The Ethics of Preservation, Restoration, and Re-Issues of Historical Sound Recordings*

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A look at the current record market shows a rapid increase in the number of re-issues of historical sound recordings—mostly on compact discs. Also, a large number of rerecordings are made to preserve the material on historical sound carriers, such as cylinders, instantaneous (acetate) disks, and early magnetic tapes which are subject to chemical and physical deterioration. Another reason for transformatting historical recordings onto modern audio formats, even when the original record (such as shellac disks) may not be endangered, is ease of handling and access.

Historical recordings sound different from the present ones, and there is an obvious temptation to take the opportunity during rerecording to "improve" the originals. Modern audio signal processing, in both the analog and digital domains, offers a diversity of ways to do this, ranging from conventional analog bandpass filtering, dynamic noise filters, transient noise suppressors ("declickers"), to elaborate digital methods that suppress background noise. This paper, however, is not aimed at those technical possibilities as such, but at the ethical side of preservation, restoration, and rerecording. How much of the original signal has to be preserved? What may—or must—be corrected? What can be omitted? What can be inserted?

The first one to approach these questions from a theoretical point of view was William D. Storm. In his paper, "The Establishment of International Rerecording Standards,"[1] Storm defined two different types of rerecording: Type I, audio history sound preservation, was defined as "the perpetuation of the sound of an original recording as it was initially produced and heard by the people of that era," and Type II was defined as "the perpetuation of the true sound of a performer."

Storm's paper provoked fervent discussion from empirically oriented enthusiasts and practitioners who preferred to rely on their ears (and therefore their personal taste), rather than follow "accurate, verifiable, and objective" procedures as demanded by Storm. His definition of a bipolar situation of two idealized extremes, difficult to achieve practically, has been a challenge for re-examination ever since its publication. This paper tries to approach the problem from a different angle, which is to analyze what the original carrier represents, technically and artistically, and to start from that analysis in defining what the various aims of rerecording may be.[2]

Let us therefore focus on the (historical) sound carrier and from there take a look back at the recording process and forward at the reproduction. A block diagram (Fig. 1) will help us examine this.

The first level is that of performance. It contains the "true" sound of the artist as well as all parameters of his artistic interpretation. However, the acoustics of the recording location are superimposed upon this performance, which has a considerable influence on the "true sound."

The next level is that of the tonmeister. In modern recording, the tonmeister adds a second level of interpretation by applying several more or less intentional alterations. Leaving aside the aspect of editing several takes, recorded at different times, into an apparent single performance, he employs various technical methods (choice and placement of microphones, equalization, reverberation, mixing, and stereo imaging) to create what he or the producer thinks is a satisfactory recording. This second level of interpretation is not prevalent in historical recordings, but arranging a group around a recording horn or a single microphone does belong to this category.

The signal, on its path onto the sound carrier, is now subjected to two kinds of technical alterations: unintentional and intentional. The first group, unintentional technical alterations, can be divided into two different subgroups. The first is caused by the imperfection of the recording technique of the time, resulting in various distortions (linear, nonlinear, and modulation distortions caused by the uneven movement of the recording medium, poor signal-to-noise ratio). The second group of unintentional alterations is caused by misalignment of the recording equipment, for example, wrong speed, deviation from the vertical cutting angle (as is often found in cylinders), or misalignment of the recording heads resulting in wrong track positions and azimuth errors on magnetic tape.

To the group of intentional alterations belong recording equalization, noise reduction systems, and so forth.

The carrier itself may be in mint condition, but with age and frequency of previous use, deterioration is likely.

*Presented but not preprinted at the 88th Convention of the Audio Engineering Society, Montreux, Switzerland, 1990 March 13–16.

Dirt as well as physical and chemical deterioration have various influences on reproduction, ranging from less obtrusive clicks on mechanical carriers to shorter or longer losses of signal, and linear and nonlinear distortions, etc.

In the rerecording process, equalization of intentional signal alterations *must* take place, and correction of unintentional signal alterations *may* take place. In keeping rerecording procedures in good order, it seems advantageous to orient respective measures structurally along the analysis of the recording process, and step by step to draw practical conclusions from them.

1) Choice of specimen to be rerecorded. Rerecordings should be made only from the original carrier, never from a rerecording which may have been subjected to unknown manipulations. In the case of a mass-produced carrier, the copy with the least deterioration should be used. If masters of such mass-produced carriers are still available, these should be used, but eventual artistically motivated alterations between the master and the final product have to be considered.

2) Restoration of carrier. Dirt as well as physical and chemical deterioration influencing the signal should be minimized to the greatest possible extent. Great care must be taken not to alter the signal in any way, or to further deteriorate or even destroy the original, which should be kept for future attempts. This is important because, with further technical developments, new and more effective rerecording methods will allow better results in the future.

