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Which Calibration Tape Should I Buy? An Elementary Guide

People who are new to analog magnetic tape recording and who are buying their first MRL Reproducer Calibration Tape often ask "Which Calibration Tape should I buy? The 'Multifrequency' tape with some 18 to 20 tones? Or a shorter and cheaper 2-, or 3-frequency tape? In the 4-minute or 8-minute length? "

The best one for you depends on the tape recorder that you have and your skill in making the adjustments. Here's some elementary information to help you make those decisions. For more advanced information, see "[Choosing and Using MRL Calibration Tapes for Audio Tape Recorder Standardization](#)".

First, you need the Operation and Maintenance Manual for your tape recorder

You should have the Operation and Maintenance Manual for your tape recorder before attempting to make measurements and adjustments on it. The manual will tell you what mechanical and electronic adjustments there are, what they do, where to find them, and how to adjust them. All tape recorders have the same basic adjustments, but their locations and adjustment procedures are usually specific to each machine.

Second, you need to know your basic recording parameters: the tape width, speed, equalization, and reference fluxivity

Most recorders can be set up for *any* of several tape widths, speeds, equalizations, and reference fluxivities ("recording levels"). Each of those takes a different Calibration Tape. Therefore the *recorder model number is no help to you or us* in determining what Calibration Tape you need.

- The information you need may be on the front panel of recorder, or in the manual, but more often it is not stated, so you have to figure it out for yourself. If you have recently purchased a used recorder, the previous owner may be able to help you.
- If you are already using an MRL Calibration Tape, the label and the voice announcement on that tape give the width, speed, equalization and reference fluxivity. If you just want to replace that tape, the part number on it will still be valid -- MRL part numbers have *never* changed, so you can reorder the same part number.
- If you have another manufacturer's old Calibration Tape that was used to setup your reproducer -- Ampex, BASF (Emtec), Standard Tape Lab, et al -- it will give the necessary information. Call or email us with their part number or specifications, and we can give you the equivalent MRL part number.
- If none of these are available, you can measure the tape width with a ruler. For speed, you can make a mark on the tape; using a watch, "play" the tape for one second, then measure how far the tape moved. (This is pretty rough, but you should be able to tell whether the tape move 3.75 in, 7.5 in, 15 in, or 30 in.) Look at the head faces, and see how many tracks there are -- often knowing the track configuration will give us a clue to the equalization likely used.
- If all of these methods fail, a service technician or a knowledgeable friend should be able to help you.

Equalizations

The equalizations are known by the standardizing organizations' names, and those organizations have changed their names over the years, resulting in some confusion. The organization names have changed more often than the equalizations! The names and equalizations are:

- For 3.75 in/s recording, the same equalization is used everywhere for new recordings; it is standardized by both the NAB and the IEC, so we call it "NAB and IEC".
- For 30 in/s recording, the equalization used everywhere for new recordings is AES, also called IEC2.
- For 7.5- and 15-in/s recording, the equalizations used are commonly called:
 - NAB, which is mostly used in the US; it is now officially called IEC2.
 - IEC or CCIR or DIN Studio (all are the same), which is mostly used in Europe; it is now officially called IEC1.
- For 15 in/s recording, the exception is that with 8-track recorders on ½-inch tape, and 16- and 24-track recorders on 1 inch tape, the IEC1 (IEC and CCIR and DIN Studio) equalization is *almost always* used.
- During the early years of tape recording (1948 thru roughly 1968), some of the equalizations were changed several times, especially at the slower speeds, as new-and-improved tapes were developed. Contact MRL for advice if you are transcribing recordings made before 1970, and you're not sure what equalization to use.

What reference fluxivity should I use?

The "reference fluxivity" section of a Calibration Tape is normally used to set the reproducer gain on a tape recorder with a vu meter so that the output level reads 0 dB. The reference fluxivity you should use depends on:

- your program level meter (whether a standard vu meter, a standard peak program meter, or something non-standard);
- the kind of blank tape you'll be using;
- whether you'll be using a noise reduction system (e.g., Dolby, dBX); and
- whether you desire "tape compression."

