a Care package for

AUDIO RECORDERS

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Recognizing that instructions for the care of magnetic tape recorders are indelibly imprinted on the memory of every recording engineer, we are nonetheless persisting in our belief that somewhere, somehow, these instructions should be restated. For those who have but recently joined us, of course.

Here, then, is a review of the professional audio recorder—what it is supposed to do, what care it should receive, some tips on checking up on it, plus a few casual indicators of trouble for engineers willing to frown knowingly at some point prior to total disintegration of the recorder in service.

Simply put, the professional magnetic audio tape recorder is a system in which signals in the frequency spectrum to which the human ear is tuned are recorded on magnetic tape for later reproduction. The name of the game is "what goes in should come out!" The fact that what comes out is remarkably similar to what goes in is what makes the magnetic tape recorder the useful tool that it is. In calling it a "professional" recorder we are simply defining the category of recorder used by the professional recording or broadcast engineer in the normal course of his day to day activities. But . . . if the professional wishes to apply the same care to his home recorder, we have no objections.

There are some peculiar twists to the process, though. Sometimes more comes out than expected. Noise, for example. And a surplus of low frequencies. At the same time *less* comes out. High frequencies get lost in the shuffle of loading signals on tape and getting them off again.

Some of this gaining and losing is cancelled out by some pretty nifty adjustments made by the manufacturer and recording engineers operating as a team. But there are some residual effects which are undesirable and these are the ones we'll attempt to thwart herein.

Mind you, we're not going to solve all of your problems, we'll just tell you some of the things to do to avoid some of them. And maybe point you in the right direction.

PREVENTIVE MAINTENANCE . . . Three Easy Steps

First, let's assume immediately that all professional audio recorders perform as specified and that performance as specified is satisfactory. Our job: to unseat those malevolent forces which suddenly appear to upset our assumptions.

Most readers will recognize three basic principles right off:

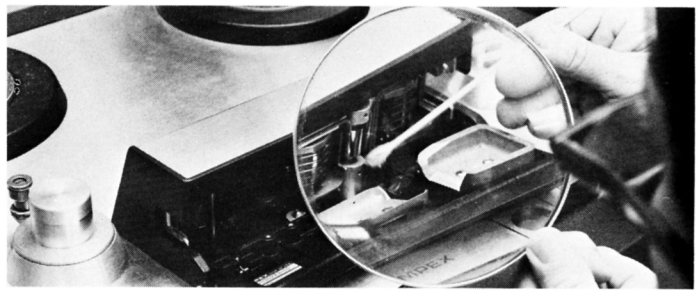
1. A recorder with clean heads, guides, capstan and surfaces is less susceptible to problems caused by dirt and oxide than a dirty recorder.
2. Proper and regular demagnetization of all elements in the tape path is quite likely to eliminate problems caused by magnetized heads, guides, etc.
3. A properly lubricated transport will not be over-lubricated or under-lubricated. It has also been known to run better as well.

When analyzed, these three basic statements will reveal one startling fact: together they constitute the entire preventive maintenance routine. Anything above or beyond this constitutes inspection, checking or troubleshooting.

This in no way implies that inspection, checking and trouble-shooting are not to be indulged in—not at all. It just pays dividends to know where one leaves off and the others begin. And while the preventive maintenance routine can be delegated to an assistant, the really careful engineer will do the next step himself: the inspection.

TAKE A LONG HARD LOOK

You'll get no quarrel from anyone by claiming that a good visual inspection can reveal many, many little pieces of information that together tell a significant story about the condition of the recorder.



While there is no way to describe it adequately, a properly adjusted tape transport literally sings a song of well-being. You can feel it. By the same token, an ailing recorder can cause the hackles on the back of your neck to stand out straight. You're uncomfortable being in the same room with it.

The well-behaved transport on close inspection will be passing tape in an absolutely flat path—flat in that motion is nearly imperceptible. It is this comfortable sensation of the rightness of things plus the beautiful, smooth flow of tape that encourages the engineer to proceed knowing that *today* things will go well.

At this point, the engineer can check the braking system. Two successful smooth stops in a row signifies that, by golly, he might have it made. And so he continues to exercise the transport through all of its modes and in the several speed ranges involved.

