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TO: All Ampex Field Personnel

FROM: E. J. Aleks

SUBJECT: Care and Storage of Ampex Computer Tape

Attached is a copy of an excellent writeup prepared by Darrel Howerton of ACPC in Culver City. Distribution was originally intended for our Computer Products field engineers only, however, we felt by broadening the circulation all field personnel would become more knowledgeable on the subject.

Additional copies will be made available upon request for those Computer tape users and prospects you feel would be interested.

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Enclosures



CARE AND STORAGE OF AMPEX COMPUTER TAPE

In the equipment field, it was Ampex research and engineering that introduced the Videotape* Magnetic Tape Television Recorder, which revolutionized the television industry. And before that, Ampex Professional Audio recorders were already established as the standard of the broadcasting industry all over the world. Ampex developed and produced stereophonic sound recorders, common in the home today. For science and industry, Ampex built the first Instrumentation Tape Recorder, and now supplies the great majority of high performance recorders in use around the world. For the Computer industry, Ampex is one of the world's largest producers of digital tape transports, and related components.

MISCONCEPTIONS

First, one of the most popular misconceptions is that a tape can be demagnetized if it is shipped by air. This is nonsense. The magnetic force required to demagnetize a reel of tape is considerable. To give you an idea of the force required, try lowering a screwdriver or any metal object over a powerful motor generator. When you can feel the screwdriver actually vibrating in your hand, you are now approaching the amount of force needed to demagnetize a tape. Now, if there was a magnetic force this powerful running around wild in an airplane, the pilot could not read his flight instruments.

Another misconception is that tape can be demagnetized if it is dropped or jarred against a hard surface. Take our word for it, this is not true. You can bounce it, jump on it, hit it with a sledge hammer, slam it on the floor, but you will not affect the magnetized tape, other than physically mutilating it.

A less popular, but just as false a statement, is that certain methods of applying the magnetic oxide to the backing gives greater adhesion. The adhesion of the magnetic coating is determined by the selection of binders. The method of application does not enter into the problem.

Another area of misunderstanding is the question of the permanency of the recorded tape during long term storage. Actually, the recorded information on a magnetic tape becomes more permanent with time, providing the tape is stored in an area free from the effects of stray fields. The longer the tape is in storage, the more difficult it is to erase or demagnetize.

STORAGE CONDITIONS

After you have recorded a tape with this great amount of data, it becomes quite a valuable record and should be treated accordingly. The tape storage room should be conditioned to maintain 70 - 75° F, and 50 - 60% relative

*TM Ampex Corp.

STORAGE CONDITIONS (Cont.)

humidity...to match the conditions in the computer room. If these conditions are not attainable, then avoid any sudden changes in temperature. For example, if your storage area is not properly conditioned, and the tape is suddenly exposed to a 30° F drop in temperature by bringing it into a controlled area, let it sit for 24 hours before using it on your Computer. A standard 10- $\frac{1}{2}$ " reel has about 1200 layers of tape wound upon each other. If a dimensional change of 1/10 of 1% on each layer were to occur, it would be amplified 1200 times and result in physical distortion of the tape, which would result in defective areas.

Physical handling of the tape reel is also important. Fingernail scratches, finger prints, bent edges, etc., are all potential defective areas and can be avoided by gentle handling of the tape. Never handle the tape by using the flanges as a sole support.

CUPPED TAPE

The outside layers of tape will sometimes have a cupped appearance; that is, the oxide side of the tape may appear slightly concave.

Acetate tape may sometimes exhibit this condition when first removed from the plastic shipping bag. The cupping occurs when the relative humidity of the surrounding air is increased over a short period of time. (An increase in relative humidity can be the result of a sudden drop in air temperature as well as an actual increase of moisture content). The acetate reacts to the humidity increase by expanding slightly, while the oxide coating does not. The cupped effect will not interfere with the proper operation of the tape and will disappear after a few passes. Mylar* base tape is less susceptible to changes in humidity.

Another condition, which can cause magnetic tape to exhibit a wavy edge results from edge damage. If the tape reel is improperly mounted, the edge of the tape will receive undue wear and become burred. This burr will cause one edge of the tape to be slightly thicker than the other. When wound on a reel, the edge of the tape with the burr will wind to a larger diameter than the undamaged edge. After a period of time, the center of tape will be permanently stretched. A tape in such condition after continued use will prove unpredictable and generally unsatisfactory. The read errors encountered are usually of the random, nonrepetitive type.

REEL WARPAGE

When not in use, reels must be properly supported. The plastic container provided has been designed so that a reel is fully supported. A reel which is supported in any other manner may become warped.

*TM DuPont

REEL WARPAGE (Cont.)

One of the common reasons that a reel wobbles or appears to be warped during use is that the reel may not be seated properly on the hub. The same effect is produced if the file protect ring is not inserted completely and the reel is, therefore, not fully seated. In either case, the reel behaves as if it is warped, and can produce damage to the edges of the tape.

