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Calibration Tapes for Use With Sound Technology 1500 Series

MRL manufactures Calibration Tapes with special test signals designed to be used with the Sound Technology 1500 Series Tape Recorder/Audio Test System. This Publication describes these signals and the advantages of using them, lists the catalog numbers and prices, and gives the test procedures for using these Calibration Tapes with the Sound Technology systems.

All of these catalog numbers are for tapes recorded with a reference fluxivity of 250 nWb/m. Inquire for catalog numbers if you need a different reference fluxivity.

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 SPECIAL MRL SWEEP 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. We have developed special test signals which are compatible with the Sound Technology 1500 Series, and are specifically designed for tape reproducer adjustment.

The particular problem is that you would like to have a fast, coarse sweep when you are doing the preliminary adjustment of the

Table of Reproducer Calibration Tapes With Signals For Use With Sound Technology 1500 Series Tape Recorder/Audio Test System

Medium	Tape Speed	Equalization Standard	Reference Fluxivity/ [nWb/m]	Level of 1 kHz tones / all other tones	4 minutes total		8 minutes total	
					Catalog Number	Price	Catalog Number	Price
6.3 mm **¼ in** Open Reel	95 mm/s **3.75 in/s**	IEC & **NAB**	250	0/-10 dB	**221-212-480-107**	100 $	**221-212-480-123**	140 $
	190 mm/s **7.5 in/s**	IEC (IEC1)	250	0/-10 dB	231-212-480-104		231-212-480-120	
		NAB (IEC2)	250	0/-10 dB	**233-212-480-100**		**233-212-480-126**	
	380 mm/s **15 in/s**	IEC (IEC1)	250	0 dB	241-211-480-104		241-211-480-120	
		NAB (IEC2)	250	0 dB	**243-211-480-100**		**243-211-480-126**	
	760 mm/s **30 in/s**	**AES** (IEC2)	250	0 dB	**251-211-480-101**	105 $	**251-211-480-127**	155 $
12.5 mm **½ in** Open Reel	95 mm/s **3.75 in/s**	IEC & **NAB**	250	0/-10 dB	**321-212-482-104**	145 $	**321-212-482-120**	225 $
	190 mm/s **7.5 in/s**	IEC (IEC1)	250	0/-10 dB	331-212-482-101		331-212-482-127	
		NAB (IEC2)	250	0/-10 dB	**333-212-482-107**		**333-212-482-123**	
	380 mm/s **15 in/s**	IEC (IEC1)	250	0 dB	341-211-482-101		341-211-482-127	
		NAB (IEC2)	250	0 dB	**343-211-482-107**		**343-211-482-123**	
	760 mm/s **30 in/s**	**AES** (IEC2)	250	0 dB	**351-211-482-108**	170 $	**351-211-482-124**	250 $
25 mm **1 in** Open Reel	95 mm/s **3.75 in/s**	IEC & **NAB**	250	0/-10 dB	**421-212-482-103**	265 $	**421-212-482-129**	415 $
	190 mm/s **7.5 in/s**	IEC (IEC1)	250	0/-10 dB	431-212-482-100		431-212-482-126	
		NAB (IEC2)	250	0/-10 dB	**433-212-482-106**		**433-212-482-122**	
	380 mm/s **15 in/s**	IEC (IEC1)	250	0 dB	441-211-482-100		441-211-482-126	
		NAB (IEC2)	250	0 dB	**443-211-482-106**		**443-211-482-122**	
	760 mm/s **30 in/s**	**AES** (IEC2)	250	0 dB	**451-211-482-107**	305 $	**451-211-482-123**	475 $
50 mm **2 in** Open Reel	190 mm/s **7.5 in/s**	IEC (IEC1)	250	0/-10 dB	531-212-482-109	375 $	531-212-482-125	570 $
		NAB (IEC2)	250	0/-10 dB	**533-212-482-105**		**533-212-482-121**	
	380 mm/s **15 in/s**	IEC (IEC1)	250	0 dB	541-211-482-109		541-211-482-125	
		NAB (IEC2)	250	0 dB	**543-211-482-105**		**543-211-482-121**	
	760 mm/s **30 in/s**	**AES** (IEC2)	250	0 dB	**551-211-482-106**	420 $	**551-211-482-122**	645 $
For Audio Broadcasting Professional Cartridges (see also MRL Pub. CART)								
6.3 mm **¼ in Lube Tape**	190 mm/s **7.5 in/s**	IEC & **NAB**	250	0/-10 dB				
On open reel, in box, for you to load into cartridge					132-212-482-106			
Lloaded into Audiopak AA-4 Cartridge					132-212-482-300			
Loaded into ITC Cart 2 Cartridge					132-212-482-407			