Note that the engineer in checking "stops" is also checking "starts" in approximately a 1:1 ratio. In both cases, the stop/start times can be checked against the manufacturer's spec. Again, the well-adjusted transport will be a delight to behold.

Satisfied that the transport functions are just short of perfection, the engineer can now continue his inspection by removing the tape from the machine and preparing for a thorough examination of the entire transport.

Two tools are helpful. Good light and a man sized magnifying glass. There need be no shame connected with the use of the glass. After all, the idea is to see what's going on.

From the engineer's vantage point all manner of wonderful things show up in the glass. (And you thought you cleaned the system, didn't you?)

Dirt and oxide particles stare balefully back from hidden corners. Here's a piece of torn tape tucked away. Safe enough where it is, but what if it should move and lodge itself smack dab against a head at a critical instant?

Get rid of it! And any others you may find.

And while you are getting rid of the scrap of tape, you've a perfect right to ask where it came from. One scrap could be a piece knocked off the end of a tape during a fast rewind—several pieces of similar size and shape *could* indicate a burr on a contact surface somewhere—missed at the last inspection.

And that oxide—where did *it* come from? Poor cleaning? Or is it newly shed—a sign of trouble?

Now the value of the glass really shows. A careful check of stationary guides and the heads will reveal any signs of wear. If slot-wear is present yet recorder performance is satisfactory, there may be no cause for alarm. Leaving well-enough alone applies. It may be sufficient simply to make a note that the wear *is* taking place and watch for further developments. But if the engineer is contemplating a change in head alignment, those wear slots will present some real problems.

Tapes will not track smoothly through the misaligned slots. Buckling, bowing or warping of the tape could result with an attendant loss of intimate tape-to-head contact. High-frequency response drops off quickly and physical tape damage is a good possibility.

Under the assumption made in the beginning, the recorder under survey is in decent condition. We have observed no signs of wear. But we're not through yet. Some additional checks should be performed.

Head alignment and electronics are still unknown quantities. While these items appear to be in proper working trim, the "let's make sure" checks are not difficult to perform, nor need they require much of your valuable time.

TEST TAPES . . . Your Best Friends

Select the proper test tapes needed (reproducer alignment tapes recorded at the proper speeds). Ideally, you should use test tapes with track configurations matching that of the recorder. You're already aware of the fringe-effect that occurs when using full-track tapes to check multitrack recorders. Low frequency response is magnified and it is next to impossible to equalize for a flat response. (Remember even with the right format tapes the "bumps" will still be there.)

Thread the alignment tape carefully and follow the voice instructions on the tape. In most test tapes, signals are provided for checking head azimuth, frequency response and the operating level, not necessarily in that order. Make the essential adjustments for both speeds, using the tape made for each speed. (Although the NAB equalization curves are identical for 15 ips and 7½ ips, the frequency response adjustments must be made with separate tapes to assure accuracy.)

In using test tapes, the confident voice on tape may sound more authoritative than the condition of the tape warrants. *Know your test tape.*

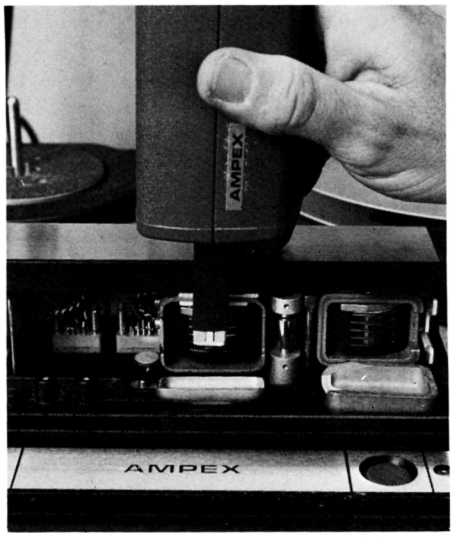
TENDER LOVING CARE FOR TEST TAPES

While test tapes are masters so far as the recorded signals are concerned, they are fragile things. Once they leave the environment in which they were made, they are susceptible to the same damage as any other tape. They not only wear out in use, but even deteriorate magnetically on the shelf. Shelf deterioration can be minimized by proper storage, but only care in use can successfully combat physical damage to test tapes. Manufacturers are cautious in expressing life-expectancy figures. Fifty to a hundred plays seems to be a safe figure. Losses as high as 5 dB have been noticed at the hundred play mark. Offsetting this are tests where tape life has been extended well beyond one-hundred plays when normal clearing and degaussing routines are followed. Professional quality heads generally will extend the life of test tapes. This would indicate the need for caution in using test tapes on heads of doubtful quality—at least those test tapes you depend on for use with your professional gear.