3) Choice of playback equipment. Equipment used must fully comply with the format-specific parameters of the original. As all equipment introduces new distortions, these have to be kept to a minimum. Therefore, the most modern equipment available should be chosen. The older the format and original playback equipment, the more advisable it is to adjust modern equipment to historical formats or even to design new equipment.[3]

It is a false though widespread belief that equipment used at the time of the production of the carrier is the best for rerecording. Generally, the opposite is true: mechanical and, where applicable, electrical parameters of modern equipment exceed those of older equipment sometimes by several orders of magnitude. Of course, modern equipment may not always comply with all of the format-specific parameters of the old recording. It will, however, be advantageous to adapt these characteristics to modern machines rather than sacrifice modern development which generally reduces playback distortions to negligible amounts. It must be particularly emphasized that acoustical gramophones and phonographs are not compensating for nonlinearities of the recording in the playback process; distortions are added and not subtracted.

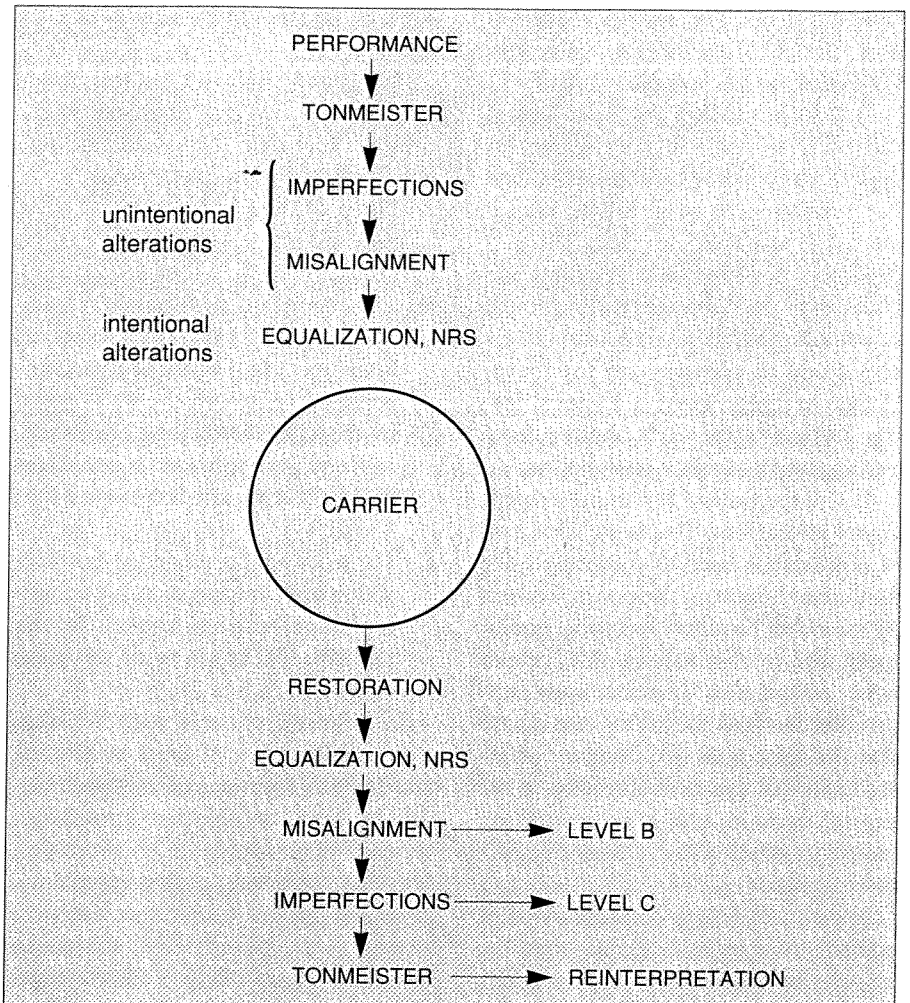

Fig. 1. Analysis of original recording process and options for restoration and reproduction.

The only case where the use of original equipment is justified is in the exotic aim to reconstruct the sound of a historical recording as it was heard originally: audio history in the full sense of William Storm's Type I rerecording. Such a rerecording would then also have to take into account different classes of equipment, e.g., deluxe versus standard, as well as the typical listening environment, which are dependent upon the social stratum of the typical listener.

4) Compensation for intentional signal alterations. The next step in systematic order is the choice of the correct playback equalization, including, possibly, the decoding of noise reduction. In practice this may cause considerable trouble. Even in LP recording, before the international adoption of the RIAA curve, various, mostly unstated, recording equalizations were used. Equalizations for 78-rpm disks are even more chaotic. Only recently have first attempts been made to collect and publish the knowledge available in this area.[4] Whenever the correct equalization is unknown, a general or most-probable standard should be used, e.g., a 250- or 500-Hz crossover between constant amplitude and constant velocity for electri-

cally cut disks. For acoustical recordings, flat equalization (implying constant velocity) has become standard.

5) Compensation for misaligned recording equipment. Amateur recordings in particular should be examined for misalignment of recording equipment. It is worthwhile to check hill-and-dale recordings for vertical cutting angle errors,[5] and tapes for misalignment of recording heads (mainly azimuth errors), and to compensate for these. Choice of replay speed is a critical factor, especially for early shellac disks and amateur recordings on cylinders.

