

# MAGNETIC REFERENCE LABORATORY, INC.

165 Wyandotte Dr ♦ San Jose, CA 95123 ♦ Phone&FAX +1.408.227.8631 ♦ www.mrltapes.com

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## Calibration Tapes for Use With Audio Precision "System One" Program 2HD-FREQ

MRL manufactures Calibration Tapes with four setup tones, followed by a 3rd octave step tone series of recorded signals designed to be used with the Audio Precision "System One" Program 2HD-FREQ.

These tapes replace tapes (described in Publication 421, and still available on special order) which did not have the four

setup tones. This publication describes the test signals on these tapes, and their use.

The Table below gives catalog numbers for Calibration Tapes having a total duration of 4 minutes. We can also make tapes of 8-, 16-, 32-, or 64-minutes, within the limitations of the length of the blank tape and its speed.

**Table of Reproducer Calibration Tapes With Four Setup Tones Plus Signals For Use With Audio Precision "System One" Program 2HD-FREQ**

| Medium   | Tape Speed               | Equalization Standard | Reference Fluxivity/<br>[nWb/m] | 4 minutes total        |        |
|--|--------------------------|-----------------------|---------------------------------|------------------------|--------|
|  |                          |                       |                                 | Catalog Number         | Price  |
| 6.3 mm<br>¼ in<br>Open Reel  | 95 mm/s <b>3.75 in/s</b> | IEC & <b>NAB</b>      | 180*                            | <b>221-423-450-102</b> | 100 \$ |
|  | 190 mm/s <b>7.5 in/s</b> | IEC (IEC1)            | 180*                            | 231-423-450-109        |        |
|  |                          | <b>NAB</b> (IEC2)     | 180*                            | <b>233-423-450-105</b> |        |
|  | 380 mm/s <b>15 in/s</b>  | IEC (IEC1)            | 355                             | 241-423-510-105        |        |
|  |                          | <b>NAB</b> (IEC2)     | 355                             | <b>243-423-510-101</b> |        |
| 760 mm/s <b>30 in/s</b>  | <b>AES</b> (IEC2)        | 355                   | <b>251-423-510-102</b>          | 105 \$                 |        |
| 12.5 mm<br>½ in<br>Open Reel   | 95 mm/s <b>3.75 in/s</b> | IEC & <b>NAB</b>      | 180*                            | <b>321-423-452-109</b> | 145 \$ |
|  | 190 mm/s <b>7.5 in/s</b> | IEC (IEC1)            | 180*                            | 331-423-452-106        |        |
|  |                          | <b>NAB</b> (IEC2)     | 180*                            | <b>333-423-452-102</b> |        |
|  | 380 mm/s <b>15 in/s</b>  | IEC (IEC1)            | 355                             | 341-423-512-102        |        |
|  |                          | <b>NAB</b> (IEC2)     | 355                             | <b>343-423-512-108</b> |        |
| 760 mm/s <b>30 in/s</b>  | <b>AES</b> (IEC2)        | 355                   | <b>351-423-512-109</b>          | 170 \$                 |        |
| 25 mm<br>1 in<br>Open Reel   | 95 mm/s <b>3.75 in/s</b> | IEC & <b>NAB</b>      | 180*                            | <b>423-423-452-108</b> | 265 \$ |
|  | 190 mm/s <b>7.5 in/s</b> | IEC (IEC1)            | 180*                            | 431-423-452-105        |        |
|  |                          | <b>NAB</b> (IEC2)     | 180*                            | <b>433-423-452-101</b> |        |
|  | 380 mm/s <b>15 in/s</b>  | IEC (IEC1)            | 355                             | 441-423-512-101        |        |
|  |                          | <b>NAB</b> (IEC2)     | 355                             | <b>443-423-512-107</b> |        |
| 760 mm/s <b>30 in/s</b>  | <b>AES</b> (IEC2)        | 355                   | <b>451-423-512-108</b>          | 305 \$                 |        |
| 50 mm<br>2 in<br>Open Reel   | 190 mm/s <b>7.5 in/s</b> | IEC (IEC1)            | 180*                            | 531-423-452-104        | 375 \$ |
|  |                          | <b>NAB</b> (IEC2)     | 180*                            | <b>533-423-452-100</b> |        |
|  | 380 mm/s <b>15 in/s</b>  | IEC (IEC1)            | 355                             | 541-423-512-100        |        |
|  |                          | <b>NAB</b> (IEC2)     | 355                             | <b>543-423-512-106</b> |        |
|  | 760 mm/s <b>30 in/s</b>  | <b>AES</b> (IEC2)     | 355                             | <b>551-423-512-107</b> | 420 \$ |
| <b>For Audio Broadcasting Professional Cartridges (see also MRL Pub. CART)</b> |                          |                       |                                 |                        |        |
| 6.3 mm ¼ in  | 190 mm/s <b>7.5 in/s</b> | IEC & <b>NAB</b>      | 125**                           |                        |        |
| On open reel, in box, for you to load into cartridge                           |                          |                       |                                 | 132-423-422-108        |        |
| Loaded into Audiopak AA-4 Cartridge  |                          |                       |                                 | 132-423-422-302        |        |
| Loaded into ITC Cart 2 Cartridge   |                          |                       |                                 | 132-423-422-409        |        |

\* Because of tape saturation at the higher frequencies at lower speeds, this tape is recorded at 6 dB below 355 (250\*\*) nWb/m, which is equivalent to a reference fluxivity of 180 (125\*\*) nWb/m.