For some specific recommendations, see the literature from the manufacturer of the tape you'll be using, and also see MRL's [Choosing and Using MRL Calibration Tapes...](#), Sec. 1.2.6 and Table 2 (pages 4 and 5).

Common usages are 200 nanowebers per meter [nWb/m] for older and consumer-type tapes; 250 nWb/m for general studio usage; and 500 nWb/m with the highest output mastering tapes when "tape compression" is desired.

If you have a Calibration Tape that is not at the reference fluxivity that you want, but is otherwise correct, you can easily use it to set your reproducer for a different reference fluxivity by the method shown in [Choosing and Using...](#), Sec. 2.3.1 "Shifting the Reference Fluxivity".

Which test signals should I use?

[Multifrequency Calibration Tapes](#)

These tapes are the "old traditional alignment tapes" sold by Ampex and others since 1948. They have 18 or 20 shorter tones -- 1 kHz level set, 8- and 16-kHz azimuth set and preliminary frequency response, and 13 frequencies from 32 Hz to 20 kHz. for frequency response. The 13 frequency response tones measure the response over the entire audio spectrum, and are necessary for diagnosis and repair of reproducers with poor frequency response. They are also needed to set up a reproducer when the equalization is not already known to be adjusted close to optimum. An example would be calibrating a newly-purchased machine for the first time. Though more expensive, multifrequency tapes are the most generally useful.

Once a reproducer is set up with a Multifrequency Calibration Tape, routine checks at 1 kHz and 10 kHz are usually adequate, and those tapes are shorter, and therefore both less expensive to purchase, and quicker to use.

Two-Frequency Calibration Tapes : 1 kHz and 10 kHz

This is the minimum set of tones to calibrate a tape reproducer. Use the 1 kHz tone to set the "Reproducer Gain" (which may be called "Reproducer Level") control. Use the 10 kHz tone first to set the mechanical azimuth of the reproducing head, then to set the "High Frequency Reproducer Equalization" control.

These tapes come in 4-minute lengths (2 minutes each of 1 kHz and 10 kHz); and 8-minute length (4 minutes for each tone). If you know how to do the adjustments, and they only need be trimmed, two minutes is more than long enough to set two channels. It is not nearly long enough to set 24 channels, nor even to set two channels if the machine is completely out of adjustment. You have to decide how much money it is worth to you to avoid rewinding the calibration tape several times because you run out of tape before you have finished the adjustments.

Three-Frequency Calibration Tapes : 1 kHz, 10 kHz, and 50 Hz

These tapes add a 50 Hz tone, at the cost of reducing the tone lengths from 2 minutes each to 72 seconds each; or from 4 minutes each to 152 seconds each.

In the past, a 100 Hz tone was commonly used to test that the low-frequency response of the reproducer had not failed. But 100 Hz is really too high a frequency for setting the low-frequency reproducer equalizer response. Also, once the low-frequency response is set, it should not require re-adjustment. In fact, some tape reproducers do not even have a low-frequency adjustment control. See [Choosing and Using...](#), Sec 2.2 "Low-frequency Response Calibration", for further recommendations.

Do I Need a Separate Calibration Tape for Each Speed and Equalization?

In general, yes -- we recommend a separate Calibration Tape for each speed and equalization that you need to calibrate. The Multifrequency Calibration Tapes are only available in single speed and equalization. The two- and three-frequency tapes, and some others, are available as [two-speed](#) calibration tapes.

It is possible to use a Calibration Tape for several speeds and equalizations other than the one it is designed for, but it makes the procedure more complicated and less accurate than having the correct tape. See [Choosing and Using...](#), Sec. 2.3.2 "Shifting the Equalization Standard".

Other and Special-purpose Calibration Tapes

For other and special purpose Calibration Tapes, see Sec 1.2.4 "Test Signals" in [Choosing and Using MRL Calibration Tapes...](#) There you will find calibration tapes with many different special test signals: single tones, fast and slow sweeps, Chromatic Sweeps, special sweeps for Sound Technology and for Audio Precision analyzers, broadband white or pink noise, a Speed and Flutter tape, and a polarity calibration tape.

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