PROCEDURES AND PRECAUTIONS

The maximum conditions of temperature and relative humidity for operating and storing IBM magnetic tape are itemized below:

Maximum Limits for Operation and Storage Conditions

	<u>Relative Humidity</u>	<u>Temperature</u>
Acetate	40 - 60%	65 - 80° F
Mylar	0 - 100%	40 - 120° F

For extended storage of Mylar at humidities greater than 80%, tape reels must be hermetically sealed within moisture-proof plastic bags. This prevents formation of mold growth and fungus.

The conditions of prolonged storage of acetate tapes can be extended to those recommended for Mylar, provided tapes are hermetically sealed in moisture-proof plastic bags. Before re-use, tapes must be reconditioned to operating conditions for a length of time equal to the time they were stored (up to a maximum reconditioning period of 24 hours). Reels of tape should always be kept in their plastic containers when not in use. Acetate base tape is not recommended for long term storage.

OPERATING PROCEDURES

Smoking should not be allowed in the machine room. Ashes can contaminate tape. Live ashes can produce permanent damage if they touch the surface of the tape.

Tapes which contain useful information must not be exposed to magnetic fields with an intensity greater than 50 oersteds. The earth's magnetic field varies with geographical location. On the average, its strength is approximately 0.5 oersteds.

During loading, the tape should be taken directly from the container and mounted in the tape unit. After unloading, the tape should immediately be replaced in its container.

OPERATING PROCEDURES (Cont.)

Extreme care must be used while removing the file protect ring. Under no circumstances should the ring be removed while the tape is loaded in the columns. When being loaded, the reels should be pushed firmly against the stop on the mounting hub to insure good alignment. Special precautions should always be taken to make sure that the hub has been tightened during loading.

To wind the take-up reel to the load point, rotate the reel with the finger in the recessed finger hold on its surface. Rotating the reel with the finger in the cut-out will nick or curl the guiding edge of the tape. While the tape is on the machine, the container should be closed and put in some location where it is not exposed to dust or dirt. The tape unit should be allowed to complete the unload sequence before the door is opened.

HANDLING

When tape is handled, as during splicing, the operator's hands should be thoroughly clean to prevent contamination of the tape by body oils and salts, which will pick up foreign particles. Some operators, in addition, find it helpful to wear clean white gloves to prevent contamination when handling tape. Unnecessary handling should always be avoided.

Heads and guides of the machine should be cleaned to remove accumulations of foreign matter each time a tape is placed on the recorder. The machine manufacturer's recommended cleaning procedure should be followed.

CLEANING

If you have difficulty with signal dropouts arising from dust, carefully wipe the surface and backing of the tape with a lint-free cloth, such as a very soft chamois, before and after using. To get rid of contamination that does not brush off easily, use a cloth lightly moistened with Freon TF. Aliphatic hydrocarbon-type solvents (heptane, gasoline, naphtha, etc.) can also be used; care should be exercised, however, since they are flammable. Freon TF is non-toxic and non-flammable. Do not use carbon tetrachloride, ethyl alcohol, trichlorethylene or other unknown cleaning agents because they may soften the oxide, deform the backing, or both.

STORING

Tapes, when not in use, should be placed on a precision reel for uniform winding at moderate tension and then given protected storage. Recommended take up tension for most instrumentation recorders is 4 to 5 ounces for each 1/4 inch of tape width. The best method of protected storage is to place the reel of tape in a self-sealing plastic case and store it on end in a storage bin equipped with partitions between each reel. The plastic case protects tape from dust and sharp humidity and temperature changes. It also guards both tape and reel against handling damage when being

STORING (Cont.)

transported between storage and work areas. Rewinding the tape once every six months during storage is recommended because this releases expansion-contraction stresses and lessens the possibility of blocking. This is particularly true of acetate base tapes.

Extremes of temperature and humidity should be avoided. In general, recommended storage conditions for acetate and polyester base tapes are:

Humidity.....40 - 60% R.H.
Temperature.....60 - 80° F.

If extremes of temperature are encountered during storage or transit, tape should be brought to equilibrium before it is used. Assuming, for instance, that a tape has been in storage or transit at sub-zero temperatures, it should be "normalized" or stored in the computer environment for 24 hours.

DISTORTION

While the majority of dropouts in instrumentation recording are caused by specks of dust and other contaminants lifting the tape away from the head, the next most significant causes are dents and creases in the base material. Dents can be caused either by foreign particles becoming wound up tightly in the roll, or by roughness in the surface of the hub on which the tape is wound. These may cause a permanent set in many layers of the tape which cannot be stretched out flat as the tape passes over the head. Stresses in the foil sufficient to stretch the backing 5% will generally leave a permanent impression. Stresses below the 5% point are not normally permanent. Creases usually are caused by handling the tape; i.e., threading, making splices, removing the tape from the guides, etc. or by damage to the edges of the tape because of uneven winding.

Most causes of distortion of the base material can be eliminated by the use of the precision reel. The tapered flange design affords greatly increased protection against dust and crushing of the tape edges. The hub has no threading slots which cause distortion of the inner turns.

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