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Slow Swept-Frequency Reproducer Calibration Tapes

0 INTRODUCTION

These tapes are for use with an automatic level recorder, in order to provide a complete graph of the frequency response of an adjusted reproducer. **We do not recommend the Slow Swept-frequency Calibration Tape for *adjusting* a reproducer:** in general, if you measure the frequency response of a reproducer by using the slow 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 (60 seconds later) to tell the effect of your change—and that's a long time to wait. We therefore recommend the MRL "Multifrequency" or "Fast Swept-frequency" calibration tapes for adjusting reproducers.

The Slow Swept-frequency signal is especially designed for use with the United Recording Electronics Industries (UREI) Model 200 Series Automatic Level Recorder with the Model 2010 Level and Frequency Detector Module; and with the Bruel and Kjaer Type 2305, 2306, 2307, or 2309 Level Recorders, with the Model 4409 or 4416 "Response Test Unit", which automatically starts the level recorder at the correct time.

This slow swept-frequency signal can also be used with any level recorder that can be set to track a sweep of 16 Hz to 20 kHz in 51.67 s or 20 Hz to 20 kHz in 50 s. This includes the UREI Model 200 with the Model 2000 Automatic Response Plotting Module, and the Bruel and Kjaer Level Recorders without the Response Test Unit.

Table of Slow Swept-Frequency Reproducer Calibration Tapes for Open-Reel Applications

Medium	Tape Speed	Equalization Standard	Level of Recorded Signals*	4 minutes total			8 minutes total		
				Catalog Number for Reference Fluxivity of:		Price	Catalog Number for Reference Fluxivity of:		Price
				250 nWb/m ("+3 dB")	355 nWb/m ("+6 dB")		250 nWb/m ("+3 dB")	355 nWb/m ("+6 dB")	
¼ in	**3.75 in/s**	IEC & **NAB**	-10 dB	**221-402-380-107**	**221-402-410-103**		**221-402-380-123**	**221-402-410-129**	
	7.5 in/s	IEC (IEC1)	-10 dB	231-402-380-104	231-402-410-100		231-402-380-120	231-402-410-126	
		NAB (IEC2)	-10 dB	**233-402-380-100**	**233-402-410-106**	100 $	**233-402-380-126**	**233-402-410-122**	140 $
	15 in/s	IEC (IEC1)	0 dB	241-402-480-104	241-402-510-100		241-402-480-120	241-402-510-126	
		NAB (IEC2)	0 dB	**243-402-480-100**	**243-402-510-106**		**243-402-480-126**	**243-402-510-122**	
	30 in/s	**AES** (IEC2)	0 dB	**251-402-480-101**	**251-402-510-107**	105 $	**251-402-480-127**	**251-402-510-123**	155 $
½ in	**3.75 in/s**	IEC & **NAB**	-10 dB	**321-402-382-104**	**321-402-412-100**		**321-402-382-120**	**321-402-412-126**	
	7.5 in/s	IEC (IEC1)	-10 dB	331-402-382-101	331-402-412-107		331-402-382-127	331-402-412-123	
		NAB (IEC2)	-10 dB	**333-402-382-107**	**333-402-412-103**	145 $	**333-402-382-123**	**333-402-412-129**	225 $
	15 in/s	IEC (IEC1)	0 dB	341-402-482-101	341-402-512-107		341-402-482-127	341-402-512-123	
		NAB (IEC2)	0 dB	**343-402-482-107**	**343-402-512-103**		**343-402-482-123**	**343-402-512-129**	
	30 in/s	**AES** (IEC2)	0 dB	**351-402-482-108**	**351-402-512-104**	170 $	**351-402-482-124**	**351-402-512-120**	250 $
1 in	**3.75 in/s**	IEC & **NAB**	-10 dB	**421-402-382-103**	**421-402-412-109**		**421-402-382-129**	**421-402-412-125**	
	7.5 in/s	IEC (IEC1)	-10 dB	431-402-382-100	431-402-412-106		431-402-382-126	431-402-412-122	
		NAB (IEC2)	-10 dB	**433-402-382-106**	**433-402-412-102**	265 $	**433-402-382-122**	**433-402-412-128**	415 $
	15 in/s	IEC (IEC1)	0 dB	441-402-482-100	441-402-512-106		441-402-482-126	441-402-512-122	
		NAB (IEC2)	0 dB	**443-402-482-106**	**443-402-512-102**		**443-402-482-122**	**443-402-512-128**	
	30 in/s	**AES** (IEC2)	0 dB	**451-402-482-107**	**451-402-512-103**	305 $	**451-402-482-123**	**451-402-512-129**	475 $
2 in	**7.5 in/s**	IEC (IEC1)	-10 dB	531-402-382-109	531-402-412-105		531-402-382-125	531-402-412-121	
		NAB (IEC2)	-10 dB	**533-402-382-105**	**533-402-412-101**		**533-402-382-121**	**533-402-412-127**	
	15 in/s	IEC (IEC1)	0 dB	541-402-482-109	541-402-512-105	375 $	541-402-482-125	541-402-512-121	570 $
		NAB (IEC2)	0 dB	**543-402-482-105**	**543-402-512-101**		**543-402-482-121**	**543-402-512-127**	
	30 in/s	**AES** (IEC2)	0 dB	**551-402-482-106**	**551-402-512-102**	420 $	**551-402-482-122**	**551-402-512-128**	645 $

* Because of tape saturation at higher frequencies at lower speeds, some tapes are recorded at 10 dB below the indicated fluxivity.
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 DESCRIPTION OF RECORDED SIGNALS

The MRL Slow Swept-frequency Calibration Tapes contain a number of repetitions of the following 60 s long sequence: 1000 Hz for 8.33 s, 20 Hz for 1.67 s, exponential sweep (often incorrectly called a logarithmic sweep) from 20 Hz to 20 kHz in 50 s. This sweep rate may be expressed as 1.67 s per a octave, or 16.67 s per decade of frequency.

