

Space / Time Control

Level Calibration Manual

Table of Contents

- 1. Preface
 - 1.1 Prerequisites
 - 1.2 Abbreviations
 - 1.3 References
- 2. Calibration Procedure
 - 2.1 Source Gain Adjustment
 - 2.2 Sine Tone Calibration
 - 2.3 Level Calibration Project
- 3. Troubleshooting

1. Preface

The purpose of level calibration is to align the levels in the digital domain with the actual levels cut onto the disk. After a successful calibration, the playback level on disk should match the disk level predicted by the software.

▲ Read and follow the instructions below carefully. If unsure about a step, please contact our support team. The signals sent to the system during the calibration procedure can potentially damage your equipment. You will perform all calibration steps at your own risk.

1.1 Prerequisites

Before starting the level calibration process, ensure the following:

- Complete Pitch Calibration and Width Calibration before starting the level calibration procedure.
- Obtain the .head calibration file specific to your cutter head.
- Verify your playback path accuracy by playing a test record with a NAB reference tone (5 cm/s stereo @ 1 kHz) and checking the hardware LEVEL meters E to show 0 dB peak level in both channels.
- Prepare a lacquer for a test cut; the position of the cut on the disk is not critical.

1.2 Abbreviations

SDMS — Sillitoe Disk Mastering System hardware **STC** — Space / Time Control software

1.3 References



STC Lathe Calibration Dialog

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SDMS Master Control and Space / Time Control Hardware Modules

I All alphabetical and numerical references in this manual refer to the images above.

2. Calibration Procedure

2.1 Source Gain Adjustment

The first step of the calibration is to find a suitable DAC gain setting for the cutterhead.

- 1. Launch STC and open the Lathe Calibration dialog
- 2. Confirm your SDMS Master Control and Space / Time Control hardware modules are connected
- **3.** Select **SINE TONE 1** as the source and set the following **SIGNAL** parameters:
 - FREQUENCY 2 1 kHz
 - LEVEL 3 -14 dB
 - PHASE
 Lateral
- 4. Set the REFERENCE LEVEL 8 to its default value of -14.0 dB
- 5. Load your .head calibration file and verify it is displayed correctly in the HEAD 9 section
- 6. Disable automation for **DEPTH** (H), **CARRIAGE** (L) and **HEAD** (P) (LED buttons OFF)
- 7. Set the INPUT C selector to (D)igital
- 8. Use the GAIN (A) knob to adjust the SOURCE LEVEL (B) to -30 dB

When ready:

- 1. Unmute the cutter head G
- 2. Press the REC (10) button to start the test tone playback
- 3. Slowly increase GAIN (A) and monitor the LEFT and RIGHT (F) current meters
- 4. Ideally, you should reach a SOURCE LEVEL B of -10 dB without exceeding 250 mA on the LEFT and RIGHT F current meters. If 250 mA is reached at a lower SOURCE LEVEL, keep the GAIN A at that level
- 5. Stop the playback by pressing STOP (10) and mute the cutter head (G)
- 6. Note the current SOURCE LEVEL B as your base source level value

A higher **SOURCE LEVEL** value on the DAC will result in more headroom for loud cuts but bears the risk of damaging the cutter head by accidentially sending a loud signal to the head. If needed, you can adjust the gain after the initial calibration (see Troubleshooting below).

△ Changing the **SOURCE LEVEL** on the **SDMS Master Control**always requires adjusting the **REFERENCE LEVEL** accordingly in **STC**. Otherwise, the level cut on disk will not match the level

predicted by the software and the calculated pitch may be insufficient, thus risking overcuts.

