S_D 06/29/1987

817

0:00:00-0:02:30: Somewhat noisy picture, occasionally jittery

3:02:38-3:05:30: Somewhat noisy picture. Band of rainbow discoloration in top quarter of screen

6:00:35-6:02:40: very noisy picture, though this may be due to crudely edited video content.

TDK-00001T TDK-00001S 8/16/1987

1214

0:00:00-0:02:02: Vertical rainbow band at very head

2:04:17-2:06:20: minor dropouts, noisy picture

5:48:59-5:51:01: noisy picture, occasional dropouts

Fuji-00006T Fuji-00006S 08/09/1989

1320

0:00:00-0:02:00: slightly noisy picture at head, but clears by 0:02:00. Very few dropouts.

3:02:05-3:04:05: clear but lo-fi picture

5:50:31-5:52:32: very noisy picture. dropouts at 5:51:40. stability issues at bottom

Fuji-00007T Fuji-00007S 04/03/1990

1339

0:00:00-0:02:00: noisy picture

3:02:29-3:04:34: occasional vertical shake, otherwise excellent quality

5:52:11-5:54:14: noisy picture. slight vertical shake.

TDK-00002T TDK-00002S 1/19/1992

1420

0:00:00-0:02:00: No notable errors

3:03:38-3:05:58: No notable errors

6:00:47-6:02:50: Brief wavering vertical rainbow banding

TDK-00002T TDK-00002S 11/26/1990

1423

0:00:00-0:02:00: Difficulty tracking at head, but resolves. Occasional dropouts in first minute, 2 in second minute.

3:02:46-3:04:50: No notable errors

5:56:42-5:58:48: Noisy picture

Fuji-00008S Fuji-00008S 12/02/1990

1517

Head: No color, unstable, traversed by huge bands of noise for first 30 seconds, then occasional dropouts through 0:02:00

Middle: No notable errors

Near tail: Somewhat noisy picture

Sony-00003T Sony-00003S 07/14/1991

1533

0:00:00-0:02:32: No notable errors

3:13:38-3:15:50: No notable errors

6:00:45-6:04:18: noisy picture with brief occasional vertical shake

Sony-00002T Sony-00001S 08/13/1991

1535

0:00:00-0:02:00: no errors

3:04:39-3:07:00: no errors

6:00:57-6:02:40: stability problems on top third of screen

Sony-00002T Sony-00001S 08/14/1991

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