You may find it convenient to cut off just one sweep, leader it, use it until it becomes worn out, then just throw it away and cut off another one. This has the advantage that you eventually have one very used sweep, and a reel of "new" sweeps, instead of an entire reel of partly-used sweeps. If you make the cut at the end of the 20 kHz sweep, just before the 1 kHz tone starts again, then you will get just one frequency sweep on your automatic plotter. Otherwise the UREI plotter will keep plotting over the previous plot; and the B & K unit will keep running out more graph sheets from the roll of graph paper. On the other hand, if you are plotting the response of a multi-track recorder, you may want to cut off as many sweeps as you have channels to test, and switch from channel to channel as you go from sweep to sweep.

The recording is full-track, so it can be played on a reproducer having any number of tracks.

2 INSTRUCTIONS

If you desire to adjust the azimuth or the equalizer response of the reproducer, this should be done *first*, using an MRL Multifrequency Calibration Tape, or an MRL Fast Swept-frequency Calibration Tape. Then use the Slow Swept-frequency Calibration Tape with a level recorder to provide a permanent graphical record of the frequency response of the reproducer.

2.1 Use with UREI Model 200 Series of Automatic Level Recorders with Model 2010 Level and Frequency Detector Module

The 8.33 s of 1000 Hz tone before the sweep may be used to set the level recorder gain so that the 1000 Hz level falls on a convenient graph division.

The 1.67 s of 20 Hz immediately preceding the sweep will allow the Frequency Detector of the Model 2010 Module to lock in on the starting frequency of 20 Hz. Then the Model 2010 will automatically track the sweep from 20 Hz to 20 kHz.

2.2 Use With Bruel and Kjaer Type 2305, 2306, 2307, and 2309 Level Recorders with the Model 4416 Reproducer Test Unit

Use the QP 1152 or similar graph paper. Set the Sweep Rate dial for 3 mm/s, which corresponds to a sweep of 20 Hz to 20 kHz on this graph paper in 50 s. Align the graph paper so that the frequency of 16 Hz is under the pen. Start the tape reproducer on the 1000 Hz section before the sweep. During this tone, set the level recorder gain control so that the pen falls on a convenient graph division. When the 1000 Hz tone stops, the Response Test Unit will automatically start the graph in motion. The 20 Hz response will be recorded in the space between the 16 Hz and 20 Hz divisions, and when the graph reaches 20 Hz (1.67 s after the 1000 Hz tone stops), the tone on the tape will begin its sweep.

2.3 Use with Other Level Recorders

In order to coordinate the sweep of a manually-operated level recorder with the sweep of the calibration tape, either of two methods can be used:

2.3.1 *First Manual-start Method*

Set the total sweep time to 60 s, and the time-base sweep rate so that the frequency range of 5 Hz to 20 kHz is traversed in 60 s. The graph scale of ANSI S1.22 and IEC 263 (5 mm per a octave, which is 15 mm per octave) is convenient; it is used on the Bruel and Kjaer QP 1152 graph, and on the MRL GP-5A Audio Frequency Response Graph Paper. In this case, set the sweep rate for 3 mm/s.

Start the pen at the point on the graph where 5 Hz would be. (This point is left of 20 Hz by two octaves, which is the same distance as that from 20 Hz to 80 Hz.) Manually start the level recorder sweep immediately when the 1000 Hz tone *starts*. The pen will then be at 16 Hz at the end of the 1000 Hz tone, and at 20 Hz when the actual sweep starts.

2.3.2 *Second Manual-start Method*

Set the total sweep time to 51.67 s and the time-base sweep rate so that the frequency range of 16 Hz to 20 kHz is traversed in 51.67 s. The graph scale of ANSI S1.22 and IEC 263 (5 mm per a octave, which is 15 mm per octave) is convenient; it is used on the Bruel and Kjaer QP 1152 graph, and on the MRL GP-5A Audio Frequency Response Graph Paper. In this case, set the sweep rate for 3 mm/s.

Start the pen at the point on the graph where 16 Hz would be. (This point is left of 20 Hz by a octave, which is the same distance as that from 20 Hz to 25 Hz.) Manually start the level recorder sweep immediately when the 1000 Hz tone *stops*. The pen will then be at 20 Hz when the actual sweep starts.

3 CALIBRATION GRAPH

The vertical scale on the graph that accompanies this tape is 5 mm $\triangleq$ 1 dB (smallest division $\triangleq$ 0.2 dB). The low-frequency response recorded on this tape is correct. The undulations that you see on the graph reflect the uncorrected response of the reproducing head used to monitor the reproduction.

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