Prices are in US \$, and do not include shipping or applicable taxes.

Prices may be changed without notice.

See "Choosing and Using MRL Calibration Tapes for Audio Tape Recorder Standardization", MRL Publication Choo&U, for more information on choosing and converting between different equalizations and levels, as well as descriptions of other test signals that are available from MRL, and notes on using Calibration Tapes.

## 1 TEST SIGNALS

When you measure the frequency response of an amplifier, you can easily change the frequency range of the test signals to suit your needs. But when you use a Reproducer Calibration Tape to measure or adjust a tape reproducer, you are stuck with the signals on the Calibration Tape. Thus we provide Calibration Tapes with test signals especially designed to be used with particular test equipment.

"Calibrating" a tape reproducer involves measuring it or adjusting it, or both. When an automatic frequency-response plotter is used, a frequency sweep is convenient in order to provide a complete graph of the frequency response of an adjusted reproducer. But you will find that a sweeping frequency is not convenient for performing any kind of adjustments: in general, if you measure the frequency response of a reproducer by using a swept frequency, you will see the output level changing versus frequency, which is what we mean by the "frequency response". But if you make an adjustment to the reproducer as the sweep progresses, you cannot tell if the output level change that you see is due to the inherent "frequency response" of the reproducer, or due to the adjustment you just made. You have to wait for the *next* sweep (which will be some 45 seconds later) to tell the effect of your change — and that's a long time to wait.

Therefore this Calibration Tape provides two kinds of test signals. First, there are four long (15...45 s) tones for adjusting the reproducer; then two  $\alpha$ rd-octave step series of tones for automatic data response plotting by the Audio Precision system.

### 1.1 SETUP TONES

First are tones of 1 kHz for setting the channel gain, 16 kHz and 10 kHz for setting the azimuth and high-frequency equalizers, and 100 Hz for setting the low-frequency equalizer. Then a 1 kHz Start tone, and the AP Sweep. It is quite possible that the sweep will show that setting the HF equalizer for flat

| Section              | Frequency        | Duration |
|----------------------|------------------|----------|
| Set Gain             | 1 kHz            | 40 s     |
| Set Azimuth & HF Eq. | 16 kHz           | 30 s     |
| Set Hi-Freq. Eq.     | 10 kHz           | 40 s     |
| Set Lo-Freq Eq.      | 100 Hz           | 15 s     |
| Start Cue for Sweep  | 1 kHz            | 1 s      |
| AP Sweep             | 20 Hz ... 20 kHz | 31 × 1 s |
| Reset Gain           | 1 kHz            | 5 s      |
| Reset HF Eq.         | 10 kHz           | 10 s     |
| Start Cue for Sweep  | 1 kHz            | 1 s      |
| AP Sweep             | 20 Hz ... 20 kHz | 31 × 1 s |
| Reset Gain           | 1 kHz            | 5 s      |
| Reset HF Eq.         | 10 kHz           | 10 s     |
| End of Tape Cue      | 1 kHz            | 5 s      |

response at 10 kHz does not give the flattest response over the entire high-frequency spectrum. Therefore another 1 kHz and 10 kHz tone follow for re-setting the response at these frequencies, then another AP Sweep, the 1 kHz and 10 kHz tones again, and a final 1 kHz tone to warn of the end of the tape.

### 1.2 $\alpha$ rd OCTAVE STEP TEST SIGNAL PROGRAM

Audio Precision has developed a program for automatically measuring the frequency response of a two channel tape reproducer, which they call 2HD-FREQ. For maximum precision, the Audio Precision system needs constant-frequency signals for a one second duration each. Neither voice announcements nor quiet spaces between the tones are used, because they cause operation of the Audio Precision analyzer's auto-ranging system, which slows the data-taking process. The "AP Sweeps" recorded on these Calibration Tapes consist of following sequence: a 1000 Hz tone for 1 s to start taking data, a set of 31 frequency response measuring tones for 1 second each, at  $\alpha$ rd octaves from 20 Hz to 20 kHz; and a 1000 Hz tone to stop data taking.

### 2 OTHER TEST SIGNALS THAT CAN BE USED

The MRL Multifrequency Reproducer Calibration Tapes (see MRL Publication 101 for details of those signals) can be used with the "System One" to produce an automatic plot of the tape reproducer frequency response. While this is technically satisfactory, it is slow — it requires playing the entire Calibration Tape for each pair of channels, which takes from 6 minutes for ¼-inch width tapes to 15 minutes for 2-inch width tapes.

Audio Precision has also developed an auto test and alignment program that can be used with these Multifrequency tapes and Studer A800 series recorders (see Bob Metzler, "Auto Test and Alignment", *Studio Sound*, Vol. 31, Nr 3, pp 68, 70, 1989 March). This program reduces the time for measurement *and adjustment* of the reproducer to 2 to 3 minutes.

Acknowledgment: Our thanks to Paul Evans of the USC School of Cinema-Television for devising and testing the sequence and duration of the setup tones.

**Note on the Calibration Graph:** At the lowest frequencies, the Calibration graph may show "spikes" in the level. **The tape flux is in fact correct**—the spikes on the graph are an artifact of the time delay between the recording and reproducing heads on our recorder.