Prices are in US $, and do not include shipping or applicable taxes. Prices may be changed without notice.

mechanics (head wrap, azimuth, etc) and the equalizers, then a fine

sweep that can take longer for the final adjustments and the final data plot. We have done this by two means:

First, because different tape reproducer controls are used for high- and low-frequency adjustments, we provide three sweep frequency ranges: High-frequency sweeps, 20 kHz to 1 kHz, and Low-frequency sweeps, 1000 Hz to 20 Hz, for adjustment; and a Full-range sweep, 20 kHz to 20 Hz, for final data taking.

Second, in order to reduce the time necessary to see roughly what is happening, we divide each sweep—say 20 kHz to 1 kHz—into four interleaved sweeps, each using every *fourth* frequency of the Sound Technology's frequency set. Each "leaf" gives a skeleton response, and all four together give a complete response.

It is clearer on the Sound Technology's screen than it is on paper, but perhaps you can get the idea:

Frequency Step Used

First sweep:	- - - - - - - - -
Second sweep:	- - - - - - - - -
Third sweep:	- - - - - - - - -
Fourth sweep:	- - - - - - - - -

Screen appearance after sweep:

After first sweep:	- - - - - - - - -
After second sweep:	- - - - - - - - - - - - - - -
After third sweep:	- --- --- --- --- --- --- ---
After fourth sweep:	----------

2 TEST SIGNAL PROGRAMS

The MRL Calibration Tapes for the Sound Technology analyzer contain the following program, where n is explained below:

Test Signal	Repetitions	Duration
1 kHz		n * 18 s
Azimuth Test		n * 18 s
High-frequency Sweeps	n * 3	n * 15 s
Low-frequency Sweeps	n * 2	n * 36 s
1 kHz		n * 8 s
Full Sweeps	n * 1	n * 22 s
Total Duration:		n * 2 min

The duration of these signals that you need will depend on how many channels you try to align per playing of the Calibration Tape (since the Sound Technology analyzer displays 2 channels, we suppose you will align 2 channels per playing), whether a minor or major readjustment is needed, the convenience of finding and making the adjustments on the tape recorder, your familiarity with the recorder and the Sound Technology analyzer, and your skill.

The Table overleaf gives catalog numbers for Calibration Tapes having a total duration of 4 minutes (n = 2), and for Calibration Tapes having a total duration of 8 minutes (n = 4). With n = 2 (4 minutes total), for instance, there is 40 s of the first 1 kHz tone, then 6 high-frequency repetitions (30 s), etc. On request we will make tapes of other n-values and corresponding durations.

2.1 Azimuth Test Signal

The Azimuth Test signal is a continuous repetition of 30 ms each of the frequencies 2.8 kHz, 5.7 kHz, 11.8 kHz, and 15.8 kHz, all at the specified level.

2.2 High-frequency Sweeps

The High-frequency Sweeps step down a ratio of 0.779 636 (four Sound Technology frequencies), 12 steps in 1.2 s, as follows: 19 900 Hz ... 1300 Hz; 17 600 Hz ... 1200 Hz; 18 700 Hz ... 1150 Hz; 16 600 Hz ... 1050 Hz; and 1000 Hz. The four interleaved sequences take 5 s total.