2.2 Sine Tone Calibration

Next, cut a reference sine tone with that **GAIN** setting and play it back to determine the **REFERENCE LEVEL** in **STC** :

- 1. Set the following parameters in the **CONTROL** section:
- PITCH 5 100 µm
 WIDTH 6 50 µm
 HEAD 7 Drop
 2. Enable automation for DEPTH H, CARRIAGE L and HEAD P (LED buttons ON)
 3. Ensure the carriage direction M is set to F(orward)
 4. Set the TURNTABLE SPEED J to 33
 5. Switch on TURNTABLE K and VACUUM & STYLUS HEAT Q
 6. Unmute the cutter head G
 7. Press REC 10 and cut the test tone for 10...30 seconds
 8. Press STOP 10 to end the cut and mute the cutter head G

When finished:

- **1.** Switch the **MONITOR D** path to **PH(ONO)**
- 2. Play the test tone back on the SDMS and note the values on the SDMS Master Control hardware LEVEL (E) meter.
- 3. Adjust the REFERENCE LEVEL 8 based on the playback meter value relative to 0 dB :
 - If playback level > 0 dB , lower the reference level by the offset
 - If playback level < 0 dB , raise the reference level by the offset

EXAMPLE:

Observed Playback Level = +3 dB REFERENCE LEVEL = -14.0 dB - 3 dB = -17.0 dB

Due to the head calibration filter, the **FEEDBACK LEVEL** or **INPUT LEVEL** shown on the **SDMS Master Control** meters during the cut will not match the **DISK LEVEL** shown in **STC**. It is only important to match the **PLAYBACK LEVEL** of the hardware to the **DISK LEVEL** predicted by the software.

2.3 Level Calibration Project

To refine your calibration, use the **Level Calibration Project**, a short test groove with two special sine sweep signals ranging from 100 Hz to 1 kHz.

You can download the Level Calibration groove file here (2.5 MB).

 \triangle Cutting the project at higher levels will generate more pronounced excursion of the groove making it easier to measure and asses the groove geometry. However, sending sine tones for a sustained time to the head may damage or fatigue the coils. Keep the disk level of the sweep signal therefore below **0 dB** to avoid damage to your cutter head.

2.3.1 Cutting The Project



- 1. Launch STC and open the project Level Calibration.groove
- 2. Adjust the AUDIO GAIN control in STC until the Disk Level graph shows a maximum of 0 dB ; leave all other settings at their defaults.
- 3. Enable automation for DEPTH (H), CARRIAGE (L) and HEAD (P) (LED buttons ON)
- 4. Ensure the carriage direction M is set to F(orward)
- 5. Unmute the cutter head G
- 6. Move the playhead in STC to 00:00.000
- 7. Select File > Record Project to open the Cut Project dialog

8. Hold down the SHIFT key and click REC to start the cut. (Holding the SHIFT key will skip the lead-in and cut only the program, thus saving lacquer space.)

2.3.2 Evaluation



Inspect the groove under the groove inspection microscope and check the following items:

- Neighboring grooves should always have minimal land of $5...10 \ \mu m$; there should be no kissing grooves or overcuts
- In the second track with vertical stylus movement, the groove should always alternate between approximately the same minimum and maximum groove width. Check the **Groove Width** analysis graph or **MICROSCOPE** view in **STC** to see what width values to expect in the cut
- If the variation in width of the vertical groove is <u>greater</u> than predicted or you see kissing grooves, <u>lower</u> the **REFERENCE LEVEL** ⁽⁸⁾ in the **Calibration Dialog** until the **Groove Width** analysis graph matches your measurement
- If the variation in width of the vertical groove is <u>less</u> than predicted and the minimum land between grooves is wider than the MIN LAND setting, <u>raise</u> the REFERENCE LEVEL ⁽⁸⁾ in the Calibration Dialog until the Groove Width analysis graph values match the measurement

3. Troubleshooting

- Once calibrated, always keep the **SOURCE LEVEL B** of the **SDMS Master Control** at the level determined during calibration. Adjusting the hardware **GAIN** A after calibration will cause a mismatch between predicted disk level and actual disk level, potentially leading to overcuts due to miscalculated pitch signals
- If you need to adjust the SOURCE LEVEL B after calibration, you must also adjust the REFERENCE LEVEL
 in STC by the inverse offset

EXAMPLE:

```
Calibrated Source Level = -15 dB
Calibrated Reference Level = -14 dB
Added Gain = + 6 dB
=> New Source Level = -15 + 6 = -9 dB
=> New Reference Level = -14 - 6 = -20 dB
```