



SHURE

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MICROPHONES AND ELECTRONIC COMPONENTS

AREA CODE 312/328-9000 • CABLE: SHUREMICRO

DATA SHEET

Model TTR-103 PHONO CARTRIDGE (45 rpm) Trackability Test Record

The TTR-103 contains three trackability\* tests:

1. 10.8 kHz pulsed high-frequency test with a 270 Hz repetition rate trackability and distortion test.
2. The 1000 Hz plus 1500 Hz mid-frequency trackability and distortion test.
3. The 400 Hz plus 4000 Hz low-frequency trackability and distortion test.

These tests appear on the record as shown in the table below:

| FREQUENCY                |           | BAND          |   | MAXIMUM PEAK VELOCITY (CM/SEC) |
|--------------------------|-----------|---------------|---|--------------------------------|
| Turntable Speed 45 rpm** |           | (Side 1)      |   |                                |
| Pulsed                   | 10.8 kHz  | Left Channel  | 1 | 15                             |
| Pulsed                   | 10.8 kHz  | Left Channel  | 2 | 19                             |
| Pulsed                   | 10.8 kHz  | Left Channel  | 3 | 24                             |
| Pulsed                   | 10.8 kHz  | Left Channel  | 4 | 30                             |
| 1000                     | + 1500 Hz | Lateral       | 5 | 20                             |
| 1000                     | + 1500 Hz | Lateral       | 6 | 25                             |
| 1000                     | + 1500 Hz | Lateral       | 7 | 31.5                           |
| 1000                     | + 1500 Hz | Lateral       | 8 | 40                             |
|                          |           | (Side 2)      |   |                                |
| Pulsed                   | 10.8 kHz  | Right Channel | 1 | 15                             |
| Pulsed                   | 10.8 kHz  | Right Channel | 2 | 19                             |
| Pulsed                   | 10.8 kHz  | Right Channel | 3 | 24                             |
| Pulsed                   | 10.8 kHz  | Right Channel | 4 | 30                             |
| 400                      | + 4000 Hz | Lateral       | 5 | 15                             |
| 400                      | + 4000 Hz | Lateral       | 6 | 19                             |
| 400                      | + 4000 Hz | Lateral       | 7 | 24                             |
| 400                      | + 4000 Hz | Lateral       | 8 | 30                             |

The ability of a pickup to track can be determined three ways: distortion measurements, visually on an oscilloscope, and audibly by listening. For best results, it is suggested that all three means be employed.

DISTORTION MEASUREMENTS

If a pickup mistracks any of these tests, distortion components are generated and distortion percentages can be defined.

A. 10.8 kHz Pulsed High-Frequency Test

The distortion component of this test appears at the repetition rate (270 Hz), and a distortion percentage can be defined as:

$$D_{HIGH} = \frac{\text{Voltage at 270 Hz}}{\text{Voltage at 10.8 kHz}} \times 100\%$$

The necessary voltages are obtained with a wave analyzer.\*\*\*

The bandpass width settings for the 10.8 kHz and 270 Hz voltages should be 1000 Hz and 30 Hz, respectively.

B. 1 kHz + 1.5 kHz Mid-Frequency Test

The distortion components of this test appear at the sum (2500 Hz) and difference (500 Hz) frequencies of the signal component frequencies. A distortion percentage is defined as:

$$D_{MID} = \frac{\text{Voltage at 2500 Hz} + \text{Voltage at 500 Hz}}{\text{Voltage at 1000 Hz} + \text{Voltage at 1500 Hz}} \times 100\%$$

The necessary voltages are obtained with a wave analyzer.\*\*\*

The bandpass width setting for the 500 Hz, 1000 Hz, 1500 Hz, and 2500 Hz voltages is 100 Hz.

C. 400 Hz + 4 kHz Test

The distortion of the 400 + 4000 Hz low-frequency test is best determined using an Amplitude Intermodulation Distortion Analyzer, as it adheres to the SMPTE\*\*\*\* intermodulation distortion input requirements.

THE DISTORTION PERCENTAGES VERSUS RECORDED VELOCITIES MAY BE PLOTTED TO PROVIDE A GRAPHIC PRESENTATION FOR EASY COMPARISONS.

VISUAL DETERMINATION OF MISTRACKING

Mistracking of a pickup for the high-frequency test can be determined by first passing the pickup output through a narrow-band filter centered at 270 Hz then displaying the filtered output on an oscilloscope. Any sudden change in the level of this output indicates mistracking.

The mid- and low-frequency tests are best presented in a Lissajous display. Any sudden change in the output at right angles to the display (vertical modulation) indicates mistracking.

AUDIBLE DETERMINATION OF MISTRACKING

A tonal change will occur in each of these tests when the pickup mistracks.

\*The term "trackability" refers to the ability of a phono pickup to reproduce high-level program material. The trackability limit of a pickup at any given tracking force and frequency is defined as the modulation velocity (measured in cm/sec) at which the stylus tip loses contact with one or both of the groove walls. This loss of contact results in severe distortion of the recorded program material.

\*\*This record has been recorded for 45 rpm playback in order to minimize the residual distortion level of the test signals due to tracing inaccuracies.

\*\*\*Care must be taken not to clip the input of the wave analyzer or associated pre-amplifier.

\*\*\*\*Society of Motion Picture & Television Engineers