2.3 Low-frequency Sweeps

The Low-frequency Sweeps step down the same ratio, 16 steps in 4.5 s, as follows: 1000 Hz ... 24 Hz; 886 Hz ... 21 Hz; 941 Hz ... 23 Hz; 830 Hz ... 20 Hz; and 19 Hz. The four interleaved sequences take 18 s total.

2.4 Full-range Sweeps

The Full-range Sweeps are intended for final data taking rather than for adjusting. Therefore they are one continuous sweep from 19 900 Hz to 20 Hz in 20s.

2.5 Calibration Graph

The calibration graph acconpanying each tape is *not* compensated for the low-frequency response (head-bumps) of our reproducer. Therefore, the graphs of the lower- and full-range sweeps show large deviations from flat. ***The tape flux is in fact correct***—only the graph is in error.

3 REPRODUCER TEST PROCEDURES

The Sound Technology Model 1500A or Model 1510A Tape Recorder Test Systems' "Operator's Manual" describes the function and sequence of operating the pushbuttons, and how to adjust the tape reproducer. It is well worth reading: the correct sequence of pushbutton operations is not obvious. These notes are intended to supplement the Manual.

3.1 Notes on the functions

START_INPUTS clears any previous display, and starts taking new data.

STOP stops taking new data, and holds existing data. If you don't STOP after a response run (either manually or by the auto-stop in the SINGLE mode), the system may replace some valid data with noise, producing a "hole" in the response plot. The auto-stop frequency is set by pressing the CURSOR POSITION switch to set the cursor to 1000 Hz for the High-frequency Sweeps, or 20 Hz for the Low-frequency sweeps or the Full Sweeps; then press LOW_SWEEP_LIMIT_SET. The current LOW_SWEEP_LIMIT_SET is displayed in the FREQ-RESP mode as, for instance, L.F.L. 1000 Hz; the setting continues until you change it.

LEFT RIGHT L&R and SWEEP_MODE in the FREQ_RESP mode:

In LEFT or RIGHT, with SWEEP_MODE: SINGLE, the system plots the four segments of a sweep, making one complete frequency response plot, then it auto-stops taking data.

In LEFT or RIGHT, with SWEEP_MODE: REPEAT, same, but doesn't auto-stop.

In L&R and SWEEP_MODE: SINGLE, plots as above left channel, auto-switches to right, then auto-stops.

In L&R and SWEEP_MODE: REPEAT, plots as above left channel, auto-switches to right, auto-switches to left, etc; doesn't auto-stop.

3.2 Test Procedure

The listing of a pushbutton (for instance START_INPUTS) means "press the pushbutton labelled START_INPUTS".

1 L&R Play the first 1 kHz tone from this Calibration Tape; adjust the tape reproducer gain control so the program level meter on the tape reproducer reads 0 dB. AC_VOLTS START_INPUTS INPUT_REF_SET/RECALL. (Turn up the Speaker knob so you can hear what's happening.) Level reference is now set for both channels.

2 Play Azimuth Test from this Calibration Tape. AZIMUTH START_INPUTS Adjust reproducer azimuth screw to minimize the height of the displayed bars.

3 FREQ_RESP Set the LOW_SWEEP_LIMIT_SET to 1 kHz as described above. FAST START_INPUTS Play the High-frequency Sweeps and adjust the reproducer high-frequency equalizers for the flattest response.

4 Set the LOW_SWEEP_LIMIT_SET to 20 Hz. START_INPUTS Play the Low-frequency Sweeps and adjust the reproducer low-frequency equalizers. See the section on Low-Frequency Response Calibration in MRL Pub. Choo&U for a discussion of problems in low-frequency calibration.

5 Using the next 1 kHz tone, repeat the procedure in Step 1 above. START_INPUTS Play the Full Sweeps and plot the final response of the adjusted reproducer.