6) Compensation for unintentional signal alterations. This is the wide area of equalization used to compensate for nonlinear frequency response, caused by imperfect historical recording equipment, and to eliminate rumble, needle noise, or tape hiss. Transient noise suppression, in both the analog and digital domain, form a second category of interventions of this kind. Recently, in the digital domain, elaborate processes have been developed to enhance signal-to-noise ratio.

Ideally, all of these compensations, if applied, must be based on an objective knowledge of respective imperfections and on the capacity for precise counteraction. While it is comparatively easy to detect and compensate for azimuth misalignment, for example, the objective knowledge of nonlinearities of a given but unknown acoustical recording device may be difficult to obtain. The controversy related to this chapter is not theoretical but practical, and lies in the different thresholds vis a vis permissibility of approximations.

7) Reinterpretation at the tonmeister level. The final step, in systematical order, involves all the manipulations that alter the sound at the tonmeister level. Subjective equalization, adding reverberation, "stereophonic re-channeling" of monaural recordings, and, most recently, the complete remix of original multitrack master tapes come under this heading.

Manipulations of this kind are definitely of a different nature than the measures mentioned previously. They are intentional attempts to reinterpret the historical performance at an artistic level.

As a consequence, two totally different aims of rerecording should be kept apart:

First, the historically faithful reproduction, in which it is important to accept the fact that "historical faithfulness" can refer to various levels:

A) The recording as it was heard in its time (Storm's Audio History Type I);

B) The recording as it has been produced, precisely equalized for intentional recording equalizations, compensated for eventual errors caused by misaligned recording equipment, and replayed on modern equipment to minimize replay distortions (steps 1 to 5);[6]

C) The recording as produced, but with additional compensation for recording imperfections caused by the recording technique of the time (steps 1 to 6).

In aligning oneself with William Storm's argument, it must be emphasized that all measures taken should ideally be based on objective knowledge. In view of unavoidable uncertainties, however, cautiously chosen approximations and guesses (as in other historical research) are permissible, subject to scholarly responsibility. As knowledge, skills, and technology advance, all results should be considered preliminary. Therefore, unless it disintegrates, the original carrier should be kept for further rerecording attempts. In cases where disintegration is possible, it is of the utmost importance to avoid any irreversible steps. Most importantly, all measures employed must be carefully documented.

In view of this situation, Level-B reproduction, i.e., the careful application of steps 1 to 5, will be the most commonly used standard.

Second, entirely different from historically faithful reproduction is the reinterpretation at the creative level of the tonmeister. From a scholarly point of view, it has to be accepted that new technology and new listening behavior will always stimulate attempts to reinterprete old recordings by modern technical means. Being of a purely artistic nature, these attempts cannot really be criticized by scholarly arguments, unless the attempt postures the reinterpretation as the original. Any criticism, therefore, has to be based upon artistic and aesthetic arguments.

In summarizing, the following statements should be made:

Sound archives are dedicated to the preservation of audio documents. Whenever rerecording (or transformatting) becomes necessary, it must be done with historical faithfulness in mind. Careful documentation of all procedures is imperative.

Re-issuing historical records by the record industry is another matter. If reinterpretations are carried out, they have to withstand artistic and aesthetic criticism. These manipulations, however, must be stated, otherwise such reissues can be interpreted as falsifications of history. In observing recent trends, it may be assumed that the market increasingly demands development towards historical faithfulness: clearly the record lover is more attuned to historical faithfulness than marketing managers generally assume.

Notes

1 William D. Storm, "The Establishment of International Re-recording Standards," *Phonographic Bulletin*, 27/1980, pp. 5–12. (See also postscript.)

2 First thoughts in that direction were expressed by the author at the International Colloquium "Geschichte, Erhaltung und Restaurierung historischer Tonträger" organized by the Schweizerische Landesphonothek, Lugano, 1986 October.

3 Franz Lechleitner and Lloyd Stickells, "The Construction of Cylinder Replay Machines," Eva Orbanz (Ed.), *Archiving the Audiovisual Heritage. Proceedings of the Joint Technical Symposium* (FIAF, FIAT, IASA), Berlin 1987. Berlin 1988, pp. 79–83.

4 James R. Powell, Jr., "The Audiophile's Guide to Phonorecord Playback Equalizer Settings," *ARSC Journal*, 20/1, 1988–89, pp. 14–23.

5 Erhard Aschinger, Franz Lechleitner, and Dietrich Schüller, "The Old Phonograms of the Vienna Phonogrammarchiv: Re-recording Principles and Practices," *Phonographic Bulletin*, 35/1983, pp. 16–20.

6 Postscript. Since this paper was read in 1990 March, William D. Storm and the author, among others, collaborated to prepare a "Guide to the Basic Technical Equipment Required by Audio, Film, and Television Archives" for UNESCO (edited by George Boston [Paris, 1991]). In this context, Storm presents a further developed version of his pioneer paper of 1980, and defines a subgroup Type IA of Audio History Re-recording, the faithful reproduction of a historical sound carrier as it has been produced, replayed on modern equipment. This type of his classification represents Level B reproduction of this paper.