Under no circumstances should a test tape be used on a machine prior to cleaning and degaussing. Remember that short wave-length flux literally rides on the oxide surface. Wear it thin and you've lost the high frequencies. Even if no wear occurs, dirt causes loss of intimate contact and again, there go the highs.

Running test tapes on magnetized surfaces offers more trouble. You can erase the highs and replace them with noise rather easily.

A word about the efficiency of head degaussers should be dropped in here.



New AMPEX HD-16 Degausser

With the wide availability of low-noise tapes, noise reduction systems, and 16 channel (or more) recording systems, noise or signal damage caused by magnetized elements in the tape path is more than ever noticeable. Tests have shown that the old familiar head degausser is not doing the job adequately. Special, more effective degaussers will undoubtedly reach the market in the near future. Until they are available, the professional must use what he has. Multi-channel head systems that can be removed from the transport should be degaussed with the more powerful bulk degaussers. Even the handheld bulk degaussers will do a better job of degaussing parts such as capstans and guides.

In storing your test tapes, rewind them carefully and store them in a magnetically secure environment—away from speakers, microphones and other magnetic devices (including magnetic latches on cabinet doors!).

Since test tapes represent one of your primary reference standards, they should be treated as precision tools. You can be sure that's how the manufacturer treats them.

Once you have checked the recorder by means of the reproducer alignment tape, you will have established several points: the azimuth of the reproducing heads is correct, the frequency response has been equalized at each operating speed and you have adjusted the output to the standard operating level.

With all these good things done you can carefully rewind the test tapes at play speed (or store them tail out) and put them away in a secure storage.

IT'S THE SIMPLE THINGS THAT COUNT

See how conveniently our assumption has served us? Since your recorder was assumed to be in good working order, all you've had to do is to perform three simple preventive maintenance steps, a visual inspection *(thorough* visual inspection), and a check of the system using properly configured alignment tapes.

Together, these routines comprise the basic care package for your recorder. Because they are simple routines, they can be repeated often. Others must be performed too, and these routines will generally be spelled out by the manufacturer in the instruction manual.

Since most of these more specialized checks and adjustments are peculiar to the machine involved, we won't detail them here.

Instead, we'll make a list of the routines, suggesting the frequency of application, and give the reasons why they should be done. This, then, is a more complete "care package for the magnetic audio recorder."

AUDIO RECORDER SCHEDULE OF ROUTINE INSPECTION AND MAINTENANCE

ROUTINE	HOW OFTEN	WHY
1. Cleaning	As often as desired but certainly no less often than once every eight operating hours.	Clean recorders eliminate a lot of possible problems. Dirt and oxide accelerate wear and degrade performance.
2. Demagnetizing	Should be considered as part of the cleaning routine.	Magnetic cleanliness is as desirable as physical cleanliness. Stray fields can rob you of the quality you put in so carefully.
3. Lubrication	As recommended by the manufacturer. No more, no less. This is no place to exercise creativity.	No one likes a squeaky wheel. Too much lubrication attracts dirt, destroys components.
4. Visual Inspection	Follow your own time-table. In practice the careful engineer is *always* inspecting.	Observation of normal behavior can tune the eye to abnormal conditions. Also, some problems can be observed in development, and corrected before catastrophe.
5. System Check Out (using alignment tapes)	After cleaning and demagnetizing, generally prior to an important session. As the commercial says, "once in the morning does it."	Test tapes are a primary reference and remove any doubts you might have.
6. System Check Out (using manufacturer's check list and flutter test tape)	Follow the manufacturer's instructions. Use flutter test tape after all adjustments to the tape handling system.	These checks determine whether or not adjustments should be made in brake or hold-back tensions, capstan idler pressures, etc. Flutter test checks adjustments in reproduce modes and is a comfortable reassurance that tape is being handled properly.